STYRENE PARK OFFSITE

Document Title:

Installation, Operating and Maintenance Manual

Rev.	Issued Date	DESCRIPTION	PREPARED	CHECKED	APPROVED
R1					
R0	17-09-2025	IFI	F.sh	M.O	A.M

REVISION RECORD SHEET

Page	Revisions								Page	Revisions						
Page	R0	R1								R0	R1	R2	R3	R4	R5	R6
1	X								41	X						
2	X								42	X						
3	X								43	X						
4	X								44	X						
5	X								45	X						
6	X								46	X						
7	X								47	X						
8	X								48	X						
9	X								49	X						
10	X								50	X						
11	X								51	X						
12	X								52	X						
13	X								53	X						
14	X								54	X						
15	X								55	X						
16	X								56	X						
17	X								57	X						
18	X								58	X						
19	X								59	X						
20	X								60	X						
21	X								61	X						
22	X								62	X						
23	X								63	X						
24	X								64	X						
25	X								65	X						
26	X								66	X						
27	X								67	X						
28	X								68	X						
29	X								69	X						
30	X								70	X						
31	X								71	X						
32	X								72	X						
33	X								73	X						
34	X								74	X						
35	X								75	X						
36	X								76	X						
37	X								77	X						
38	X								78	X						
39	X								79	X						
40	X								80-751	X						

MAYEKAWA Europe MYCOM

TECHNICAL UNIT MANUAL

CUSTOMER	MAYEKAWA MIDDLE EAST
REF. CUSTOMER	PO240070
UNIT	160VSD-M/PROPANE/0/56
REF. MAYEKAWA	SO 119897

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How to use the Instruction manual ?

Section 1

- To check the flow of the unit
- To find back the tags / POS in the components list on the unit layout
- To check the details on operation, noise and oil charge and others

Section 2

- To follow important steps for installation and start-up
- To check the items on wear and how to deal with it
- To check the quality of the oil and how to follow it up
- How to take care of major issues, troubles
- How to take care of the Safety labels on the unit.
- Be careful to take care of the limits accordingly.

Section 3

- How to take care of the spare parts
- Listing up the maintenance situation
- The separate manual on the compressor is imperative to read. to take care of the details and additional info on the items directly linked to the compressor.

Section 4 Contains the information of the items of the vendors.

- Here you find the details on the specific items,
- You can add notes and additional personal details on the item sheet and the first page of each technical page.
- Here is also general information on the vessels and bolt torques to take care of

How to find the individual technical page for a certain item?

There are three ways:

1) In the INDEX itself, when you look for the name of the item
2) In Section 4 Listing technical pages, right column with more description details
3) In the bookmark overview under the Listing technical pages of the IOM-manual, based on the numbering of the Technical page itself. When you click on the technical page number you find immediately the corresponding technical page.

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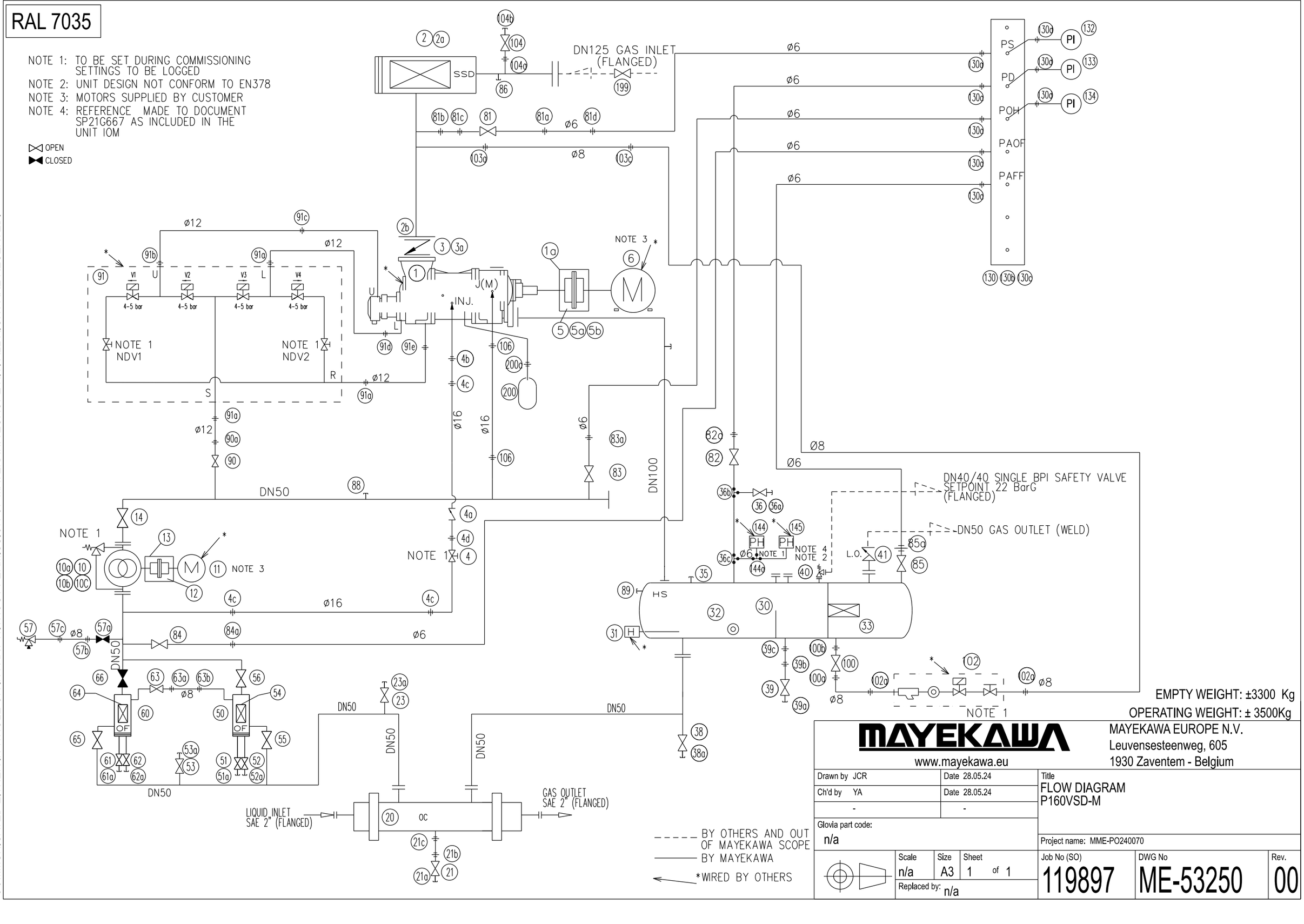
RAL 7035

NOTE 1: TO BE SET DURING COMMISSIONING SETTINGS TO BE LOGGED
NOTE 2: UNIT DESIGN NOT CONFORM TO EN378
NOTE 3: MOTORS SUPPLIED BY CUSTOMER
NOTE 4: REFERENCE MADE TO DOCUMENT SP21G667 AS INCLUDED IN THE UNIT IOM

OPEN
CLOSED

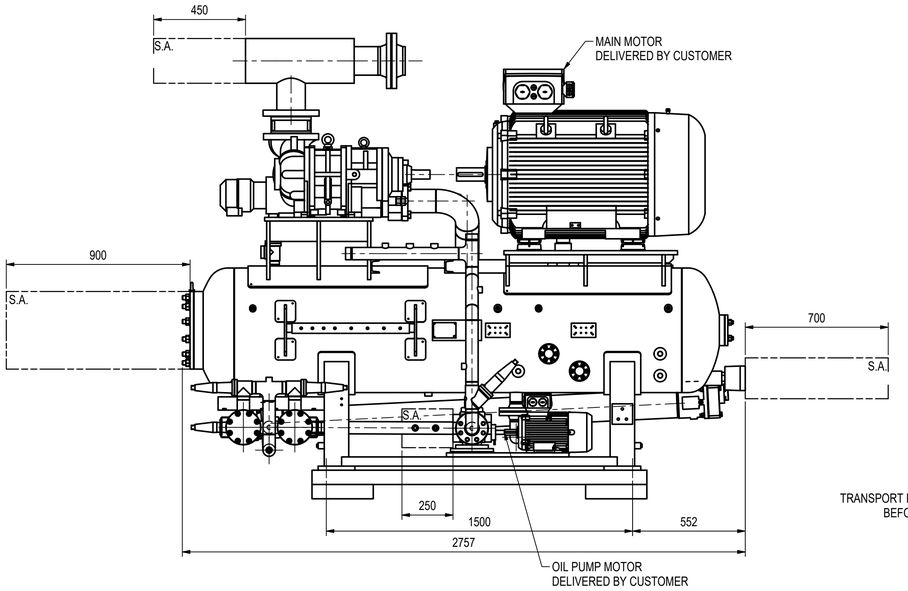


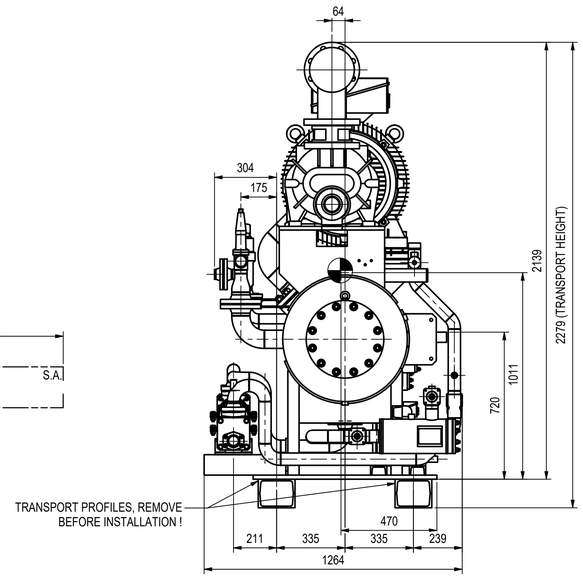
EMPTY WEIGHT: ±3300 Kg
OPERATING WEIGHT: ± 3500Kg

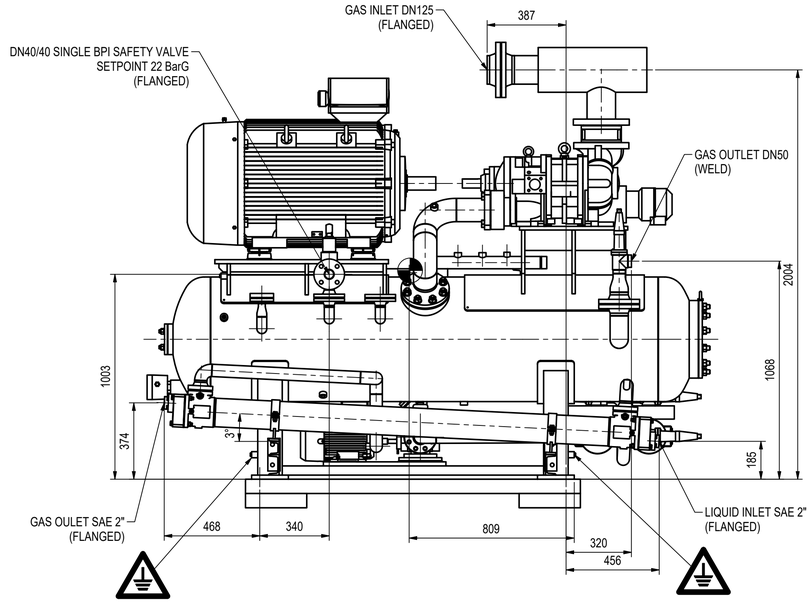
MAYEKAWA
www.mayekawa.eu

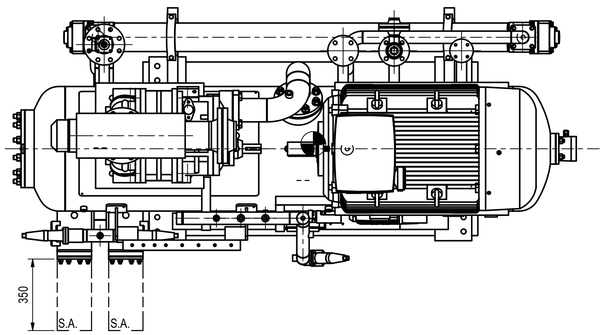
MAYEKAWA EUROPE N.V.
Leuvensesteenweg, 605
1930 Zaventem - Belgium

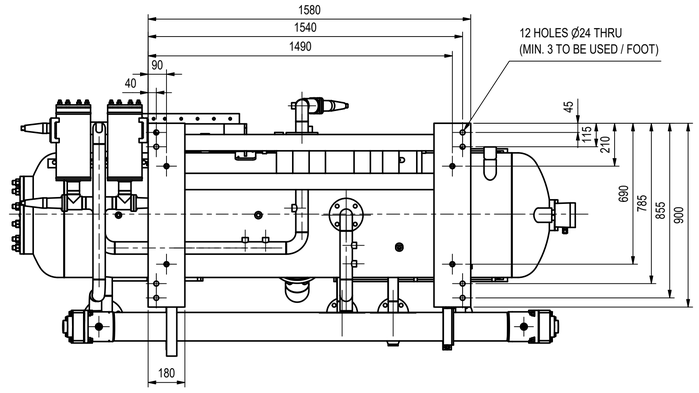
Drawn by JCR	Date 28.05.24	Title: FLOW DIAGRAM P160VSD-M
Ch'd by YA	Date 28.05.24	
-	-	
Glovia part code: n/a		Project name: MME-PO240070
Scale n/a	Size A3	Sheet 1 of 1
Replaced by: n/a		Job No (SO) 119897
		DWG No ME-53250
		Rev. 00

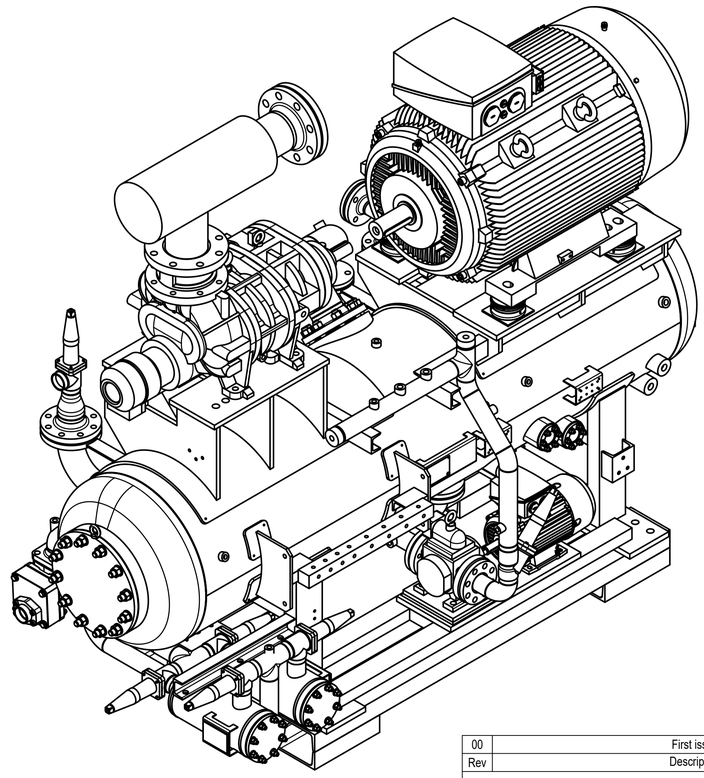












S.A. = SERVICE AREA

= CENTER OF GRAVITY

= GROUNDING
(AT LEAST 1 MANDATORY)

For more accurate transport dimensions, please contact Mayekawa Europe one week in advance of foreseen shipment date.			
Weight information (Approx.):			
Empty weight (kg):	3300	Max. operating weight (kg):	3500
Paint information:			
Unit color (RAL):	7035	Motor in the unit color: ☐ Yes ☒ No	
Paint system:			

Rev	Description	Drw	App	Date App
00	First issue	JCR	YA	04/06/2024

Revision table

MAYEKAWA EUROPE N.V.
Leuvensesteenweg, 605
1930 Zaventem - Belgium
www.mayekawa.eu

Customer:
Proj. nr:
Proj. name:
Ext. dwg. nr:
Ext. Rev.:

Status: **Released**

P160VSD-M

General arrangement for customer

Unit data
Idw file: 119897-0-ME-UL-00001.idw
Mod file: 119897-0-ME-UL-00001.iam
Cat.:

Drawn: JCR 04/06/2024
Chk'd: YA 04/06/2024
App'd:
Eng:

Unless mentioned, all dimensions in mm
Rc = Int. BSPT taper (ISO 7)
Rp = Int. BSPT parallel (ISO 7)
R = Ext. BSPT (ISO 7)

Scale: 1 : 15
Replaces:

GLOVIA Code

Size A1 | Sheet 1 of 1

SO | Emittor | Type | Doc. number: 119897-0-ME-UL-00001 | Rev. 00

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COMPONENTS LIST

CUSTOMER	**MME**	**DELIVERY DATE**	**20/08/2024**
UNIT TYPE	**160VSD-M/PROPANE/0/56/119897**	**REVISION**	**2 (30/07/2024)**
YOUR REFERENCE	**PO240070**	**QUANTITY**	**2**
OUR REFERENCE (SO)	**119897**	**DONE BY**	**YA / KVE**

POS	ITEM	QTY	PART CODE	DESCRIPTION	SUPPLIER
1	SCREW COMPRESSOR	1	P160VSD	PROCESS BARE SCREW COMPRESSOR	MAYEKAWA
1a	COUPLING COVER	1	COV-160/DD-AL	COUPLING COVER, 160V, ALU, EXT=115, ME-04928	MAYEKAWA
2	SUCTION STRAINER HOUSING	1	VES-SSD200-26/52-RM3-CE	SSD200 SUCTION STRAINER; 26/52 BARG ACC. CE-DESIGN	MAYEKAWA
2a	SUCTION STRAINER ELEMENT	1	FG423-200	SCREEN, SUCTION STRAINER SSD200	MAYEKAWA
2b	SSD BOLT SET	1	BOL-SSD-160V/1612V-SET	SSD BOLT SET, 160V & 1612V, M20X180, 8PCS, 42EVZ	MAYEKAWA
3	SUCTION CHECK VALVE	1	CHV-M125-DUO	M125G25GCPF DUO-CHECK VALVE, 25G, -46/+260°C	MAYEKAWA
3a	MACHINING SUCTION CHECK VALVE	1	MCH-CHV125-S	MCH DUO CHECK VALVE, M125, IN N/OUT F, SUCTION	MAYEKAWA
4	OIL INJECTION REGULATING VALVE	1	REV-1/2"NPT-SB-ANG	1/2"NPT REG-SB, CONE B, ANGULAR	MAYEKAWA
4a	OIL INJECTION CHECK VALVE	1	KD122-16E	OIL CHECK VALVE KZC16-050E, 1/2" BSPT - 16mm	MAYEKAWA
4b	NIPPLE 100MM	1	FIT-OILINJ-160V	NIPPLE3/8"BSPTM-1/2"BSPTF L=100 ST52.0	MAYEKAWA
4c	I HALF UNION	3	NJ2-1604NE	STRAIGHT HALF UNION, JO-6190, 16mm*1/2" BSPT	MAYEKAWA
4d	ELBOW M-F	1	NN130-04	STREET ELBOW (HP), 1/2" M-F	MAYEKAWA
5	COMPRESSOR COUPLING	1	COU-SR52-225-E130-SPACER-KIT	SPACER FOR SR52 225, DBSE = 130MM + FLEX EL + KIT	MAYEKAWA
5a	COMPRESSOR HUB	1	COU-SR52-225-HUB-160V	COMPR. HUB WITH HOLE AND KEYWAY 45MM, 160V-I-FM	MAYEKAWA
5b	MOTOR HUB	1	COU-SR52-225-HUB-M65	MOTOR HUB WITH HOLE AND KEYWAY 65MM	MAYEKAWA
6	MAIN MOTOR (HELMKE 120KW)	1	DELIVERED BY CUSTOMER	PART PROCURED AND DELIVERED TO MAYEKAWA	MAYEKAWA
10	OIL PUMP	1	OILP-M50P-M-VT	M50P-M OIL PUMP ASSY (CW) VITON O-RING	MAYEKAWA
10a	BASEPLATE FOR M50P	1	FRA-BASEPLATE-M50P-4KW	BASE PLATE FOR M50P, MOTOR FRAME = 112	MAYEKAWA
10b	OIL PUMP FLANGE	2	FLG-M50P-DN050-265GH	FLG M50/60P PUMP I/O SLIP-ON DN50 P265GH	MAYEKAWA
11	OIL PUMP MOTOR	1	DELIVERED BY CUSTOMER	PART PROCURED AND DELIVERED TO MAYEKAWA	MAYEKAWA
12	OIL PUMP COUPLING	1	COU-5R-P20-M28	COUPL. 5R BORE PUMP 20 MM / MOTOR 28 MM	MAYEKAWA
13	COUPLING COVER OIL PUMP	1	COV-M50P-ALU	COUPLING GUARD M50P, 3MM, ALU W/EXT	MAYEKAWA
14	STOP VALVE	1	SOV-DN50-SVAS-ST-A	DN50 STRAIGHT STOP VALVE, WELD, 52 barG	MAYEKAWA
20	OIL COOLER	1	VES-KS12-FEH-113-L2200-CE	COOLER TYPE KS12-FEH-113 L2200 INCL.CNTR FL	MAYEKAWA
21	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
21a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
21b	ELBOW M-F	1	NN130-03	STREET ELBOW (HP), 3/8" M-F	MAYEKAWA
21c	BUSHING	1	NF031-0403	HEXAGONAL BUSHING, 1/2" MALE * 3/8" FEMALE	MAYEKAWA
23	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
23a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
30	OIL SEPARATOR	1	VES-HS6022V-160-A-26-39-CE	HS6022V-160 OIL SEPARATOR ACC 005220-0-ME-VD-61000	MAYEKAWA
31	OIL HEATER	1	HEA-2000W-400	HEATER+THERMOSTAT 2kW, 3x 400V, L=700, 1½", IP65	MAYEKAWA
32	SIGHT GLASS	2	SIG-SW904610	FLANGED SIGHT GLASS SW 90.46.10, PE/NI-TUV	MAYEKAWA
33	FILTER ELEMENT	1	FC317-04	FILTER ELEMENT PS-KR1100-046P	MAYEKAWA
35	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	MAYEKAWA
36	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
36a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
36b	TEE	1	NN210-03	TEE, (HP) PT3/8" BSPT	MAYEKAWA
36c	TEE	1	NJ4-0603NE	TEE, JO-4140, 3/8" BSPT(M) * 6 mm * 3/8" BSPT(M)	MAYEKAWA

COMPONENTS LIST

CUSTOMER	**MME**	**DELIVERY DATE**	**20/08/2024**
UNIT TYPE	**160VSD-M/PROPANE/0/56/119897**	**REVISION**	**2 (30/07/2024)**
YOUR REFERENCE	**PO240070**	**QUANTITY**	**2**
OUR REFERENCE (SO)	**119897**	**DONE BY**	**YA / KVE**

POS	ITEM	QTY	PART CODE	DESCRIPTION	SUPPLIER
38	OIL DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
38a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
39	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
39a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
39b	ELBOW M-F	1	NN130-03	STREET ELBOW (HP), 3/8" M-F	MAYEKAWA
39c	BUSHING	1	NF031-0403	HEXAGONAL BUSHING, 1/2" MALE * 3/8" FEMALE	MAYEKAWA
40	SAFETY VALVE	1	SAV-458-40/40/40-22.0G	SINGLE BPI SAFETY VLV DN40/40 PN40 22.0G	MAYEKAWA
41	DISCHARGE STOP/CHECK VALVE	1	CHV-DN50-SCAX-ANG-D	DN50 ANGULAR STOP/CHECK VALVE, WELD, 52 barG	MAYEKAWA
50	OIL FILTER	1	VES-OF50-26-39-CE	OIL FILTER OF50-26-39 CE	MAYEKAWA
51	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
51a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
52	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
52a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
53	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
53a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
54	OIL FILTER ELEMENT	1	FG219-003	NYLON OIL FILTER ELEMENT, HC2003FN2T12HYR14-3, 20µ	MAYEKAWA
55	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	MAYEKAWA
56	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	MAYEKAWA
57	QUICK CLOSING DRAIN VALVE	1	QCV-1/2NPT-SSO-CS-ANG-40B	QUICK CLOSING VALVE, ½" NPT(F), ANG, 40G CS	MAYEKAWA
57a	STOP VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
57b	L HALF UNION	1	NJ3-0803NE	L TYPE HALF UNION, JO-4060, 8mm*3/8" BSPT	MAYEKAWA
57c	I HALF UNION	1	NJ2-0804NE	STRAIGHT HALF UNION, 8mm*1/2" BSPT	MAYEKAWA
60	OIL FILTER	1	VES-OF50-26-39-CE	OIL FILTER OF50-26-39 CE	MAYEKAWA
61	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
61a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
62	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
62a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	MAYEKAWA
63	STOP VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
63a	L HALF UNION	1	NJ3-0803NE	L TYPE HALF UNION, JO-4060, 8mm*3/8" BSPT	MAYEKAWA
63b	I HALF UNION	1	NJ2-0803NE	STRAIGHT HALF UNION, JO-4040, 8mm*3/8" BSPT	MAYEKAWA
64	OIL FILTER ELEMENT	1	FG219-003	NYLON OIL FILTER ELEMENT, HC2003FN2T12HYR14-3, 20µ	MAYEKAWA
65	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	MAYEKAWA
66	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	MAYEKAWA
81	VALVE TO PS	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
81a	I HALF UNION	1	NJ2-0603NE	STRAIGHT HALF UNION, JO-4020, 6mm*3/8" BSPT	MAYEKAWA
81b	NIPPLE 100MM	1	FIT-2X3/8"BSPTM-L100-A333G6	NIPPLE 2 X 3/8" BSPT-M L=100MM ASTM A333 SCHXXS	MAYEKAWA
81c	SOCKET	1	NN11ST-10	PT SOCKET S25C S80 RC 10A, 3/8" BSPT	MAYEKAWA
81d	UNION	1	NJ1-06NE	UNION JOINT(NE) 6*6 JO4180	MAYEKAWA
82	VALVE TO PD	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA

COMPONENTS LIST

CUSTOMER	**MME**	**DELIVERY DATE**	**20/08/2024**
UNIT TYPE	**160VSD-M/PROPANE/0/56/119897**	**REVISION**	**2 (30/07/2024)**
YOUR REFERENCE	**PO240070**	**QUANTITY**	**2**
OUR REFERENCE (SO)	**119897**	**DONE BY**	**YA / KVE**

POS	ITEM	QTY	PART CODE	DESCRIPTION	SUPPLIER
82a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	MAYEKAWA
83	VALVE TO POH	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
83a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	MAYEKAWA
84	VALVE TO PAOF	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
84a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	MAYEKAWA
85	VALVE TO PAFF	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
85a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	MAYEKAWA
86	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	MAYEKAWA
88	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	MAYEKAWA
89	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	MAYEKAWA
90	VALVE TO CAPACITY CONTROL	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
90a	L HALF UNION	1	NJ3-1203KNNT	L TYPE HALF UNION JO-4990 NNT 12*3/8	MAYEKAWA
91	CAPACITY CONTROL BLOCK	1	SLV-ME-230V-50HZ-BLOCK	SOL VLV CAP BLOCK, 230V 50Hz, 1/2"BSPT IP65, 3MM	MAYEKAWA
91a	L HALF UNION	3	NJ3-1204NE	L TYPE HALF UNION, JO-4070, 12mm*1/2" BSPT	MAYEKAWA
91b	L HALF UNION	1	NJ3-1204NE	L TYPE HALF UNION, JO-4070, 12mm*1/2" BSPT	MAYEKAWA
91c	L HALF UNION	1	NJ3-1202KNNT	L TYPE HALF UNION 12*1/4 NNT	MAYEKAWA
91d	L HALF UNION	1	NJ3-1203KNNT	L TYPE HALF UNION JO-4990 NNT 12*3/8	MAYEKAWA
91e	L HALF UNION	1	NJ3-1203KNNT	L TYPE HALF UNION JO-4990 NNT 12*3/8	MAYEKAWA
100	OIL RETURN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	MAYEKAWA
100a	L HALF UNION	1	NJ3-0803NE	L TYPE HALF UNION, JO-4060, 8mm*3/8" BSPT	MAYEKAWA
100b	ELBOW M-F	1	NN130-03	STREET ELBOW (HP), 3/8" M-F	MAYEKAWA
102	OIL RETURN BLOCK	1	SLV-ME-230V-50HZ-RET-BLOCK-20B	RETURN BLOCK, 230V 50Hz, 3/8"BSPT IP65, 2.7MM	MAYEKAWA
102a	I HALF UNION	2	NJ2-0803NE	STRAIGHT HALF UNION, JO-4040, 8mm*3/8" BSPT	MAYEKAWA
103a	I HALF UNION	1	NJ2-0803NE	STRAIGHT HALF UNION, JO-4040, 8mm*3/8" BSPT	MAYEKAWA
103c	UNION	1	NJ1-08NE	UNION JOINT(NE) 8*8 JO5010	MAYEKAWA
104	PURGE VALVE	1	SOV-1/2"FPT-SVAS-ST	1/2"FPT STRAIGHT STOP VALVE, 52 barG (DN25 BW)	MAYEKAWA
104a	NIPPLE 100MM	1	FIT-2X1/2"BSPTM-L100-A333G6	NIPPLE 2 X 1/2" BSPT-M L= 100MM ASTM A333 SCHXXS	MAYEKAWA
104b	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	MAYEKAWA
106	L HALF UNION	2	NJ3-1604NE	L TYPE HALF UNION, 16mm*1/2" BSPT	MAYEKAWA
130	TERMINAL BLOCK	1	MCH-SUC5264	TERMINAL BLOCK, 8X 1/4" NPT + 16X 1/4" BSPT	MAYEKAWA
130a	L HALF UNION	5	NJ3-0602KNNT	L TYPE HALF UNION JO-4080 NNT 6*1/4	MAYEKAWA
130b	PLUG	8	NF02-02	PLUG w/ HEXAGONAL HEAD, 1/4" BSPT, JO-4541	MAYEKAWA
130c	PLUG NPT	8	FIT-PLUG-1/4"NPT-CS	PLUG w/ HEXAGONAL HEAD, 1/4"NPTF-M, CARBON STEEL	MAYEKAWA
130d	ELBOW M-F	3	NN130-02	STREET ELBOW (HP), 1/4" M-F	MAYEKAWA
132	PRESSURE GAUGE SUCTION	1	GAU-63-10BAR	PRESSURE GAUGE 63MM, -1/10 Bar(g), ¼" BSPT	MAYEKAWA
133	PRESSURE GAUGE DISCHARGE	1	GAU-63-25BAR	PRESSURE GAUGE 63MM, -1/25 Bar(g), ¼" BSPT	MAYEKAWA
134	PRESSURE GAUGE OIL HEADER	1	GAU-63-25BAR	PRESSURE GAUGE 63MM, -1/25 Bar(g), ¼" BSPT	MAYEKAWA
144	HIGH PRESSURE SAFETY SWITCH	1	CTR-HP-RT6AES-M-G3/8"	RT6AES SWITCH (NH3) MAN.RESET G3/8" IP54 10-28BAR	MAYEKAWA
144a	TEE	1	NJ4-06NE	TEE, JO-4110, 6*6*6 mm	MAYEKAWA

COMPONENTS LIST

CUSTOMER	**MME**	**DELIVERY DATE**	**20/08/2024**
UNIT TYPE	**160VSD-M/PROPANE/0/56/119897**	**REVISION**	**2 (30/07/2024)**
YOUR REFERENCE	**PO240070**	**QUANTITY**	**2**
OUR REFERENCE (SO)	**119897**	**DONE BY**	**YA / KVE**

POS	ITEM	QTY	PART CODE	DESCRIPTION	SUPPLIER
144b	EXTRA BACK PLATE	2	FRA-SUPP-CTR-RT-AL	SUPPORT PLATE RT SWITCHES	MAYEKAWA
144c	U BRACKET WELD	2	FRA-SUPP-CTR-KP/RT-U-CS	U-BRACKET FOR CTR RT/KP WELD	MAYEKAWA
145	HIGH PRESSURE LIMITER	1	CTR-HP-RT6AEB-M-G3/8"	RT6AEB SWITCH (NH3) MAN.RESET G3/8" IP54 10-28BAR	MAYEKAWA
199	*LD* SUCTION STOP VALVE	1	SOV-DN125-SVAS-ANG-B4	DN125 ANGULAR STOP VALVE, WELD, 52 barG	MAYEKAWA
200	OIL LEAK RECEIVER	1	OIL-LEAKRECEIVER	OIL SEAL LEAK RECEIVER + PLASTIC BOTTLE	MAYEKAWA
200a	I HALF UNION	1	NJ2-0602NE	STRAIGHT HALF UNION, JO-4010, 6mm*1/4" BSPT	MAYEKAWA
GAS	GASKET COMPRESSOR SUCTION	1	CR72000-125N	GASKET, MYCOM FLANGE 125A (ASBESTOS FREE)	MAYEKAWA
GAS	GASKET COMPRESSOR DISCHARGE	1	CS23600-160N	GASKET 100CD, DISCHARGE FLANGE SPACER (ASBESTOS FR	MAYEKAWA
GAS	GASKET COMPRESSOR ECONOMIZER	1	CR72000-025N	GASKET, MYCOM FLANGE 25A (ASBESTOS FREE)	MAYEKAWA
GAS	GASKET SUCTION STRAINER GAS INLET	1	GAS-FLT-GRO-125-MLGRA	GASKET DN125 TON-GRO (TG) (175X155X2) MLGRA	MAYEKAWA
GAS	GASKET SUCTION STRAINER GAS OUTLET	1	GAS-FLT-GRO-125-MLGRA	GASKET DN125 TON-GRO (TG) (175X155X2) MLGRA	MAYEKAWA
GAS	GASKET SUCTION STRAINER COVER	1	GAS-SSD200-COVER-MLGRA	GASKET SSD200/OF200 COVER (170X150X2) MLGRA	MAYEKAWA
GAS	GASKET OIL SEPARATOR HANDHOLE	1	GAS-HS-COVER-CIRC-12XM20-FIBGA	GASKET HANDHOLE CIRC 380X280 - 12XM20 - FIBGA	MAYEKAWA
GAS	GASKET OIL SEPARATOR INSPECTION HOLE	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	MAYEKAWA
GAS	GASKET OIL SEPARATOR GAS INLET	1	GAS-FLT-PN40-100-CORGR	GASKET DN100 PN25-40 CR/RF (170X115X2) CORGR	MAYEKAWA
GAS	GASKET OIL SEPARATOR GAS OUTLET	1	GAS-FLT-GRO-080-MLGRA	GASKET DN080 TON-GRO (TG) (120X106X2) MLGRA	MAYEKAWA
GAS	GASKET OIL SEPARATOR OIL OUTLET	1	GAS-FLT-GRO-050-MLGRA	GASKET DN050 TON-GRO (TG) (87X73X2) MLGRA	MAYEKAWA
GAS	GASKET OIL SEPARATOR SAFETY VALVE	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	MAYEKAWA
GAS	GASKET HORIZONTAL FINE FILTER	1	GAS-MBC9434-FNP	GASKET FINE FILTER (40x18x3) PREMIUM II	MAYEKAWA
GAS	GASKET OIL FILTER	2	FN14-150N	GASKET, REVERSE FLANGE GRA150 1.5TN	MAYEKAWA
GAS	GASKET DSV2 FLANGE	1	GAS-DAN-DSV2-IN-025-MLGRA	GASKET DANFOSS DSV2 IN DN25 (48X37X2) MLGRA	MAYEKAWA
GAS	GASKET PILOT BLIND FLANGE	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	MAYEKAWA
GAS	GASKET OIL PUMP	2	PL021-050	FLANGE GASKET V6502 20K RF 50A	MAYEKAWA
MMM	OIL FILTER SET	1	VES-OF50D5-SET-26-39-CE	OF50-26-39 DN50 OIL FILTER HOUSING ACC.CE-DESIGN	MAYEKAWA
XXX	SUPPORT OIL RETURN BLOCK	1	FRA-SUPPORT-OILRETURN-BLOCK	FRAME SUPPORT OILRETURN BLOCK	MAYEKAWA
XXX	MOTOR ALIGNMENT BLOCK	4	ADJ-BLOCK-150X40X20-M16	MOTOR ALIGNMENT BLOCK, M16, ME-SUC1000	MAYEKAWA
XXX	SUPPORT FOR CAPACITY CONTROL BLOCK	1	FRA-CAPCON-BLK-SUPP-235JR	SUPPORT FOR CAPACITY CONTROL BLOCK - 235JR	MAYEKAWA
XXX	GASKET SAFETY VALVE INLET	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	MAYEKAWA
XXX	VES RES	1	VES-RESERVATION-FOR-WO	VES RESERVATION FOR WO	MAYEKAWA
YYY	*LD* GASKET SAFETY VALVE OUTLET	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	MAYEKAWA
YYY	*LD* OIL FILTER ELEMENT	1	FG214-200	SS OIL FILTER ELEMENT ESD200, OF50, 44µ	MAYEKAWA
YYY	*LD* GASKET OIL FILTER	1	FN14-150N	GASKET, REVERSE FLANGE GRA150 1.5TN	MAYEKAWA

Compressor Order Datasheet	SO 119897		
MODEL :		P160VS*-M	P160VS*-M
REFRIGERANT :		PROPANE	PROPANE
RECOMMENDED PORT :		M	M

Vi :	[-]	3,64	3,64
COMPRESSION RATIO :	[-]	4,37	4,37
CAPACITY :	[kW]	196,1	46,7
CAPACITY :	[TR]	55,8	13,3
ABSORBED POWER :	[kW]	98,2	57,3

DRIVE SHAFT SPEED :	[min-1]	2950	2950
COMPRESSOR SPEED :	[min-1]	2950	2950
INDICATOR POSITION :	[%]	90	10
CONDENSING TEMP. :	[degC]	56	56
EVAPORATIVE TEMP. :	[degC]	0	0
SUCTION SUPERHEAT :	[degC]	0	0
LIQUID SUBCOOLING :	[degC]	0	0
SUCTION TEMP. :	[degC]	0	0
OIL SUPPLY TEMP. :	[degC]	60	60
SUCTION PRESS. :	[MPaA]	0,466	0,466
DISCHARGE PRESS. :	[MPaA]	2,03	2,03
OIL SUPPLY PRESS. :	[MPaA]	2,23	2,23
SUCTION PRES. DROP :	[MPa]	0,005	0,005
DISCHARGE PRES. DROP :	[MPa]	0,05	0,05

SWEPT VOLUME :	[m3/h]	415	415
LOAD(SUCTION VOL. FLOW RATE) :	[%]	86,5	20,6
DISCHARGE TEMP. :	[degC]	70,2	74,7
REFRIG. FLOW RATE SUC. :	[m3/h]	317	75,6
REFRIG. FLOW RATE DIS. :	[m3/h]	76	18,7
REFRIG. FLOW RATE SUC. :	[kg/h]	3213	765,8
REFRIG. FLOW RATE DIS. :	[kg/h]	3213	765,8
INJECT. OIL FLOW RATE :	[L/min]	31,2	35,7
LUB. OIL FLOW RATE :	[L/min]	46	46
F.SIDE OIL FLOW RATE :	[L/min]	8,53	8,53
TOTAL OIL FLOW RATE :	[L/min]	85,7	90,3
OIL HEAT REJECTION :	[kW]	24,7	37,5
OIL SPEC HT :	[J/kgK]	1930	1930
OIL DENSITY :	[kg/m3]	880	880

COP :	[-]	2	0,815

Elevation :	[m]	NA	NA
Atmospheric :	[MPa]	NA	NA

Noise calculation

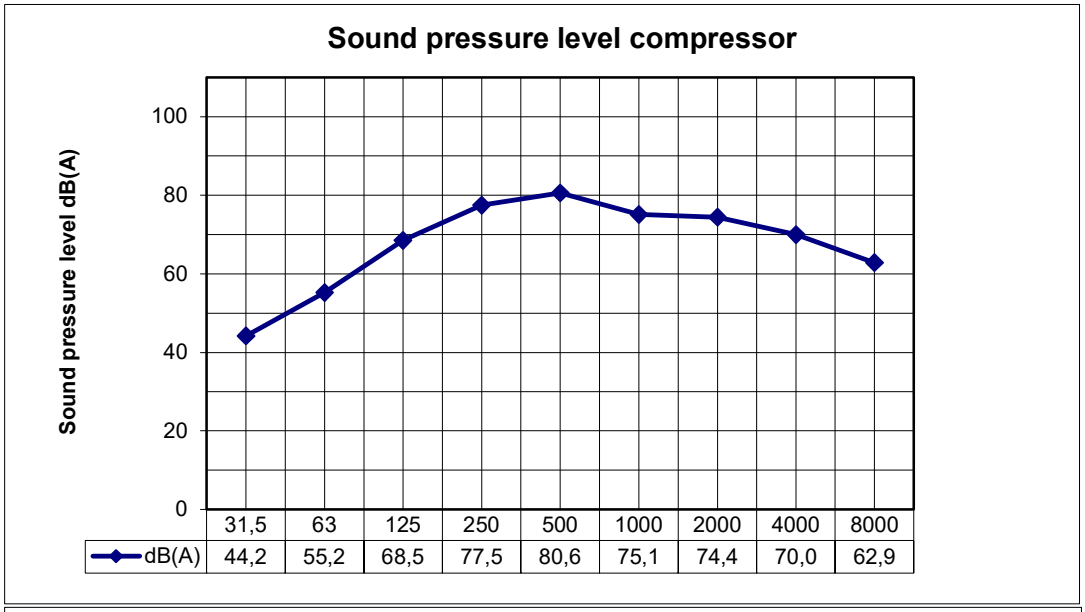
rev12

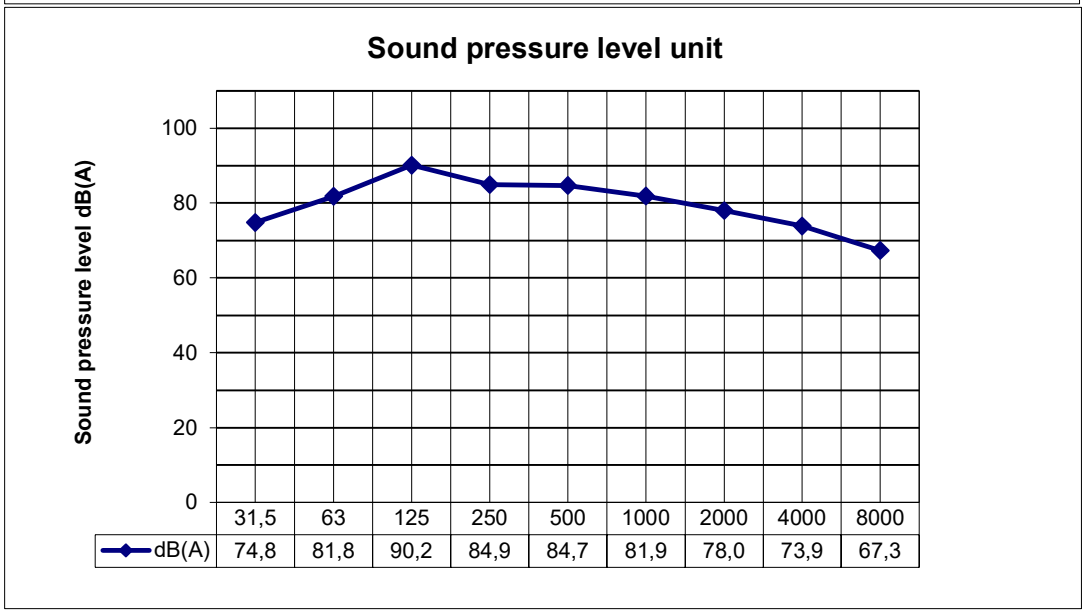
Compressor 160S-50

Values are for reference only!!!
they depend on operating conditions and construction at site.

Hz	Compressor dB(A)	Unit dB(A)
31,5	**44,2**	74,8
63	**55,2**	81,8
125	**68,5**	90,2
250	**77,5**	84,9
500	**80,6**	84,7
1000	**75,1**	81,9
2000	**74,4**	78,0
4000	**70,0**	73,9
8000	**62,9**	67,3
Overall	**84,0**	**93,2**

Distance from compressor 1 m
Distance from unit 1 m





MAYEKAWA EUROPE, LEUVENSESTEENWEG 605, 1930 ZAVENTEM

DATE	15/05/2024
USER ID	YA / KVE
CUSTOMER	MME
INSTALLATION	
SO NUMBER	119897
COMPRESSORTYPE	P160VSD-M
SERIAL NUMBER	

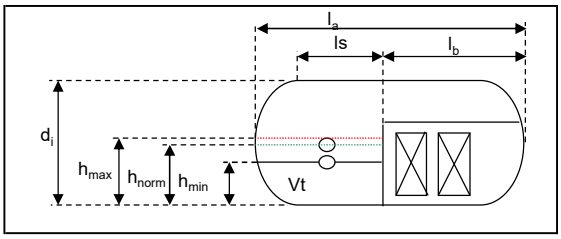
OIL SEPARATOR

HS 6022V-XXX

l_a =	2,572 m	V_t =	0,043 m³
l_b =	1,202 m	$V_{t\,min}$ =	43 L
d_i =	0,59 m	$V_{t\,norm}$ =	0,099 m³
h_{max} =	0,204 m	$V_{t\,norm}$ =	99 L
h_{norm} =	0,18 m	$V_{t\,max}$ =	0,117 m³
h_{min} =	0,095 m	$V_{t\,max}$ =	117 L
Marine tank volume		V_{tank} =	0 L

	hmin	hnorm	hmax
h / di =	0,17	0,31	0,35
k1 =	0,0885	0,2073	0,245
k2 =	0,0178	0,0338	0,0377

$$Vt[m^3] = (Ka \bullet di^2 \bullet la - Kb \bullet di^3) - (Ka \bullet di^2 \bullet lb - Kb \bullet di^3)$$



OIL COOLER

OC25320

Oil Cooler =	KS12-FEH-113-L2200
Oil volume =	17 L

THERMOSIPHON

Vtmin =	60	L
Vtnorm =	116	L
Vtmax =	134	L

vessel + cooler volume

OIL FILTER(S)

Type/model = OFC50
Quantity = 2

$Volume_{filter}$ = 14 L

Vtmin =	74	L
Vtnorm =	130	L
Vtmax =	148	L

vessel + cooler + filter volume

TOTAL OIL VOLUME

(●) DN50 ( ) DN65 ( ) DN80 ( ) DN100

Vt min =	82	L
Vt norm =	143	L
Vt max =	163	L

OPERATIONAL WEIGHT = EMPTY WEIGHT + 200

MAYEKAWA Europe MYCOM

INSTALLATION, PREPARATION, START-UP, MAINTENANCE SCREW COMPRESSORS

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

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1. INSPECTION AT RECEIPT OF UNIT

- At receipt of equipment at site it is essential that unit is inspected on transport damages. In case of damages please note down the details & take necessary photos and report immediately to transport company and MAYEKAWA.
- Connection flanges of piping are covered by steel plates; control panel is protected by plastic against water & humidity (if part of delivery).
- Unit is pressurised with approx. 0,5 barG dry nitrogen for rust prevention.
- Spacer and flexible elements of coupling and compressor toolkit are shipped as loose items packed in separate carton box.

2. RIGGING AND LIFTING

Crane or suitable lifting equipment with following care can lift unit.
The ground condition is to be checked by lifting specialist and flat- and stiff ground must be selected for lifting.

2.1) In case of using forklift. This is only possible if suitable transport / lifting profiles are mounted under the unit. Please refer to attached detail. Forklift with sufficient lifting capacity and sufficient long forks is to be used.
Lifting cables should be as long as possible for balancing.
Care should be taken that lifting cables do not touch the unit equipment & damage it.
The lifting lugs foreseen on compressor, motor and other individual components can not be used for the lifting of the unit.

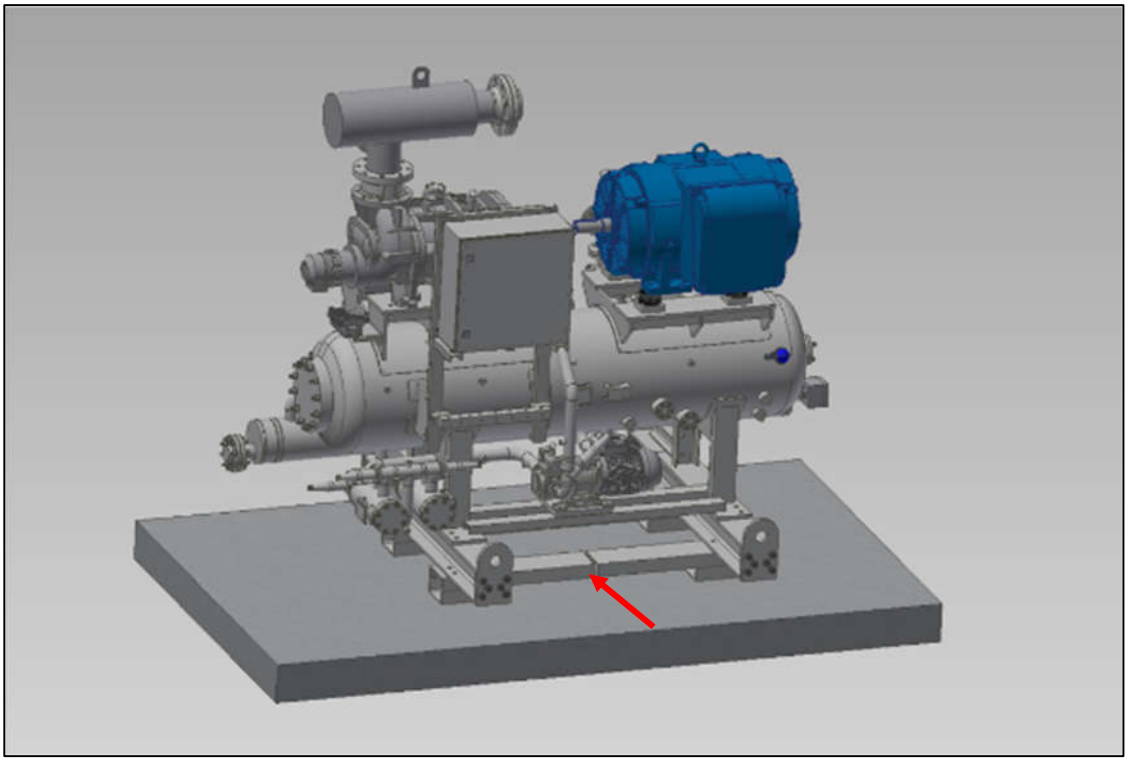
2.2) In case of using crane, lifting points on the unit should be used.
Please refer to attached detail.

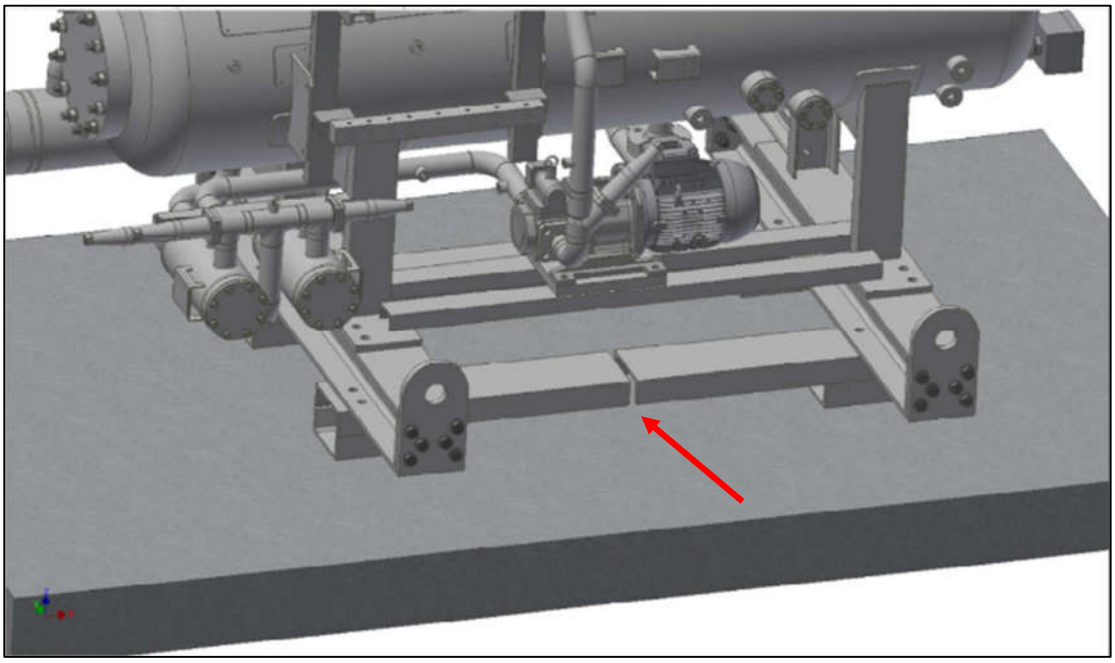
IMPORTANT: It is forbidden to stand under lifted goods or to come too close to moving goods which can cause injuries & death to persons.

The lifting of goods shall be done with approved lifting equipment and by a company with the necessary expertise. The installation company might need to consider the use of an experienced 'lift and shift' company that is certified to manipulate goods on a safe way. The customer/installation company is responsible for any risk assessments that might be necessary to manipulate the goods.

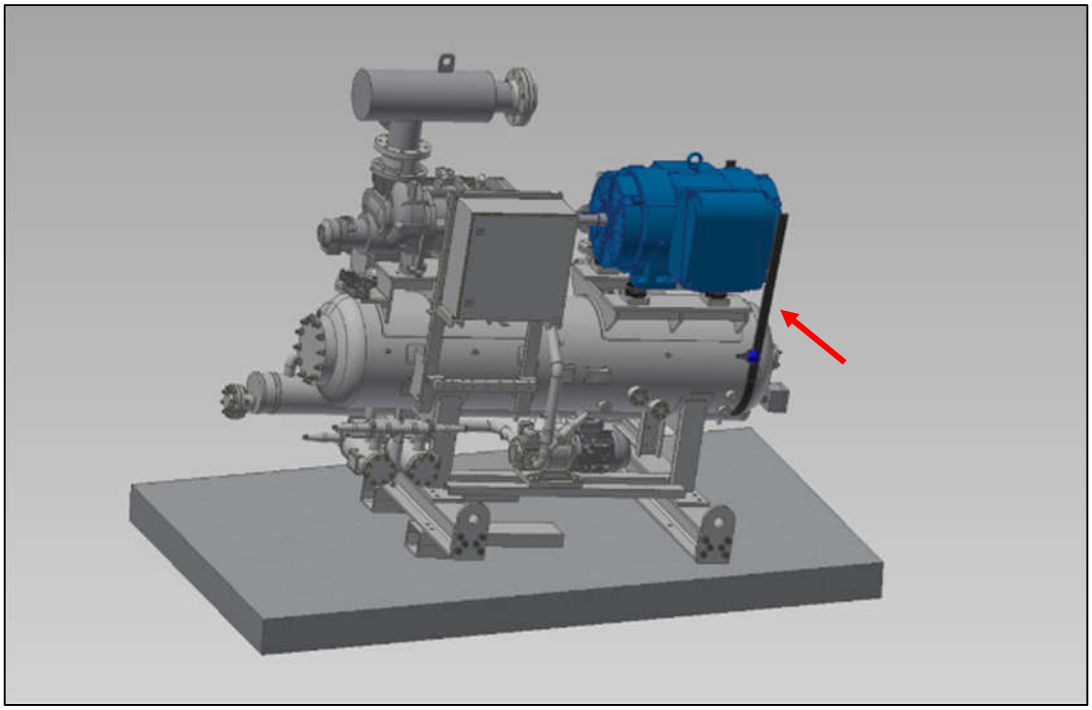
2.3) In case that compressor units must be suitable for lifting by crane and by forklift, but the oil separator used does not have permanent lifting lugs
(HS5026I - 125I + 160I, or HS6022J/V - 160V + 200V + 170J), it will be needed to follow a specific procedure, once the unit is in position:

1- Split frame in two pieces with a cutting torch:

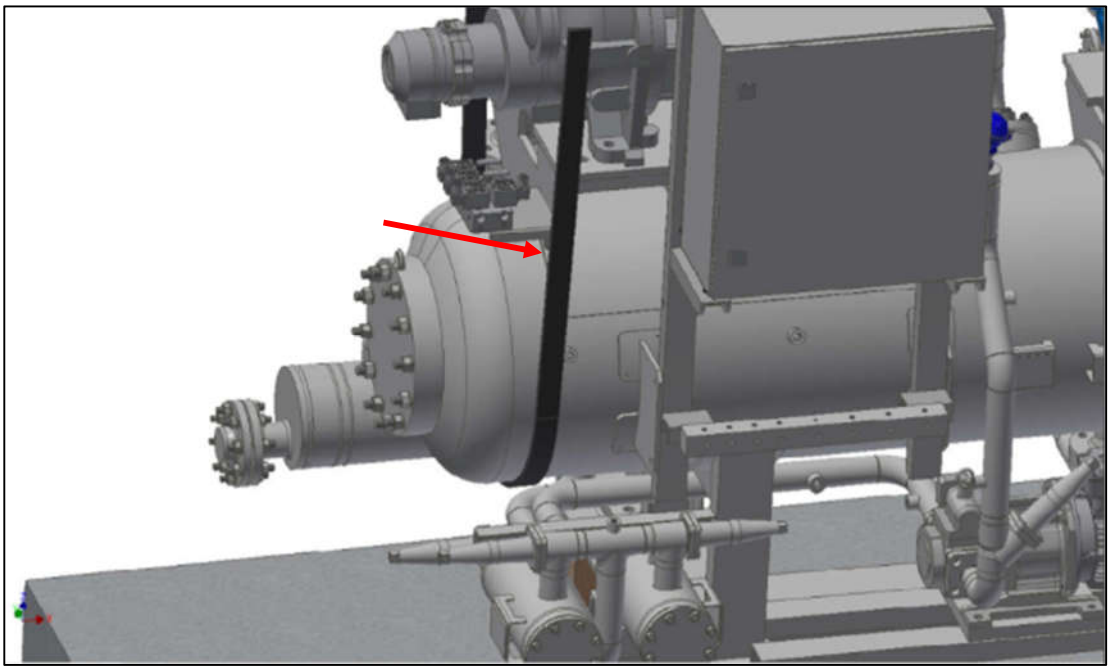


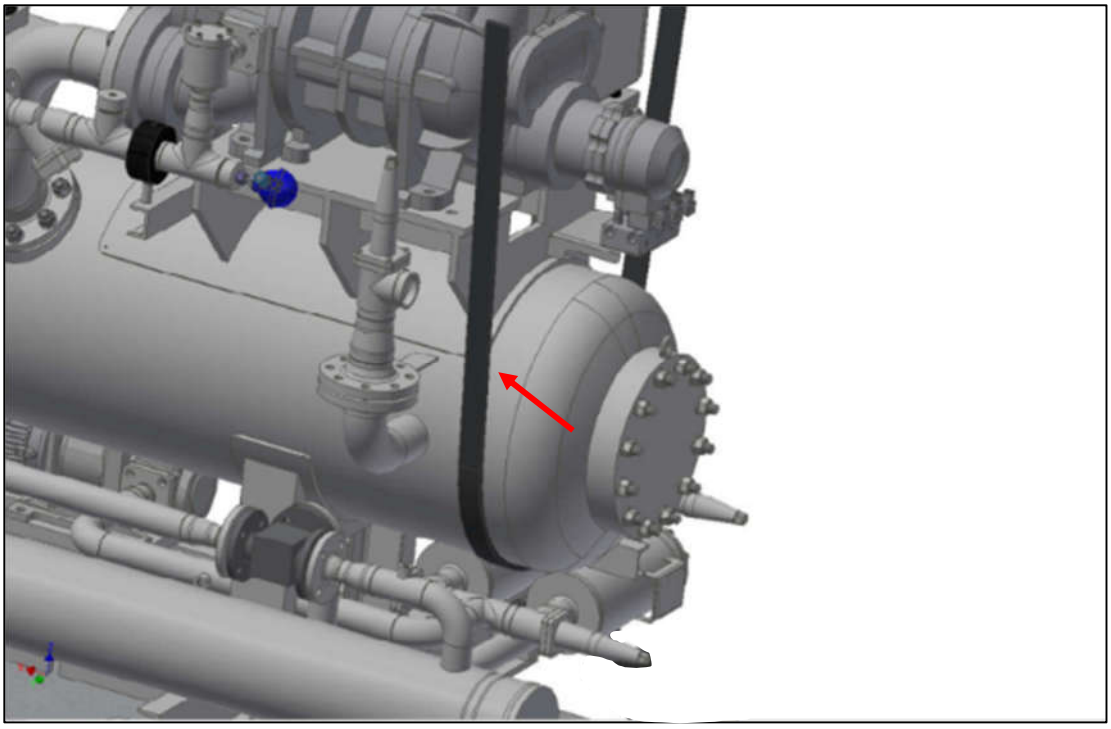


2- It is required to work in two steps, in order to avoid the unit to be in a tilted position:

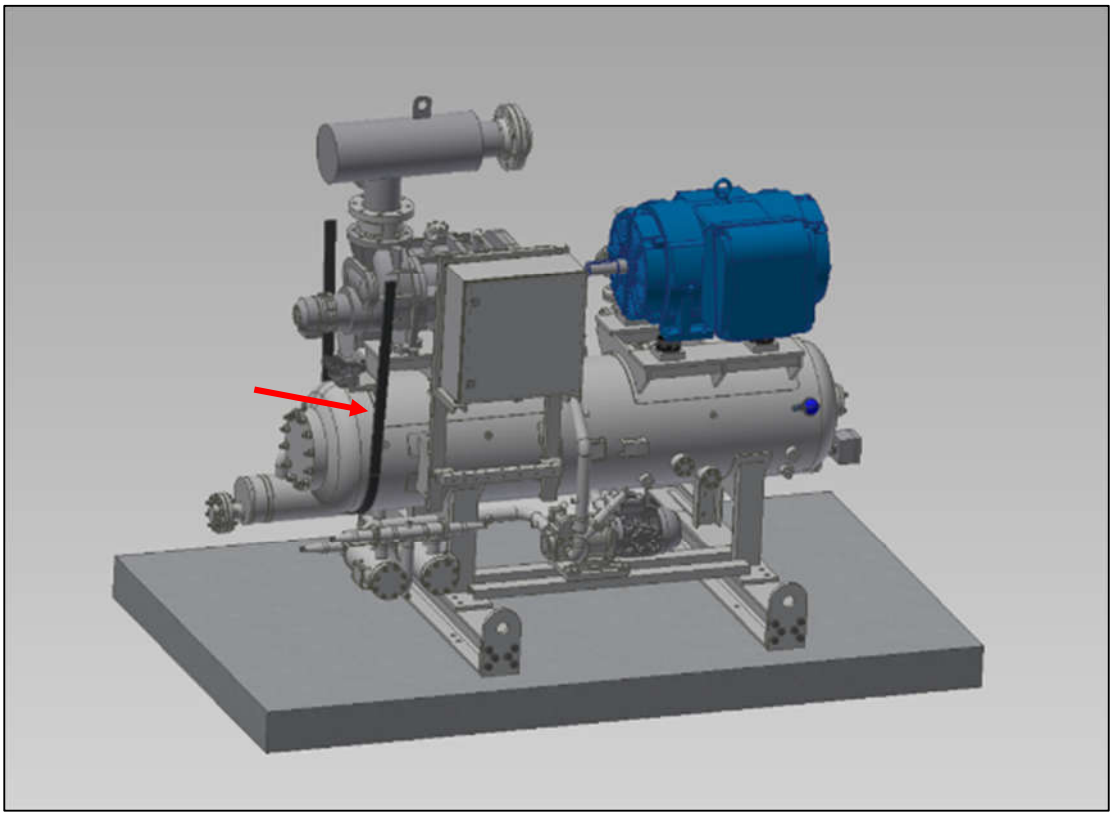


In addition, it is strongly recommended lifting only one part of the unit at time, as mentioned before, since if both extremes are raised at the same time, unit could roll up completely and cause structural damage. To avoid being in conflict with nozzles, support plates or even transmitters, lifting belts must be located as indicated in the following schemes:

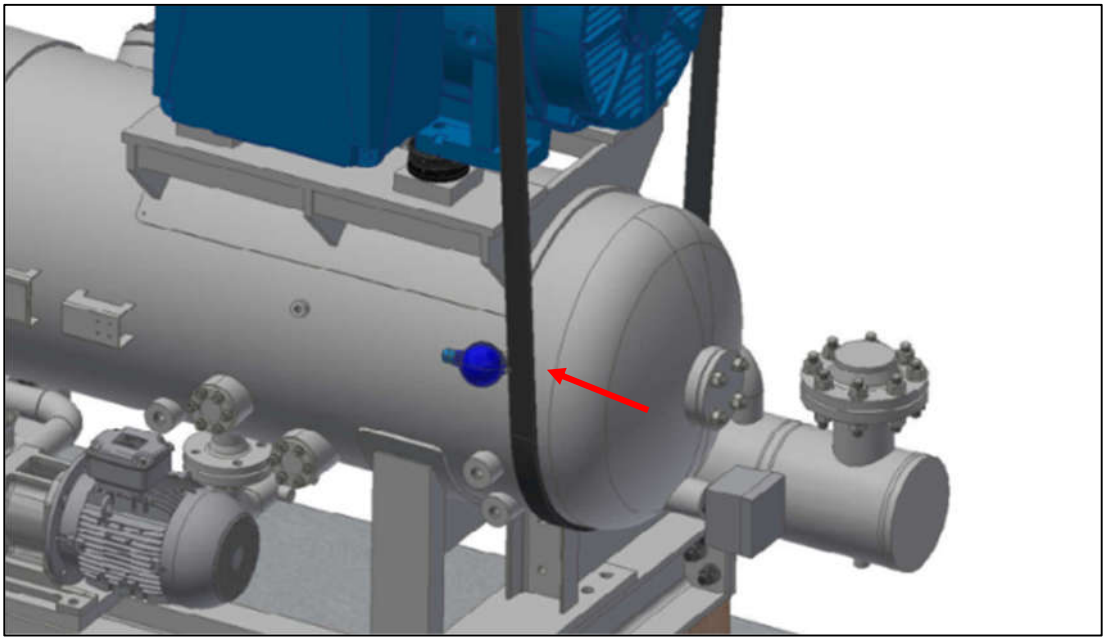


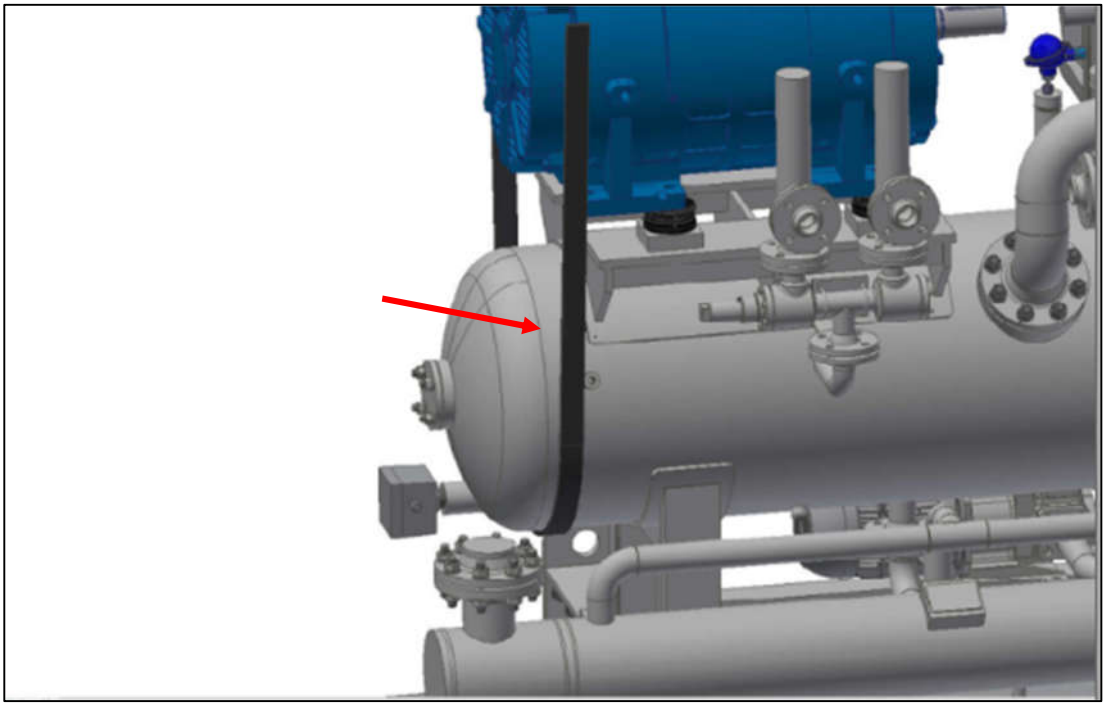


3- Similar procedure should be followed for another part of the unit, then, transport profiles are already removed:

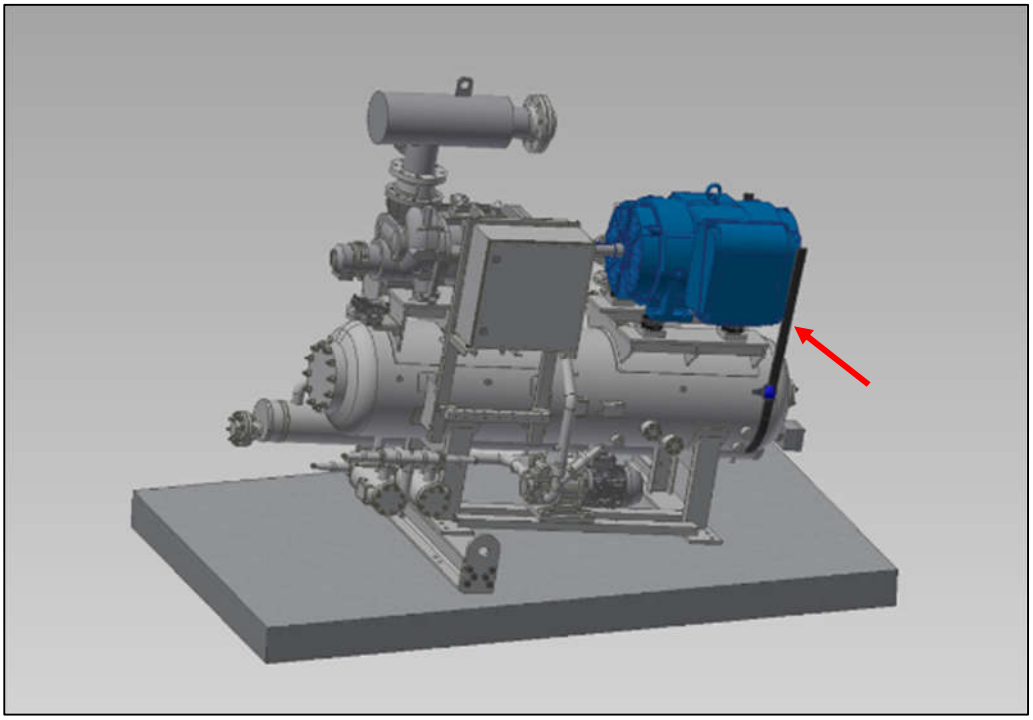


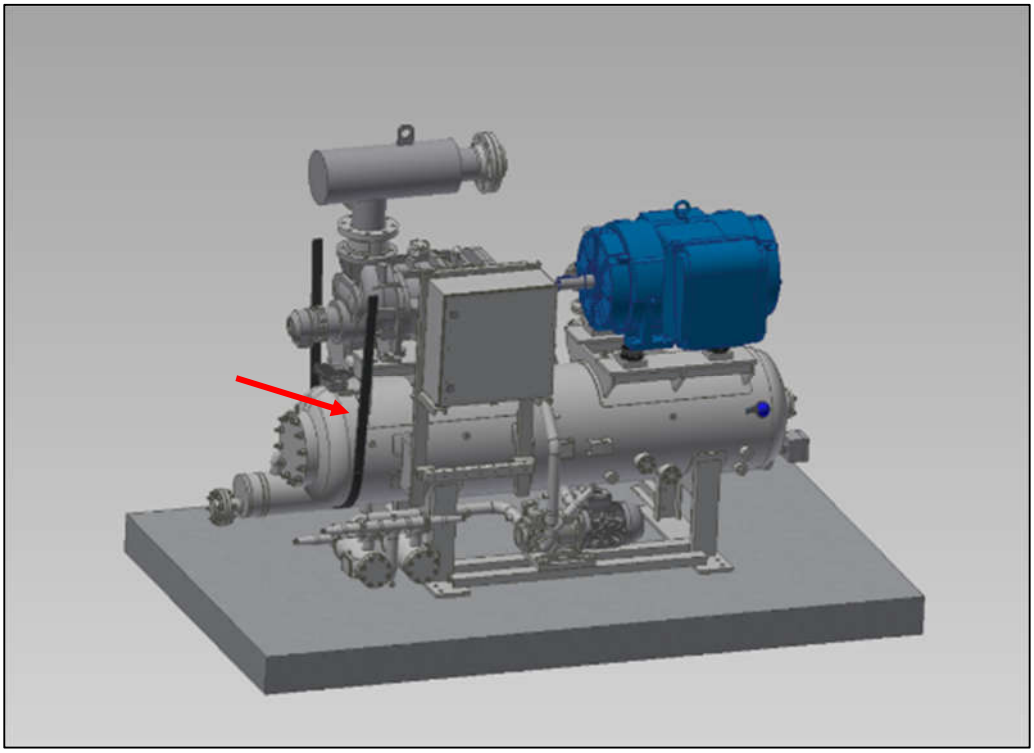
As mentioned above, lifting belts have to be located in a position where there is no conflict with other items:





4- Finally, the lifting structures have to be removed, as it has been done in previous steps:





3. INSTALLATION

3.1) Unit installation

Following procedures should be followed to install the assembled unit on the foundation:

- Prepare the foundation conform to MAYEKAWA's instruction.
- Clean the foundation surface.
- Place anti-vibration mats under the unit if necessary **
- Set the skid at orientation mentioned in the drawings.
- Insert the anchor bolts in the bolt holes of skid and fit the nuts & washers for each anchor bolt. Anchor bolts are optionally available.
- Adjust the skid position in correct dimension & flatness.
- Fill the anchor holes with concrete & grout.
- Do not tighten the nuts of anchor bolts until the concrete and grouting will be dry & stiffened.
- After confirmation of concrete stiffness (3 days) anchor bolts & nuts must be tightened sufficiently.

** MAYEKAWA allows the use of 10mm thick anti-vibration mats underneath the standard screw compressor units. Make sure that the size of the anti-vibration mat corresponds with the footprint of the unit. Please contact MAYEKAWA in case other type of anti-vibration equipment is to be used.

3.2) Piping connections.

Necessary pipe connections are as follows:

- Suction piping.
- Discharge piping.
- Safety valve outlet piping.
- Oil cooler liquid supply piping (if applicable).
- Oil cooler gases return piping (if applicable).
- Economiser liquid connection piping (if applicable).

For exact sizes please refer to MAYEKAWA's unit outer dimensions / connection drawing.

(Note: as the suction piping is large and heavy, suitable support structure for the piping must be provided in order to prevent excessive force and distortion on the compressor.)

3.3) Wiring connections.

Necessary electric power wiring is to be foreseen for:

- Main motor
- Oil pump motor
- Oil heater
- Control panel
- Ground connection (*)

Please refer to MAYEKAWA's wiring diagram for all details related to wiring of MAYEKAWA's scope of component supply.

* (*) It is mandatory to connect the compressor or base frame with the common ground in a technical correct manner.

- Recommended connections:
- inside the unit/package : 4mm²
- frame to the common ground : 6mm²
- Bolt size for connection : M10

3.4) Alignment compressor & motor.

The MYCOM Screw Compressor Unit is a factory made packaged unit and compressor and motor installed on the monocoque oil separator are already pre-aligned.

Final alignment is to be done when unit is completely installed at site, after all piping works are finished, conform the standard alignment procedure & permissible misalignment criteria mentioned in MAYEKAWA's instruction manual.

Additional note of height adjustable motor supports.

When the unit is placed outside, we recommend to cover the surface of the height adjustable motor support with grease to prevent oxidation.

3.5 Thermal insulation

3.5.1 Cold insulation:

Suction strainer and suction piping (if applicable) are installed and connected enabling the installer to apply cold insulation with a maximum thickness of 60mm. We highly recommend to insulate the suction cover of the compressor as well. When the unit is equipped with an economizer. This heat exchanger and associated cold piping (typically below +10°C) can be insulated by the installer with a maximum thickness of 30mm. Mayekawa recommends to insulate cold parts to protect the unit from oxidation due to dripping water.(ice formation + condensation) Cold insulation of the type closed cell is optionally available with Mayekawa.

Remark Suction side flange bolt holes: some of them are through the flange, some are not. It is important to avoid water getting into the stud bolt hole and prevent frozen water strains the suction frame. Take care that water never gets into the stud bolt hole, this can be prevented by putting some grease into thread hole and prevent water entering.

3.5.2 Insulation for personal protection:

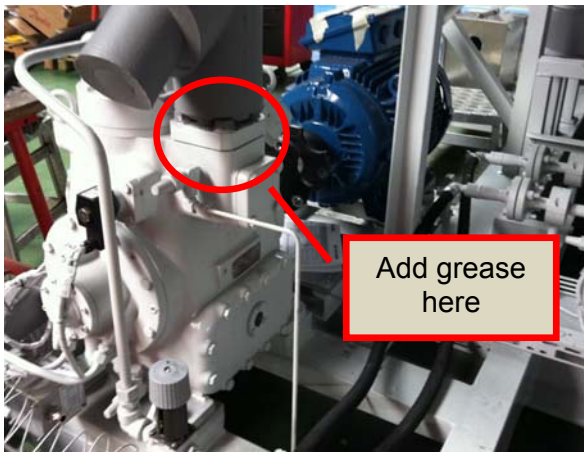
If insulation is required in order to protect against human injuries, insulation for personal protection can be applied. The design of a unit enabling the installation of personal protection may vary from Mayekawa's standard design. This modified design is optionally available with Mayekawa.

3.5.3 Hot insulation:

In case the expected ambient temperature is below +10°C, it is advisable to place heat tracing on the oil circuit and fine filter section of the oil separator and to insulate the oil piping and oil separator vessel with a maximum thickness of 30mm. Minimum and maximum ambient temperatures are to be informed during quotation phase. The design of a unit enabling the installation of hot insulation may vary from Mayekawa's standard design. This modified design is optionally available with Mayekawa.

3.5.4 Heat pumps:

Please contact Mayekawa for insulation and heat tracing requirements on heat pumps.



4. PREPARATIONS BEFORE COMMISSIONING

After all installation works are completed the compressor unit will be put into commissioning. Care must be taken that following checks are done before starting the compressor:

1. Remove any blind plates inserted in flange connections etc., which were used for pressure test of piping by the customer.
2. Leak test must be done for all flanges & threads and especially for all piping connections with compressor unit made at site.
3. Tighten all the bolts, nuts, screws to check if any are getting loose.
4. Confirm power supply for all electric equipment as main motors, oil pump motor, oil heater, solenoid valves etc.
5. Give proper grease for all electrical motor conform the instructions enclosed with the motor.
6. Check cabling of components conform to MAYEKAWA's cabling instructions. Check parameter settings and register all settings.
7. Check Motor Rotation Direction by starting motor without main coupling spacer. Direction must be clock-wise for motor shaft (when looking to the motor shaft), for all screw compressor packaged units with exception of the "FM"-series and GHS-series compressor where the rotation direction is counter clock-wise.
8. Check instrumentation valves and make sure that all instrumentation valves are open. Refer to MAYEKAWA's unit flow diagram for complete list of valves.
9. Check readings on panel.
10. Insert paper oil filter elements to be used for flushing & initial operation.
11. Insert an extra fine cotton cloth bag in the suction strainer element to protect the unit against dirt coming from the system..
12. When the position of each of the main and auxiliary valves is confirmed (open/close), start putting the unit under vacuum till a pressure of 0.15 barA is reached. After this pressure is reached, leave the vacuum pump in operation for at least 6 hours to get all moisture evaporated. Mind to close the service valve first before switching off the vacuum pump. Increasing pressure after shutting down the vacuum pump might indicate that there is a leak and/or high humidity level. In this case, check the unit on leaks and proceed the vacuum process.
    Note that the refrigerant side of the installation shall be completely dry before proceeding with the next step of the commissioning as indicated in the next point
13. Charge initial oil quantity via oil charge connections. Conform to MAYEKAWA's instructions.
14. Run the oil pump for oil flushing to clean the oil circuit. Conform to MAYEKAWA's instructions.
15. Check Oil Pump Operations; operate oil pump in manual and verify that oil pressure is build-up.

    If the Unit package is equipped with multiple oil pumps, it is important to apply same pressure setting. You might need to close isolation valves in order to operate pumps one by one. After successful manipulation of the pumps, open all these valves again before proceeding

16. If motor rotation direction & oil pump operation are satisfactory :

    16.1 Execute simulated start (automatic / manual).
    16.2 Power down power supply and seal main switch in "OFF" position!
    16.3 Rotate compressor shaft by hand during 1 minute to drain all oil from the compressor.
    16.4 Mount main coupling spacer.

17. Charge refrigerant **

    ** only charge refrigerant when normal oil level in oil separator is confirmed.

5. COMMISSIONING & START-UP

1. Check Stop Valves Suction / Discharge. Please make sure that suction & discharge stop valve are opened. In case used as stop & check valve, when completely closed, it should be opened as many times as indicated on the ring fitted on the valve under the spindle.
2. In case that an isolating valve is fitted before the safety valve please make sure that it is fully opened and that valve is sealed so that it cannot be closed anymore !!
   (if hand wheel is foreseen it should be dismounted).
3. Check oil tank temperature to be minimum 15°C. If not please use oil heating before continuing.
4. Check isolation valves of the oil filter(s). Make sure that at least 1 oil filter is in operation (check notes on unit PID to learn more about required oil filters in operation) by opening 2 isolation valves of that particular filter. If a backup oil filter is equipped, then this shall be put in standby by closing the isolation valve at outlet and opening the isolation valve at inlet.
   If filter set is equipped with a pressure equalizing line, then this should be opened during normal operation.
   It is important to first open the equalizing line before opening any of the oil filter isolation valves
   The equalizing line is only closed when the oil filter needs service overhaul.
   Any valves that are indicated on the PID (disclosed with the unit manual), that shall be locked in position either a L.O. (locked in open position) or L.C. (locked in closed position) are to be verified before compressor startup. Locking and tagging of valves is to be done by others with respect to local norms and end-user's phylosophy. Locking and tagging equipment is not in Mayekawa's scope unless mentioned otherwise.
5. Make sure that the pressure within the oil separator is high enough to start the oil pump without the risk of cavitation. Typically, a 2 barG pressure head is sufficient.
6. Start compressor:
   When starting please check immediately:
   - oil pressure header
   - oil filter differential pressure with gauges
   - if oil pressure is not reached STOP immediately the compressor
   - if abnormal noise or vibration is observed please STOP the compressor immediately.
7. Make sure that continuous recording by printer is done by printing (if available) minute per minute.
8. Check capacity control in manual from 0 to 100% and 100 to 0% please take care that slide valve moves not too quick that maximum amperage limit is not reached.
9. When condition becomes stable please measure necessary time to move in one step manually:
   1- from 0 to 100%
   2- from 100 to 0%
10. Check capacity control in AUTO verify control LOAD / UNLOAD (verify Current overriding if applicable).
11. Adjust slide valve movement times at first stop.
12. Operate again unit
13. Adjust the oil return valves (of the fine separation-section to the compressor-suction.)
14. Check oil filters.

6. OPERATING INSTRUCTIONS CONTROL PANEL

For complete instruction please refer to control panel manual.

7. SHORT TERM MAINTENANCE

During commissioning period of the first 200 hrs. of operation, following check & replacements shall be done in order to know the actual unit condition:

- Oil filter element; during initial start-up, it is advised that start up oil filter elements are mounted in the oil filters and used for flushing & initial filtration of the lubrication oil. Those temporary start-up filters can only be used for a short period and to be replaced whenever 200 running hours have been passed or when the pressure drop over the oil filters has exceeded 0.7 bar.
  Start-up filters are optionally available and available for ammonia as well as for all commonly used refrigerants and lubrication oils. Currently Mayekawa has nylon and paper start-up oil filter cartridges available.
- Mayekawa advises to use a start-up filter at the suction of the compressor in order to catch debris, scale and weld balls that could have entered the installation during manufacturing of the suction pipe/vessels and associated equipment. These so called cloth bags are optionally available and are to be removed after restricted hours of operation as per technical page of Suction strainer (SP19G143) If no abnormal dirt is found, standard stainless steel element should be suitable for normal continuous operation. (See 8. LONG TERM MAINTENANCE)
- Shaft alignment; at the end of commissioning or after 200 hrs initial running, shaft alignment of compressor & driver shall be checked to find any change of the alignment level.
  If found out of tolerance, alignment must be done once again and registered.
- Oil separator element; in case that gas has no solid particles or dirt normally fine oil separator elements should not have any significant clogging or contamination in short time. However, it should be recommended to check those separator elements and oil return filter at the end of commissioning or after 200 hrs of initial running even if no alarm is made during that time. After verification of the good condition, following long continuous operation can be assured without oil separator problems. The oil return line shall be checked whenever high oil carry over is noticed.
  Check the oil filter physically after commissioning period is finished.
  If process gas, poluted gas is used more regular checking and replacing is to be considered
- Lubrication oil analysis; together with above mentioned short term maintenance the first lube oil analysis shall be done at the end of commissioning or after 200 hrs. of initial operation.
- Please follow the MAYEKAWA standard document « Criteria for oil replacement » for recommendations on oil quality.

8. LONG TERM MAINTENANCE

Here in this clause, standard long-term maintenance items will be introduced, but it should not be assumed that long-term items could take over the necessity of all the routine maintenance. It is always important to have the daily monitoring and routine check for operating conditions of compressor unit equipment as described in previous paragraphs.

a) periodical maintenance schedule
Attached page is the recommendable maintenance schedule for the components fitted on the Mycom screw compressor unit. This list is not intended to give certain limit for the operator's positive will to check the system and equipment. This list should be regarded as the minimum guideline to maintain the normal mechanical condition of unit components. In case of any irregular situations and/or abnormal conditions take place on process system or compressor unit components, compressor shall be stopped and be inspected regardless the elapsed operating hours and recommended inspection schedule.

Major items, which are very important to keep the unit operating in good condition, are as follows:

- Lubrication oil analysis.
  The good condition of the lubrication oil for the compressor and its accessories is as important as the good condition of the blood in the human body!
  Therefore, periodical sampling and quality analysis are strongly recommended to check the actual condition of the lube oil during long term operation.
  It shall be checked, at 200hrs of initial operation, and every half year as minimum requirement, and it shall be replaced when any abnormal condition is found by analysis, or at least once per every 6000hrs of operation depending on the process condition when using mineral oils. In case more improved oil products are used (hydrotreated, semi or full synthetic), this period can be extended to once every 12000hrs of operation on the condition that the analysis results are satisfactory.

In the event that the oil is to be renewed, it is recommended to apply all drain valves and toremove as much as possible of the old oil and residues. This will improve the quality and longlife time of the new oil charge, as well will it allow any dirt that have deposited over time, to evacuate from the unit. This will help to keep filters clean and increase their lifetime.
As a minimum but not limited to, the following parts shall be drained:
- any oil recovery system present (evaporator, low pressure receiver, intermediate vessel)
- oil filters
- fine filter section
- oil separator (apply all drain connections present)
- oil piping
- oil cooler
- oil pump
- compressor
- …

When changing to another brand/type, the compatibility of the old and the new oil shall be checked by the oil supplier. A specific cleaning procedure might need to be considered Assistance can be provided by Mayekawa Europe.

MAYEKAWA standard "criteria for oil replacement" as included in the service manual shall be referred to for the lube oil analysis.

- Compressor
  During normal operation, shaft seal leakage shall be monitored every day, and be inspected by removing the cover at least once per year. In order to ensure the stable operation of following year, wearing parts of shaft seal are recommended to be replaced with new one's. Complete overhaul of compressor is suggested to be done at least once per 25.000hrs of operation. It is the normal period to check all the compressor internal parts, and to renew the wearing parts for following long term operations.

- Filters, separators, strainers.
  As described in previous paragraphs, filters shall be replaced when high differential pressure alarm or trip is given even during continuous operation. And also, they must be inspected once per year during periodical maintenance work even if any high differential pressure is not observed during operation.
- Protection switches, instruments, safety valve.
  These items may have certain error in measuring in pressure, temperatures, and in set point values during operation. The accuracy shall be checked at least once per year, and calibration or readjustments of settings are required.

b) Irregular situations and abnormal conditions.

Following list summarises irregular situations and abnormal conditions, which require serious inspections:

- Abnormal noise of compressor, pump drivers.
- Abnormal vibration of compressor, pump driver, frame and piping.
- Drastic increasing of shaft seal leakage.
- Unusual temperature of compressor casing.
- Remarkable increase of motor power/current reading in spite of the same conditions of pressure, temperature, load, etc.
- In case if any abnormal colour or bad quality of lube oil are found.

c) When compressor is to be inspected.

- Stop the compressor.
- Close necessary stop valves for isolation.
- Purge all the gas and depressurise the unit
- Switch off all power supplies: main, oil pump, and heater. Leave any indication on power supply for warning.
- Seal main switch is ”Power OFF” position.
- Compressor shall be taken out from base frame. Suitable blind plates for flange openings should be fitted in order to prevent incoming of dirty particles, excessive air and humidity in compressor and system.

d) Spare parts

Necessary spare parts can be picked up from drawings of screw compressor, oil pump, etc. Those listed parts are recommended to be kept at site, in customer’s possession which can avoid any shortage for unusual problems, any time delay of delivery.

MAYEKAWA wishes long life stable operations of all mechanical equipment provided by daily, periodical good maintenance cares.

9. LONG STANDSTILL AND/OR STORAGE OF COMPRESSOR UNITS

The compressor must be kept pressurised at 0.3 barG or higher. (Under N2 if isolated from the plant).
Necessary pressure reading device is to be foreseen on the unit and to be registered daily.
To prevent that the shaft seal will start leaking, MAYEKAWA recommends that the oil pump shall be operated every 4 weeks during 5 minutes to assure that the necessary lubrication oil shall be present on the shaft seal.

10.OPERATING MANUAL

Foreword

This manual is addressed to contractors of whom the level of knowledge and experience has to be recorded.

1. SELECTION

The suitable unit shall be selected by means of the
Compressor selection program based on:
- required capacity
- required evaporating- and condensing temperature
- required medium

For confirmation of selection please consult Mayekawa.

2. INSTALLATION

2.a. INSTALLATION ON THE FOUNDATION

The foundation for the unit is to be prepared conform Mayekawa's standard instructions.
Installation works should only be done by a Mayekawa qualified service representative.
For exact dimensions please refer to lay-out drawing in the technical manual. Foundation drawing can be requested.

2.b. COMPLETATION OF THE SYSTEM

In case of chiller unit, the evaporator and condenser are installed by Mayekawa qualified personnel.
If the condenser and evaporator with their additional components are not part of the unit, they should be delivered and installed by a qualified refrigeration contractor.

The necessary main control panel and starter equipment etc. is to be supplied by the customer.

In case the safety valve(s) is (are) not delivered by Mayekawa Europe, it is the customers' responsibility to protect the unit appropriately by the use of a well-designed safety valve.
For details of safety valve connection size and safety valve set pressure, please refer to the P & id.

2.c. CONNECTIONS TO THE UNIT (IF APPLICABLE)

The following piping connections need to be made:

- Refrigerant discharge gas piping from oil separator to the condenser
- Refrigerant suction piping from evaporator to the suction strainer (if available) , with necessary stop valves, or to the suction connection of the compressor
- Piping from and to the evaporator
- Safety valve gas outlets
- In case of liquid subcooler :
  Refrigerant piping from the condenser/receiver to the liquid subcooler and from the liquid subcooler to the evaporator.
- In case of thermosiphon oil cooler :
- Refrigerant piping to and from the oil cooler (fall line, riser line and priority tank) is to be foreseen following Mayekawa's recommendations.
  In case of water-cooled oil cooler:
  Water piping to and from the oil cooler.
- In case of piston compressor:
- Refrigerant/water piping to and from the oil cooler/piston compressors (head-covers & jacket if applicable) and return.

Suitable support structures must be foreseen for this piping to prevent extra forces/moments and distortion on the unit.
For exact sizes please refer to Mayekawa's lay-out drawing & P&ID in the technical manual.

Necessary wiring connections to be made by the customer are as follows:
- main motor
- pump motor (if applicable)
- oil heater
- control panel
- capacity control solenoid valves
- oil return solenoid valve(s)
- high pressure switch
- all other electrical components that are mounted on the unit as far as they are not already wired by Mayekawa (if applicable)

Please refer to Mayekawa's manual in the technical manual for all details related to wiring of Mayekawa's scope of component supply.

2.d. MOUNTING OF DRIVE COUPLING AND ALIGNMENT

The final alignment is to be done after the unit is completely installed at site and all piping-works are finished. It needs to be done conform the standard alignment procedure and permissible misalignment criteria mentioned in Mayekawa's technical manual. The procedure must be executed by a Mayekawa qualified service representative.
This should be done without any power on the unit, power switch to be in 'OFF' position and sealed.

3. COMMISSIONING AND OPERATION

Commissioning and operation of the unit should be done by Mayekawa qualified engineers.
The standard Mayekawa start-up and running instructions are to be followed.

The oil recommendation and applicable oil charges for this unit can be found in the technical manual.

The customer must respect the normal operating conditions and corresponding protections, which are

mentioned on the compressor parameter datasheet in the technical manual.

In case of chiller unit:

The refrigerant charge data for this unit can be requested.

The maximum refrigerant charge should in no case be exceeded as the liquid receiver must be able to keep all the refrigerant of the unit and may not be filled more than 75% of its volume. Please refer to the maximum liquid level limitation shown on the level glass.
Overfilling the liquid receiver is dangerous for the good operation of the unit and can result in accidents with injuries or death as result.

4. WARNINGS

4.a. WARNING FOR ROTATING PARTS

The rotating coupling and shafts can cause serious injuries or death when they are not covered, therefore they must be covered by a suitable coupling guards which prevents contact of the rotating parts.
Dismounting of this coupling and its guard should only be done when the unit is switched off and with suitable tools by qualified service engineers.

4.b. WARNING FOR AUTOMATIC STARTS

Unexpected machine starts are possible in automatic operation and can lead to accidents due to fright-effects. Necessary warning is shown on the machine with warning pictogram.

4.c. WARNING FOR ELECTROCUTION

The danger for direct contact of persons with electrical parts under tension exists when opening panels/terminals with injuries or death as a result. Therefore power switches must be absolutely sealed in 'OFF' position when executing commissioning, service, or maintenance works on the unit.

4.d. WARNING FOR BURNING

The danger of direct contact of persons with hot surfaces (such as discharge side of compressor, hot gas discharge line, oil separator) exists, with burn injuries as result. Therefore necessary warnings are installed by use of pictograms.
Heat protection should be installed by the contractor if necessary.
The same goes for cold surfaces, which can be on the suction side of the unit.

4.e. WARNING FOR EAR DAMAGE

As the noise level of this unit is above 70 dBA the danger of ear damage exists when executing commissioning, operating, maintenance or service works on the unit. Therefore necessary ear protections should be used!

5. MAINTENANCE

Maintenance-works should only be done by a Mayekawa qualified service representative. Before commencing disassembly and re-assembly service works on the unit, read carefully and understand the contents of the compressor-manual, which explains the structure and the work methods appropriate for the concerned compressor.

Opening of drains/purges can lead to the release of liquid/gas under high pressure if the machine is opened without taking the correct preparations. This can lead to injuries or death.

If any service work is performed which disregards the instructions given in the manual, the risk of an accident exists.

Gas masks must be available and are to be used in case that gas leakage could occur and the contractor must be informed immediately so that necessary countermeasures can be taken.

Slipping, stumbling, falling of persons is possible when oil drain rests are not adequately couth and recovered during services. This can lead to serious injuries of persons and contamination of the environment.
These works can only be executed by the contractor or by Mayekawa's authorized personnel.

6. REPEATED INSPECTIONS

This equipment assembly contains vessels according to a vessel category requiring repeated inspections. Therefore it will be necessary to execute an internal vessel inspection, by means of mirror and/or endoscope (if necessary), every 5 years and vessel pressure test every 10 years.
The necessary protections of the equipment assembly, like high pressure switches, must be inspected regular (yearly).

7. APPROVAL DOCUMENTS

Mayekawa's standard scope of supply contains all required declarations of conformity of the individual components.
CE marking of the final completed and installed unit is to be organized by the customer.
On customer demand, CE-marking for partial unit assembly can be organized by Mayekawa.

11. TRANSPORT and STORAGE OVERPRESSURE

Bare compressors

Storage of the compressors is done indoors and in a dry environment.

The end of the shaft has a protective cover of green paint, this coating remains as it is.

A nitrogen level is maintained at a pressure of 0.5 – 1 barG during storage. Therefore a pressure gauge is installed and the pressure should be checked regularly (at least 1 time a month). When the pressure decreases in this period , it is necessary to charge the nitrogen level. In case of a nitrogen leakage the shaft seal might be dried up. Relubrication of the shaft seal is then needed. This is done from the outside of the casing; Periodically (every 2 months) rotation of the shaft keeps the seal wet.

Units

The units are put under a N_2 overpressure of 0.1 to 1 barG at the factory. This overpressure is needed during transport to the site and storage at site. This prevents air and moisture to enter the units, so to avoid corrosion of the internal piping + components.

TO DO ! Check at reception if this overpressure is present, if not, contact Mayekawa immediately.

TO DO ! In case of a long period of storage, check this overpressure at least once a month. Recharge if needed to keep the same overpressure. Continue if needed at regular intervals. Logg the information. Contact Mayekawa when recharging is needed.

WARNING ! In case of a nitrogen leakage, check if the shaft seal of the compressor is dried up. If dried up, relubrication of the shaft seal is needed. This is done from the outside of the casing. Periodically rotation of the shaft is needed to keep the seal wet.

The overpressure is checked by :

- Present manometers
- specially installed transport manometers.

TO DO ! If transport manometers are present, remove them first before start-up of the unit!

See also tape here under with text :

“Transport overpressure gauge, remove before start-up”

Illustrations:

- Permanent manometer:

- Transport manometer:

MAYEKAWA Europe MYCOM

ABNORMAL VIBRATIONS AND OIL CONSUMPTION WITH FREQUENCY CONTROLLED COMPRESSOR UNITS

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FREQUENCY CONTROLLED COMPRESSOR – UNITS

1 MOUNTING

UNIT BASEPLATES ARE TO BE FIXED ON THE FOUNDATION(INERTIA) BLOCK BY USING ALL REQUIRED ANCHORING CONNECTIONS AND BOLTS.

2 VIBRATION CHECK

CHECK OF VIBRATION PEEKS TO BE DONE FOR THE COMPLETE SPEED RANGE ON WHICH THE UNIT IS TO BE OPERATED PER STEP OF 1 HERTZ.

IF VIBRATION PEEKS ARE PRESENT NECESSARY CONTROL CORRECTION IS TO BE DONE NOT TO KEEP THE COMPRESSOR RUNNING AT THE PEEK FREQUENCY.

3 OIL CONSUMPTION CHECK

CHECK OF PRESENCE OF FOAMING IS NECESSARY WHEN PRESSURE IN THE UNIT IS DECREASING TOO QUICK.

REDUCING OF SPEED TO BE DONE IN SUCH WAY THAT NO ABNORMAL FOAMING, RESP. ABNORMAL OIL CONSUMPTION, IS OCCURING.

MAYEKAWA Europe MYCOM

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SAFETY VALVE ARRANGEMENTS (Mayekawa Europe Standard)

Introduction

There are different approaches available in regards to the safety valve/overflow arrangement on compressor packages assembled in Mayekawa Europe.

Whatever the arrangement is and unless otherwise specified, always:

- ➔ arrangement fulfills requirements as per **EN378**
- ➔ calculations are following **EN13136**
- ➔ safety relief devices are certified as per PED/cat. IV

1. Compressor unit

1.1 Double safety valve

Safety valve assembly calculated for fire case ánd compressor full flow

- change over valve at inlet where independent of the position of the lever/spindle at least one safety valve is active. The change over valve allows service with a limited loss of refrigerant/gas.

- in some cases the changeover valve induces a pressure drop which is too high following the EN13136, in this case Mayekawa could choose to install an arrangement of on/off valves in the inlet of the safety valves. It will be the installer's responsibility to install locking devices to ensure proper setting of the valve: at least one shut off valve that is connected to a safety valve shall be set in 'open' position.

- the outlet of each of the safety valves shall be connected to atmosphere or in case of a type which is back pressure independent, it can be connected to the low pressure side of the installation by customer/installer. The designer of the plant shall consider the necessary provisions to avoid refrigerant loss when safety valve is serviced.

- Customer/installer to ensure maximum pressure drop in blow off lines/header is not exceeding the limits as specified in EN13136

- Mayekawa Europe could choose to apply one double safety valve to protect several parts against exceeding their design pressures (e.g. oil separator and oil cooler). These parts shall than be connected directly or provided with a shut off device which is lockable in open position. Locking device provided and set by customer/installer.

1.2 Single pressure relief valve (overflow valve)

Pressure relief valve calculated for compressor full flow

- the outlet of the pressure relief valve is to be connected to the low pressure side

- customer to provide adequate provisions to allow service of the pressure relief valve with a limited refrigerant/gas loss and to avoid dangerous situations. Compressor unit shall be stopped and locked in ‘off-position’. If no inlet/outlet shut off valves are provided, the unit shall be fully depressurized before starting any service works on relief valves.

- Any service valve that might be installed upstream and downstream of the relief valve needs to be lockable and locked in open position by customer/installer before compressor start.

- Customer/installer to ensure maximum pressure drop in blow off lines/header is not exceeding the limits as specified in EN13136

- In order to meet with the EN378, responsibilities are shared between Mayekawa and customer/installer. Instructions will be provided by Mayekawa to customer/installer by means of the process and instrumentation diagram (PID).
Customer/installer is obliged to protect the compressor unit against excessive pressure caused by fire (fire case) following requirements as gives per EN378. E.g. locking the compressor unit discharge valve in open position and to include the blow off capacity within the safety valve installed downstream of the compressor unit. Take special care of the set pressures in relation to the design pressure of the compressor unit.

1.3 Single pressure relief valve (overflow valve) in combination with a double safety valve (fire case)

1.3.1 Single pressure relief valve calculated for compressor full flow

- customer to provide adequate provisions to allow service of the pressure relief valve with a limited refrigerant/gas loss and to avoid dangerous situations. Compressor unit shall be stopped and locked in ‘off-position’. If no inlet/outlet shut off valves are provided, the unit shall be fully depressurized before starting any service works on relief valves.

- Any service valves that might be installed upstream and downstream of the relief valve need to be lockable and locked in open position by customer/installer before compressor start.

- the outlet of the safety relief valve is to be connected to the low pressure side

- Customer/installer to ensure maximum pressure drop in blow off lines/header is not exceeding the limits as specified in EN13136

1.3.2 Double safety valve for fire case

- change over valve at inlet where independent of the position of the lever/spindle at least one safety valve is active. The changeover valve allows service with limited loss of refrigerant/gas.

- the outlet of each of the safety valves can be either connected to atmosphere or to low pressure side of the installation. Customer/installer shall foresee the necessary provisions to avoid refrigerant loss when safety valve is to be serviced.

- Customer/installer to ensure maximum pressure drop in blow off lines/header is not exceeding the limits as specified in EN13136

- Mayekawa Europe could choose to apply one double safety valve to protect several parts against exceeding their design pressures (e.g. oil separator and oil cooler). These parts shall than be connected directly or provided with a shut off device which is lockable in open position. Locking device provided and set by customer/installer.

2. Chiller/condenser compressor unit

2.1 Compressor skid

To see section 1.

2.2 Vessels and heat exchangers

- Depending on its module, measures are taken by Mayekawa Europe to limit the pressure in vessels and heat exchangers above their design pressure in case of a fire (fire case).

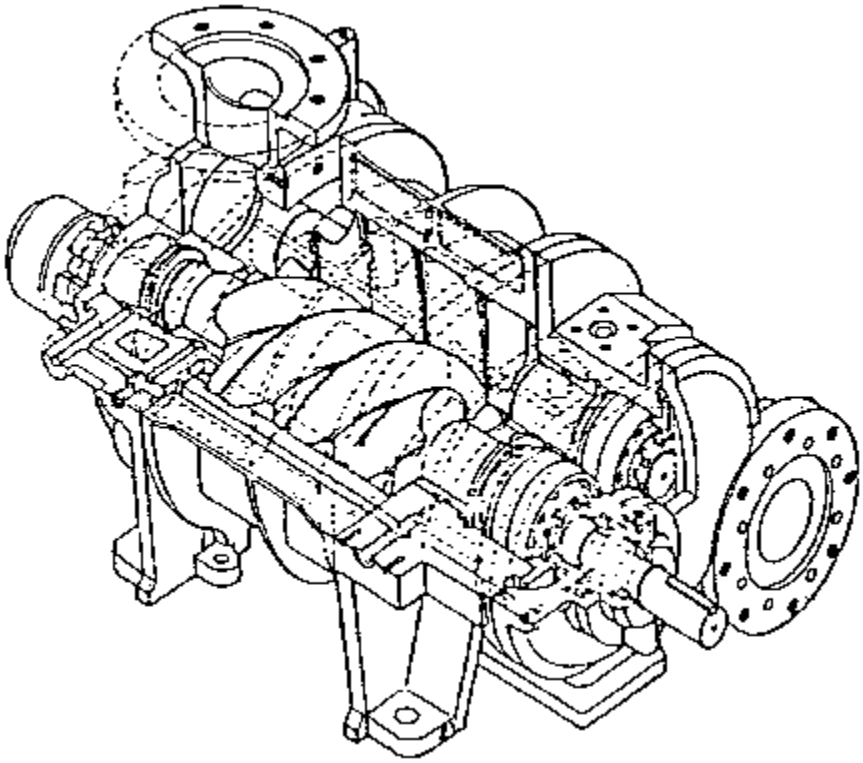
- Typically, double safety valves with changeover possibilities are used where as independent of the position of the lever/spindle at least one safety valve is active.

- the outlet of each of the safety valves can be either connected to atmosphere or to low pressure side of the installation. Customer/installer shall foresee the necessary provisions to avoid refrigerant loss when safety valve is to be serviced.

- Mayekawa Europe could choose to apply one double safety valve to protect several parts against exceeding their design pressures. These parts shall than be connected directly or provided with a shut off device which is lockable in open position. Locking device provided by customer/installer.

MAYEKAWA Europe MYCOM

PARTS DIMENSIONS AND SERVICEABLE WEAR LIMIT GUIDE OF SCREW COMPRESSOR MENTIONED



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Screw compressor part replacement standard

Introduction

The screw compressor has a simple structure and the number of components it comprises are fewer than other types of compressors. Its characteristics include high efficiency, superior operability and durability over a wide operating range. Despite these superior features, if maintenance/inspections and the replacement of parts are not done at the appropriate time and proper methods are not observed, the overall performance of the compressor will be significantly reduced in short order, with impairment due to degraded parts.

Without proper maintenance of the compressor, the expected performance/functions and durability will not be exhibited and consequently economical operation is impossible. Inspecting, recording the dimensions, and observing the condition of each part on a regular basis leads to a quantitative understanding of the function of the individual part, which helps to determine whether it is functioning appropriately as a compressor.

Below are how to check, how to measure, and the replacement standards on the main parts that make up the screw compressor. In order to assure long life and economic use of our screw compressor, we recommend appropriate inspection according to this document.

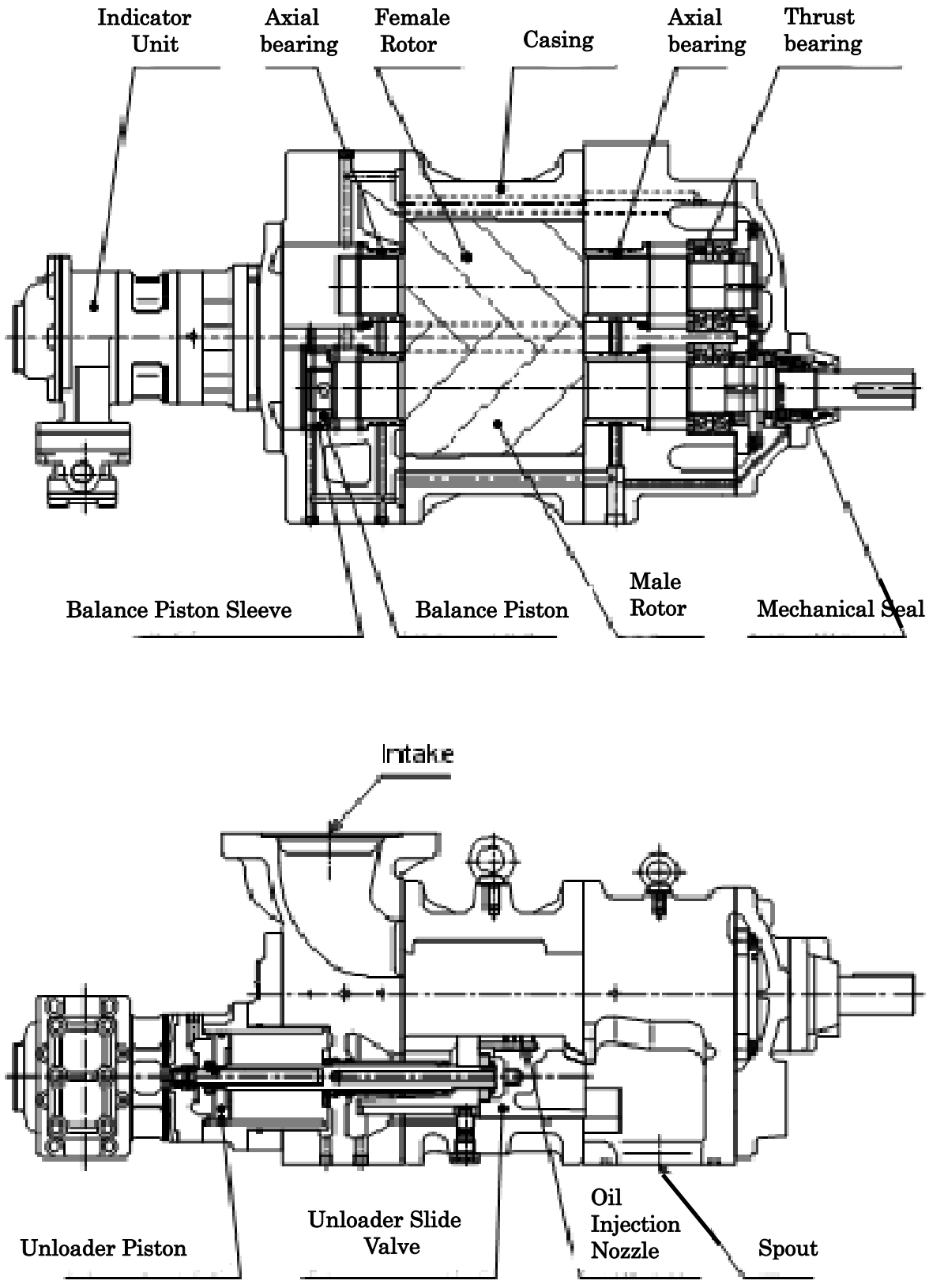


Figure 1. Structure of the screw air compressor unit

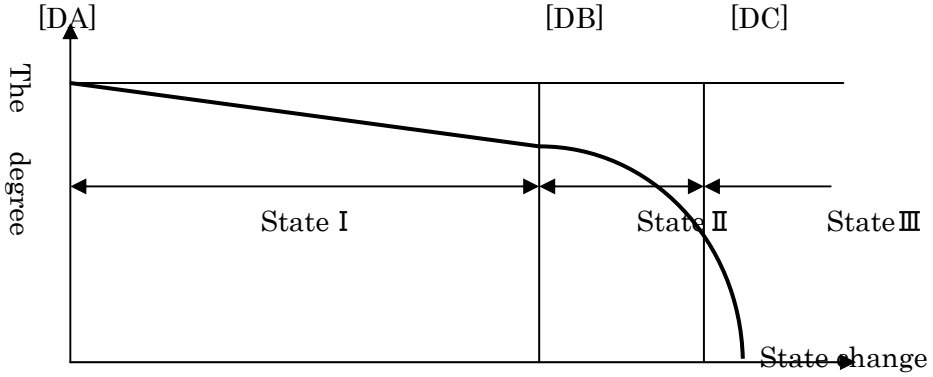
— Table of Contents —

1 Overview
2 Indicator cylindrical cam
3 Balance piston
4 Balance piston sleeve
5 Unloader cylinder
6 Main side bearing
7 Rotor (Coupling shaft)
8 Rotor (Mechanical seal shaft)
9 Rotor (Thrust bearing shaft)
10 Rotor (Main side bearing shaft)
11 Rotor (Lobes OD)

1. Overview

a) Meaning of dimension
Each value included in this document for replacement standards has the following meaning.

Standard Dimension Replacement Standard Dimension Dimension for Disposal



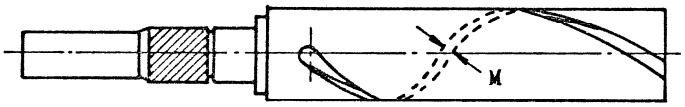
Range of state Ⅰ : Dimension of parts properly functioning (continuous use of the parts is possible).
(Dimension [DA][DB])
Range of state Ⅱ : Dimension that indicates the part is not functioning sufficiently and replacement is recommended.
(Dimension [DB] through [DC]) (If the part is to be used continuously, although the removal of the cause of the size reduction is the major premise, in this particular case it is necessary to shorten the time until the next inspection.)
Range of state Ⅲ : Dimension that interferes with the part functioning and leads to damage.
(Dimension [DC] -) (Replace the part with a new one upon finding the fault)

b) Importance of recording dimensions
When inspecting the unit, measuring and recording the dimension of each part will replace qualitative matters such as the elapsed time. State a change of parts with a quantitative expression such as a decreasing of dimensions. This enables everybody to determine whether the parts should be replaced based on the values rather than experience and traditional guesswork.

Note: This standard may be added and corrected, and is subject to change without notice.

2 - 1 Indicator cylindrical cam UD/G series

a) Measure the width of the groove using a caliper.
b) If the wear is excessive, replace it.
c) If there are scratches on the portion coming out, polish the part using Emery paper
(#800 to #1200).

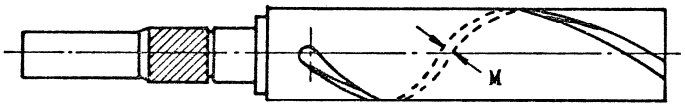


[Unit : mm]

Model	[DA]	[DB]	[DC]
125	3.0	3.5	4.0
160	3.0	3.5	4.0
200	5.0	6.0	6.5
250	5.0	6.0	6.5
320	6.0	7.0	7.5
400	6.0	7.0	7.5

2 - 2 Indicator cylindrical cam SCV series

a) Measure the width of the groove using a caliper.
b) If the wear is excessive, replace it.
c) If there are scratches on the portion coming out , polish the part using Emery paper
(#800 to #1200).

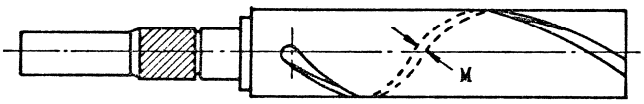


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	3.0	3.5	4.0
200V	5.0	6.0	6.5
250V	5.0	6.0	6.5
320V	6.0	7.0	7.5
400V	6.0	7.0	7.5

2 - 3 Indicator cylindrical cam C series

a) Measure the width of the groove using a caliper.
b) If the wear is excessive, replace it.
c) If there are scratches on the portion coming out, polish the part using Emery paper (#800 to #1200).



Lower area [Unit:mm]

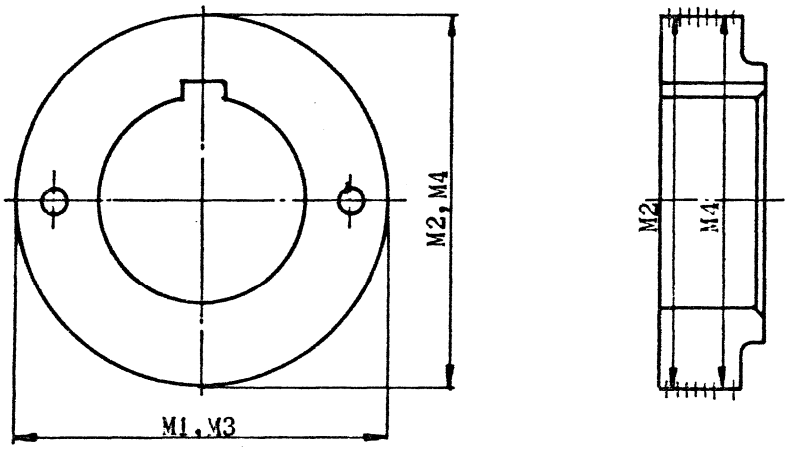
Model	[DA]	[DB]	[DC]
1610C	3.0	3.5	4.0
1612C	3.0	3.5	4.0
2016C	5.0	6.0	6.5
2520C	5.0	6.0	6.5
3225C	6.0	7.0	7.5
4032C	6.0	7.0	7.5

Higher area [Unit:mm]

Model	[DA]	[DB]	[DC]
2016C	3.0	3.5	4.0
2520C	5.0	6.0	6.5
3225C	5.0	6.0	6.5
4032C	6.0	7.0	7.5

3 - 1 Balance piston UD/G series

a) Remove it from the rotor for measurement using a micrometer.
b) Measure four points and take the maximum value.

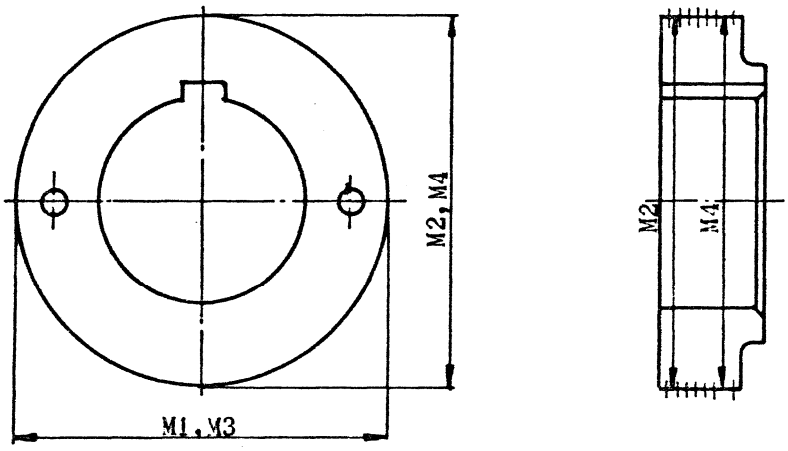


[Unit:mm]

Model	[DA]	[DB]	[DC]
125	φ81	−0.12	−0.15
160	φ88	−0.08	−0.11
200	φ108	−0.11	−0.14
250	φ140	−0.13	−0.17
320	φ176	−0.16	−0.21
400	φ220	−0.20	−0.26

3 - 2 Balance piston SCV series

a) Remove it from the rotor for measurement using a micrometer.
b) Measure four points and take the maximum value.

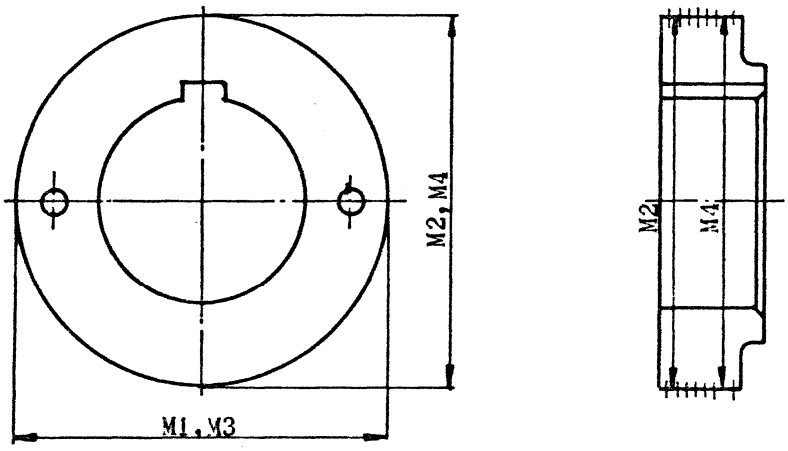


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	φ94	−0.09	−0.12
200V	φ115	−0.11	−0.14
250V	φ145	−0.13	−0.17
320V	φ182	−0.16	−0.21
400V	φ220	−0.20	−0.26

3 - 3 Balance piston C series

a) Remove it from the rotor for measurement using a micrometer.
b) Measure four points and take the maximum value.

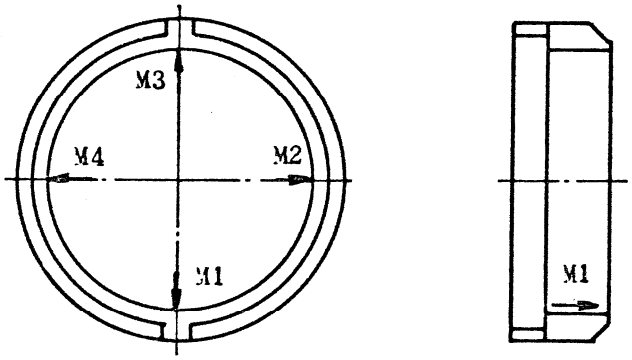


[Unit : mm]

Model		[DA]	[DB]	[DC]
1610C	M side	φ70	−0.08	−0.11
	F side	φ40	−0.05	−0.08
1612C		φ88	−0.08	−0.11
2016C		φ88	−0.08	−0.11
2520C		φ128	−0.12	−0.15
3225C		φ140	−0.13	−0.17
4032C		φ176	−0.16	−0.21

4 - 1 Balance piston sleeve UD/G series

a) Remove it through the suction cover and place it on a flat machining surface to measure the depth of wear on the labyrinth-like wear groove inside the surface using a dial gauge with a stand or a picking-type dial gauge with a stand.
b) Measure four points and take the maximum value as shown below.
c) If the measurement described above cannot be achieved appropriately, check for the degree of wear by visual inspection.

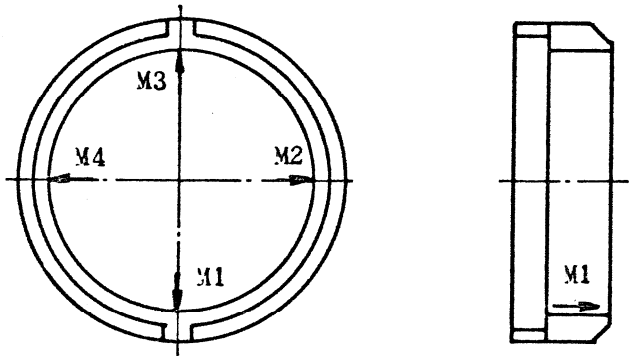


[Unit : mm]

Model	[DA]	[DB]	[DC]
160	0	+0.05	+0.08
200	0	+0.07	+0.10
250	0	+0.07	+0.10
320	0	+0.10	+0.14
400	0	+0.10	+0.14

4 - 2 Balance piston sleeve SCV series

a) Remove it through the suction cover and place it on a flat machining surface to measure the depth of wear on the labyrinth-like wear groove inside the surface using a dial gauge with a stand or a picking-type dial gauge with a stand.
b) Measure four points and take the maximum value as shown below.
c) If the measurement described above cannot be achieved appropriately, check for the degree of wear by visual inspection.

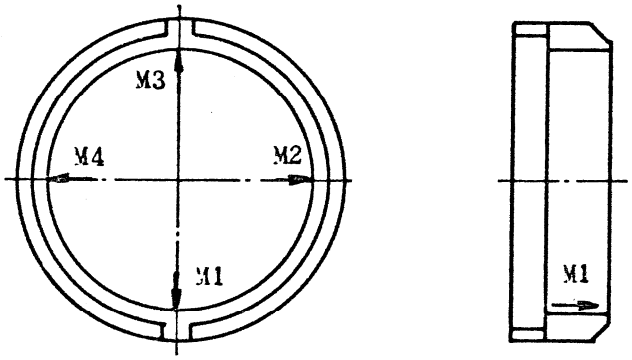


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	0	+0.05	+0.08
200V	0	+0.07	+0.10
250V	0	+0.07	+0.10
320V	0	+0.10	+0.14
400V	0	+0.10	+0.14

4 - 3 Balance piston sleeve C series

a) Remove it through the suction cover and place it on a flat machining surface to measure the depth of wear on the labyrinth-like wear groove inside the surface using a dial gauge with a stand or a picking-type dial gauge with a stand.
b) Measure four points and take the maximum value as shown below.
c) If the measurement described above cannot be achieved appropriately, check for the degree of wear by visual inspection.

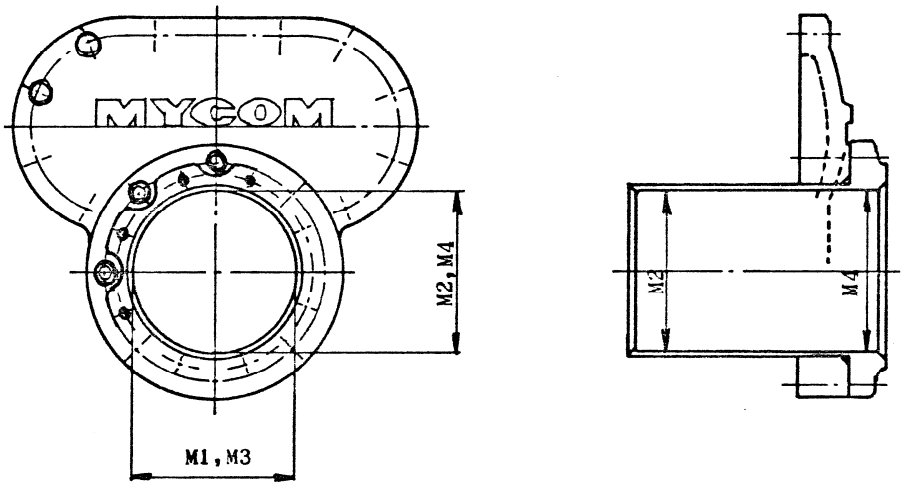


[Unit : mm]

Model		[DA]	[DB]	[DC]
1610C	M side	0	+0.04	+0.07
	F side	0	+0.04	+0.07
1612C		0	+0.05	+0.08
2016C		0	+0.05	+0.08
2520C		0	+0.07	+0.10
3225C		0	+0.07	+0.10
4032C		0	+0.10	+0.14

5 - 1 Unloader cylinder UD/G series

a) Remove the balance piston cover and the unloader cover together to measure the inner diameter using a micrometer.
b) If local scratches more than 0.5 mm deep or more than 3 mm in length of the sliding direction are observed by visual inspection, replace it.

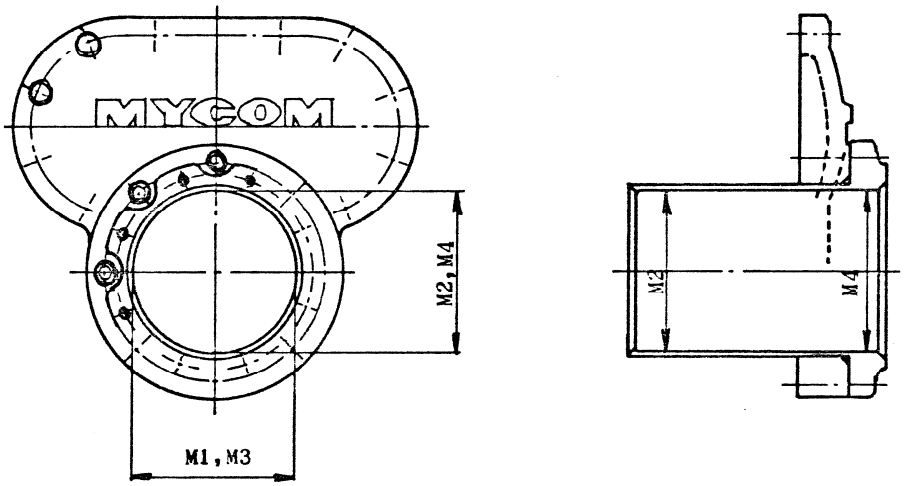


[Unit : mm]

Model	[DA]	[DB]	[DC]
125	φ85	+0.5	+0.8
160	φ110	+0.5	+0.8
200	φ135	+0.6	+0.9
250	φ170	+0.6	+0.9
320	φ215	+0.6	+0.9
400	φ280	+0.6	+0.9

5-2 Unloader cylinder SCV series

a) Remove the balance piston cover and the unloader cover together to measure the inner diameter using a micrometer.
b) If local scratches more than 0.5 mm deep or more than 3 mm in length of the sliding direction are observed by visual inspection, replace it.

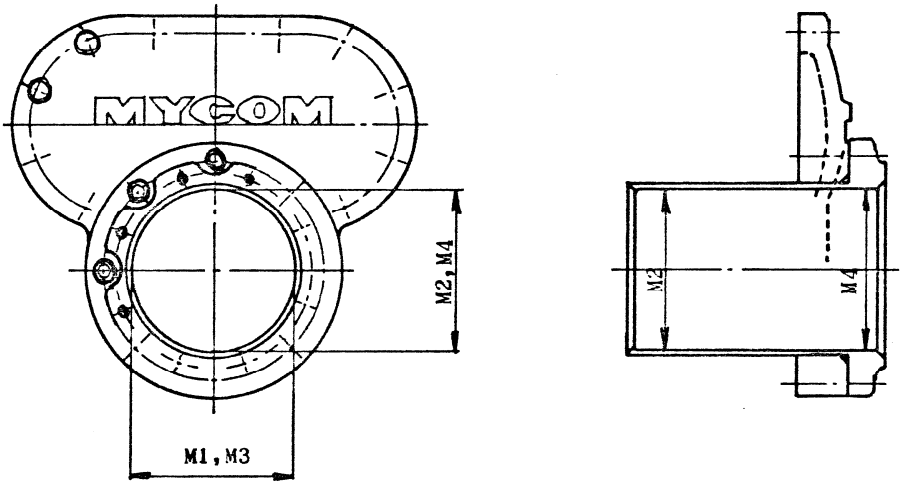


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	φ110	+0.5	+0.8
200V	φ135	+0.6	+0.9
250V	φ170	+0.6	+0.9
320V	φ215	+0.6	+0.9
400V	φ230	+0.6	+0.9

5-3 Unloader cylinder C series

a) Remove the balance piston cover and the unloader cover together to measure the inner diameter using a micrometer.
b) If local scratches more than 0.5 mm deep or more than 3 mm in length of the sliding direction are observed by visual inspection, replace it.



Lower area

[Unit : mm]

Model	[DA]	[DB]	[DC]
1610C	φ85	+0.5	+0.8
1612C	φ85	+0.5	+0.8
2016C	φ110	+0.5	+0.8
2520C	φ135	+0.6	+0.9
3225C	φ150	+0.6	+0.9
4032C	φ230	+0.6	+0.9

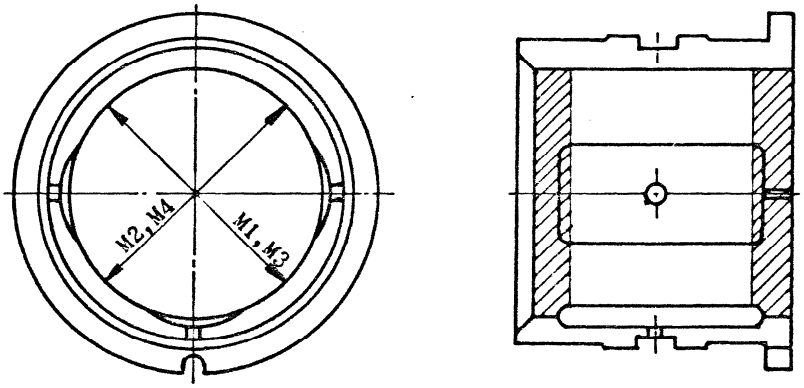
Higher area

[Unit : mm]

Model	[DA]	[DB]	[DC]
2016C	φ110	+0.5	+0.8
2520C	φ135	+0.6	+0.9
3225C	φ170	+0.6	+0.9
4032C	φ215	+0.6	+0.9

6 - 1 Main side bearing UD/G series

a) If metal delamination or metal flow is observed on the metal surface, replace it.
b) If extreme wear or gouges are observed on the part coming out, replace it.
c) If extreme deformation, scratches in the circumferential direction, or black discoloration are observed on the inner surface of the metal, replace it.
d) Measure the inner diameter using an inner diameter micrometer or cylinder gauge.

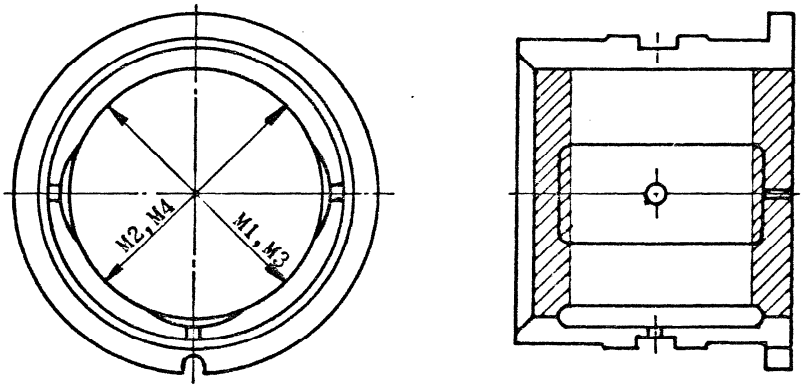


[Unit : mm]

Model	[DA]	[DB]	[DC]
125	φ55	+0.06	+0.08
160	φ72	+0.08	+0.11
200	φ90	+0.09	+0.12
250	φ110	+0.11	+0.14
320	φ140	+0.13	+0.16
400	φ180	+0.16	+0.20

6 - 2 Main side bearing SCV series

a) If metal delamination or metal flow is observed on the metal surface, replace it.
b) If extreme wear or gouges are observed on the hutching part, replace it.
c) If extreme deformation, scratches in the circumferential direction, or black discoloration are observed on the inner surface of the metal, replace it.
d) Measure the inner diameter using an inner diameter micrometer or cylinder gauge.

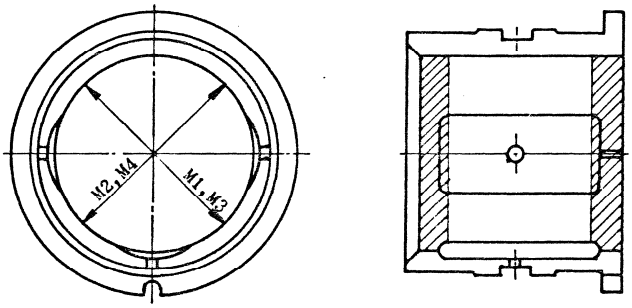


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	φ72	+0.08	+0.11
200V	φ90	+0.09	+0.12
250V	φ110	+0.11	+0.14
320V	φ140	+0.13	+0.16
400V	φ180	+0.16	+0.20

6 - 3 Main side bearing C series

a) If metal delamination or metal flow is observed on the metal surface, replace it.
b) If extreme wear or gouges are observed on the hutching part, replace it.
c) If extreme deformation, scratches in the circumferential direction, or black discoloration are observed on the inner surface of the metal, replace it.
d) Measure the inner diameter using an inner diameter micrometer or cylinder gauge.



Lower area [Unit : mm]

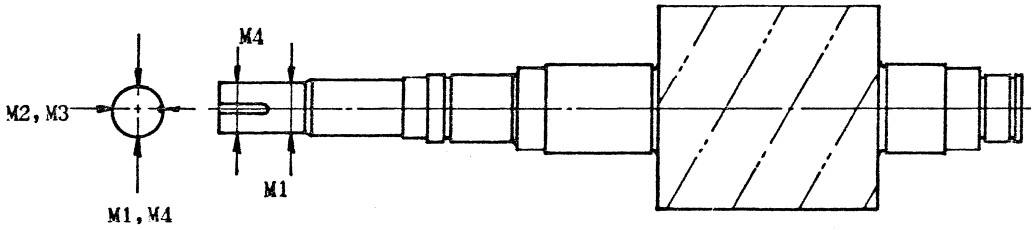
Model	[DA]	[DB]	[DC]
1610C	φ72	+0.08	+0.11
1612C	φ72	+0.08	+0.11
1612C M side (Main bearing)	φ82	+0.09	+0.12
2016C	φ90	+0.09	+0.12
2520C	φ110	+0.11	+0.14
3225C	φ140	+0.13	+0.16
4032C	φ180	+0.16	+0.20

Higher area [Unit : mm]

Model	[DA]	[DB]	[DC]
1610C	φ45	+0.06	+0.08
1612C	φ55	+0.06	+0.08
2016C	φ72	+0.08	+0.11
2520C	φ90	+0.09	+0.12
3225C	φ110	+0.11	+0.14
4032C	φ140	+0.13	+0.16

7 - 1 Rotor (Coupling shaft) UD/G series

a) Measure using a micrometer.
b) Please pay special attention to deformation of the key groove.

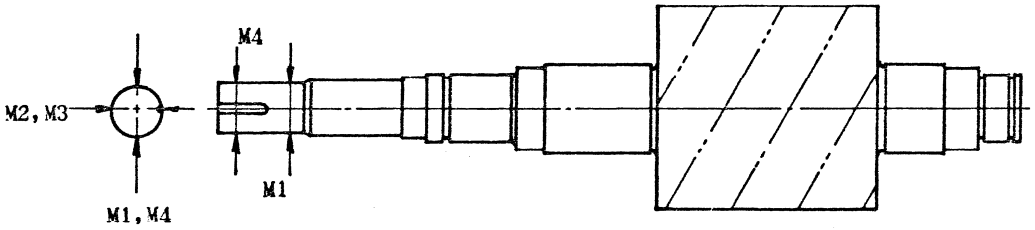


[Unit: mm]

Model	[DA]	[DB]	[DC]
125	φ38	−0.03	−0.045
160	φ45	−0.02	−0.035
200	φ55	−0.025	−0.04
250	φ67	−0.025	−0.04
320	φ85	−0.03	−0.05
400	φ110	−0.03	−0.05

7 - 2 Rotor (Coupling shaft) SCV series

a) Measure using a micrometer.
b) Please pay special attention to deformation of the key groove.

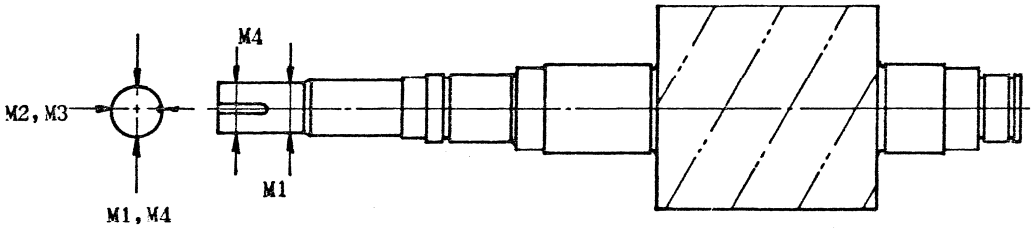


[Unit:mm]

Model	[DA]	[DB]	[DC]
160V	φ45	−0.02	−0.035
200V	φ55	−0.025	−0.04
250V	φ67	−0.025	−0.04
320V	φ85	−0.03	−0.05
400V	φ110	−0.03	−0.05

7 - 3 Rotor (Coupling shaft) C series

a) Measure using a micrometer.
b) Please pay special attention to deformation of the key groove.

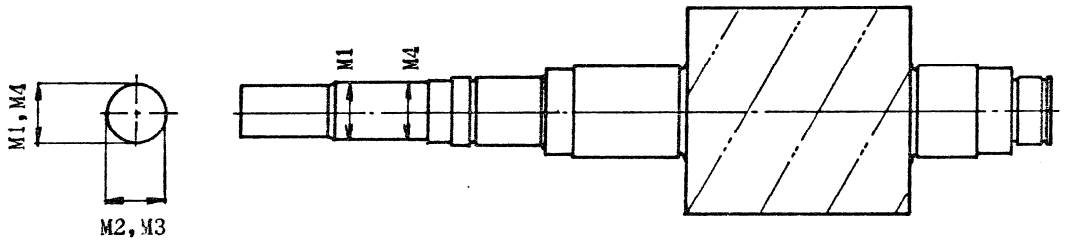


[Unit : mm]

Model	[DA]	[DB]	[DC]
1610C	φ45	−0.02	−0.035
1612C	φ45	−0.02	−0.035
2016C	φ55	−0.025	−0.04
2520C	φ67	−0.025	−0.04
3225C	φ85	−0.03	−0.05
4032C	φ110	−0.03	−0.05

8 - 1 Rotor (Mechanical seal shaft) UD/G series

a) Measure using a micrometer.
b) If local scratches less than 0.1 mm deep are observed parallel to the axis, polish them using emery paper from #800 to #1200 before use.

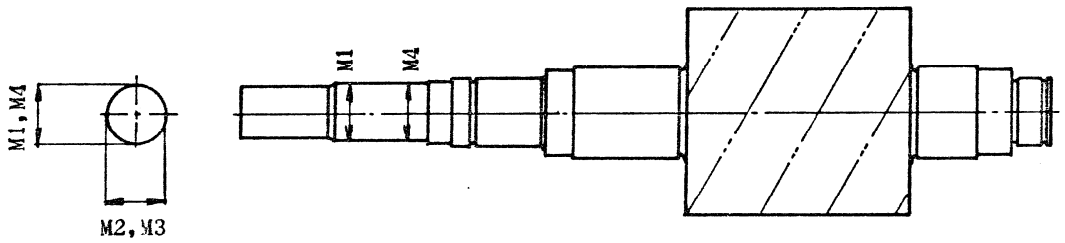


[Unit : mm]

Model	[DA]	[DB]	[DC]
125	φ40	−0.07	−0.10
160	φ50	−0.07	−0.10
200	φ60	−0.09	−0.12
250	φ70	−0.09	−0.12
320	φ90	−0.10	−0.13
400	φ116	−0.10	−0.13

8 - 2 Rotor (Mechanical seal shaft) SCV series

a) Measure using a micrometer.
b) If local scratches less than 0.1 mm deep are observed parallel to the axis, polish them using emery paper from #800 to #1200 before use.

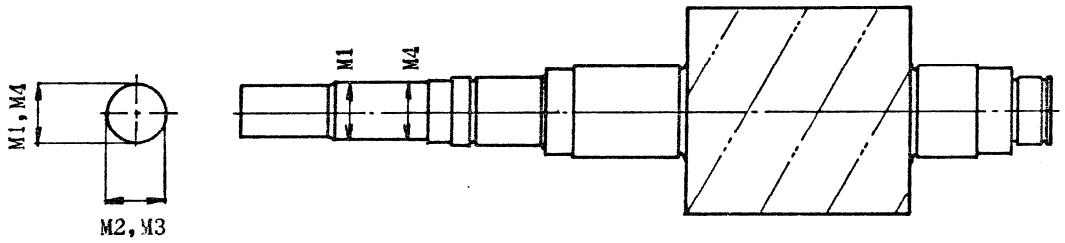


[Unit: mm]

Model	[DA]	[DB]	[DC]
160V	φ50	−0.07	−0.10
200V	φ60	−0.09	−0.12
250V	φ70	−0.09	−0.12
320V	φ90	−0.10	−0.13
400V	φ116	−0.10	−0.13

8 - 3 Rotor (Mechanical seal shaft) C series

a) Measure using a micrometer.
b) If local scratches less than 0.1 mm deep are observed parallel to the axis, polish them using emery paper from #800 to #1200 before use.

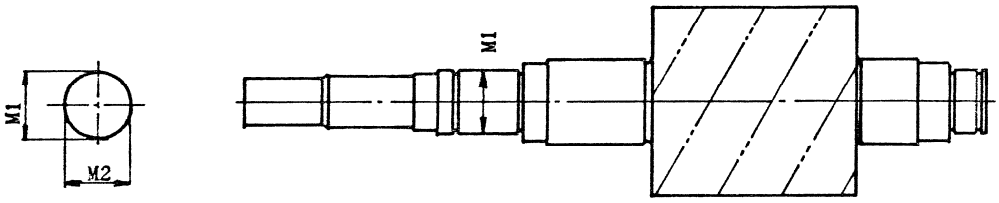


[Unit: mm]

Model	[DA]	[DB]	[DC]
1610C	φ50	−0.07	−0.10
1612C	φ50	−0.07	−0.10
2016C	φ60	−0.09	−0.12
2520C	φ70	−0.09	−0.12
3225C	φ90	−0.10	−0.13
4032C	φ116	−0.10	−0.13

9 - 1 Rotor (Thrust bearing shaft) UD/G series

a) Measure using a micrometer.

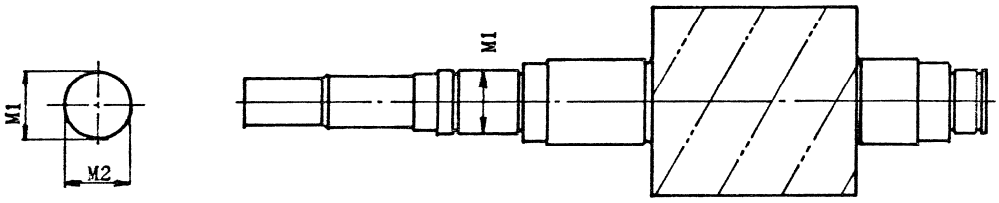


[Unit : mm]

Model	[DA]	[DB]	[DC]
125	φ45	−0.02	−0.035
160	φ60	−0.03	−0.045
200	φ65	−0.035	−0.05
250	φ85	−0.035	−0.05
320	φ105	−0.035	−0.05
400	φ140	−0.035	−0.05

9 - 2 Rotor (Thrust bearing shaft) SCV series

a) Measure using a micrometer.

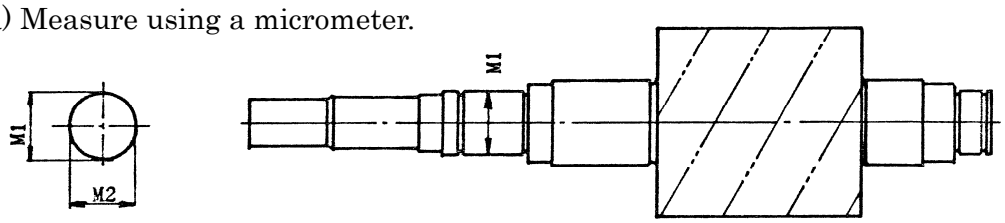


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	φ60	−0.03	−0.045
200V	φ65	−0.035	−0.05
250V	φ85	−0.035	−0.05
320V	φ105	−0.035	−0.05
400V	φ140	−0.035	−0.05

9 - 3 Rotor (Thrust bearing shaft) C series

a) Measure using a micrometer.



Lower area

[Unit : mm]

Model	[DA]	[DB]	[DC]
1610C	φ60	−0.03	−0.045
1612C	φ60	−0.03	−0.045
1612CM side (Increased speed)	φ70	−0.035	−0.05
2016C	φ65	−0.035	−0.05
2520C	φ85	−0.035	−0.05
3225C	φ105	−0.035	−0.05
4032C	φ140	−0.035	−0.05

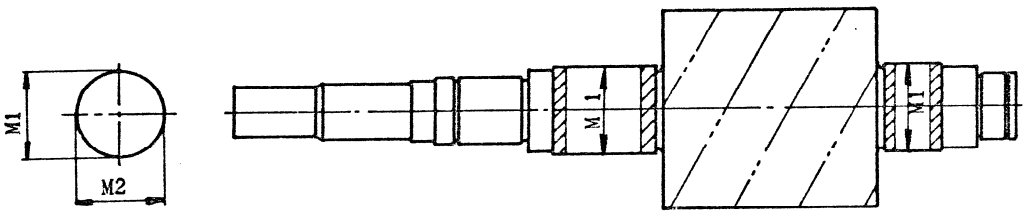
Higher area

[Unit : mm]

Model	[DA]	[DB]	[DC]
1610C	φ35	−0.03	−0.045
1612C	φ45	−0.02	−0.035
2016C	φ60	−0.03	−0.045
2520C	φ65	−0.035	−0.05
3225C	φ85	−0.035	−0.05
4032C	φ105	−0.035	−0.05

10 - 1 Rotor (Main side bearing shaft) UD/G series

a) Measure using a micrometer.
b) Pay close attention, especially to the part coming out. If wear is observed by visual inspection, surface treatment such as hard chrome plating should be applied.

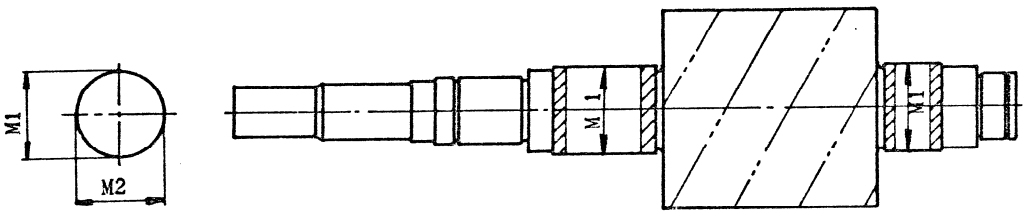


[Unit:mm]

Model	[DA]	[DB]	[DC]
125	φ55	−0.02	−0.03
160	φ72	−0.02	−0.03
200	φ90	−0.02	−0.03
250	φ110	−0.02	−0.03
320	φ140	−0.025	−0.035
400	φ180	−0.08	−0.09

10 - 2 Rotor (Main side bearing shaft) SCV series

a) Measure using a micrometer.
b) Pay close attention, especially to the part coming out. If wear is observed by visual inspection, surface treatment such as hard chrome plating should be applied.

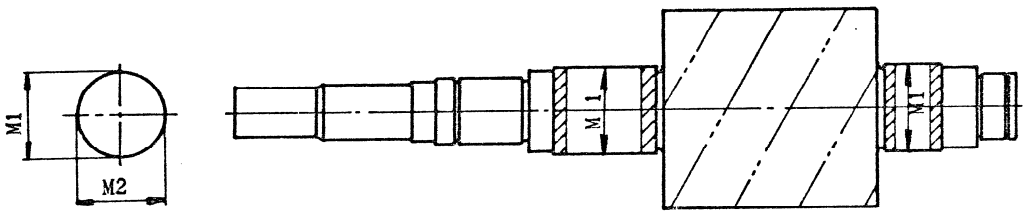


[Unit:mm]

Model	[DA]	[DB]	[DC]
160V	φ72	−0.02	−0.03
200V	φ90	−0.02	−0.03
250V	φ110	−0.02	−0.03
320V	φ140	−0.025	−0.035
400V	φ180	−0.08	−0.09

10 - 3 Rotor (Main side bearing shaft) C series

a) Measure using a micrometer.
b) Pay close attention, especially to the part coming out. If wear is observed by visual inspection, surface treatment such as hard chrome plating should be applied.



Lower area

[Unit: mm]

Model	[DA]	[DB]	[DC]
1610C	φ72	−0.02	−0.03
1612C	φ72	−0.02	−0.03
1612C M side (Increased spped)	φ82	−0.02	−0.03
2016C	φ90	−0.02	−0.03
2520C	φ110	−0.02	−0.03
3225C	φ140	−0.025	−0.035
4032C	φ180	−0.08	−0.09

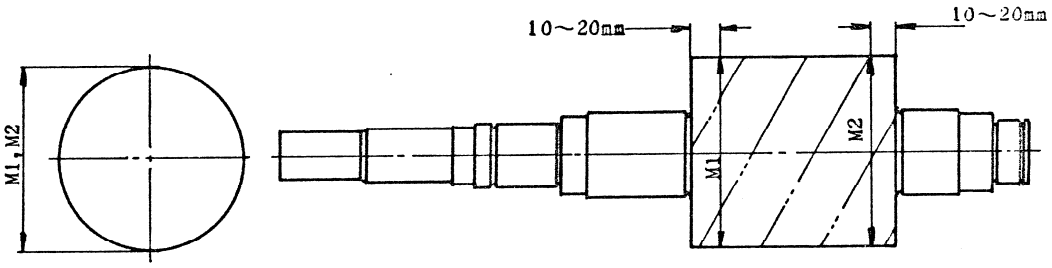
Higher area

[Unit: mm]

Model	[DA]	[DB]	[DC]
1610C	φ45	−0.02	−0.03
1612C	φ55	−0.02	−0.03
2016C	φ72	−0.02	−0.03
2520C	φ90	−0.02	−0.03
3225C	φ110	−0.02	−0.03
4032C	φ140	−0.025	−0.035

11 - 1 Rotor (Rotor lobes OD) UD/G series

a) Measure the depth 10 to 20 mm from the edge inward using a micrometer to determine the precise value of the wear.
b) If the measurement described above cannot be achieved in an appropriate way, check for abnormal wear.

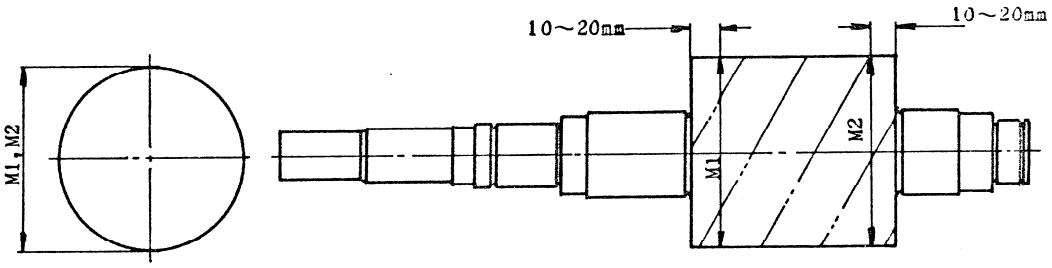


[Unit:mm]

Model	[DA]	[DB]	[DC]
125	φ127.5	−0.38	−0.51
160	φ163.2	−0.49	−0.65
200	φ204.0	−0.61	−0.82
250	φ255.0	−0.76	−1.02
320	φ321.3	−0.96	−1.29
400	φ408.0	−1.22	−1.64

11 - 2 Rotor (Rotor lobes OD) SCV series

a) Measure the depth 10 to 20 mm from the edge inward using a micrometer to determine the precise value of the wear.
b) If the measurement described above cannot be achieved in an appropriate way, check for abnormal wear.

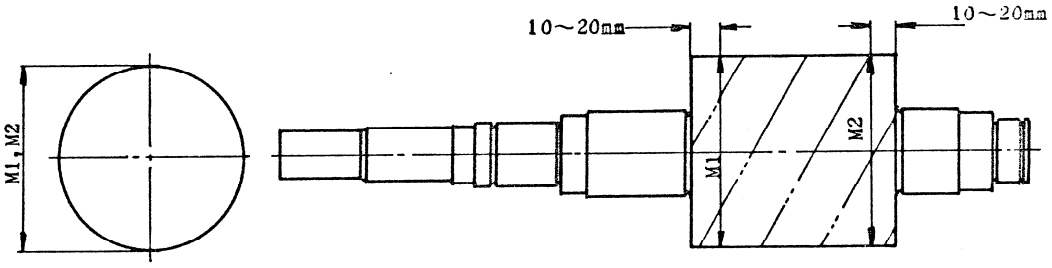


[Unit : mm]

Model	[DA]	[DB]	[DC]
160V	φ163.2	−0.49	−0.65
200V	φ204.0	−0.61	−0.82
250V	φ255.0	−0.76	−1.02
320V	φ321.3	−0.96	−1.29
400V	φ408.0	−1.22	−1.64

11 - 3 Rotor (Rotor lobes OD) C series

a) Measure the depth 10 to 20 mm from the edge inward using a micrometer to determine the precise value of the wear.
b) If the measurement described above cannot be achieved in an appropriate way, check for abnormal wear.



Lower area

[Unit: mm]

Model	[DA]	[DB]	[DC]
1610C	φ163.2	−0.49	−0.65
1612C	φ163.2	−0.49	−0.65
2016C	φ204.0	−0.61	−0.82
2520C	φ255.0	−0.76	−1.02
3225C	φ321.3	−0.96	−1.29
4032C	φ408.0	−1.22	−1.64

Higher area

[Unit: mm]

Model	[DA]	[DB]	[DC]
1610C	φ102	−0.25	−0.41
1612C	φ127.5	−0.38	−0.51
2016C	φ163.2	−0.49	−0.65
2520C	φ204.0	−0.61	−0.82
3225C	φ255.0	−0.76	−1.02
4032C	φ321.3	−0.96	−1.29

MAYEKAWA Europe MYCOM

PARTS DIMENSIONS AND SERVICEABLE WEAR LIMIT GUIDE OF OIL PUMP MENTIONED

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MAYEKAWA MYCOM

Oil Pump

Replacement Parts Guideline for Oil Pump	06.Sep.2017	G0022-00E

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Revision history

Rev. No.	Issue Date	Description of Changes	Prepared/Approved by:
00	2017-09-06	Change document number and document review	Kajiwara / Shozu

MAYEKAWA MYCOM	Oil Pump	
Replacement Parts Guideline for Oil Pump	06.Sep.2017	**G0022-00E**

1 General

a) Significance of recording part dimensions

Recording part dimensions enables us to convert qualitative things such as the passing of time and part-status change into quantitative indication of change in dimensions. This makes it possible to judge when replacement is required by referring to the numbers.

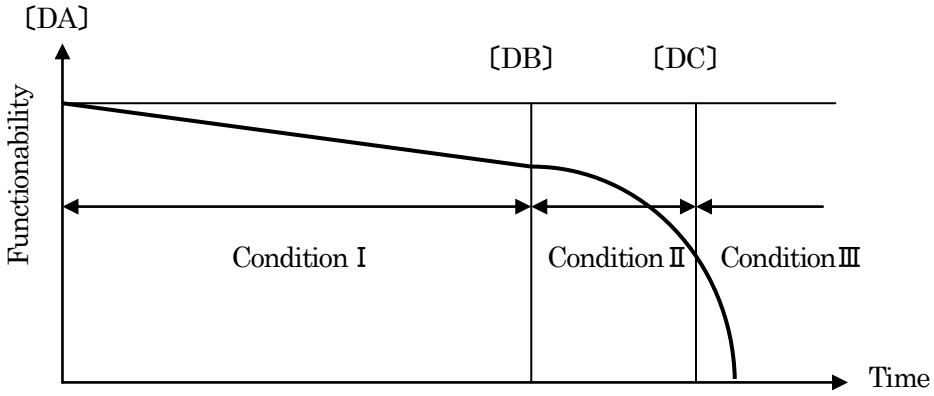
b) Symbols and abbreviations

Each number and indication in this guideline mean as follows;

DA : Standard dimension A

DB : Replacement dimension B

DC : Disposal dimension C



Condition Ⅰ (Dimension from DA to DB):
The part works fully functionally so it can be used continuously.

Condition Ⅱ (Dimension from DB to DC):
Replacement is desirable. The function as the part is not sufficient.
First remove the causes of wear. If the part should be used continuously, advance the date for next periodic inspection.

Condition Ⅲ (Dimension from DC or more):
The part doesn't function as designed and may cause failure. (Replace the part at the point you find it.)

Note) The criteria in this document may be subject to addition, correcting or change without notice.

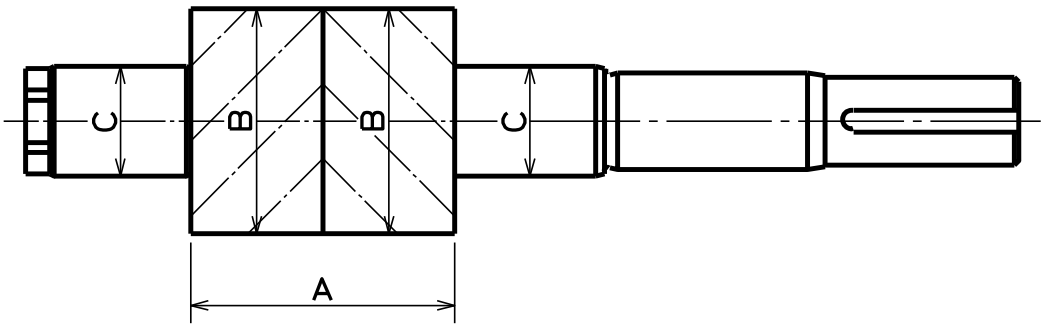
2 Precautions on replacement parts

Please use MYCOM genuine parts for replacement. Otherwise unexpected failure may occur.
We shall be exempted from offering the warranty for malfunctions of and damage to the product that result from the use of replacement parts other than genuine MYCOM parts.

3 M50P, F50P

3.1 Rotor (Outer diameter, Width, Bearing portion)

a) Measure the part with a micrometer.
b) By visual inspection, please replace if stepped with wear is confirmed even in one place.

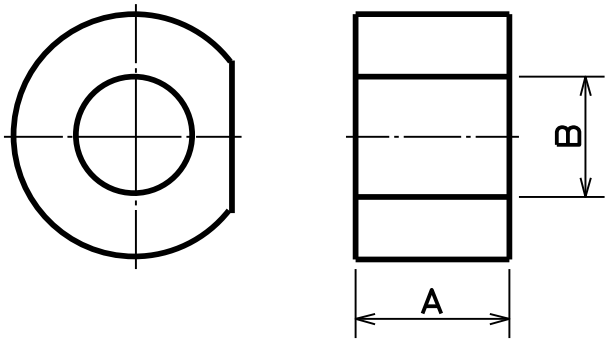


〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	60	-0.015	-0.025
B	ϕ51	-0.075	-0.085
C	ϕ25	-0.020	-0.030

3.2 Bearing

a) Measure the part with a micrometer and cylinder gauge.
b) Replace the part if extreme abrasion, scratch in the circumferential direction, or black discoloration is found in inner metal.



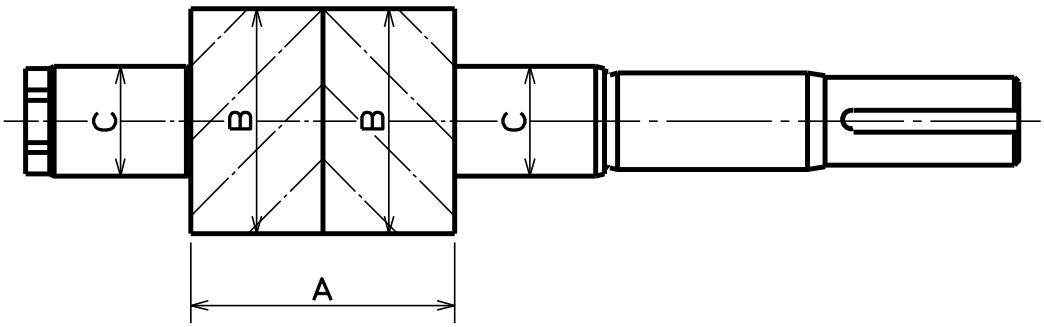
〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	32	-0.060	-0.080
B	ϕ25	+0.060	+0.075

4 M60P, F60P

4.1 Rotor (Outer diameter, Width, Bearing portion)

a) Measure the part with a micrometer.
b) By visual inspection, please replace if stepped with wear is confirmed even in one place.

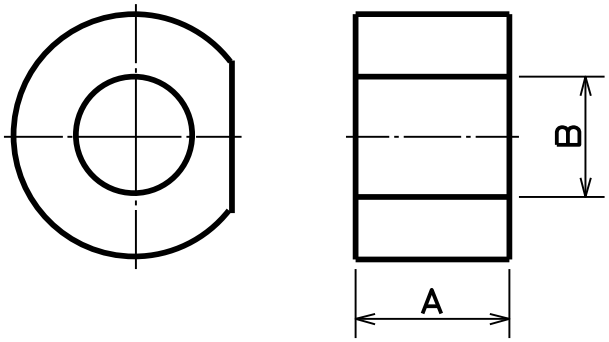


〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	76	-0.015	-0.025
B	ϕ64.2	+0.025	+0.015
C	ϕ32	-0.020	-0.030

4.2 Bearing

a) Measure the part with a micrometer and cylinder gauge.
b) Replace the part if extreme abrasion, scratch in the circumferential direction, or black discoloration is found in inner metal.



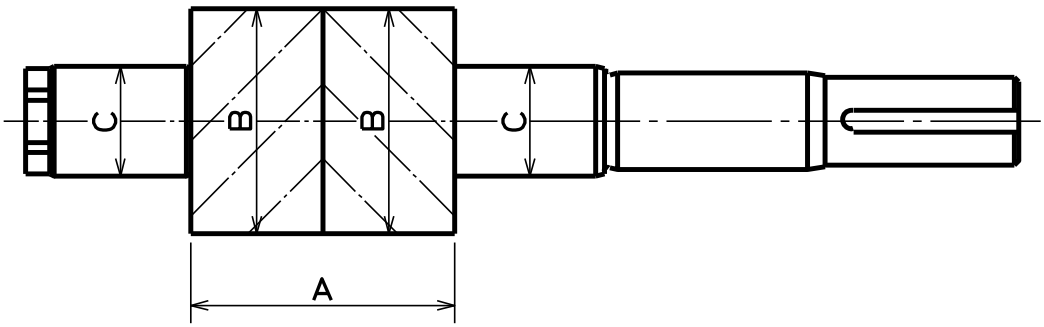
〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	40	-0.050	-0.070
B	ϕ32	+0.070	+0.085

5 M80P

5.1 Rotor (Outer diameter, Width, Bearing portion)

a) Measure the part with a micrometer.
b) By visual inspection, please replace if stepped with wear is confirmed even in one place.

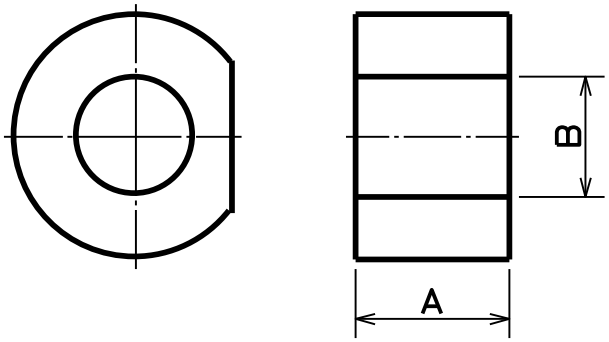


〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	96	-0.015	-0.025
B	ϕ81.6	-0.085	-0.095
C	ϕ40	-0.024	-0.034

5.2 Bearing

a) Measure the part with a micrometer and cylinder gauge.
b) Replace the part if extreme abrasion, scratch in the circumferential direction, or black discoloration is found in inner metal.



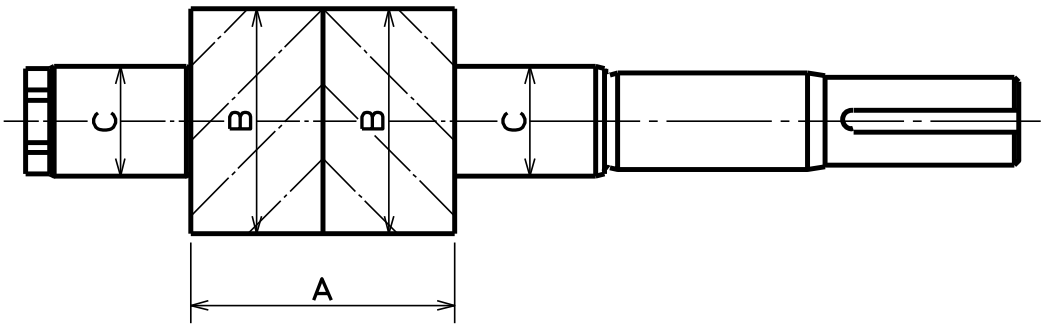
〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	52	-0.105	-0.125
B	ϕ40	+0.079	+0.094

6 M100P

6.1 Rotor (Outer diameter, Width, Bearing portion)

a) Measure the part with a micrometer.
b) By visual inspection, please replace if stepped with wear is confirmed even in one place.

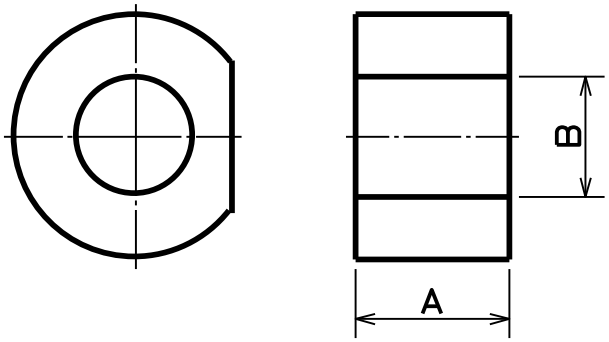


〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	120	-0.020	-0.030
B	ϕ120	-0.055	-0.070
C	ϕ50	-0.035	-0.045

6.2 Bearing

a) Measure the part with a micrometer and cylinder gauge.
b) Replace the part if extreme abrasion, scratch in the circumferential direction, or black discoloration is found in inner metal.



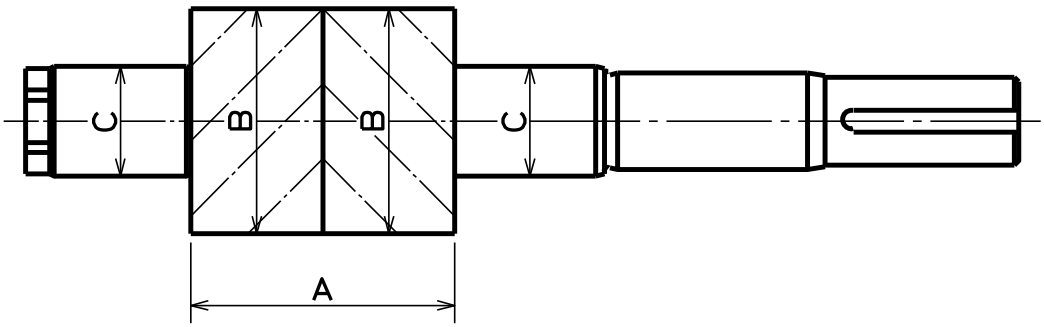
〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	65	-0.060	-0.085
B	ϕ50	+0.080	+0.100

7 M125P

7.1 Rotor (Outer diameter, Width, Bearing portion)

a) Measure the part with a micrometer.
b) By visual inspection, please replace if stepped with wear is confirmed even in one place.

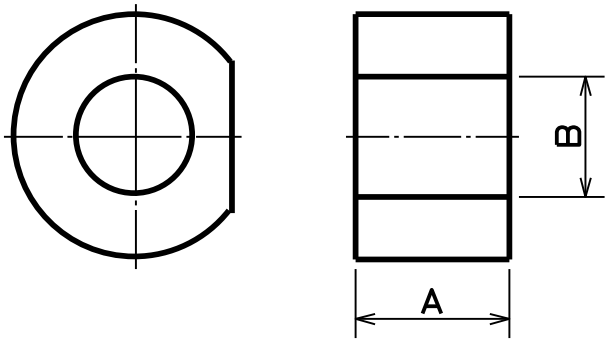


〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	150	-0.030	-0.040
B	ϕ127.5	-0.070	-0.080
C	ϕ60	-0.040	-0.050

7.2 Bearing

a) Measure the part with a micrometer and cylinder gauge.
b) Replace the part if extreme abrasion, scratch in the circumferential direction, or black discoloration is found in inner metal.



〔unit:mm〕

Item	[DA]	[DB]	[DC]
A	75	-0.060	-0.090
B	ϕ60	+0.090	+0.110

MAYEKAWA Europe MYCOM

CRITERIA FOR OIL REPLACEMENT

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There are two ways to determinate the correct time for replacement of the oil:

A) SIMPLE ROUTINE OBSERVATION. which can be carried out by any operator.

- Critical change of original color of fresh oil by use of ASTM color standard.
- Solid matter collected at oil filter and liquid refrigerant strainer during first year of operation.
- Waterpresence by the degree of clearness of the oil-cracking test.

B) PERIODIC LABORATORY ANALYSIS which can be carried out by the oil producer.

- This method is a reliable way to determinate the correct time for oil replacement.
  This method provides one of the new non-destructive tools available that can be used in preventive maintenance for refrigerant.
- The test results can be classified into 2 parts.

"MUST" – items

- Color, maximum L 6.0 following ASTMD 1500
- Viscosity, 40 c St at 40°C ±15% maximum after dehydration in comparison with fresh oil.
- Total acid number (T.A.N.), maximum 0,5 mg KOH / gr.
- Copper strip corrosion, maximum 2 following class 100°C – 3hrs.
- Falex test, minimum 500 lbs.
- Water content, maximum 50 ppm.

"WANT" – items

- Millipore filter, maximum 20 mg / 100 ml.
- Normal pentane insoluble, maximum 0,1% by weight.
- Special gravity, at 15°C / 4°C.
- Interfacial tension , minimum 20 dynes / cm.
- Flash, COC, minimum 10°C drop in temperature in comparison with fresh oil.
- Pour: minimum 10°C rise in temperature in comparison with fresh oil.

The most important benefit for the plant owners is probably the low cost of periodic lubricant analysis. Our customer saves a great deal of money in direct costs: it is far less expensive to overhaul a compressor before it is damaged than after it has been nearly totally destroyed.

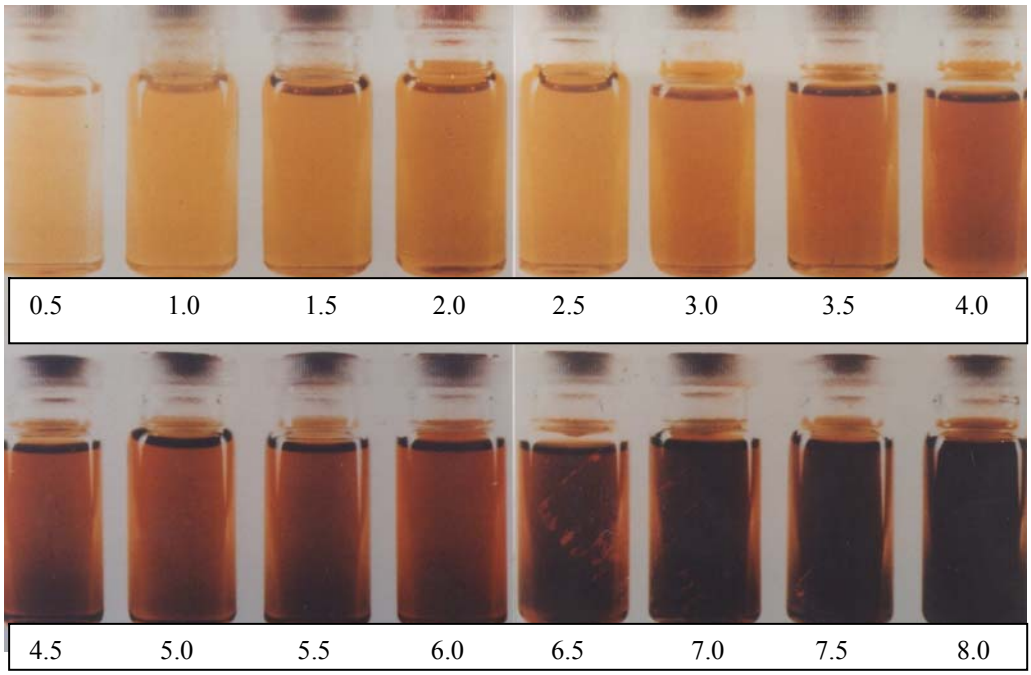
C) Taking oil samples – recommended procedure:

1. Material that should be available when carrying out oil sampling
   - personal protection (a minimum of safety goggles, gas mask, gloves, protective clothes will be required)
   - check with the local/company regulations if additional measures shall be taken as the oil sample will be taken from the main oil line which might be on high pressure and contain refrigerant/process gas
   - certified particle free glass or hard plastic bottle (100-200ml)
   - cloths
   - an open oil container of approx. 4 litres
   - standard tools

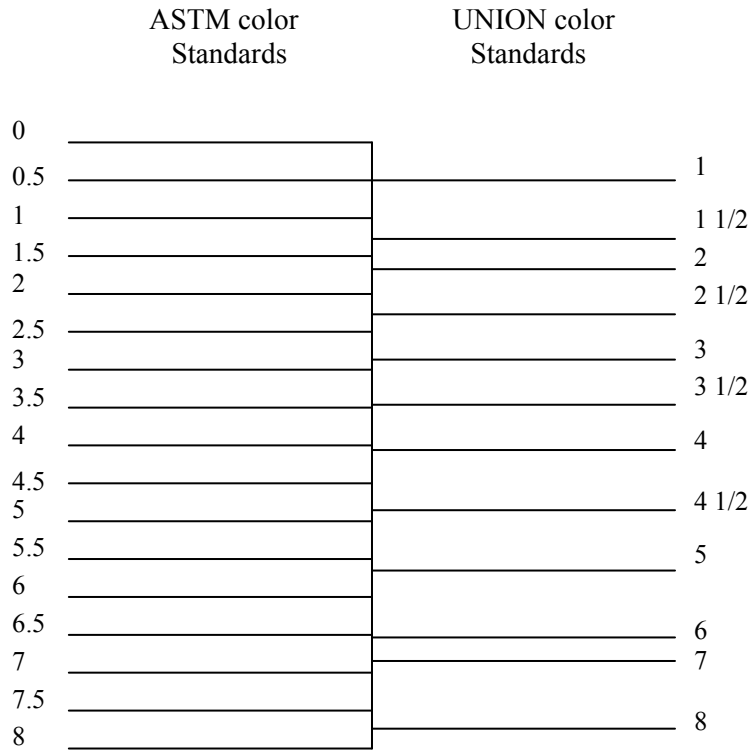
2. Location:
   Before and after the oil filter(s), preferably by using the available drain connection.

3. Sampling instruction:
   3.1 The installation shall be operating fairly stable before starting to take the oil sample
   3.2 Install the oil container underneath the sampling valve
   3.3 Install a hose or pipe on the sampling valve
   3.4 Open and close the valve approx. 5 times to make sure local deposits are removed and are not badly influencing the analysis results
   3.5 Open the valve and flush the hose/pipe by draining approx.. 1 liter into the container
   3.6 Open the sampling bottle (limit the time that the bottle is open to avoid ingress of dirt)
   3.7 Place the bottle under the oil flow without touch the hose.
   3.8 Fill the bottle until it is reaching a level of maximum 80%
   3.9 Put back the cover of the bottle (the time that the bottle is opened to air shall be limited)
   3.10 Label the bottle with at least the following information: date, unit identification, position of sample point, person in charge, operating hours
   3.11 Repeat for these steps for all samples you wish to take
   3.12 Arrange sending the bottle(s) to a certified analyzer.

ASTM Colour Standards



Comparison of color standards



Judgement of oil quality from appearance

	USED OIL WITH WATER	USED OIL WITH IMPURITY AND SOLID MATTER	
APPEARANCE			
VIEW	Unclear and white - yellowish appearance. If drastic of water at the bottom of the vessel.	A small quantity of solid matter or waterdrops Still clear with a tinge of light brown.	A large quantity of black solid matter Cloudy appearance.
NOTE	OPERATE WITH CARE/ REPLACE IF AMOUNT OF WATER IS GREAT.	OPERATE WITH CARE	REPLACE ALL OIL
CRITERIA FOR OIL MAINTANANCE & COUNTERMEASURE	Drain water only from oil drain valve. Dehydrate system If contamination is excessive, drain oil completely from the system before flushing the oil system and charging fresh oil.	Sample another bottle of oil within 10 days and compare the difference of both oils to confirm the course of contamination. Clear oil filter element.	After investigating the cause, clean the system thoroughly before replacing with fresh oil.

Note: If more copies of oil appearance scale are required, contact the nearest Mobil office.

Judgement of oil quality from appearance

USED OIL WITHOUT IMPURITY AND SOLID MATTER

APPEARANCE

ASTM Color 1.0 2.5 4.0 6.0 8.0

VIEW	Almost clear with a yellowish tinge. No solid matter	Still clear with a tinge of light brown. Very little solid matter	Still clear with a brownish tinge Very little solid matter	Clear but cloudy (red brown) appearance Still little solid matter	Darkened (dark brown) appearance Still little solid matter
NOTE	STILL USABLE		OPERATE WITH CARE	REPLACE ALL OIL	NEVER USE THIS OIL.
CRITERIA FOR OIL MAINTENANCE & COUNTERMEASURE	STANDARD FOR OIL MAINTENANCE Color ,ASTM D 1500 – L 6.0 max Viscosity, CST / 40°C approx. 15% max. Total acid no., mg KOH/gr. – 0.5 max. Falex test, lbs. – 500 min Interfacial tension, dynes /cm – 20 min Undissolved water, ppm – 50 max Millipore filter, mg / 100ml – 20 max. Normal pentane insoluble, wt – 0.1 max Copper strip corrosion, class, 100°C – 3hr – 2 max Solid matter, vol 7% - 0.1 max -Items determinable by “simple routine observation.” -Change in viscosity in comparison with fresh oil.		Time for oil replacement is approaching. If viscosity and Total acid No. are normal the oil can be still used. If hours of operation exceed the scheduled service life of oil, replace all oil.	Never fail to replace oil completely, or compressor trouble will occur.	Investigate the cause of this heavy contamination.

MAYEKAWA Europe MYCOM

PROCEDURE FOR OIL CHARGING SCREW UNITS

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info@mayekawa.eu

1. Instructions

BEFORE STARTING: BE SURE TO USE PROTECTING HANDGLOVES AND SAFETY GLASSES.

A. Pull the complete unit vacuum.
B. Connect a tube to a bottle with N_2-gas.
C. Be sure to have a small gas flow.
D. Connect the oil charge hose to the oil charge connection on the unit.
E. Put the tube with N_2-gas into the barrel. Be sure to stay above the oil surface with the tube. Check if N_2-gas is coming out of the barrel. If this is not the case, turn the valve on the gas bottle more open.
F. When gas is coming out of the barrel, place the oil charge hose into the barrel.
G. Open the oil charge valve on the unit. The oil will flow from the barrel into the compressor.
H. Fill the compressor with oil until the 'normal' level (*figure 2*) on the Top oil sight glass has been reached.
I. Close the oil charge valve.
J. Pull out the oil charge hose, than the N_2-gas tube.
K. Close the barrel.
L. Close the N_2-gas bottle.

ATTENTION:

1. Some oils do no react well to atmosphere.
   Do not expose the oil to long too the atmosphere. (Expl: JOMO oil)

2. If the unit is NOT on over pressure when starting the initial oil charge procedure, then a pressure test with N2 has to be performed to check for leaks.

Note:

A. On a screw compressor unit the oil charge valve is mounted on the oil separator. This valve can also be used as a purge valve.
B. On a reciprocating compressor unit the oil charge valve is mainly positioned on the oil cooler. Some types of compressors do not have the valve on the oil cooler, but have an oil charge valve on the bottom of the casing, on the oil pump side.

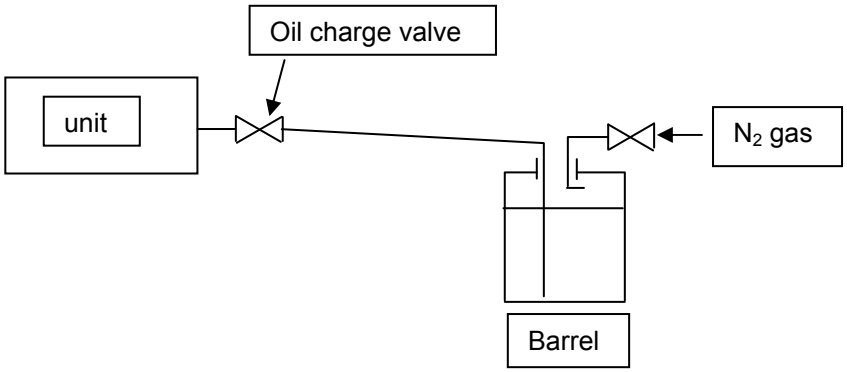

Figure 1: Scheme sketch

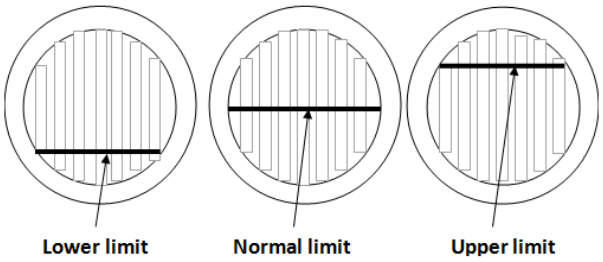

Figure 2: Oil levels (sight glass at oil separator)

2. Initial oil charges

The oil charge data below is for reference only. The oil charge data is depending on the oil separator volume which is designed according to design conditions.

Compressor	Thermosiphon Oil cooler		PHE Oil Cooler	
FM160 S M L	*OC15245*	272 L	NB76	235 L
160 VSD VMD VLD	OC15245	274 L	NB76	238 L
200 VSD VMD VLD	OC20245	321 L	NB76	276 L
250 VSD VMD VLD	OC25245	420 L	NB76	342 L

(In case of IOM- manual)
TO USE SEE SECTION 1 : Oil charge datasheet

NOTE:

- The main column gives the initial oil charges based on thermosiphon cooled oil coolers.
- The second column gives the initial oil charges for plate heat exchanger type water cooled oil coolers (types are only given for reference).
- Data only for reference use.

Remark:

In case more accurate information is needed of 320 units the intial oil charge is on request.

3. Analysis

Mycom Europe NV recommends to take an oil sample every 6 months. The results have to be compared with the results of every previous analysis, so a report has to be made. Normally the quality of the oil becomes sligthly more bad. When the results are put in a curve, this one descends slowly. If between two measurements a big difference is found, then the oil has suddenly been contaminated. The curve will show a gap. It is very important at that time to search for the possible causes and to take the correct countermeasures. Generally spoken the oil will have to be changed completely.

Remark:

Only the limit of contamination has been exceeded => the system can be cleaned with a special bypass filter. (BF-15) Instructions + technical information can be obtained on request.

4. How to do the analysis

1. The customer takes contact with a company which can do oil analysis.
2. This company must send the customer a paper where the customer can fill out what he wants to have examined.
3. The customer sends this paper together with the oil sample (for example 50 ml) to the analysing company.
4. The analysing company will analyse the sample and send the required data in a report to the customer.

MAYEKAWA Europe MYCOM

TROUBLESHOOTING
SCREW COMPRESSOR UNIT

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During continuous long run operation, unpredictable shut down and / or sudden abnormal operation of the compressor unit can happen. The daily operation can show every small or large changing of equipment condition.
Operators and owner of the compressor unit should be able to provide suitable actions and countermeasures for the problems in order to minimise the mechanical loss and cost which may be caused by such troubles.

Following lists are the examples and guideline for the possible troubles relating to the compressor system, assumed causes and effective actions to be taken for such troubles

Operators and owners are advised to read them, and to under stand whole of the clause in order to be able to protect their machines from such abnormal situations.

MYCOM standard trouble shooting advises for following compressor problems:
- Capacity control troubleshooting.
- Oil pressure failure troubleshooting
- Abnormal sounds generated during full unload operation.
- Mechanical shaft seal troubleshooting

CAPACITY CONTROL TROUBLESHOOTING

1) General

The MYCOM Research and Development department has investigated most causes of compressor trouble and new design approaches and intensive technical development have been brought to bear on these problems

In the case that the compressors is already in operation however, malfunctioning of the unloader mechanism may occur because of faults on the package or plant side rather than the compressor side, e.g. oil pipelines in the package, operating conditions, control systems, etc.

When working out a countermeasure for an unloader mechanism problem, you should examine thoroughly the many possible causes in the package. The following troubleshooting 1-tints have been proved successful by MYCOM engineers

2) Analysis guides for unloader mechanism.

Problems listed in Table 1 are those most likely to be encountered during, operation, together with probable cause and remedial action to be taken
You may encounter causes other than those listed in the next pages
We hope that you will furnish us with accurate information on them Your information will be valuable in supplying you with trouble-free compressors.

PROBLEM

Capacity control device works but it takes longer, than usual to activate.

Remarks:

Standard activating time

S type compressor No load – Full load: 15 sec.	L type compressor No load – Full load: 25 sec.
Full load – No load: 40 sec.	Full load – No load: 60 sec.

Note: Activating time changes according to Pd/Ps and built in volume ratios (L, M, and H)

PROBABLE CAUSE

a) Oil pressure is lower than the lowest permissible pressure (discharge gas pressure + 2 bar (28 psi)).

b) Oil piping to unloader mechanism is clogged or throttled.

c) Unloader cylinder is coated with oil sludge.

d) Aged or defective unloader push rod "o" ring.

e) Abnormal abrasion of the slide valve.

REMEDY

a) Adjust oil pressure, referring to Technical Information, TD–76–963 to 969

b) Check the opening of service valve, oil pipelines & pipe fittings and clean if necessary. In case of test *operation, check size of* piping and orifice of solenoid, valve Replace if improper

c) As the unloader cylinder 'is separated from the rotor chamber except for an oil flow channel, it *can be* disassembled separately. Purge gases from the *compressor, remove* the unloader cover and check the inside of the cylinder. Inspect the movement of the unloader piston by screwing in a long, threaded eyebolt. If there is nothing abnormal on the cylinder surface (stains or rubber like slag), go to remedy “d”

d) Remove the unloader piston and check the "O" ring and Teflon cap seal. Replace if defective, hardened or swollen

e) Remove the unloader piston and cheek slide valve operation by moving the unloader push pipe back and forth manually.

PROBLEM

Capacity control device does not work automatically but operates arbitrarily.

PROBABLE CAUSE

a) Gas is present in the unloader cylinder at the time of start-up when the slide valve moves to the load direction

b) When the slide valve moves arbitrarily to the “load” direction, there is a defective "O" ring of NV3 type manual unloader operating valve or a defective seal of SV4 type electrical unloader operating valve or a defective “O” ring of the unloader piston

c) When the slide valve moves by itself to the “no load” direction, the solenoid valve for unloading operation is defect

REMEDY

Disassemble the compressor completely if the slide valve does not move smoothly. Check the friction surface of the slide valve and the "O" ring (see screw compressor manual)

a) Before start-up of the compressor operate the oil pump only and move the slide valve manually two or three times so as to discharge gas from the unloader cylinder
Caution: In this case, wait for about 10 minutes until the oil in the compressor drains

b) Check valves and "O" ring Repair or replace if defective

c) Check the seat surface of the solenoid valve. Replace if defective.

PROBLEM

Capacity control device works in one direction only.

PROBABLE CAUSE

a) When the slide valve moves to the “load” direction only, there is insufficient oil pressure.

b) The shut-off valve on the oil supply header or the oil return shut-off valves of compressor side and low pressure side are closed

c) Blind pipe fitting for capacity control oil pipeline or incorrect installation of solenoid valves

d) Miswiring to solenoid valves or no electricity to one of the solenoid valves.

e) Solenoid valve coils burned out

REMEDY

a) Adjust the oil pressure

b) Judging from the direction of slide valve operation, open the shut-off valves

Note: In case of “load” direction, open the oil supply valve. In case of "no-load" direction, open the oil return valve

c) Check oil pipelines. Repair if defective.

d) Check electric circuits.

Note: In case of “load” direction only, check solenoid valves for oil supply. In case of 'no load" direction only, check solenoid valves for oil return

e) Check voltage and rating of the coil. Replace coil if defective.

PROBLEM

Capacity control device moves to a certain position but no further.

PROBABLE CAUSE

a) Improper positioning of the potentiometer in the unloader indicator.

b) Stains or rubber like slag stick to surface of unloader cylinder. (12 / 2003)

c) Defective slide valve or breakage of the slide valve

d) A broken piece of unloader piston is lodged between the piston and the cylinder

e) Abnormal abrasion of the ditch of the indicator cam.

REMEDY

a) This case is liable to occur on compressors manufactured before 1974. Dismantle the unloader indicator, adjusts the position of the potentiometer and fix in place with set screws.

b) Trace the past operation records. Check the cylinder surface. Remove slag

c) Dismantle the unloader cylinder section. Confirm the working of the slide valve by hand. Disassemble the compressor and replace the slide valve if defective

d) This is almost impossible. Mycom has met such trouble once. It was due to incorrect re-assembly at periodic inspection. Replace the unloader piston

e) In this case, the 'indicator does not work normally. Disassemble the unloader cover assembly, Replace the indicator cam if damaged or defective.

PROBLEM

Capacity control device works hut unloader indicator does not work.

PROBABLE CAUSE

a) The set screw (128) holding the indicator cam shaft and micro switch cam is loosen

b) The guide pin (68) fixed 'in the unloader push rod is broken or falls out

REMEDY

a) Disassemble the unloader indicator and tighten the set screw (128)

b) Disassemble the unloader cover. Cheek the pin (68). Replace if defective

PROBLEM

Capacity control device fails to operate.

PROBABLE CAUSE

a) Improper connection of oil pipelines.

b) Shut-off valve(s) closed.

c) Miswiring or improper connection to solenoid valve.

d) Seizure of unloader mechanism.

e) Defective "O" rings.

f) Abrasion or seizure of indicator cam.

g) Broken unloader push rod

REMEDY

a) This occurs particularly at the time of initial operation. Inspect and adjust

b) Inspect if shut-off valves are closed. Open the valves.

c) Test solenoid operation by ear or with tester. Repair electrical circuit.

d) Check the unloader piston, unloader slide valve, unloader push rod, injection pipe, etc. Reconstruct or replace if defective.

e) Check "O" rings. Replace if defective.

f) Disassemble the unloader cover. Replace fine indicator cam if defective.

g) Extremely rare occurrence, which may occur on the welded type push rods, manufactured before 1975. Replace if defective.

OIL PRESSURE TROUBLESHOOTING

Troubles listed in table 1 are those most likely to be encountered during operation. Probable cause and remedial action to be taken are indicated.)

PROBLEM

Ooil pressure was at the very limit of sufficiency from the beginning of test operation

PROBABLE CAUSE

a) Imperfect modulation of oil pressure regulating valve

b) Insufficient oil pump capacity

c) Insufficient viscosity of oil used

d) Large pressure drop in oil pipelines

e) Insufficient filtration area of oil filter

f) Large pressures drop at oil cooler.

REMEDY

a) Build up oil pressure by turning the adjusting screw of the oil pressure-regulating valve.

b) Replace with a larger size oil pump if capacity is insufficient. When the discharge gas temperature during normal operation does not exceed 85°C, i.e. the maximum permissible discharge gas temperature minus 5°C installs a throttle on the oil injection inlet.

COMP	Dia. of throttle
160 S/L	3 mm
200 S/L	5 mm
250 S/L	8 mm

c) Replace oil with higher viscosity oil

d) Replace oil pipelines if size is too small.

e) Replace with a larger size oil filter assembly if filtration area is insufficient. Note: Do not change to large oil filter screen mesh.

f) Maximum allowable pressure drop for oil at oil cooler is 0,5 bar. Calculate again considering number of baffles, baffle layout. etc

PROBLEM

Oil pressure was normal at the time of test operation but became insufficient gradually as time passed.

Remarks: This type of oil pressure failure trouble can be classified into the following two cases:

Case A: Operating conditions remain unchanged.
Case B: Operating conditions have changed greatly compared with those of test operation.
1) Ambient temperature was low when you started operating in winter.
2) Ambient temperature was high when you started operating in summer.

PROBABLE CAUSE

Case A

a) Abnormal abrasion of major parts of oil pump.

b) Malfunction of oil pressure regulating valve

c) Oil filter or oil suet-Ion filter clogged,

d) Large tolerances of lubricated parts caused by abnormal wear. Increase oil flow quantity for bearing lubrication

Case B 1) AMMONIA FLUOROCARBON

a) Insufficient oil, pump capacity caused by increased flow for oil injection.
Note: High discharge pressure leads to the increase of oil flow quantity for oil injection

b) Low efficiency of oil pump caused by insufficient oil viscosity. (Note) High cooling water inlet temperature creates a rise in oil supply temperature resulting, in low viscosity of oil.

Case B 2) FLUOROCARBON ONLY}

a) Low efficiency of the oil pump caused by insufficient viscosity of oil
Note: In case of fluorocarbon, the more oil temperature falls, the more refrigerant is liable to dissolve in oil, under the same pressure. Therefore, oil is diluted with refrigerant resulting in insufficient oil viscosity. Insufficient oil pressure caused by gasified refrigerant resulting from pressure drop at oil pump suction side.

REMEDY

Case A:

a) Check the oil pump. Repair or replace defective parts.

b) Disassemble, inspect and clean.

c) Overhaul the compressor. Check worn parts. Repair or replace if defective.

d) Overhaul the compressor. Check worn parts- Repair or replace if defective.

Case B 1

a) Replace with a larger size oil pump if insufficient. When the discharge gas temperature during normal, operation does not exceed 85°C i.e. the maximum permissible discharge gas temperature minus 5°C, restrict the oil flow quantity for oil injection by closing the shut-off valve gradually or by installing a throttle on the oil injection inlet

COMP	Dia. of throttle
160 S/L	3 mm
200 S/L	5 mm
250 S/L	8 mm

b) Clean the oil cooler. Change water flow quantity or water temperature

Case B 2

a) This case is especially liable to occur at the time of start-up. Maintain the oil temperature at 30°C or more with the oil heater during shutdown or control the oil temperature at the oil cooler outlet so as to maintain the oil supply temperature at 40°C - ±2°C.
Insulate so as to prevent heat radiation of oil separator during shut-down

PROBLEM

Oil pressure drops temporarily during operation. (Ooil pressure ffailure protection switch activates to stop compressor.)

PROBABLE CAUSE

a) Cavitation of oil pump caused by insufficient quantity of oil.

b) Oil foaming in oil reservoir tank caused by liquid flow-back.

c) Cavitation of oil pump caused by gasified refrigerant resulting from pressure drop at oil suction filter

d) Cavitation of oil pump caused by oil foaming in oil reservoir tank owing to a sudden pressure change on the high pressure side.

e) Oil filter or oil suction filter clogged.

f) Insufficient viscosity of oil caused by abnormally high oil temperature.

g) Insufficient viscosity of oil caused by dissolution of refrigerant due to abnormally low temperature in the oil separator.

h) Insufficient oil pressure caused by gasified refrigerant resulting from pressure drop at oil pump suction

REMEDY

a) Replenish oil.

b) Adjust operation. (Close expansion valves)

c) Adjust operation so as to maintain the discharge as temperature at condensing temperature plus 15°C (Min 10°C)

d) Take remedies to decrease sudden high pressure change e.g. stop automatic start/stop of condenser fans.

e) Clean filters

f) Clean oil cooler. Drain oil from oil cooler when high pressure liquid cooling system or direct expansion system is used.

g) Maintain the oil temperature at 30°C or more with the oil heater mounted on the oil separator. In very cold areas, insulation of oil separator may be required.

h) Adjust operation so as to maintainthe discharge gas temperature at condensingtemperature plus 15°C (min. 10°C)

THRUST BEARINGS TROUBLESHOOTING

Replacement of thrust bearing.

1) Visual inspection (See " Inspection standard for thrust bearing")

2) Criteria for replacement by operating hours.

Suction pressure		Life expectancy (hrs)	Max. usable hrs.
A1	-60cmHg – 0 bar	An x Bn x Cn x Dn	30.000
A2	0 bar – 4 bar		25.000
A3	4 bar – 5 bar		15.000

Max usable period: 5 years
An: Max usable hours

multiplier max hours

(A): Suction pressure

(B): Refrigerant
- B1: NH3 1.0
- B2: Freon R12, R22 0.8

(C): Lubrication oil.
- C1: Viscosity more than 55 cst at 40°C
  Excellent maintenance 1.0
- C2: Viscosity more than 55 cst at 40°C
  Inferior maintenance 0.8
- C3: Viscosity less than 54 cst at 40°C
  Excellent maintenance 0.8
- C4: Viscosity less than 54 cst at 40°C
  Inferior maintenance 0.7

(D): Replacement of thrust bearing.
- D1: Replaced since initial operation 1.0
- D2: No replacement since initial operation 0.7

Example:

1) Model: FM160LUD 2-M
Oil: Suniso 4GS
55cts at 40°C
Replenishment once a year
Suction pressure: 1 to 2 bars
Total running hours: 8.500 hrs in 3 years
Services: no overhaul carried out before
no major break-down

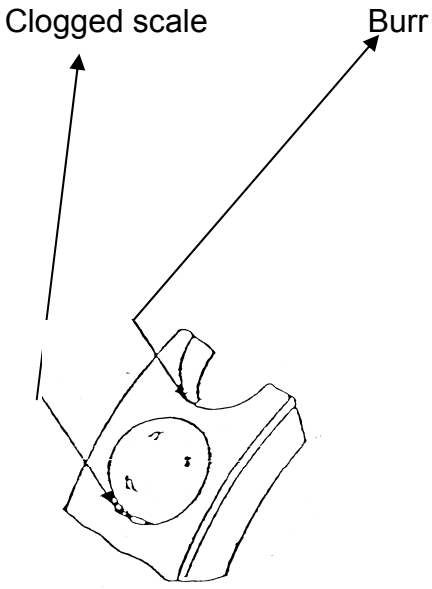
A= 25.000 (A2) B= 0.8 (B2) C=1.0 (C1) D= 0.7 (D2)

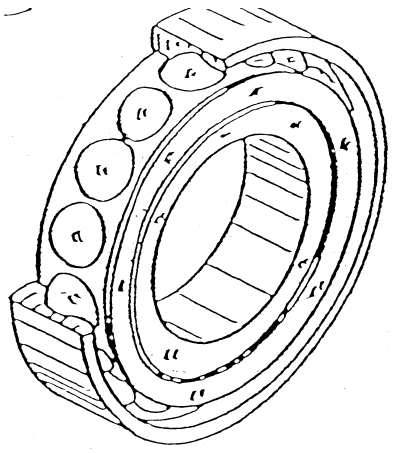
25.000 x 0.8 x 1.0 x 0.7 = 14.000 hrs (bigger than 8.500 hrs)
Trust bearing is still usable until 14.000 hrs.

2) Same compressor continued to run until 14.200 hrs
= replacement is desirable as continuous operating hours exceed 14.000 hrs.

Step 1: Check operating period.
Thrust bearing should be renewed when the operating period is 3 years or 25.000 running hours. Use the criteria, which occurs first.

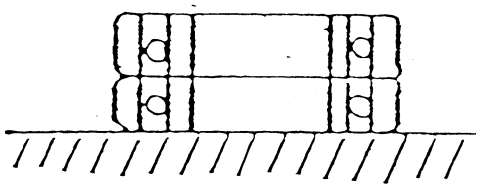
Step 2: Check the retainer for any burr.
Thrust bearing should be renewed if any burr or clogged scale is found by visual inspection.





Step 3: Check the backlash in the bearing.

Inspection of the backlash shall be done as following
Clean a matched pair of the bearings and place it on a smooth and flat surface.
Rotate the outer ring of the upper bearing to check the movement.
The bearing noise should be soft, no grating, and the bearing should reduce speed smoothly before stopping.



Place upside down to inspect both bearings

The thrust bearing should be renewed if rotation of the outer ring is not smooth and stops suddenly (it is recommended to confirm normal movement of new bearings to seek the difference with the used ones)

Check the clearance between the rotor and the inner ring. If the clearance exceeds more than 0-03 mm inner diameter of the inner ring and outer diameter of the rotor should be checked. The thrust bearing should be renewed if inner diameter exceeds the limit. (Please refers to screw compressor manual for- the limit a standard dimensions).

Step 4: Judge finally if the thrust bearing is to be renewed or not.

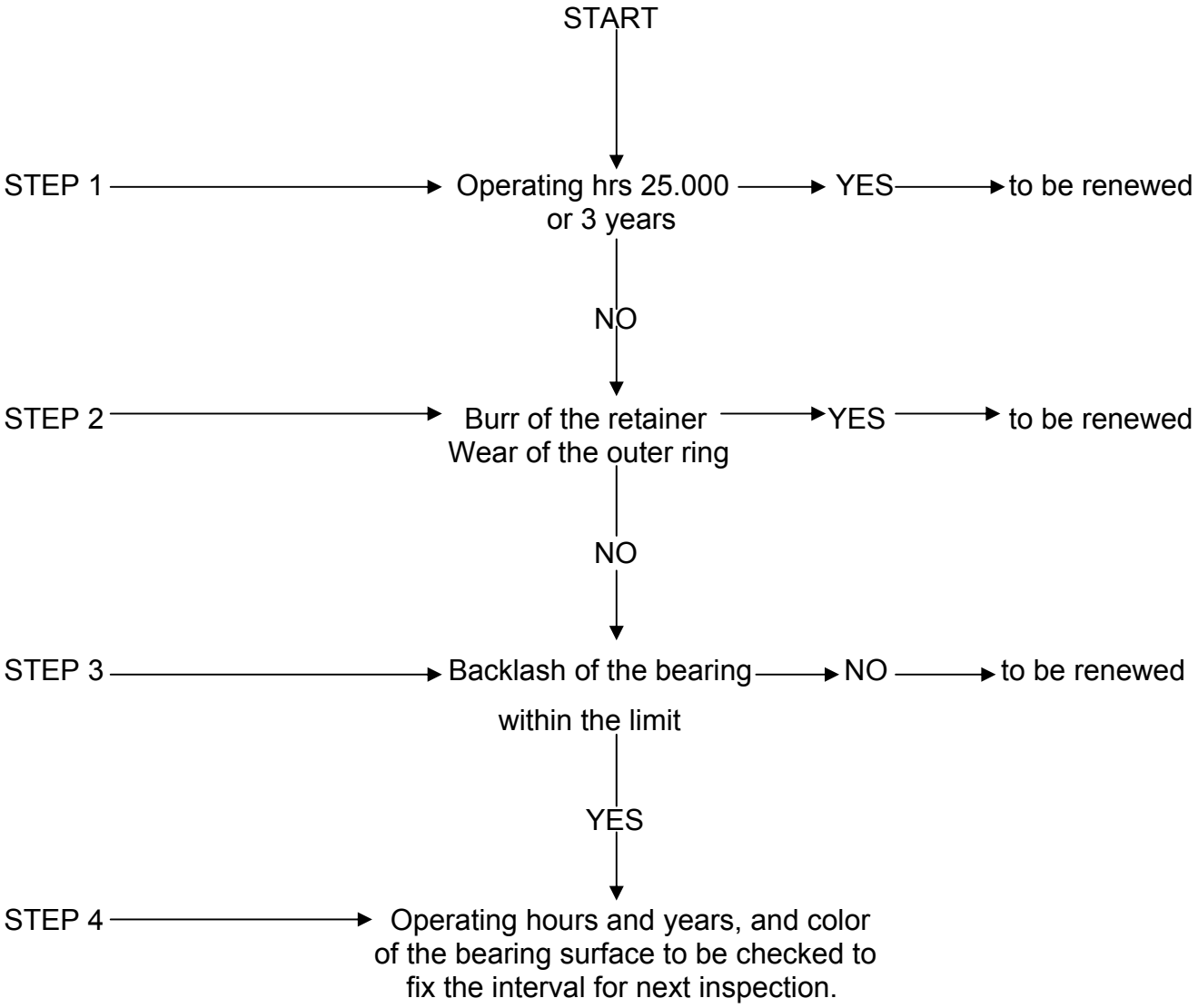
The thrust-bearing can be re-assembled for use if no abnormal condition is found by inspection following step 1 to step 3. The following, final inspection should be made to fix next inspection period:

Check and confirm that the operating next inspection period will not exceed 25000 running hours or 3 years before next inspection.
Check the fatigue of the ball bearing visually. The surface of the ball bearing should be shine and not be dull if its fatigue is not very much. Next inspection period should be scheduled by judging operating period and the fatigue of the ball.

NOTE: It 'is strongly recommended to renew the thrust bearing periodically as the thrust bearing is a very essential part for the screw compressor for it's mechanical performance and any trouble of the bearing should cause important damage on the screw compressor. Should any question please, please contact the nearest MYCOM office

INSPECTION STANDARD FOR THRUST BEARING

Procedure for inspection



MECHANICAL SHAFT SEAL TROUBLESHOOTING

Many users complain that the oil cannot be stopped from leaking at the mechanical shaft seal. The cause of this problem is often attributed to improper Carbon insert material.

Actually however most shaft seal leakage problems are produced by faults on the package or plant side rather than the compressor side- Unless the real cause is eliminated the problem will reoccur

When working out a countermeasure for a shaft seal leak-age problem, you should check the carbon insert first and then thoroughly examine the many possible causes in the package The following troubleshooting hints have been proven successful by MYCOM.

PROBABLE CAUSES

1. Suction gas pressure 5psi is close to the lowest or highest limit.

2. Oil supply temperature (To) is too high or too low.

3. Insufficient viscosity of oil.
   Remarks: Standard viscosity range recommended by MYCOM is 200 to 300 SUS (44 to 64 cst) at 38°C (100°F).

4. Oil pressure is below the standard.

5. Aged or dirty oil.

6. Frequent off-and-on operation. Short operational hours per day. Extended stopping. Reversed rotation of the compressor at the time of stopping.

7. Frequent liquid flow-back or extended stopping in winter.

8. Improper contraction allowance of the spring used in the mechanical seal assembly. Remarks: Standard contraction allowance Singel shaft seal type: 3 mm Double shaft seal type: 6 mm

9. Abnormal radial run-out of the male rotor at the shaft seal.
   Remarks: Maximal allowable run-out is 0,015 mm (0,0006 inch)

10. Abnormal parallel and angular alignment between the compressor shaft and the motor shaft. Remarks: Maximum permissible parallel and angular is 0,03 mm (0,0012 inch).

11. The oil supply for shaft seal lubrication is interrupted.

12. Rough seal cover and rotor shaft surfaces.

13. Incorrect mounting position of seal collar.

14. Abnormal wears of main and side bearings.

Note: This leads to abnormal radial run-out of the male rotor at the shaft seal.

REMARKS

1. Check whether there is sufficient lubrication. For remedial action, see TD76-625-1 to TD76-625-3.

2. Note that to is directly related to the viscosity of the oil. For remedial action, see TD76-968 to TD76-969.

3. Select proper oil as per MYCOM recommendations. Avoid selecting oil by price only. Note: Brand name of lube oils approved by MYCOM Suniso 3GS or 4GS (Sun oil Co) Clavuss 29 or 33 (Shell oil Co)

4. In this case, the temperature of the seal box will rise as the oil flow quantity to the mechanical shaft seal is reduced. For remedial action, see TD76-966 to TD76-969.

5. In this case, abrasion of the carbon insert will be accelerated. Replace with fresh oil.

6. Frequent off-and-on operation should be avoided. After extended stopping, operate the oil pump first for 30 seconds and turn the compressor shaft several times by hand.

7. Note that frequent liquid flow-back is directly related to insufficient viscosity of oil and oil pressure failure. Check the temperature of the compressor body when you start operation. If the temperature is abnormally low, the shaft seal will be adversely affected by abrupt starting. For remedial action, see TD76-969.

8. Check the spring. Replace if improper. Note: For single type and double type, shaft seals, see Figures 3 and 4.

9. Frequent liquid flow-back is also directly related to this trouble. If the run-out exceeds 0,015 mm, the shaft seal is affected. Check radial run-out. Adjust referring to the compressor manual.

10. The better the alignment, the better it is for the compressor. Note: Coupling manufacturers also specify max. permissible misalignment to protect their own products this has no influence on the compressor however.

11. The offsetting of a gasket may reduce the oil supply quantity resulting refrigerant leakage from the shaft seal.

12. The contact surface of the Teflon V ring and the shaft surface should be checked carefully and polished with fine emery paper

13. Check whether the setscrews or the seal collar are correctly positioned in the countersunk holes on the shaft.

14. Check the main and side bearings for wear, burring of foreign matter on the inner surfaces.

Noise analysis of screw compressor by use of sound recorder.

Please proceed as follows:

To be informed:

Customer name:	
End-user name:	
Compressor type:	
Compressor Serial No:	
Actual no. of operating hours:	
Are thrust bearings already being replaced:	
If Yes; at which no. of operating hours:	
Date of recordings:	
Source (Normal /Cr / FeCr : Metal)	
Make:	
Done by:	

Operating conditions:

Refrigerant:			
Oil type:			
Revolution:			
Suction pressure			BARG / BARA / PSIG / PSIA
Discharge pressure			BARG / BARA / PSIG / PSIA
Oil pressure			BARG / BARA / PSIG / PSIA
Suction temperature:			°C / °F
Oil temperature:			°C / °F
Discharge temperature:			°C / °F
Load percentage:			%
In case of compound	LS:		%
	HS		%

It is very important, in order to enable us to make an efficient analysis, that the compressor is operating at full load 100% and at stable operating conditions during the noise / vibration recording.

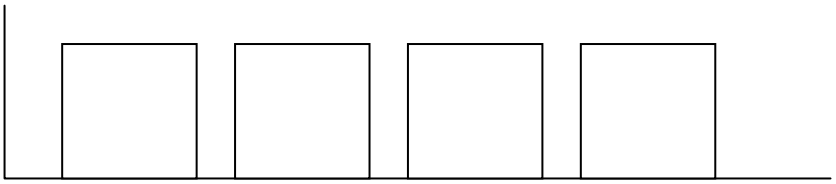
Distances shown on the scheme are only given as example and should be kept as short as possible.
Very important is that there is no mechanical contact between the applied microphone and the compressor body. The minimum distances are to be maintained if this is not possible, due to pipe positions, this to be clearly informed.

The recording itself has to be done in such way that per position the location in announced on the tape by the service engineer. (For positions, please refer to scheme on page 3)

The recording should be done during 1 to 2 minutes per position. Sufficient blank space (record mute) is to be left between each recording in order to be able to identify each measuring position from another.

EXAMPLE

YES



No 0 1 2 3 4 5 6 7 8 9 10 11 12 Recording time minutes

In order to enable MYCOM to evaluate your data, it is also necessary to give a rough scheme of the machine room implantation. Mentioning position dimensions sizes (output) of other noise producing equipment in the same area.

MAYEKAWA Europe MYCOM

SAFETY INFORMATION

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info@mayekawa.eu

This information is prepared to protect engineers, system operators and maintenance personel of MYCOM screw / Piston compressors and to assure effective utilization of the unit.
The installation of the unit is to be done by a MYCOM qualified service representative following the procedures mentioned in the installation manual including preparations and checkings to be done before pre-commissioning, and commissioning.

OPERATION INSTRUCTIONS

The operator can start, operate in manual/automatic mode, and stop the unit after receipt of necessary instructions from the Mycom representative.
During operation it is recommendable to make regular registration by means of logbooks of the operating conditions of the compressor unit.
In case that alarm occurs on the unit, the operator should immediately check which alarm message is displayed on the panel and inform the Mycom representative of it. In case of trip or emergency stop, the whole compressor unit shall automatically be stopped by the control system.
The operator must immediately check whether there is any abnormal situation present on the unit such as gas leakage, oil leakage, compressor problem, instrument failure, etc., trace the cause of the trip from the control panel and contact the Mycom representative for necessary instructions or intervention from Mycom to rectify the situation.
For a short period of standstill, the oil heater power shall be kept on during standstill in order to maintain the oil tank warm enough for the next start-up, the cooling water shall be kept flowing during standstill to prevent freezing of water.
For long plant shutdown or overhaul, the power source for main- and oil pump motors shall be cut-off, oil heater power shall also switched off, control panel shall be kept powered on, all the stop valves related to the system shall be closed off, cooling water supply shall be stopped and water be drained completely from the unit and compressor.

	EAR PROTECTION As the noise level of the compressor unit is higher than 60dBA it is necessary to wear the necessary ear-protections when the compressor is in operation. This is indicated on the compressor unit by use of an ear protection pictogram.
	GAS MASK Gasmasks must be available and be used in case that gas leakage might occur what is shown on the unit with the suitable 'gasmask' pictogram

	ROTATING PARTS Rotating parts are protected with guards foreseen with a 'warning' pictogram.This concerns the compressor-motor coupling and pump-motor coupling. Dismounting and services works on rotating parts are only allowed when unit is sealed in 'POWER-OFF'condition by Mayekawa qualified personal.
	HOT SURFACES Necessary protection is to be worn against high surface temperatures which can be present on the high pressure gas side and the oil circuit. The necessary 'hot surface' pictogram is foreseen on discharge piping and oil separator of the unit.
	COLD SURFACE Necessary protection is to be worn against low surface temperatures which can be present on the low pressure gas side and the liquid medium lines.
	POWER SUPPLY Protection against electrical power is required for all unit components under power such as motors, panels, oil heater, solenoid valves, etc… The necessary 'lightning' pictogram is foreseen on the drive motors and control panels.
	AUTOMATIC START Special care is to be taken for automatic starting of compressor when operating in automatic mode. The necessary corresponding pictogram is fitted on the oil separator.
	DANGER OF DEATH During all life phases of the equipment, care shall be taken that only authorised and well instructed personnel are allowed near by the machinery. Accessing the machine room without proper safety measures may lead to dangerous situations that could lead to heavy injuries or death.
	SLIPPERY FLOOR Necessary care shall be taken when entering the machine room. Any leakage could lead to slipping ground surface that could lead to heavy injuries or death.
	WATCH YOUR STEP

	STRONG MAGNET FIELD PRESENT
	WATCH FOR FALLING OBJECTS Make sure that necessary personnel protection is used when entering the machine room. Watch out for falling objects.
	HAZARDOUS TO THE ENVIRONMENT Disposal of liquids, gases and machinery shall be carried out according to local authorities and rules. Not taking care of the correct disposal procedure could lead into distortion of environment

MAINTENANCE WORKS.

Maintenance works should only be done by a Mycom qualified service representative. Before commencing disassembly and reassembly service works on the compressor, read carefully and understand the contents of the compressor manual, which explains the structure of and the work methods appropriate for the concerned compressor.
If any service work is performed which disregards the instructions given in the manual, there is a risk of accident.
Most accidents and problems encountered during operation are a result of negligence in following basic safety precautions, insufficient understanding of and failure to observe proper operating principles and procedures and failure to implement appropriate inspection and maintenance procedures and precautions.

DANGER !
Indicates a hazardous situation in which failure to observe all safety precautions will lead to death or serious injury and major damage to the compressor system.

WARNING !
Indicates a hazardous situation in which failure to observe all safety precaution may lead to death or injury and major damage to the compressor

CAUTION !
Indicates a hazardous situation in which failure to observe all safety precautions could lead to injury or damage to the compressor.

IMPORTANT !
Indicates that the compressor may be damaged or the life of the system shortened if the instructions given are not followed precisely.
The safety and precautionary warning contained in this manual establish the minimum level of safety required to perform maintenance work on the compressor.
System operators and maintenance personnel are advised to implement at their own responsibility any further safety activities in line with the particular environment or location of the compressor system.

WARNING !

Should this machine be operated carelessly and in disregard of the instruction given in this manual, death or serious injury may result.
This manual must therefore be kept in a convenient easily accessible location near the system and should be studied periodically by those working with the system.

Maintenance work on this compressor should only be undertaken by Mycom qualified service personnel, with thorough understanding of the instructions given in this manual.

Prior to commencing any inspection or maintenance work on the compressor, read the safety warnings at the beginning of the compressor manual.

Keep this manual in a convenient, easily-accessible location near the system and study frequently.

If this manual is lost or damaged, a replacement should be obtained immediately from Mycom or the nearest representative in your area.

If ownership of the compressor passes to another party, this instruction manual should always accompany the compressor.

Mycom reserves the right to make changes or improvements to its products without notice. It is possible, therefore, that some explanations given in this manual may not apply a particular machine.
If any uncertainly exists on the part of the compressor operator, contact Mycom or the nearest representative in your area.

Any questions regarding this manual or the compressor should be addressed to Mycom or the nearest representative in your area.

CAUTION !
Residual oil from compressor unit should be cached in an oil pan in order not to contaminate the environment and be handled following the local rules of treatment of waste oil.

Draining of oil should be done by trained personnel and should be executed with greatest care. It is recommendable to use gas mask and rubber hand gloves and to avoid in any case contact between skin and process medium.
During the draining the area where the unit is located should be sufficiently ventilated.
Smoking during oil draining is prohibited, as well as every presence of open fire.

PROTECTION MEASURES.

GENERAL
For the protection of persons and goods against danger it is necessary to foresee efficient protection means on an easy accessible place.
The following stipulations should be taken into account, apart from the measures already prescribed by the local authorities.

FIRE EXTINGUISHING
Portable fire extinguisher should be sufficiently present in the vicinity of the unit. When choosing the extinguishing medium it is necessary to take into account the process medium as dangerous chemical reaction can occur between certain extinguishing media and certain process media.

PERSONAL EQUIPMENT.
Safety clothing and -gloves and efficient breath protection means must be present in sufficient numbers. The breath protection means must be suitable for the used process medium. The safety equipment must be protected against unauthorized use, and be preserved in a dedicated cabinet in the vicinity of the unit. The safety equipment must be regularly checked, in accordance with manufacturer’s prescriptions.

FIRST AID
Bandages, medicines and special chemicals related to the used process medium must be present and be preserved in a dedicated cabinet in the vicinity of the unit. Special attention must be given to means for urgent treatment of eye-injuries!

In case of a general power failure an interlock within the MCC – installation is required.

The interlock system is necessary to prevent the unit from starting automatically when the power is turned on again.

The interlock needs to be reset manually by the operator. This reset must be done so the installation can start automatically after this general power failure of the electricity installation.

For the safety switches in this manual there are the following actions to do :

- The switches must be connected directly to interrupt the main motor of the unit
- The switches must have a manual reset. If the device switches have an automatic reset, the customer must place a circuit with a manual reset.
- The switches must be set according to the project specifications.

(see technical page of applicable safety switches)

INFORMATION

DIRECTIVES FOR VENTILATION PRACTICE 1434

a three page issue

June 2013
revision of 10-1999

Ventilation is required for reasons of health and safety. In addition for solvent containing coatings the quality of a coating system is greatly affected by the amount and type of residual solvent in the layer when the coating dries or cures.
Adhesion, water resistance, mechanical and chemical properties can all be adversely affected when solvents remain trapped in the paint film. Very slow evaporation of trapped solvents can also develop internal stresses due to shrinkage.

The ventilation must be maintained throughout the application process at a minimum level of 10% of LEL value and for a period after application is completed when the paint cures or dries. As a guide line for good ventilation after application the confined space should be ventilated 4 to 5 times its contents per hour.
Product data sheets indicate when any special ventilation requirements are required.
Hot ventilation: Ventilating air with too high temperature can cause surface curing of epoxy coatings and although it may be necessary to produce a dry substrate before painting, the steel and air temperature should be such that when the application starts, the temperature of the ventilation (dehumidifier/heater) should be dropped so that the conditions stay stable. Hot ventilation air should be replaced by cool dry ventilation air as soon as possible after application of any coat is completed.

Good ventilation consists of at least extraction at the lowest areas, but in most cases when controlled conditions are needed, also of air input (dry and/or heated). The combination of in and output must be correctly balanced.
The opening of the extraction hose should be close to the bottom of the tank (approx 30-60 cm).
Ventilation air should be directed to the bottom of the tank or compartment and should be extracted by exhaust fans of correctly balanced capacity.

For complex structures the ventilation should be distributed over all compartments and confined spaces in order to facilitate good ventilation in all areas.

BALLAST TANKS AND OTHER CONFINED SPACES.

Due to regulations of the shipbuilding industry ballast tanks and double skin tanks count for many square meters confined spaces. Therefore it is necessary to pay good attention to the ventilation conditions during application, drying and curing of the coating on these areas.

Depending on the structure of the ballast tanks, forced ventilation or natural ventilation is used during coating of the new building blocks.
However, natural ventilation in many cases is not sufficient due to half open box conditions and can cause serious drawbacks related to health and safety as well as curing and performance of the coating.

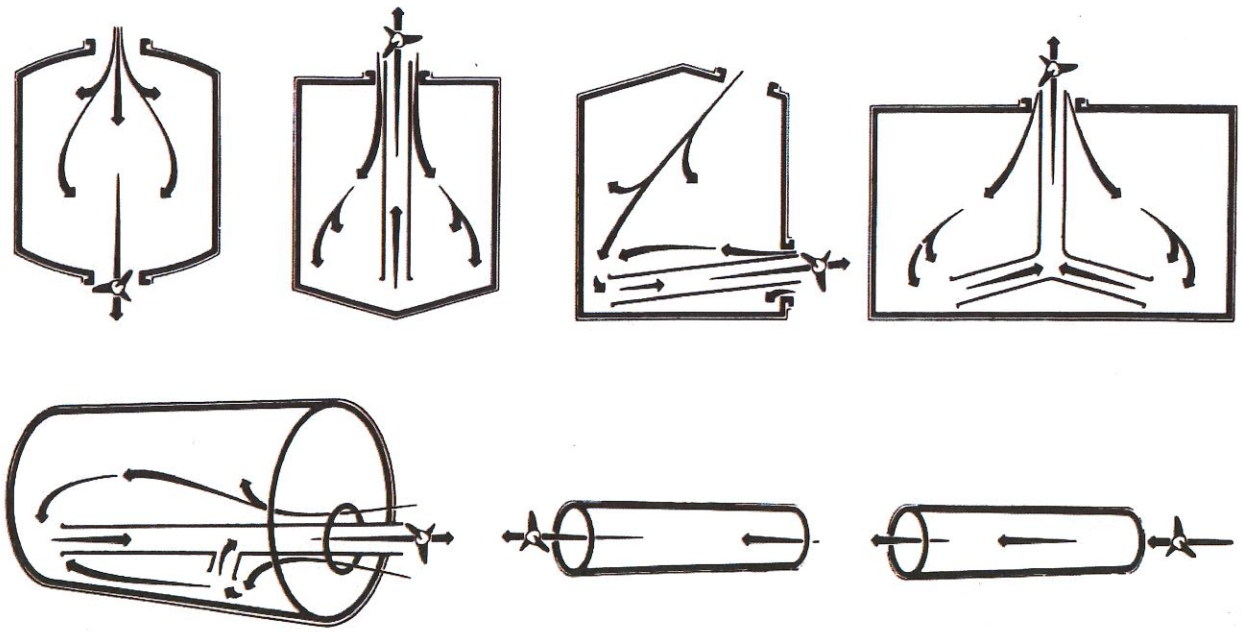
When ventilation is not sufficient solvents will not be removed, but will drift to the lower part of the section. As normally first the upperparts of a section will be painted, the solvents evaporating from the applied coating will drift to the lower part where it will attack the earlier applied coating (not yet fully cured) and this coating will absorb part of the solvents and swell. This coating will then be overcoated and problems related to bad adhesion, curing, water resistance etc. will result.

In case of waterborne paints, this advice is not valid. Water vapour rises to the upper areas of the tank and may give condensation. Therefore it is recommended to position an extra exhaust outlet at the top of the tank.

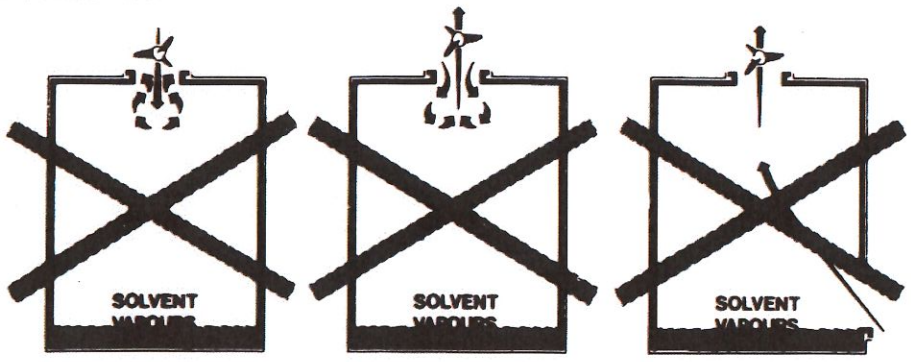
DIRECTIVES FOR VENTILATION PRACTICE 1434

June 2013

Also in this case ventilation is of utmost importance as drying under insufficient ventilation will prevent paint film formation.



Practices not recommended



Airflow and direction Fan

INFORMATION

DIRECTIVES FOR VENTILATION PRACTICE 1434

June 2013

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SAFETY DATA SHEET

Date of issue/Date of revision : 27 July 2017 **Version** : 13.03

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Product name : SIGMACOVER 456 BASE RAL 7035

Product code : 00150083

Other means of identification : Not available.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Product use : Professional applications, Used by spraying.

Use of the substance/ mixture : Coating.

1.3 Details of the supplier of the safety data sheet

PPG Coatings SPRL/BVBA
Tweemontstraat 104
B-2100 Deurne
Belgium
Telephone +32-33606311
Fax +32-33606435

e-mail address of person responsible for this SDS : PMC.Safety@PPG.com

1.4 Emergency telephone number

Supplier

Telephone number :

+31 20 4075210

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Flam. Liq. 3, H226
Skin Irrit. 2, H315
Eye Irrit. 2, H319
Skin Sens. 1, H317
STOT SE 3, H335
STOT RE 2, H373
Aquatic Chronic 3, H412

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Regulation (EU) No. 2015/830

Code	: 00150083	Date of issue/Date of revision	: 27 July 2017

SIGMACOVER 456 BASE RAL 7035

SECTION 2: Hazards identification

2.2 Label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Flammable liquid and vapour.
Causes serious eye irritation.
Causes skin irritation.
May cause an allergic skin reaction.
May cause respiratory irritation.
May cause damage to organs through prolonged or repeated exposure.
Harmful to aquatic life with long lasting effects.

Precautionary statements

Prevention : Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not breathe vapour.

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage : Store in a well-ventilated place. Keep cool.

Disposal : Not applicable.

P280, P210, P260, P304 + P340, P303 + P361 + P353, P305 + P351 + P338, P403, P235

Hazardous ingredients : xylene
epoxy resin (MW ≤ 700)
2-methylpropan-1-ol
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine

Supplemental label elements : Contains epoxy constituents. May produce an allergic reaction.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Other hazards which do not result in classification : Prolonged or repeated contact may dry skin and cause irritation.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	% by weight	Classification Regulation (EC) No. 1272/2008 [CLP]	Type
xylene	REACH #: 01-2119488216-32 EC: 215-535-7 CAS: 1330-20-7 Index: 601-022-00-9	≥10 - ≤25	Flam. Liq. 3, H226 Acute Tox. 4, H312 Acute Tox. 4, H332 Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 STOT RE 2, H373 (central nervous system (CNS), kidneys, liver) Asp. Tox. 1, H304	[1] [2]
epoxy resin (MW ≤ 700)	REACH #: 01-2119456619-26 EC: 500-033-5 CAS: 25068-38-6	≥5.0 - ≤10	Skin Irrit. 2, H315 Eye Irrit. 2, H319 Skin Sens. 1, H317 Aquatic Chronic 2, H411	[1]
ethylbenzene	REACH #: 01-2119489370-35 EC: 202-849-4 CAS: 100-41-4 Index: 601-023-00-4	≥1.0 - ≤5.0	Flam. Liq. 2, H225 Acute Tox. 4, H332 STOT RE 2, H373 (hearing organs) Asp. Tox. 1, H304	[1] [2]
2-methylpropan-1-ol	REACH #: 01-2119484609-23 EC: 201-148-0 CAS: 78-83-1 Index: 603-108-00-1	≥1.0 - <3.0	Flam. Liq. 3, H226 Skin Irrit. 2, H315 Eye Dam. 1, H318 STOT SE 3, H335 STOT SE 3, H336	[1] [2]
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine	REACH #: 01-2119979085-27 EC: 309-629-8 CAS: 100545-48-0	≤0.30	Skin Sens. 1B, H317 Aquatic Chronic 3, H412 **See Section 16 for the full text of the H statements declared above.**	[1]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SUB codes represent substances without registered CAS Numbers.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Remove contact lenses, irrigate copiously with clean, fresh water, holding the eyelids apart for at least 10 minutes and seek immediate medical advice.

Inhalation : Remove to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.

Skin contact : Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Do NOT use solvents or thinners.

Ingestion : If swallowed, seek medical advice immediately and show the container or label. Keep person warm and at rest. Do NOT induce vomiting.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : May cause respiratory irritation.

Skin contact : Causes skin irritation. Defatting to the skin. May cause an allergic skin reaction.

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Ingestion : No specific data.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

5.2 Special hazards arising from the substance or mixture

SECTION 5: Firefighting measures

Hazards from the substance or mixture : Flammable liquid and vapour. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. This material is harmful to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous combustion products : Decomposition products may include the following materials:
carbon oxides
sulfur oxides
halogenated compounds
metal oxide/oxides

5.3 Advice for firefighters

Special precautions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

6.3 Methods and material for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product.

SECTION 6: Accidental release measures

6.4 Reference to other sections : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities : Storage temperature: 0 to 35°C (32 to 95°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

7.3 Specific end use(s)

Recommendations : Not available.

Industrial sector specific solutions : Not available.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
xylene	**EH40/2005 WELs (United Kingdom (UK), 12/2011). Absorbed through skin.** STEL: 441 mg/m³ 15 minutes. STEL: 100 ppm 15 minutes. TWA: 220 mg/m³ 8 hours. TWA: 50 ppm 8 hours.
ethylbenzene	**EH40/2005 WELs (United Kingdom (UK), 12/2011). Absorbed through skin.** STEL: 552 mg/m³ 15 minutes. STEL: 125 ppm 15 minutes. TWA: 441 mg/m³ 8 hours. TWA: 100 ppm 8 hours.
2-methylpropan-1-ol	**EH40/2005 WELs (United Kingdom (UK), 12/2011).** STEL: 231 mg/m³ 15 minutes. STEL: 75 ppm 15 minutes. TWA: 154 mg/m³ 8 hours. TWA: 50 ppm 8 hours.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
xylene	DNEL	Short term Inhalation	289 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	289 mg/m³	Workers	Local
	DNEL	Long term Dermal	180 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	77 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	174 mg/m³	Consumers	Systemic
	DNEL	Short term Inhalation	174 mg/m³	Consumers	Local
	DNEL	Long term Dermal	108 mg/kg bw/day	Consumers	Systemic
	DNEL	Long term Inhalation	14.8 mg/m³	Consumers	Systemic
	DNEL	Long term Oral	1.6 mg/kg	Consumers	Systemic

SECTION 8: Exposure controls/personal protection

			bw/day		
ethylbenzene	DNEL	Long term Inhalation	77 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	293 mg/m³	Workers	Local
	DNEL	Long term Dermal	180 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	15 mg/m³	Consumers	Systemic
	DNEL	Long term Oral	1.6 mg/kg bw/day	Consumers	Systemic
2-methylpropan-1-ol	DNEL	Long term Inhalation	310 mg/m³	Workers	Local
	DNEL	Long term Inhalation	55 mg/m³	Consumers	Local

PNECs

Product/ingredient name	Type	Compartment Detail	Value	Method Detail
xylene	-	Fresh water	0.327 mg/l	-
	-	Marine water	0.327 mg/l	-
	-	Sewage Treatment Plant	6.58 mg/l	-
	-	Fresh water sediment	12.46 mg/kg dwt	-
	-	Marine water sediment	12.46 mg/kg dwt	-
	-	Soil	2.31 mg/kg	-
ethylbenzene	-	Fresh water	0.1 mg/l	Assessment Factors
	-	Marine water	0.01 mg/l	Assessment Factors
	-	Sewage Treatment Plant	9.6 mg/l	Assessment Factors
	-	Fresh water sediment	13.7 mg/kg dwt	Equilibrium Partitioning
	-	Marine water sediment	1.37 mg/kg dwt	Equilibrium Partitioning
	-	Soil	2.68 mg/kg dwt	Equilibrium Partitioning
	-	Secondary Poisoning	20 mg/kg	-
2-methylpropan-1-ol	-	Fresh water	0.4 mg/l	Assessment Factors
	-	Marine water	0.04 mg/l	Assessment Factors
	-	Sewage Treatment Plant	10 mg/l	Assessment Factors
	-	Fresh water sediment	1.56 mg/kg dwt	Equilibrium Partitioning
	-	Marine water sediment	0.156 mg/kg dwt	-
	-	Soil	0.076 mg/kg dwt	Equilibrium Partitioning

8.2 Exposure controls

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Chemical splash goggles.

SECTION 8: Exposure controls/personal protection

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. When prolonged or frequently repeated contact may occur, a glove with a protection class of 6 (breakthrough time greater than 480 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 2 or higher (breakthrough time greater than 30 minutes according to EN 374) is recommended.

Gloves : butyl rubber

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves. Refer to European Standard EN 1149 for further information on material and design requirements and test methods.

Other skin protection Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workers are exposed to concentrations above the exposure limit, they must use appropriate, certified respirators. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Filter type: organic vapour (Type A) and particulate filter P3

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Various

Odour : Aromatic.

Odour threshold : Not available.

pH : insoluble in water.

Melting point/freezing point : May start to solidify at the following temperature: -94.9°C (-138.8°F) This is based on data for the following ingredient: ethylbenzene. Weighted average: -95.12°C (-139.2°F)

Initial boiling point and boiling range : >37.78°C

Flash point : Closed cup: 27.5°C

Evaporation rate : Highest known value: 0.84 (ethylbenzene) Weighted average: 0.77compared with butyl acetate

Material supports combustion. : Yes.

SECTION 9: Physical and chemical properties

Flammability (solid, gas)	:	liquid
Upper/lower flammability or explosive limits	:	Lower: 0.84% Upper: 6.75%
Vapour pressure	:	Highest known value: <1.6 kPa (<12 mm Hg) (at 20°C) (2-methylpropan-1-ol). Weighted average: 0.97 kPa (7.28 mm Hg) (at 20°C)
Vapour density	:	Highest known value: 3.7 (Air = 1) (xylene). Weighted average: 3.65 (Air = 1)
Relative density	:	1.41
Solubility(ies)	:	Insoluble in the following materials: cold water.
Partition coefficient: n-octanol/ water	:	Not applicable.
Auto-ignition temperature	:	430°C
Decomposition temperature	:	Stable under recommended storage and handling conditions (see Section 7).
Viscosity	:	Kinematic (room temperature): >4 cm^2/s Kinematic (40°C): >0.21 cm^2/s
Viscosity	:	60 - 100 s (ISO 6mm)
Explosive properties	:	Product does not present an explosion hazard.
Oxidising properties	:	Product does not present an oxidizing hazard.

9.2 Other information

No additional information.

SECTION 10: Stability and reactivity

10.1 Reactivity : No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability : The product is stable.

10.3 Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid : When exposed to high temperatures may produce hazardous decomposition products.

Refer to protective measures listed in sections 7 and 8.

10.5 Incompatible materials : Keep away from the following materials to prevent strong exothermic reactions: oxidising agents, strong alkalis, strong acids.

10.6 Hazardous decomposition products : Depending on conditions, decomposition products may include the following materials: carbon oxides sulfur oxides halogenated compounds metal oxide/oxides

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Regulation (EU) No. 2015/830

Code : **00150083** **Date of issue/Date of revision** : 27 July 2017

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SECTION 11: Toxicological information

Product/ingredient name	Result	Species	Dose	Exposure
xylene	LD50 Dermal	Rabbit	>1.7 g/kg	-
	LD50 Oral	Rat	4.3 g/kg	-
epoxy resin (MW ≤ 700)	LD50 Dermal	Rabbit	>2 g/kg	-
	LD50 Oral	Rat	>2 g/kg	-
ethylbenzene	LC50 Inhalation Vapour	Rat	17.8 mg/l	4 hours
	LD50 Dermal	Rabbit	17.8 g/kg	-
	LD50 Oral	Rat	3.5 g/kg	-
2-methylpropan-1-ol	LD50 Dermal	Rabbit	3400 mg/kg	-
	LD50 Oral	Rat	2460 mg/kg	-
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine	LC50 Inhalation Dusts and mists	Rat	5.05 mg/l	4 hours
	LD50 Oral	Rat	>2000 mg/kg	-

Conclusion/Summary : Not available.

Acute toxicity estimates

Route	ATE value
Dermal	5760.9 mg/kg
Inhalation (vapours)	51.93 mg/l

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
xylene	Skin - Moderate irritant	Rabbit	-	24 hours 500 mg	-

Conclusion/Summary : Not available.

Sensitisation

Conclusion/Summary : Not available.

Mutagenicity

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Specific target organ toxicity (single exposure)

Product/ingredient name	Category	Route of exposure	Target organs
xylene	Category 3	Not applicable.	Respiratory tract irritation
2-methylpropan-1-ol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects

Specific target organ toxicity (repeated exposure)

SECTION 11: Toxicological information

Product/ingredient name	Category	Route of exposure	Target organs
xylene	Category 2	Not determined	central nervous system (CNS), kidneys and liver
ethylbenzene	Category 2	Not determined	hearing organs

Aspiration hazard

Product/ingredient name	Result
xylene	ASPIRATION HAZARD - Category 1
ethylbenzene	ASPIRATION HAZARD - Category 1

Information on likely routes of exposure : Not available.

Potential acute health effects

Inhalation : May cause respiratory irritation.

Ingestion : No known significant effects or critical hazards.

Skin contact : Causes skin irritation. Defatting to the skin. May cause an allergic skin reaction.

Eye contact : Causes serious eye irritation.

Symptoms related to the physical, chemical and toxicological characteristics

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Ingestion : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness
dryness
cracking

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

Conclusion/Summary : Not available.

General : May cause damage to organs through prolonged or repeated exposure. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.

SECTION 11: Toxicological information

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Other information : Not available.

There are no data available on the mixture itself. The mixture has been assessed following the conventional method of the CLP Regulation (EC) No 1272/2008 and is classified for toxicological properties accordingly. See Sections 2 and 3 for details.

Exposure to component solvent vapour concentrations in excess of the stated occupational exposure limit may result in adverse health effects such as mucous membrane and respiratory system irritation and adverse effects on the kidneys, liver and central nervous system. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and, in extreme cases, loss of consciousness.
Solvents may cause some of the above effects by absorption through the skin. Repeated or prolonged contact with the mixture may cause removal of natural fat from the skin, resulting in non-allergic contact dermatitis and absorption through the skin.
If splashed in the eyes, the liquid may cause irritation and reversible damage.
Ingestion may cause nausea, diarrhea and vomiting.
This takes into account, where known, delayed and immediate effects and also chronic effects of components from short-term and long-term exposure by oral, inhalation and dermal routes of exposure and eye contact.

Based on the properties of the epoxy constituent(s) and considering toxicological data on similar mixtures, this mixture may be a skin sensitiser and an irritant. It contains low molecular weight epoxy constituents which are irritating to eyes, mucous membrane and skin. Repeated skin contact may lead to irritation and to sensitisation, possibly with cross-sensitisation to other epoxies. Skin contact with the mixture and exposure to spray mist and vapour should be avoided.

Contains epoxy resin (MW ≤ 700), Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine. May produce an allergic reaction.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
ethylbenzene	Acute LC50 150 to 200 mg/l Fresh water	Fish - Lepomis macrochirus - Young of the year	96 hours
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine	Acute EC50 >100 mg/l	Algae - Pseudokirchneriella subcapitata	72 hours
	Acute EC50 >10 mg/l	Daphnia - Daphnia magna	48 hours
	Acute LC50 >10 mg/l	Fish - Oncorhynchus mykiss	96 hours

Conclusion/Summary : Not available.

12.2 Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine	301D Ready Biodegradability - Closed Bottle Test	22 % - 28 days	-	-

Conclusion/Summary : Not available.

SECTION 12: Ecological information

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
xylene	-	-	Readily
ethylbenzene	-	-	Readily
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine	-	-	Inherent

12.3 Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
xylene	3.16	7.4 to 18.5	low
ethylbenzene	3.15	79.43	low
2-methylpropan-1-ol	0.76	-	low
Octadecanoic acid, 12-hydroxy-, reaction products with ethylenediamine	>5.86	-	high

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

PBT : Not applicable.

vPvB : Not applicable.

12.6 Other adverse effects

: No known significant effects or critical hazards.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : Yes.

European waste catalogue (EWC)

Waste code	Waste designation
08 01 11*	waste paint and varnish containing organic solvents or other hazardous substances

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 13: Disposal considerations

Type of packaging	European waste catalogue (EWC)	
Container	15 01 06	mixed packaging

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapour from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14. Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN1263	UN1263	UN1263	UN1263
14.2 UN proper shipping name	PAINT	PAINT	PAINT	PAINT
14.3 Transport hazard class(es)	3	3	3	3
14.4 Packing group	III	III	III	III
14.5 Environmental hazards	No.	Yes.	No.	No.
Marine pollutant substances	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Additional information

ADR/RID : This class 3 viscous liquid is not subject to regulation in packagings up to 450 L according to 2.2.3.1.5.1.

Tunnel code : (D/E)

ADN : The product is only regulated as an environmentally hazardous substance when transported in tank vessels. This class 3 viscous liquid is not subject to regulation in packagings up to 450 L according to 2.2.3.1.5.1.

IMDG : This class 3 viscous liquid is not subject to regulation in packagings up to 30 L according to 2.3.2.5.

IATA : None identified.

14.6 Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code : Not applicable.

Conforms to Regulation (EC) No. 1907/2006 (REACH), Annex II, as amended by Regulation (EU) No. 2015/830

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SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Other EU regulations

Ozone depleting substances (1005/2009/EU)

Not listed.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
P5c: Flammable liquids 2 and 3 not falling under P5a or P5b 6: Flammable (R10)

15.2 Chemical safety assessment : No Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms

ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
PBT = Persistent, Bioaccumulative and Toxic
vPvB = Very Persistent and Very Bioaccumulative
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway
IMDG = International Maritime Dangerous Goods
IATA = International Air Transport Association

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

SECTION 16: Other information

Classification	Justification
Flam. Liq. 3, H226	On basis of test data
Skin Irrit. 2, H315	Calculation method
Eye Irrit. 2, H319	Calculation method
Skin Sens. 1, H317	Calculation method
STOT SE 3, H335	Calculation method
STOT RE 2, H373	Calculation method
Aquatic Chronic 3, H412	Calculation method

Full text of abbreviated H statements

H225	Highly flammable liquid and vapour.
H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H373	May cause damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

Full text of classifications [CLP/GHS]

Acute Tox. 4, H312	ACUTE TOXICITY (dermal) - Category 4
Acute Tox. 4, H332	ACUTE TOXICITY (inhalation) - Category 4
Aquatic Chronic 2, H411	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 2
Aquatic Chronic 3, H412	LONG-TERM (CHRONIC) AQUATIC HAZARD - Category 3
Asp. Tox. 1, H304	ASPIRATION HAZARD - Category 1
Eye Dam. 1, H318	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
Eye Irrit. 2, H319	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2
Flam. Liq. 2, H225	FLAMMABLE LIQUIDS - Category 2
Flam. Liq. 3, H226	FLAMMABLE LIQUIDS - Category 3
Skin Irrit. 2, H315	SKIN CORROSION/IRRITATION - Category 2
Skin Sens. 1, H317	SKIN SENSITISATION - Category 1
Skin Sens. 1B, H317	SKIN SENSITISATION - Category 1B
STOT RE 2, H373	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2
STOT SE 3, H335	SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE (Respiratory tract irritation) - Category 3
STOT SE 3, H336	SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE (Narcotic effects) - Category 3

History

Date of issue/ Date of revision : 27 July 2017

Date of previous issue : 28 November 2016

Prepared by : EHS

Version : 13.03

Disclaimer

SECTION 16: Other information

The information contained in this data sheet is based on present scientific and technical knowledge. The purpose of this information is to draw attention to the health and safety aspects concerning the products supplied by us, and to recommend precautionary measures for the storage and handling of the products. No warranty or guarantee is given in respect of the properties of the products. No liability can be accepted for any failure to observe the precautionary measures described in this data sheet or for any misuse of the products.

SAFETY DATA SHEET

Date of issue/Date of revision : 18 January 2018 **Version** : 14.07

SECTION 1: Identification of the substance/mixture and of the company/ undertaking

1.1 Product identifier

Product name : THINNER 91-92

Product code : 00115649

Other means of identification : Not available.

1.2 Relevant identified uses of the substance or mixture and uses advised against

Product use : Professional applications, Used by spraying.

Use of the substance/ mixture : Thinner.

1.3 Details of the supplier of the safety data sheet

PPG Coatings SPRL/BVBA
Tweemontstraat 104
B-2100 Deurne
Belgium
Telephone +32-33606311
Fax +32-33606435

e-mail address of person responsible for this SDS : PMC.Safety@PPG.com

1.4 Emergency telephone number

Supplier

Telephone number :

+31 20 4075210

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition : Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Flam. Liq. 2, H225
Acute Tox. 4, H312
Acute Tox. 4, H332
Skin Irrit. 2, H315
Eye Dam. 1, H318
STOT SE 3, H335
STOT SE 3, H336
STOT RE 2, H373
Asp. Tox. 1, H304

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

SECTION 2: Hazards identification

2.2 Label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Highly flammable liquid and vapour.
Harmful in contact with skin or if inhaled.
Causes serious eye damage.
Causes skin irritation.
May be fatal if swallowed and enters airways.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs through prolonged or repeated exposure.

Precautionary statements

Prevention : Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not breathe vapour.

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. IF SWALLOWED: Immediately call a POISON CENTER or physician. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage : Store in a well-ventilated place. Keep cool.

Disposal : Not applicable.

P280, P210, P260, P304 + P340, P301 + P310, P303 + P361 + P353, P305 + P351 + P338, P403, P235

Hazardous ingredients : xylene
2-methylpropan-1-ol

Supplemental label elements : Not applicable.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Special packaging requirements

Containers to be fitted with child-resistant fastenings : Not applicable.

Tactile warning of danger : Not applicable.

2.3 Other hazards

Other hazards which do not result in classification : Prolonged or repeated contact may dry skin and cause irritation.

SECTION 3: Composition/information on ingredients

3.2 Mixtures : Mixture

Product/ingredient name	Identifiers	% by weight	Classification Regulation (EC) No. 1272/2008 [CLP]	Type
xylene	REACH #: 01-2119488216-32 EC: 215-535-7 CAS: 1330-20-7 Index: 601-022-00-9	≥50 - ≤75	Flam. Liq. 3, H226 Acute Tox. 4, H312 Acute Tox. 4, H332 Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 STOT RE 2, H373 (central nervous system (CNS), kidneys, liver) Asp. Tox. 1, H304	[1] [2]
2-methylpropan-1-ol	REACH #: 01-2119484609-23 EC: 201-148-0 CAS: 78-83-1 Index: 603-108-00-1	≥10 - ≤25	Flam. Liq. 3, H226 Skin Irrit. 2, H315 Eye Dam. 1, H318 STOT SE 3, H335 STOT SE 3, H336	[1] [2]
ethylbenzene	REACH #: 01-2119489370-35 EC: 202-849-4 CAS: 100-41-4 Index: 601-023-00-4	≥10 - ≤17	Flam. Liq. 2, H225 Acute Tox. 4, H332 STOT RE 2, H373 (hearing organs) Asp. Tox. 1, H304	[1] [2]
toluene	REACH #: 01-2119471310-51 EC: 203-625-9 CAS: 108-88-3 Index: 601-021-00-3	<1.0	Flam. Liq. 2, H225 Skin Irrit. 2, H315 Repr. 2, H361d (Unborn child) STOT SE 3, H336 STOT RE 2, H373 Asp. Tox. 1, H304 **See Section 16 for the full text of the H statements declared above.**	[1] [2]

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

[1] Substance classified with a health or environmental hazard
[2] Substance with a workplace exposure limit
[3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
[4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
[5] Substance of equivalent concern
[6] Additional disclosure due to company policy

Occupational exposure limits, if available, are listed in Section 8.

SUB codes represent substances without registered CAS Numbers.

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek immediate medical attention.

Inhalation : Remove to fresh air. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel.

Skin contact : Remove contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Do NOT use solvents or thinners.

Ingestion : If swallowed, seek medical advice immediately and show the container or label. Keep person warm and at rest. Do NOT induce vomiting.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects

Eye contact : Causes serious eye damage.

Inhalation : Harmful if inhaled. Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Skin contact : Harmful in contact with skin. Causes skin irritation. Defatting to the skin.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
dryness
cracking
blistering may occur

Ingestion : Adverse symptoms may include the following:
stomach pains
nausea or vomiting

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture : Highly flammable liquid and vapour. Runoff to sewer may create fire or explosion hazard. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous combustion products : Decomposition products may include the following materials:
carbon oxides

5.3 Advice for firefighters

Special precautions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

6.2 Environmental precautions

: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and material for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

SECTION 6: Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product.

6.4 Reference to other sections : See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities : Store between the following temperatures: 0 to 35°C (32 to 95°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

7.3 Specific end use(s)

See Section 1.2 for Identified uses.

SECTION 8: Exposure controls/personal protection

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

Product/ingredient name	Exposure limit values
xylene	**EH40/2005 WELs (United Kingdom (UK), 12/2011). Absorbed through skin.** STEL: 441 mg/m³ 15 minutes. STEL: 100 ppm 15 minutes. TWA: 220 mg/m³ 8 hours. TWA: 50 ppm 8 hours.
2-methylpropan-1-ol	**EH40/2005 WELs (United Kingdom (UK), 12/2011).** STEL: 231 mg/m³ 15 minutes. STEL: 75 ppm 15 minutes. TWA: 154 mg/m³ 8 hours. TWA: 50 ppm 8 hours.
ethylbenzene	**EH40/2005 WELs (United Kingdom (UK), 12/2011). Absorbed through skin.** STEL: 552 mg/m³ 15 minutes. STEL: 125 ppm 15 minutes. TWA: 441 mg/m³ 8 hours. TWA: 100 ppm 8 hours.
toluene	**EH40/2005 WELs (United Kingdom (UK), 12/2011). Absorbed through skin.** STEL: 384 mg/m³ 15 minutes. STEL: 100 ppm 15 minutes. TWA: 191 mg/m³ 8 hours. TWA: 50 ppm 8 hours.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
xylene	DNEL	Short term Inhalation	289 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	289 mg/m³	Workers	Local
	DNEL	Long term Dermal	180 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	77 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	174 mg/m³	Consumers	Systemic
	DNEL	Short term	174 mg/m³	Consumers	Local

SECTION 8: Exposure controls/personal protection

		Inhalation			
	DNEL	Long term Dermal	108 mg/kg bw/day	Consumers	Systemic
	DNEL	Long term Inhalation	14.8 mg/m³	Consumers	Systemic
	DNEL	Long term Oral	1.6 mg/kg bw/day	Consumers	Systemic
2-methylpropan-1-ol	DNEL	Long term Inhalation	310 mg/m³	Workers	Local
	DNEL	Long term Inhalation	55 mg/m³	Consumers	Local
ethylbenzene	DNEL	Long term Inhalation	77 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	293 mg/m³	Workers	Local
	DNEL	Long term Dermal	180 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	15 mg/m³	Consumers	Systemic
	DNEL	Long term Oral	1.6 mg/kg bw/day	Consumers	Systemic
toluene	DNEL	Long term Inhalation	192 mg/m³	Workers	Systemic
	DNEL	Short term Inhalation	384 mg/m³	Workers	Systemic
	DNEL	Long term Inhalation	192 mg/m³	Workers	Local
	DNEL	Short term Inhalation	384 mg/m³	Workers	Local
	DNEL	Long term Dermal	384 mg/kg bw/day	Workers	Systemic
	DNEL	Long term Inhalation	56.5 mg/m³	Consumers	Systemic
	DNEL	Short term Inhalation	226 mg/m³	Consumers	Systemic
	DNEL	Long term Inhalation	56.5 mg/m³	Consumers	Local
	DNEL	Short term Inhalation	226 mg/m³	Consumers	Local
	DNEL	Long term Dermal	226 mg/kg bw/day	Consumers	Systemic
	DNEL	Long term Oral	8.13 mg/kg bw/day	Consumers	Systemic

PNECs

Product/ingredient name	Type	Compartment Detail	Value	Method Detail
xylene	-	Fresh water	0.327 mg/l	-
	-	Marine water	0.327 mg/l	-
	-	Sewage Treatment Plant	6.58 mg/l	-
	-	Fresh water sediment	12.46 mg/kg dwt	-
	-	Marine water sediment	12.46 mg/kg dwt	-
	-	Soil	2.31 mg/kg	-
2-methylpropan-1-ol	-	Fresh water	0.4 mg/l	Assessment Factors
	-	Marine water	0.04 mg/l	Assessment Factors
	-	Sewage Treatment Plant	10 mg/l	Assessment Factors
	-	Fresh water sediment	1.56 mg/kg dwt	Equilibrium Partitioning

SECTION 8: Exposure controls/personal protection

	-	Marine water sediment	0.156 mg/kg dwt	-
	-	Soil	0.076 mg/kg dwt	Equilibrium Partitioning
ethylbenzene	-	Fresh water	0.1 mg/l	Assessment Factors
	-	Marine water	0.01 mg/l	Assessment Factors
	-	Sewage Treatment Plant	9.6 mg/l	Assessment Factors
	-	Fresh water sediment	13.7 mg/kg dwt	Equilibrium Partitioning
	-	Marine water sediment	1.37 mg/kg dwt	Equilibrium Partitioning
	-	Soil	2.68 mg/kg dwt	Equilibrium Partitioning
	-	Secondary Poisoning	20 mg/kg	-
toluene	-	Fresh water	0.68 mg/l	Sensitivity Distribution
	-	Marine water	0.68 mg/l	Sensitivity Distribution
	-	Sewage Treatment Plant	13.61 mg/l	Sensitivity Distribution
	-	Fresh water sediment	16.39 mg/kg dwt	Equilibrium Partitioning
	-	Marine water sediment	16.39 mg/kg dwt	-

8.2 Exposure controls

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Chemical splash goggles and face shield. Use eye protection according to EN 166.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. When prolonged or frequently repeated contact may occur, a glove with a protection class of 6 (breakthrough time greater than 480 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 2 or higher (breakthrough time greater than 30 minutes according to EN 374) is recommended.

Gloves : For prolonged or repeated handling, use the following type of gloves:

May be used: nitrile rubber
Recommended: butyl rubber, polyvinyl alcohol (PVA), Viton®

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves. Refer to European Standard EN 1149 for further information on material and design requirements and test methods.

SECTION 8: Exposure controls/personal protection

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workers are exposed to concentrations above the exposure limit, they must use appropriate, certified respirators. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Wear a respirator conforming to EN140. Filter type: organic vapour (Type A) and particulate filter P3

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state : Liquid.

Colour : Colourless.

Odour : Aromatic.

Odour threshold : Not available.

pH : insoluble in water.

Melting point/freezing point : May start to solidify at the following temperature: -94.9°C (-138.8°F) This is based on data for the following ingredient: ethylbenzene. Weighted average: -95.93°C (-140.7°F)

Initial boiling point and boiling range : >37.78°C

Flash point : Closed cup: 21.5°C

Evaporation rate : Highest known value: 0.84 (ethylbenzene) Weighted average: 0.75compared with butyl acetate

Material supports combustion. : Yes.

Flammability (solid, gas) : liquid

Upper/lower flammability or explosive limits : Greatest known range: Lower: 1.7% Upper: 10.9% (2-methylpropan-1-ol)

Vapour pressure : Highest known value: <1.6 kPa (<12 mm Hg) (at 20°C) (2-methylpropan-1-ol). Weighted average: 1.06 kPa (7.95 mm Hg) (at 20°C)

Vapour density : Highest known value: 3.7 (Air = 1) (xylene). Weighted average: 3.42 (Air = 1)

Relative density : 0.85

Solubility(ies) : Insoluble in the following materials: cold water.

Partition coefficient: n-octanol/water : Not applicable.

Auto-ignition temperature : 415°C

Decomposition temperature : Stable under recommended storage and handling conditions (see Section 7).

Viscosity : Kinematic (40°C): <0.14 cm^2/s

Explosive properties : Product does not present an explosion hazard.

Oxidising properties : Product does not present an oxidizing hazard.

9.2 Other information

SECTION 9: Physical and chemical properties

No additional information.

SECTION 10: Stability and reactivity

10.1 Reactivity : No specific test data related to reactivity available for this product or its ingredients.

10.2 Chemical stability : The product is stable.

10.3 Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

10.4 Conditions to avoid : When exposed to high temperatures may produce hazardous decomposition products.

Refer to protective measures listed in sections 7 and 8.

10.5 Incompatible materials : Keep away from the following materials to prevent strong exothermic reactions: oxidising agents, strong alkalis, strong acids.

10.6 Hazardous decomposition products : Depending on conditions, decomposition products may include the following materials: carbon oxides

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
xylene	LD50 Dermal	Rabbit	>1.7 g/kg	-
	LD50 Oral	Rat	4.3 g/kg	-
2-methylpropan-1-ol	LD50 Dermal	Rabbit	3400 mg/kg	-
	LD50 Oral	Rat	2460 mg/kg	-
ethylbenzene	LC50 Inhalation Vapour	Rat	17.8 mg/l	4 hours
	LD50 Dermal	Rabbit	17.8 g/kg	-
	LD50 Oral	Rat	3.5 g/kg	-
toluene	LC50 Inhalation Vapour	Rat	49 g/m³	4 hours
	LD50 Dermal	Rabbit	8.39 g/kg	-
	LD50 Oral	Rat	5580 mg/kg	-

Conclusion/Summary : There are no data available on the mixture itself.

Acute toxicity estimates

Route	ATE value
Dermal	1711.1 mg/kg
Inhalation (vapours)	15.42 mg/l

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
xylene	Skin - Moderate irritant	Rabbit	-	24 hours 500 mg	-

Conclusion/Summary

Skin : There are no data available on the mixture itself.

Eyes : There are no data available on the mixture itself.

Respiratory : There are no data available on the mixture itself.

Sensitisation

SECTION 11: Toxicological information

Conclusion/Summary

Skin : There are no data available on the mixture itself.

Respiratory : There are no data available on the mixture itself.

Mutagenicity

Conclusion/Summary : There are no data available on the mixture itself.

Carcinogenicity

Conclusion/Summary : There are no data available on the mixture itself.

Reproductive toxicity

Conclusion/Summary : There are no data available on the mixture itself.

Teratogenicity

Conclusion/Summary : There are no data available on the mixture itself.

Specific target organ toxicity (single exposure)

Product/ingredient name	Category	Route of exposure	Target organs
xylene	Category 3	Not applicable.	Respiratory tract irritation
2-methylpropan-1-ol	Category 3	Not applicable.	Respiratory tract irritation and Narcotic effects
toluene	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Category	Route of exposure	Target organs
xylene	Category 2	Not determined	central nervous system (CNS), kidneys and liver
ethylbenzene	Category 2	Not determined	hearing organs
toluene	Category 2	Not determined	Not determined

Aspiration hazard

Product/ingredient name	Result
xylene	ASPIRATION HAZARD - Category 1
ethylbenzene	ASPIRATION HAZARD - Category 1
toluene	ASPIRATION HAZARD - Category 1

Information on likely routes of exposure : Not available.

Potential acute health effects

Inhalation : Harmful if inhaled. Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. May cause respiratory irritation.

Ingestion : Can cause central nervous system (CNS) depression. May be fatal if swallowed and enters airways.

Skin contact : Harmful in contact with skin. Causes skin irritation. Defatting to the skin.

Eye contact : Causes serious eye damage.

Symptoms related to the physical, chemical and toxicological characteristics

SECTION 11: Toxicological information

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness

Ingestion : Adverse symptoms may include the following:
stomach pains
nausea or vomiting

Skin contact : Adverse symptoms may include the following:
pain or irritation
redness
dryness
cracking
blistering may occur

Eye contact : Adverse symptoms may include the following:
pain
watering
redness

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

Conclusion/Summary : Not available.

General : May cause damage to organs through prolonged or repeated exposure. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Other information : Not available.

There are no data available on the mixture itself. The mixture has been assessed following the conventional method of the CLP Regulation (EC) No 1272/2008 and is classified for toxicological properties accordingly. See Sections 2 and 3 for details.

Exposure to component solvent vapour concentrations in excess of the stated occupational exposure limit may result in adverse health effects such as mucous membrane and respiratory system irritation and adverse effects on the kidneys, liver and central nervous system. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and, in extreme cases, loss of consciousness.
Solvents may cause some of the above effects by absorption through the skin. Repeated or prolonged contact with the mixture may cause removal of natural fat from the skin, resulting in non-allergic contact dermatitis and absorption

SECTION 11: Toxicological information

through the skin.
If splashed in the eyes, the liquid may cause irritation and reversible damage.
Ingestion may cause nausea, diarrhea and vomiting.
This takes into account, where known, delayed and immediate effects and also chronic effects of components from short-term and long-term exposure by oral, inhalation and dermal routes of exposure and eye contact.

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
ethylbenzene	Acute LC50 150 to 200 mg/l Fresh water	Fish - Lepomis macrochirus - Young of the year	96 hours

Conclusion/Summary : There are no data available on the mixture itself.

12.2 Persistence and degradability

Conclusion/Summary : Not available.

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
xylene	-	-	Readily
ethylbenzene	-	-	Readily
toluene	-	-	Readily

12.3 Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
xylene	3.16	7.4 to 18.5	low
2-methylpropan-1-ol	0.76	-	low
ethylbenzene	3.15	79.43	low
toluene	2.73	8.32	low

12.4 Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Mobility : Not available.

12.5 Results of PBT and vPvB assessment

PBT : Not applicable.

vPvB : Not applicable.

12.6 Other adverse effects : No known significant effects or critical hazards.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

SECTION 13: Disposal considerations

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction.

Hazardous waste : Yes.

European waste catalogue (EWC)

Waste code	Waste designation
08 01 21*	waste paint or varnish remover

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Type of packaging	European waste catalogue (EWC)	
Container	15 01 06	mixed packaging

Special precautions : This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapour from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

14. Transport information

	ADR/RID	ADN	IMDG	IATA
14.1 UN number	UN1263	UN1263	UN1263	UN1263
14.2 UN proper shipping name	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL	PAINT RELATED MATERIAL
14.3 Transport hazard class(es)	3	3	3	3
14.4 Packing group	II	II	II	II
14.5 Environmental hazards	No.	No.	No.	No.
Marine pollutant substances	Not applicable.	Not applicable.	Not applicable.	Not applicable.

Additional information

ADR/RID : None identified.

Tunnel code : (D/E)

ADN : None identified.

IMDG : None identified.

IATA : None identified.

14. Transport information

14.6 Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code : Not applicable.

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles : Not applicable.

Other EU regulations

Ozone depleting substances (1005/2009/EU)

Not listed.

Seveso Directive

This product is controlled under the Seveso Directive.

Danger criteria

Category
P5c: Flammable liquids 2 and 3 not falling under P5a or P5b 6: Flammable (R10)

15.2 Chemical safety assessment : No Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Indicates information that has changed from previously issued version.

Abbreviations and acronyms

ATE = Acute Toxicity Estimate
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
DNEL = Derived No Effect Level
EUH statement = CLP-specific Hazard statement
PNEC = Predicted No Effect Concentration
RRN = REACH Registration Number
PBT = Persistent, Bioaccumulative and Toxic
vPvB = Very Persistent and Very Bioaccumulative
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway
IMDG = International Maritime Dangerous Goods
IATA = International Air Transport Association

SECTION 16: Other information

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Flam. Liq. 2, H225	On basis of test data
Acute Tox. 4, H312	Calculation method
Acute Tox. 4, H332	Calculation method
Skin Irrit. 2, H315	Calculation method
Eye Dam. 1, H318	Calculation method
STOT SE 3, H335	Calculation method
STOT SE 3, H336	Calculation method
STOT RE 2, H373	Calculation method
Asp. Tox. 1, H304	Calculation method

Full text of abbreviated H statements

H225	Highly flammable liquid and vapour.
H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H361d	Suspected of damaging the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.

Full text of classifications [CLP/GHS]

Acute Tox. 4, H312	ACUTE TOXICITY (dermal) - Category 4
Acute Tox. 4, H332	ACUTE TOXICITY (inhalation) - Category 4
Asp. Tox. 1, H304	ASPIRATION HAZARD - Category 1
Eye Dam. 1, H318	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 1
Eye Irrit. 2, H319	SERIOUS EYE DAMAGE/EYE IRRITATION - Category 2
Flam. Liq. 2, H225	FLAMMABLE LIQUIDS - Category 2
Flam. Liq. 3, H226	FLAMMABLE LIQUIDS - Category 3
Repr. 2, H361d	REPRODUCTIVE TOXICITY (Unborn child) - Category 2
Skin Irrit. 2, H315	SKIN CORROSION/IRRITATION - Category 2
STOT RE 2, H373	SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE - Category 2
STOT SE 3, H335	SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE (Respiratory tract irritation) - Category 3
STOT SE 3, H336	SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE (Narcotic effects) - Category 3

History

Date of issue/ Date of revision : 18 January 2018

Date of previous issue : 26 December 2017

Prepared by : EHS

Version : 14.07

Disclaimer

SECTION 16: Other information

The information contained in this data sheet is based on present scientific and technical knowledge. The purpose of this information is to draw attention to the health and safety aspects concerning the products supplied by us, and to recommend precautionary measures for the storage and handling of the products. No warranty or guarantee is given in respect of the properties of the products. No liability can be accepted for any failure to observe the precautionary measures described in this data sheet or for any misuse of the products.

MAYEKAWA Europe MYCOM

OPERATING LIMITS FOR SCREW COMPRESSORS

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MAYEKAWA Europe MYCOM

OPERATING LIMITS OF SCREW COMPRESSORS

The following table shows operating limits for Mycom standard screw compressors.

Description	Applicable models	Operating limits [6]	Remarks
Maximum Discharge Gas Pressure [1] [barG]	SCV, UD Series	22*	In instruction manual, SCV, UD: 20, FM:19 This limit is only in ME
	FM, C Series	20*	
	250VLL, 320LL	13,7	400XL is only for booster use. Please consult Mayekawa to go over the limit.
	400LL, 400XL	5,9	
	J	32	
	i- Series	19	
Minimum Discharge Gas Pressure [barG]	SCV, UD, FM, C Series J	Ps + 3,0	With pressurised oil supply.
	i- series	10	Difference pressure oil supply.
Maximum Suction Gas Pressure [barG]	SCV, UD, C Series	5,88	Including high stage (inter stage pressure) of C Series (Compound model). Please consult Mayekawa to go over the limit.
	FM Series	4,99	
	J	10,0	
	i- Series	3,5	
Minimum Suction Gas Pressure [barG]	All Models [5]	-0,80	
	i- Series	-0,50	
Maximum Start-up Suction Gas Pressure [barG]	SCV, UD, FM, C Series	10	Between 10 barG and 5.88 barG, the load is to be kept at 0% capacity indicator. Maximum allowable time is 60 seconds.
	320, 400	8	
	J	12,3	
	i - Series	6	
Maximum intermediate Gas Pressure [barG]	C Series	5,88	Please consult Mayekawa to go over the limit.
Minimum intermediate Gas Pressure [barG]	C Series	Ps + 1,0	Please consult Mayekawa to go over the limit.
Maximum Economizer Port Gas Pressure [barG]	SCV, UD, FM Series, i-Series	Pd	
	J Series	10	Please consult Mayekawa to go over the limit.
Oil Supply Pressure to Bearing [2] [barG]	SCV Series	Pd -0,49 to 4,0	
	UD, C, 400 Series	Pd +0,50 to 4,0	
	FM, i -Series	Pd -2,50 to 4,0	
	J Series	Pd – 1,50 to 4,0	
Minimum Oil Supply Pressure to Bearing [2] [barG]	SCV, UD, J, i- Series	Ps +5,0	
	FM Series	Ps +3,0	
	C Series	Pm +4,9	

Minimum Oil Supply Pressure for Balance Piston [barG]	SCV Series	Pd -0,49	
	UD, C, 400 Series	Pd +0,50	
	J, FM, i-Series	-	
Minimum Injection Oil Supply Pressure [barG]	All Models	-	With check valve
Maximum Discharge Gas Temperature [°C]	SCV, UD Series	90	Please consult Mycom to go over the limit.
	FM, i- Series	90	
	400, C Series	100	
	J Series	100	
Maximum Suction Gas Temperature [°C]	J Series	50	Please consult Mycom to go over the limit.
	Other Models	85	
Minimum Suction Gas Temperature [°C]	All Models	-60	
Minimum Discharge Super Heat [deg.K]	All Models	15	AMMONIA, CO2, R22, Propane, Propylene [8)]
		25	HFCs [8)]
Maximum Suction Super Heat [deg.K]	All Models	30	Discharge temperature limit has higher priority than suction super heat limit.
Maximum Oil Supply Temperature to bearing [3)] [°C]	SCV, UD, FM, C Series	60	In operation more than 13 mm^2/s viscosity is required
	J Series	70	
	i – Series	80	
	Explosion proof	55	
Minimum Oil Supply Temperature to bearing [4)] [°C]	J Series	20	In operation less than 40 mm^2/s viscosity is required
	Other models	30	
Maximum Ambient Temperature [°C]	All Models	50	
Minimum Ambient Temperature [°C]	All Models	15	
Maximum Compression Ratio [-]	L Port	6	Except C series (compound).
	M Port	10	
	H Port	15	
	J Series	13 without eco.	
		20 with eco.	
Minimum Compression Ratio [-]	J Series	1,5	
	C Series	8,0	
Maximum Male Rotor Speed [RPM]	250L and Smaller, 1612C	4 500	
	1610C, 2016C	4 000	
	320, 400, FM Series, 2520C, 3225C, 4032C	3 600	
	170J, 220J	4 500	
	280J	3 600	
	i- series 125S 160S	4 500	
	i- series 125L 160M 160L	3 550	

Minimum Male Rotor Speed [RPM]	All Models	1 450	
Minimum Capacity Indicator [%]	J type	0	Unloading indicator position depends on model type.
Minimum Capacity Load [9] [%]	All	20	This is actual compressor load. Indicator position depends on model and operation condition. C series up to 2520 with high stage slide fixed at 100% [10) 11)] C series: $P_{interm.}$ > Ps + 1bar
Minimum Oil filter Mesh Size [mesh]	J + i- Series	Beta 20>150	20 µm
	Other Models	300 mesh	44 µm
Maximum Suction strainer Mesh Size	J + i – Series	200 mesh	
Maximum Eco./Aqua. Line Strainer Mesh Size	J + i – Series	100 mesh	
Minimum drain time [min]	All Models	5	

Notes

1) Casing design pressure
   SCV, UD, i, C: 26 barG, FM: 23 barG, J: 35 barG
2) Ps: Suction Gas Pressure, Pd: Discharge Gas Pressure.
   When the expected oil pressure could not reach to Ps+4,9 bar, oil pump should be installed.
3) Proper oil viscosity for operation should be between 13 and 40 mm^2/s.
   For C(H)FC's oil viscosity for operation can be between 5 and 40 mm^2/s.
4) However, during start-up time, oil temperature should be kept over 15 deg.C (less than 200 mm^2/s viscosity).
5) All Models: FM, SCV, UD, C, J and i series.
   C series: 1610C, 1612C, 2016C, 2520C, 3225C, 4032C
6) If it is required to operate over the limitation, please consult Mayekawa.
7) Booster specification is recommended following conditions;
   1. Pd < 6,0 barG and Ps < 1,5 barG
   2. Low stage compressor
   3. SCV, UD, low stage of C series
8) To avoid condensation in the compressor.
9) Refer to "Load(SUCTION VO. FLOW RATE" of MYCOMW
10) For 3225 and 4032 compressors consult compressor division.
11) If high stage to be controlled by intermediate pressure consult compressor division.

OVH 160V-D VITON

RECOMMENDED SPARE PARTS LIST 25000 HOURS OR 3 YEARS

Manual N°	Qty	Part Code	Item.Description	Um	Remark
GA	1	CS7119-DVD	GASKET SET 160VS/LD	EA	
OR	1	CS7109-VDVS	O-RING SET VITON 160VSD.G	EA	
LW	1	CS8009-1DVW	LOCK WASHER SET 160VS/VLD.G	EA	
30/33	1	CS0309-DH	160 BALANCE PISTON/SLEEVE	EA	
38	2	CS03800-160PKV	THRUST BEARING 160 BA1-7466/DF V MARKING	EA	
50	1	CS05000-160VD	OIL SEAL 160S/L (TEFLON)	EA	
100	1	CS10002-160EBS-VT	W/ MECHANICAL SEAL ASSY 160 BELLOW-E VITON	EA	
46	8	ND150-010	CONICAL SPRING WASHER M10,	EA	
66	1	CS06600-160-1	CAP SEAL 160S/L SPGF100	EA	
83	1	CS08300-200	SPRING (SCREW/STD)	EA	
237	2	CS23700-160	TORSIONAL SLIP WASHER 160S/L	EA	
82	1	CS08200-200V	TEFLON V-RING VH10 VITON	EA	
78	1	CS07800-200	BALL BEARING #6000	EA	
79	1	NG12-010	STOP RING (AXIS) S10	EA	

RECOMMENDED SPARE PARTS LIST 50000 HOURS OR 6 YEARS

Manual N°	Qty	Part Code	Item.Description	Um	Remark
GA	1	CS7119-DVD	GASKET SET 160VS/LD	EA	
OR	1	CS7109-VDVS	O-RING SET VITON 160VSD.G	EA	
LW	1	CS8009-1DVW	LOCK WASHER SET 160VS/VLD.G	EA	
27	2	CSH02700-160	MAIN BEARING (WITHOUT O-RING) 160S/L	EA	
28	2	CSH02800-160	SIDE BEARING (WITHOUT O-RING) 160S/L	EA	
30/33	1	CS0309-DH	160 BALANCE PISTON/SLEEVE	EA	
38	2	CS03800-160PKV	THRUST BEARING 160 BA1-7466/DF V MARKING	EA	
50	1	CS05000-160VD	OIL SEAL 160S/L (TEFLON)	EA	
78	1	CS07800-200	BALL BEARING #6000	EA	
82	1	CS08200-200V	TEFLON V-RING VH10 VITON	EA	
83	1	CS08300-200	SPRING (SCREW/STD)	EA	
100	1	CS10002-160EBS-VT	W/ MECHANICAL SEAL ASSY 160 BELLOW-E VITON	EA	
46	8	ND150-010	CONICAL SPRING WASHER M10,	EA	
237	2	CS23700-160	TORSIONAL SLIP WASHER 160S/L	EA	
66	1	CS06600-160-1	CAP SEAL 160S/L SPGF100	EA	
79	1	NG12-010	STOP RING (AXIS) S10	EA	

RECOMMENDED SPARE PARTS LIST 75000 HOURS OR 9 YEARS

Manual N°	Qty	Part Code	Item.Description	Um	Remark
GA	1	CS7119-DVD	GASKET SET 160VS/LD	EA	
OR	1	CS7109-VDVS	O-RING SET VITON 160VSD.G	EA	
LW	1	CS8009-1DVW	LOCK WASHER SET 160VS/VLD.G	EA	
30/33	1	CS0309-DH	160 BALANCE PISTON/SLEEVE	EA	
38	2	CS03800-160PKV	THRUST BEARING 160 BA1-7466/DF V MARKING	EA	
50	1	CS05000-160VD	OIL SEAL 160S/L (TEFLON)	EA	
100	1	CS10002-160EBS-VT	W/ MECHANICAL SEAL ASSY 160 BELLOW-E VITON	EA	
46	8	ND150-010	CONICAL SPRING WASHER M10,	EA	
66	1	CS06600-160-1	CAP SEAL 160S/L SPGF100	EA	
83	1	CS08300-200	SPRING (SCREW/STD)	EA	
237	2	CS23700-160	TORSIONAL SLIP WASHER 160S/L	EA	
82	1	CS08200-200V	TEFLON V-RING VH10 VITON	EA	
78	1	CS07800-200	BALL BEARING #6000	EA	
79	1	NG12-010	STOP RING (AXIS) S10	EA	

RECOMMENDED SPARE PARTS LIST 100000 HOURS OR 12 YEARS

Manual N°	Qty	Part Code	Item.Description	Um	Remark
GA	1	CS7119-DVD	GASKET SET 160VS/LD	EA	
OR	1	CS7109-VDVS	O-RING SET VITON 160VSD.G	EA	
LW	1	CS8009-1DVW	LOCK WASHER SET 160VS/VLD.G	EA	
27	2	CSH02700-160	MAIN BEARING (WITHOUT O-RING) 160S/L	EA	
28	2	CSH02800-160	SIDE BEARING (WITHOUT O-RING) 160S/L	EA	
30/33	1	CS0309-DH	160 BALANCE PISTON/SLEEVE	EA	
38	2	CS03800-160PKV	THRUST BEARING 160 BA1-7466/DF V MARKING	EA	
50	1	CS05000-160VD	OIL SEAL 160S/L (TEFLON)	EA	
78	1	CS07800-200	BALL BEARING #6000	EA	
82	1	CS08200-200V	TEFLON V-RING VH10 VITON	EA	
83	1	CS08300-200	SPRING (SCREW/STD)	EA	
100	1	CS10002-160EBS-VT	W/ MECHANICAL SEAL ASSY 160 BELLOW-E VITON	EA	
46	8	ND150-010	CONICAL SPRING WASHER M10,	EA	
237	2	CS23700-160	TORSIONAL SLIP WASHER 160S/L	EA	
66	1	CS06600-160-1	CAP SEAL 160S/L SPGF100	EA	
79	1	NG12-010	STOP RING (AXIS) S10	EA	

MAYEKAWA Europe MYCOM

PERIODICAL MAINTENANCE SCHEDULE FOR MYCOM SCREW COMPRESSOR UNITS

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PERIODICAL MAINTENANCE SCHEDULE FOR MYCOM SCREW COMPRESSOR UNITS

1. Medium and long-term maintenance / inspection measures:

Elapsed operation hours	**200**	**4.000**	**8.000**	**12.000**	**16.000**	**20.000**	**25.000**	**50.000**
Screw compressor								
Shaft seal	C	C	C	C	C	C	IR	IR
Unloader							IR	IR
Thrust bearing							IR	IR
Main / side bearing							IR	IR
Rotors							IR	IR
Gaskets & O-rings							R (total)	R (total)
Oil filters	I		IR / CL		IR / CL		IR / CL	IR / CL
Oil separator elements			IR		IR		IR	IR
Suction strainer	I		IR / CL		IR / CL		IR / CL	IR / CL
Coupling elements	C		IR		IR		IR	IR
Shaft alignment	A		A		A		A	A
Main motor								
Grease up Bearings	G	G	GC	C	GC	G	GIR	GIR
Suction check valve			I		I		IR	IR
Leak of connections			C		C		C	C
Protection instruments			C		C		C	C
Safety valve			C		C		C	C
Lubrication oil (*1)	C	C	C	C	C	C	C	C
Oil pump (*2)	C	C	C	C	C	C	IR	IR

Abbreviations:

- C: check and / or analysis routinely
- I: inspection to be done with removing or disassembling of item
- R: replace if abnormal found by inspection
- A: alignment of the shaft must be checked and adjusted
- G: grease up periodically as required by motor manufacturer
- CL: cleaning

*1 Oil analysis at least every 4.000 hours or every 6 months

*2 For FM only when supplied with oil pump!

2. Daily inspection measures :

Following operating parameters have to be monitored at least 1x daily from compressor control and kept written in the operation logbook (see e.g. template page 4):

- Suction pressure & condensing pressure [barG]
- Oil supply pressure (after oil pump, if present) [barG]
- Oil filter differential pressure [barG]
- Fine filter differential pressure (Oil separator) [barG]
- Suction gas temperature & discharge gas temperature [°C]
- Oil temperature (compressor inlet) [°C]
- Speed (only with frequency inverter operation) [U/Min]
- Motor power consumption [A]
- Position power slide [%]
- Vi-setting (for SCV series only at mechanical modification of Vi) [-]
- Suction gas superheat & discharge gas superheat [K]
- Oil level [mm] & maybe oil refill [l] + height of oil foam (sight glass oil separator) [mm]

During daily inspection following sight checks have to be executed and registered in the operation logbook in case of any anomaly / error:

- Condition of the shaft seal (with ammonia: smell / leakage)
- Over all impression of the compressor unit (abnormal noise and / or vibrations, oil spills, loose cables etc.)

Capturing this data is general good operators practice and gives the basis for causal research of abnormal operating conditions or damages of the compressor. In addition to that changes in the operating characteristics of the compressor can be detected and corrected in an early stage to ensure maximum life-time of the compressor.

In particular the recording of pressures and temperatures of suction and discharge gas allows a very effective assessment of the compressor operating performance and especially deviations in the pressure-/ temperature dependence of the used refrigerant at evaporation and condensation condtions.

In case of malfunction / damage of the compressor unit or complete refrigeration system, the history of the operating parameters as well as regular oil analysis are essential for a fast and effective clarification of the causes and the establishment of suitable countermeasures and are therefore an important foundation for any warranty claims.

data log sheet - calender week:	
continuous document no.:	

MAYEKAWA MYCOM

name of the company		location		
description of the system				
compressor type / model		serial no.		refrigerant
oil manufacturer & type		date of commissioning		
control (SPS / MYPRO)		contractor		
remarks				

date	**xx/yy/zz**							
time	**hrs:min**							
name of reporter	**-**							
operating hours	**hrs**							
suction pressure	**barG**							
condensation pressure	**barG**							
oil supply pressure	**barG**							
oil filter differential pressure	**bar**							
fine filter differential pressure	**bar**							
suction gas temperature	**°C**							
discharge gas temperature	**°C**							
oil temperature	**°C**							
speed (for VSD)	**rpm**							
motor current	**A**							
slide valve position	**%**							
Vi only when changed)	**-**							
suction gas superheat	**K**							
discharge gas superheat	**K**							
oil level sight glass [mm]								
oil filled	**[Liter]**							
oil foam height [mm]								
special events / alarms / errors etc. or **OK**:	-							
	-							
	-							

2207Q2JE-HO-S6-N_2022.07.

MYCOM

SCV-series Screw Compressor Instruction Manual

160VLD／160VMD／160VSD
200VLD／200VMD／200VSD
250VLLD／250VLD／250VMD／250VSD
320VLD／320VMD／320VSD
160VLG／160VMG／160VSG
200VLG／200VMG／200VSG
250VLLG／250VLG／250VLG／250VSG

CAUTION

Read this manual carefully and thoroughly before operating, maintaining or inspecting this product. It is important to fully comprehend the contents of this manual. Keep the operation manual in a safe, designated place for future reference whenever the need arises.

Specifications of this product are subject to change without prior notice.

MYCOM MAYEKAWA MFG. CO., LTD.
3-14-15 Botan Koto-ku, Tokyo 135-8482, Japan

Preface

Thank you for purchasing the MYCOM SCV-series/screw compressor (hereinafter referred to as "this product").

This instruction manual (hereinafter referred to as "this manual") describes safety information, operational and detailed maintenance procedures for safe and effective use of this product、It is applicable to the following compressor types

160VSD, 160VMD, 160VLD, 200VSD, 200VMD, 200VLD, 250VSD, 250VMD, 250VLD, 250VLLD, 320VSD, 320VMD, 320VLD

160VSG, 160VMG, 160VLG, 200VSG, 200VMG, 200VLG, 250VSG, 250VMG, 250VLG, 250VLLG

Before installing or using this product, make sure you read this manual.

Keep this manual in a safe place near this product for quick reference whenever needed.

Revision History

Title of Instruction Manual		Document No.	Date of Initial Issue
SCV-series Instruction Manual		2207Q2JE-HO-S6-N_2022.07.	February 17, 2015
Rev. No.	**Issue Date**	**Revision Details**	**Prepared/Approved by**
00	Feb. 17, 2015	Complete revision and reissue as an electronic manual.	Ikehara/ Muta
01	June 12, 2015	Corrected errors in writing (e.g., footer in Chapter 2)	Ikehara/ Muta
02	Feb.28.2018	Corrected Table 2-1, 2-5, 3-1, 4-2, 7.Parts Configuration Table, 7.5.1 List of O-rings Used, Corrected other errors. Deleted Contact Information	Takenouchi・Ito / Kato
03	Mar.11.2019	7.Parts Configuration Table of 250V** models	Takenouchi / Kato
04	Jun.11.2019	Correction of the outer dimension. Revision of lock nut tightening angle.	Muta / Kato
05	Jan.07.2020	Correction of errors and sentences. Revision of parts list	Takita,Takenouchi / Muta
06	Dec.08.2020	Correction of errors and sentences. Revision of parts list	Takita / Muta
07	July.11.2022	Correction of parts list, Chapter 6 “Troubleshooting”, and Chapter 7 Changing the lock nut tightening method	Takita,Takenouchi / Muta

Warranty and Disclaimer

Warranty Clauses

If malfunctions or damages occur under proper usage and conditions following documents such as specifications or instruction manual of this product, or, if MAYEKAWA judges that malfunctions or damages are related to design or manufacture of the product, and if the malfunctions or damages are within the warranty period, MAEKAWA will repair this product or replace parts without any charges.

The warranty period is “12 months from factory shipment of this product”. However, if any separate agreement has been concluded, such an agreement will have the priority in principle.

Disclaimer Clauses (Exclusion of Warranty Clauses)

Please note that we disclaim any responsibility for malfunction and/or damage to this product in case of the following incidents:.

- Malfunction or damage of this product caused by force majeure such as windstorm, intense rainfall, flood, tidal wave, earthquake, land subsidence, thunderbolt, fire, etc.
- Malfunction, damage, or defect to this product due to abuse or misuse such as storing this product outdoors or in hot and humid locations, operation with excessive liquid flow-back and start-and-stop.
- Malfunction or damage caused by devices or equipment not provided by MAYEKAWA including operation control methods of those devices or equipment.
- Malfunction or damage caused by the usage of refrigerants, gases, and/or lubricants which are not approved by MAYEKAWA for this product.
- Malfunction or damage caused by maintenance or inspection procedures which are not recommended by MAYEKAWA.
- Malfunction or damage caused by parts which are not MAYEKAWA genuine.
- Malfunction or damage caused by parts which are not MAYEKAWA genuine.
- MAEKAWA shall not be liable to buyer for any incidental, indirect, special or consequential damages that buyer may suffer in relation to this product.

Important Information

Intended Use of this Product

This product is a screw compressor intended use for freezing and refrigeration.

Do not use this product for any other purposes for which it is not intended or deviate from the specifications which are described in Chapter 2, Article 2.3 “Compressor Specifications”.

The maintenance service should be performed according to the procedures described in this manual. Always pay attention to perform the works in a safe manner and working environment.

Important Information for Safe Use of This Product

Although MAYEKAWA has paid a lot of attention to safety measures for this product, all hazards including potential hazards caused by human errors, or due to environmental conditions can not be anticipated.

There are guidelines that must be followed to ensure proper use of this product. However, the warnings in this manual and safety labels on this product are not all inclusive. When operating the product, pay extreme caution on personnel safety as well as on items described in this manual or required by common safety practice.

Important rules for safety work with the product that apply to all workers including managers and supervisors are listed below.

Before using this product, carefully read and fully understand the contents written in this manual and pay attention to safety.

- Operation, maintenance, and inspection of this product should be performed by qualified personnel educated about the fundamentals of the product and trained about hazards involved and measures to avoid danger.
- Do not allow any person other than those educated on the fundamental expertise of the product and trained about hazards involved and measures to avoid dangers to approach the product while it is operating or during maintenance.
- Observe all related federal/national and local codes and regulations.
- To prevent accidents, do not carry out any operation or maintenance other than those described in this manual, or use the product for any unapproved purpose.
- Replace the parts with the MYCOM genuine parts.
- Not only workers but also managers should actively participate safety and health activities in the workplace to prevent accidents.
- When closing or opening valves during work, apply lockout/tagout without failure, to prevent the valves from closing or opening accidentally during the work.

[Lockout] To lock with a key in order to keep people, except the workers involved, from operating the product.

“Lockout” is a safety procedure to make sure that machines or equipment are property shut off and not able to be started up again by locking the power source to them.

Lockout is not just simply turning off the switches to stop the power supply, but includes immobilizing them with a key or similar device to prevent unauthorized access.

Lockout devices are devices such as keys, covers, and latches, to immobilize and shut-off switches, valves, opening and closing levers, etc.

[Tagout] To prevent any inappropriate work by hanging tag plates indicating like “work in progress”.

“Tag-out” means to clearly indicate that a device is in lockout and that operation of the device is

prohibited. The sole purpose of the tag plates such as prohibition of operation or commissioning is to warn others that it is prohibited to operate the locked out product. It should always be accompanied by a suitable lockout device to make operation impossible.

Observe the following precautions when performing maintenance work on electrical control.

- Electrical maintenance of the product must be performed by certified/qualified personnel and only those who have been trained in the potential danger and its avoidance relevant to the electrical control of the product.
- Before servicing or inspecting the electrical equipments or devices, turn "OFF" the motor main power and control power, and perform lockout/tagout to prevent the power from being turned on during work.

During maintenance work, make sure that the power supply on the power source side is shut off and perform lockout/tagout to prevent the product from being accidentally turned on.

About this Manual

- This product may be modified without prior notice. Therefore, the appearance of actual machine may differ from the descriptions in this manual. If you have any questions contact your sales offices or service centers. For each sight of MAYEKAWA, refer to following URL. http://www.mayekawa.com/about/network/
- This manual is in English. If any other language is required it is the customers responsibility to prepare a manual for safety education and operation instructions.
- This manual is copyrighted. Drawings and technical references including this manual shall not, in whole or part, be copied, photocopied, or reproduced into any electronic medium or machine-readable form without prior permission from MAYEKAWA.
- Photographs or drawings included in this manual may differ from the appearance of actual product.
- If this manual is lost or damaged, immediately place a purchase order to your local sales office or service center for a new manual. Using the product without the manual may result in safety issues.
- In the event that this product or the compressor package is resold, don’t forget to supply this manual together with the product.

Construction of this Manual

Title of section and chapter	Description details
Preface	Describes the outline of this manual and how to read it.
Warranty and Disclaimer	Describes clauses and coverage of warranty. Exemption of warranty clauses is described as disclaimer.
Important Information	Describes important information related to this product and this manual.
1. Safety	Describes safety information for the worker, safety rules for this product, and management details regarding work safety required for handling the product.
2. Structure and Specifications of the Compressor	Describes the main components of this product, functional information, specifications, and operating limits.
3. Installation	Describes installation procedure of this product.
4. Compressor and Package Operation	Describes precautions for operating this product.

Title of section and chapter	Description details
5. Maintenance and Inspection	Describes sections and period for inspecting, disassembly and assembly of the product.
6. Troubleshooting	Describes troubleshooting methods for the product in case problems occur during operation of the product.
7. Related Documents	Describes documents such as illustrated parts breakdown and parts list.

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Chapter 1 Safety

1.1 Observation/Prevention

1.1.1 Observance (Do's)

■ Do’s on Operation

- Always use the MAYEKAWA specified or recommended controller designed for this product.
- The controller protects this product based on the sensor output values.
- Make sure that all necessary safety devices are installed and that their control values are set correctly to assure proper and safe operation.
- Inspect the safety devices and the controller's protective functions on a regular base. Ensure that they perform according to the specifications.
- If the safety devices and the controller's protective functions do not work properly or the machine operates abnormally, immediately stop the operation and report the incident to your supervisor. Do not restart the machine until the supervisor determines the machine’s safety and provides proper instructions for a safe restart of the compressor.
- If the machine stops due to unknown reasons, immediately inform your supervisor. Do not restart the machine until the supervisor determines the machine’s safety and provides proper instructions for a safe restart of the compressor.
- Some types of refrigerants are toxic and/or generate bad odors which can cause oxygen deficiency. Make sure to ventilate the working area sufficiently to prevent asphyxiation.
- Some refrigerants and refrigeration compressor oils may be corrosive, decomposable, or toxic. Make sure to obtain their Safety Data Sheets (SDS) and strictly follow the mentioned instructions.
- When stopping the compressor for a long time, turn "OFF" the main motor, heater, and control power. Close the suction and discharge side shut-off valves.

■ Do’s on Maintenance

- When performing work with at least two or more persons, thoroughly confirm the work procedure and clearly understand each others work before commencement.
- Always turn “OFF” and use the lockout /tag-out procedure for the main motor, control and other devices before troubleshooting, setup, cleaning, maintaining, or inspecting this product. Also, make sure that the power is NOT turned on accidentally during the intervention.
- Always confirm that the pressure inside the packages for freezing, refrigerating and air conditioning is at atmospheric level before troubleshooting, setup, cleaning, maintaining or inspecting this system.
- Before troubleshooting, setup, cleaning, servicing or inspecting this product, apply the lockout / tag-out procedure to the liquid supply stop valves and valves in the upstream and downstream of the compressor so that they do not open accidentally during the work.
- Some types of refrigerants are toxic and/or generate bad odors which can cause oxygen deficiency. Make sure to ventilate the working area sufficiently to prevent asphyxiation.
- Some refrigerants and refrigerant oils may be corrosive, decomposable, or toxic. Make sure to obtain their Safety Data Sheets (SDS) and strictly follow the mentioned instructions.
- After working on the machine, always store the used tools at specified places and make sure that no tools are left in or around the machine.

Do's on Lockout/Tagout after Shutting off the Power

- Prepare lockout / tag-out devices for the main breakers in the power lines to the main motor and control cabinet.
- By applying the lockout/tag-out procedure after turning off the power, you can prevent any other personnel from restoring the power inadvertently. It enhances the safety of the personnel working on the power supply equipment and the package.
- If there are any possibilities of danger during work (especially during cleaning, maintenance, inspection, or troubleshooting), turn the main motor and control power "OFF" and perform a lockout/tag-out procedure.
- Before working on the package for troubleshooting, setup, cleaning, maintenance and/or inspection, it is recommended to always perform a lockout/tag-out procedure to the main motor and control power. It is also recommended to check if the lockout/tag-out procedure has been performed according to good practice.
- Turn off the power and perform lockout/tag-out before working on the package. Clearly notify the workers of the necessity of lockout/tagout.
  - It is assumed that workers do not perform lockout/tagout of the main motor and control power before starting work because it is troublesome, and only turn "OFF" the main motor and control power.
  - It is assumed that workers only turn off main motor and control power and do not lockout/tagout the main motor and control power, because they think it is not important.
- Upon completion of the work, the worker responsible for the lockout/tag-out must remove the lockout/tag-out device.

Do’s about Personal Protective Equipment(PPE)

- Prepare and use personal protective equipment which is in accordance with the area’s safety standards.
- Check the function of each PPE before use.
- Wear appropriate work cloth and avoid loose clothing.
- Do not wear any neckties or jewelry that can get entangled in the moving or rotating parts. A helmet is recommended for the protection against head injuries
- Empty your pockets to prevent objects from falling into the machine

Do’s about Handling of Hazardous and Toxic Substances

- Obtain Safety Data Sheets (SDS) from manufacturers/suppliers of hazardous and toxic substances.
- Check the SDS and follow the handling instructions recommended by the manufacturers to handle and store those substances.

Do’s about the Handling Emergency Situations

- Develop an emergency action procedure in accordance with the legal regulations and post it at a safe and easy to reach place.

Do’s about Waste Oil, Fluid, and Materials

- Disposal of refrigerant and waste oil from the compressor are subject to a number of environmental protection regulations. Follow the local, state or federal acts and regulations as well as your company's rules, when disposing of such waste oil, fluid and materials.

■ Other Do's

- Keep the floor around the freezing, refrigeration, and/or air conditioning packages clean and provide a safety aisle.
- Use the safety aisle only to move around the equipment. Keep the safety aisle free under all circumstances to ensure safe passage when required.
- If water or oil is spilled on the compressor or the floor, immediately wipe it off to prevent workers from injury caused by slipping.

1.1.2 Prohibitions (Don'ts)

- Do not remove or relocate any safety devices, including electrical interfaces.
- Do not disable any safety device by short-circuiting or bypassing without any permission.
- Do not leave the compressor unsafe and unattended, by removing the safety cover or some other safety measures.
- Do not touch, clean, or lubricate any part of the compressor (especially moving parts) when the compressor is operating.
- Do not touch relays or electric systems such as terminal block with bare hands when activating the power.

1.2 Warnings

To alert workers about possible dangers, the following information is always provided with the compressor.

- Warnings described in this manual
- Safety labels on the compressor

1.2.1 Types and Meanings of Warnings

This manual uses the following four types of warnings to emphasize potential hazards during operation or maintenance of the compressor:

Neglecting the warnings may cause damage to the compressor or its auxiliary equipment. Furthermore, it may lead to accidents, personal injury or even death. Be sure to always take the instructions in this manual into consideration.

Table 1-1 Types and Meanings of Warnings in this manual

Warning Type	Meaning
DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.
WARNING	Indicates a potential hazardous situation which, if not avoided, could result in serious injury or death.
CAUTION	Indicates a potential hazardous situation which, if not avoided, may result in minor or moderate injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

1.2.2 Safety labels

The section shows the different types of safety labels and their positions affixed on the compressor.

Always follow the warnings instructed on the safety label.

WARNING

- **Make sure to follow the instructions mentioned on the safety labels. Failure to do so may result in personal injury, death, or property damage.**
- **Do not smear, cover, or remove the safety labels.**
- **If the safety labels are damaged or missing, purchase new labels and install them onto their proper positions according to this manual.**

【POINT】

- Inform our service centers the product name and safety label number when placing a purchase order for safety labels.

■ Types of Safety Labels

Table 1-2 Safety Label

No.	Safety label	Remarks
1		
2		

1.3 Residual Risks

The following information is provided on the assumption that this product is operated, inspected, and maintained while being used in freezing, refrigeration, and air conditioning packages. Note that all hazardous sources cannot be predicted for the applications mentioned.

Foresee appropriate countermeasures for hazardous sources applicable to your systems.

Table 1-3 Hazardous Sources

	Danger source	Predicted hazard	Measures to be taken in operation	Measures to be taken when cleaning, inspecting, and replacing parts
A	Coupling for motor and compressor	Entanglement caused by contact	Install coupling covers and prohibit opening 1)Avoid contact	Shut off and lockout/tagout of motor's main power and control power
B	Motor terminals	Electric shock caused by live wiring contact and electrical leakage	2)Avoid contact Do not open terminal box Do not touch terminal box	Shut off and lockout/tagout of motor's main power and control power
C	Compressor suction casing	Frostbite caused by contact Contact with or inhalation of hazardous substances caused by leaking refrigerant, etc.	3)Avoid contact Wear protective gear Gas leakage detection	Wear protective gear Work under normal temperature
D	Compressor discharge casing	Burn caused by contact Contact with or inhalation of hazardous substances caused by leaking and blowing off refrigerant, etc.	4)Avoid contact Wear protective gear Sufficient ventilation Gas leakage detection	Wear protective gear Work in temperatures below 40 °C Appropriate refrigerant handling Sufficient ventilation
E	Discharge piping			
F	Lubricating piping and joints			
G	Solenoid valves and motorized valves mounted on compressor unit	Electric shock caused by live wiring contact and electrical leakage Trapping caused by contact with a drive part	Install terminal protective cover and prohibit opening 5)Avoid contact Wear protective gear	Shut off each breaker, and shut off and lockout/tagout the control power Wear protective gear
H	electric components (oil heater, protective switch, etc.) mounted on compressor unit	Electric shock caused by live wiring contact and electrical leakage Burn caused by contact	Install terminal protective cover and prohibit opening 6)Avoid contact Wear protective gear	Shut off each breaker, and shut off and lockout/tagout the control power Wear protective gear Work in temperatures below 40 °C

	Danger source	Predicted hazard	Measures to be taken in operation	Measures to be taken when cleaning, inspecting, and replacing parts
I	Oil drains from compressor unit	Contact with hazard-ous substances caused by leakage and blowoff Burn caused by contacting with high temperature fluid	Sufficient ventilation 7)Avoid contact Keep away and do not touch Wear protective gear	Sufficient ventilation Wear protective gear Work in temperatures below 40 °C
J	Noises	Hearing disabilities caused by noises	Wear protective gear	—

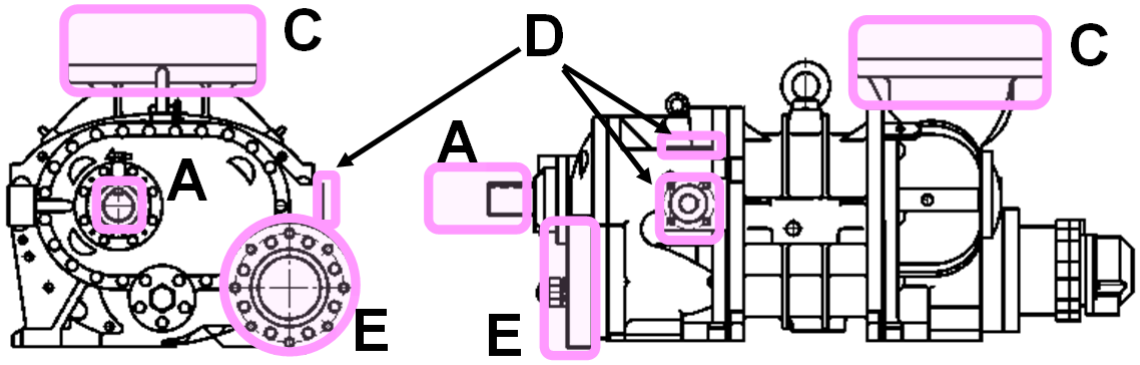


Figure 1-1 Hazardous Sources
(Compressor: V*D type i.e. discharge port facing sideways)

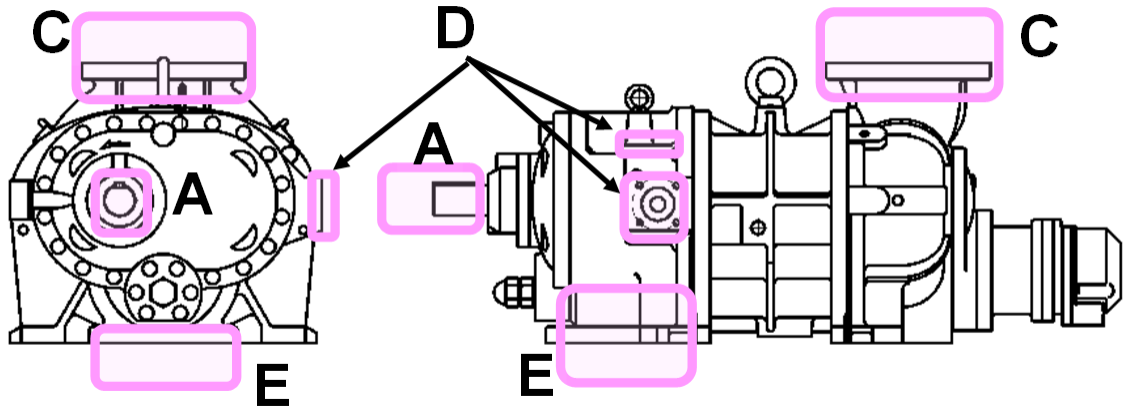


Figure 1-2 Hazardous Sources
(Compressor: V*G type i.e. discharge port facing down)

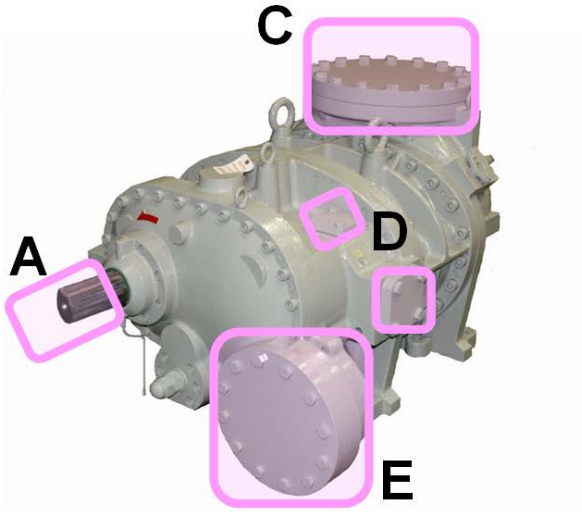


Figure 1-3 Hazardous Sources
(Compressor: V*D type)

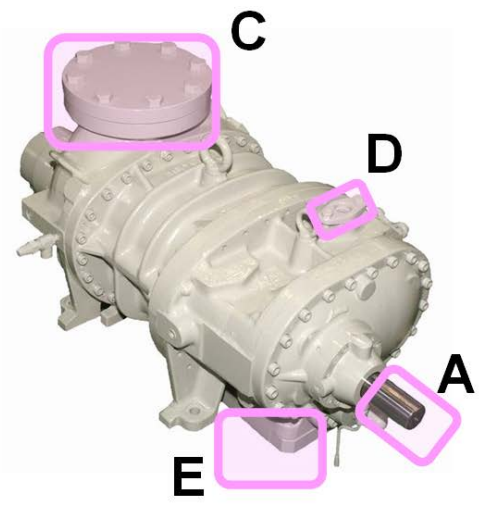


Figure 1-4 Hazardous Sources
(Compressor: V*G type)

1.4 Safety Devices

For safe use and protection of the compressor, make sure to foresee and install safety devices to the compressor that comply with the regulations and the following descriptions.

Safety devices must be properly and periodically maintained and inspected. It is important to include maintenance and inspection of safety devices in the periodical maintenance/inspection schedule. Make sure to provide users of the compressor with necessary information on types, attachment positions, functions, inspection method of the safety devices.

WARNING

- **Please inspect the operation of all safety protection devices before starting the compressor. If any kind of malfunction and/or wrong operation is detected, immediately take measures to resolve the hazardous situation. Operating the compressor with faulty safety devices can lead to dangerous situations for personnel and environment.**

1.4.1 Emergency Stop Button

■ Overview/Function/Purpose

The emergency stop buttons are used to stop the compressor operation immediately if an emergency occurs to the compressor.

■ Installation Locations

The emergency stop buttons should be installed in the controller on the compressor and in the operating control room

■ Stop/Reset Methods

To activate and reset the emergency stop buttons, refer to the unit instruction manual.

■ Inspection Method/Cycle

The emergency stop buttons must be activated before commissioning as well as periodically. For details about the inspection procedure and inspection cycle of the emergency stop buttons, please consult the unit instruction manual.

1.4.2 Breakers for the Main Motor Power and Control Power (with Lockout/Tagout Devices)

■ Overview/Function/Purpose

Turn off the main motor and control power, and if there are any possibilities of danger during work (especially during cleaning, maintenance, inspection, or troubleshooting), lockout/tagout devices must be set up for breakers of the main motor and control powers to prevent injury to workers in case the power is turned on accidentally during work.

■ Methods of Performing and Releasing Lockout/Tagout

In accordance with the regulations created by Occupational Safety & Health Administration (OSHA) and other authorities, make sure to clearly indicate methods of performing and releasing lockout/tagout and provide users of this compressor with the necessary information.

■ Inspection Method/Cycle

Please consult the unit instruction manual for inspection procedures.

1.4.3 Compressor Protection Devices

■ Overview/Function/Purpose

To protect the compressor, the following safety functions of the CP4 controller are used.

■ Protection against High discharge temperature

This function stops the compressor when the discharge temperature exceeds the set value.

A temperature sensor is installed in the oil separator.

■ Protection against High oil temperature

This function stops the compressor when the oil temperature exceeds the set value.

A temperature sensor is installed in the package lubrication piping after the oil cooler.

■ Protection against abnormal High pressure

This function stops the compressor when the discharge pressure abnormally rises due to faulty operation of the compressor or insufficient cooling water supply to the condenser.

This function prevents explosion of the equipment and components.

A pressure sensor is installed in the oil separator.

■ Protection against abnormal Low suction pressure

This function stops the compressor when the suction pressure is below the set value.

A pressure sensor is installed in the suction piping.

■ Protection against abnormal oil pressure

This function stops the compressor when oil supply is not sufficient, the oil filter is clogged, too much refrigerant in oil, or oil supply pressure difference (from suction pressure) is below the set value. This is to protect the compressor from wear and seizure.

A pressure sensor is installed in the package lubrication piping after the oil filter.

■ Protection against oil filter Differential pressure

This function stops the compressor when the differential pressure between discharge and lubrication pressure is below the set value due to clogging of filters or other reasons.

The discharge and the oil pressure sensors is used.

■ Protection against Low oil level

[Case 1 Differential pressure oil supply system]

This function continuously detects the oil level in the oil separator and stops the compressor when the oil level is below the lower limit.

Oil level sensor is installed in the oil separator.

[Case 2 Forced oil supply system]

When the oil level gets lower and the oil pump takes in the refrigerant gas, the differential pressure between before and after the oil pump decreases. When the differential pressure between before and after the oil pump is less than the specified value, the system will stop the compressor operation.

■ Protection against motor over-current

When motor current exceeds the set value (upper limit), it stops the compressor..

The current value is monitored by MAYEKAWA controller.

■ Sensor positions and settings

Consult the package instruction manual for the positions and sensor settings for compressor protection. Make sure that the set values of the sensors do not exceed the operating limits indicated in Chapter 2, section 2.3.2 and Table 2-6 in this manual.

■ Inspection Method/Cycle

Compressor protection sensors require activation tests and checking the set values before starting or operating the compressor and must be periodically inspected. For inspection methods and periods, please consult the package instruction manual.

⚠ WARNING

- **Adjust and fine-tune the set values of all safety protection devices (controllers and sensors) during the commissioning.**

⚠ CAUTION

- **To test the functionality and operation of each safety device, use appropriate testing tools to ensure that all alarms and switches operate normally. Do not operate the compressor with all valves closed or in any other conditions which will lead to dangerous situations.**
- **It is highly recommended to investigate the cause when the safety protection devices detect low oil pressure, abnormal high discharge pressure or high oil filter differential pressure. The compressor should not be operated as long as the situation has been unresolved.**

Chapter 2 Compressor Specifications and Structure

2.1 Features of SCV-series Screw Compressors

MYCOM SCV-series Screw is a single-stage screw compressor classified into a rotary displacement pump type, and it consists of the following features.

■ High Efficiency

The SCV-series has achieved high efficiency by applying "MYCOM original O-profile screw robes with the minimum leakage".

In addition, the SCV series provides economical operations due to its variable capacity control mechanism, which well follows the load variation.

■ Responding to a Wide Range Condition

In the SCV-series compressors, there are four types of rotor lobe diameter, and each rotor has three types of shaft length (for types shaft length in the 250 mm diameter rotor) as a standard specification.

Also, there are two types of the discharge direction of the compressed gas, i.e. one is sideway discharge type, another one is downward discharge type. For details, refer to next Section 2.2.

With these features, the SCV-series compressor is providing a high versatility that can satisfy a wide range of operation conditions required by different applications at the load side.

Moreover, the SCV-series models feature a “Readily changing mechanism to three ranges of internal volume ratio Vi”. Using this variable Vi mechanism, customers can be corresponding to large change of the load side operating conditions as a case of refrigerant changing or like.

■ High Reliability

The SCV-series has extended the long span continuous operation without compressor overhauling because of the following features:

Radial sleeve bearings specially designed with MYCOM’s original technology, special high-load capacity thrust ball bearings, and a bellows type mechanical seal assembly.

Furthermore, from December 2014 Moriya factory production, the SCV-series models have employed the new type unloader indicator assembly with the protection grade IP66 of the dust and water proof, at the same timing, have installed a durable conductive plastic potentiometer as the standard inner component of the indicator.

Because of this improvement, the SCV-series has equipped with further high reliability.

■ Less Vibration/Noises

The O-profile rotors along with other various design considerations have reduced noise and vibrations further.

2.2 Model Designation of the Compressor

The meaning of the type designation, which is engraved on the MODEL column of the compressor nameplate, is as follows.

[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
N	**200**	**V**	**L**	**D**			**-**	**H**		

[1] When there is specification, working fluid is shown by the symbol. This symbol may not be indicated.
(Example: **N=** Ammonia, **F=**Hydro Fluoro Carbon, **P**: Propane)

[2] Means rotor diameter which is **160**, **200**, **250** or **320.**

[3] Means the specifications of the rotor length which is **S**, **M**, **L** or **LL** (for rotor diameter 250 only).

[4] Means gas discharge direction which is **D** (sideways) or **G** (down: except for rotor diameter 320).

[5] Means the specifications of the slide valve, which is D (grooved type) or Z (low Vi type) as special specifications. When using standard slide valve, symbol is not added and left justified.

[6] When using the short cut rotors, add the symbol "S". When using the standard rotors, symbol is not added and left justified.

[7] When the compressor is standard specifications (standard slide valve, H-port, standard compression ratio, with economizer port and with liquid injection port) without symbols [8] to [10], this symbol is not indicated, either.

[8] This symbol is indicated only when specified by the order. This symbol means a discharge port which is H (Vi=5.8, with gorooveless standard slide valve), M (Vi=3.65, with gorooveless standard slide valve), MS (Vi=2.63 equivalent, with grooved slide valve), HS (Vi=1.8, with low Vi slide valve), or MS (Vi=1.3, with low Vi slide valve).

Note: In the case of following specifications set of discharge port and slide valve, variable Vi slide valve should be adjusted the first character of this symbol (left side to "S").

Note: If the evaporating temperature of the system exceeds 0 °C under the L port condition, select a grooved slide valve for the compressor.
In addition, note that grooved slide valve is available to even less than 0 °C evaporating temperature under the L port condition.

[9] When the compressor is booster specifications, the symbol "B" is added. When the compressor is standard specifications, symbol is not added and left justified.

[10] This symbol is indicated only when specified by the order. This symbol indicates if there is economizer port or/and liquid injection port or not. When this symbol is not indicated, both ports are provided and symbol may be added as “X”.

Symbol	Economizer port	Liquid injection port
E	with port	no port
I	no port	with port
X	with port	with port
N	no port	no port

The meanings of symbols [8] to [10] are shown below as examples.

200VLD: Discharge port is H port. With economizer and liquid injection ports both.

N200VID-MX: Discharge port is M port. With economizer and liquid injection ports both.

N200VLD-MBX: Discharge port is M port. Booster type, with economizer and liquid injection ports both.

N200VLD-HE: Discharge port is H. With economizer port, without liquid injection port

N200VLD-HN: Discharge port is H. Without economizer and liquid injection ports both.

2.3 Compressor Specifications

2.3.1 Standard Specifications

Table 2-1 Standard Specifications of SCV-series 160V**

Item			160					
			VLD	VMD	VSD	VLG	VMG	VSG
Working fluid (Refrigerant)		—	Ammonia, Hydro Fluoro Carbon and Other					
Mass of compressor alone		kg	390	380	370	410	360	350
Capacity control (Actual load)		%	10 to 100					
Rotation direction		—	CCW viewed from motor					
Swept volume	@ 3550 min^{-1}	m^3/h	749	624	499	749	624	499
	@ 2950 min^{-1}	m^3/h	622	519	415	622	519	415
Connected pipe size								
Gas inlet port			MYK 125A					
Gas outlet port			MYK 100CD			MYK 100A		
Main oil supply port (Journal)			Rc1/2					
Oil supply port for side bearing of F rotor			Rc1/4					
Oil injection port			Rc3/8					
Economizer port			MYK 25A					
Liquid injection port 1			MYK 20A					
Liquid injection port 2			Rc3/8					
Capacity control	decrease (unload)		Rc1/4					
	increase (load)		Rc3/8					
Oil drain			Rc3/8					

Note 1: Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.
Note 2: MYK flange is the standard flange for MYCOM single screw compressor.

Table 2-2 Standard Specifications of SCV-series 200V**

Item			200					
			VLD	VMD	VSD	VLG	VMG	VSG
Working fluid (Refrigerant)		—	Ammonia, Hydro Fluoro Carbon and Other					
Mass of compressor alone		kg	700	670	630	680	650	610
Capacity control (Actual load)		%	10 to 100					
Rotation direction		—	CCW viewed from motor					
Swept volume	@ 3550 min^{-1}	m^3/h	1460	1220	975	1460	1220	975
	@ 2950 min^{-1}	m^3/h	1210	1020	810	1210	1020	810
Connected pipe size								
Gas inlet port			MYK 150A					
Gas outlet port			MYK 125CD			MYK 125A		
Main oil supply port (Journal)			MYK 20A					
Oil supply port for side bearing of F rotor			Rc3/8					
Oil injection port			Rc1/2					
Economizer port			MYK 32A					
Liquid injection port 1			MYK 25A					
Liquid injection port 2			Rc1/2					
Capacity control	decrease (unload)		Rc3/8					
	increase (load)		Rc3/8					
Oil drain			Rc1/2					

Note 1: Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.
Note 2: MYK flange is the standard flange for MYCOM single screw compressor.

Table 2-3 Standard Specifications of SCV-series 250V*D

Item			250			
			VLLD	VLD	VMD	VSD
Working fluid (Refrigerant)		—	Ammonia, Hydro Fluoro Carbon and Other			
Mass of compressor alone		kg	1390	1300	1220	1180
Capacity control (Actual load)		%	10 to 100			
Rotation direction		—	CCW viewed from motor			
Swept volume	@ 3550 min^{-1}	m^3/h	3370	2840	2380	1900
	@ 2950 min^{-1}	m^3/h	2800	2360	1980	1580
Connected pipe size						
Gas inlet port			MYK 250A			
Gas outlet port			MYK 150CD			
Main oil supply port (Journal)			MYK 25A			
Oil supply port for side bearing of F rotor			Rc3/8			
Oil injection port			Rc1/2			
Economizer port			MYK 50A			
Liquid injection port 1			MYK 32A			
Liquid injection port 2			Rc1/2			
Capacity control	decrease (unload)		Rc3/8			
	increase (load)		Rc1/2			
Oil drain			Rc1/2			

Note 1: Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.
Note 2: MYK flange is the standard flange for MYCOM single screw compressor.

Table 2-4 Standard Specifications of SCV-series 250V*G

Item			250			
			VLLG	VLG	VMG	VSG
Working fluid (Refrigerant)		—	Ammonia, Hydro Fluoro Carbon and Other			
Mass of compressor alone		kg	1350	1260	1180	1120
Capacity control (Actual load)		%	10 to 100			
Rotation direction		—	CCW viewed from motor			
Swept volume	@ 3550 min^{-1}	m^3/h	3370	2840	2380	1900
	@ 2950 min^{-1}	m^3/h	2800	2360	1980	1580
Connected pipe size						
Gas inlet port			MYK 250A			
Gas outlet port			MYK 150A			
Main oil supply port (Journal)			MYK 25A			
Oil supply port for side bearing of F rotor			Rc3/8			
Oil injection port			Rc1/2			
Economizer port			MYK 50A			
Liquid injection port 1			MYK 32A			
Liquid injection port 2			Rc1/2			
Capacity control	decrease (unload)		Rc3/8			
	increase (load)		Rc1/2			
Oil drain			Rc1/2			

Note 1: Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.
Note 2: MYK flange is the standard flange for MYCOM single screw compressor.

Table 2-5 Standard Specifications of SCV-series 320V*D

Item			320		
			VLD	VMD	VSD
Working fluid (Refrigerant)		—	Ammonia, Hydro Fluoro Carbon and Other		
Mass of compressor alone		kg	2640	2480	2240
Capacity control (Actual load)		%	10 to 100		
Rotation direction		—	CCW viewed from motor		
Swept volume	@ 3550 min^{-1}	m^3/h	5700	4760	3820
	@ 2950 min^{-1}	m^3/h	4740	3960	3170
Connected pipe size					
Gas inlet port			MYK 350A		
Gas outlet port			MYK 200CD		
Main oil supply port (Journal)			MYK 40A		
Oil supply port for side bearing of F rotor			MYK 20A		
Oil injection port			MYK 25A		
Economizer port			MYK 80A		
Liquid injection port 1			MYK 50A		
Liquid injection port 2			Rc3/4		
Capacity control	decrease (unload)		Rc3/8		
	increase (load)		Rc1/2		
Oil drain			Rc1/2		

Note 1: Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.
Note 2: MYK flange is the standard flange for MYCOM single screw compressor.

2.3.2 Operation Limits

Table 2-6 Operation Limits of SCV-series Screw Compressors

Item		Operation Limit	
Maximum discharge pressure	MPa	1.96 (250VLL* is 1.37)	
Maximum suction pressure	MPa	0.59	
Minimum suction pressure	MPa	-0.080	
Minimum differential pressure between oil supply pressure and suction pressure	MPa	0.49	
Maximum oil supply pressure	MPa	Forced oil supply	Differential pressure oil supply
		Pd + 0.39	Pd (＝Discharge pressure)
Minimum oil supply pressure	MPa	Forced oil supply	Differential pressure oil supply
		Pd + 0.049	Pd - 0.049
Maximum suction temperature	°C	85	
Minimum suction temperature	°C	-60	
Maximum discharge temperature	°C	90	
Maximum oil supply temperature	°C	60	
Minimum oil supply temperature	°C	30	
Maximum M rotor rotation speed	min^{-1}	4500 (250VLL and 320V*D are 3600)	
Minimum M rotor rotation speed	min^{-1}	1450	

Note 1: Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.

Note 2: The oil supply pressure of the capacity control part (control hydraulic pressure of the unloader slide valve), the value of the forced oil supply pressure is applied.

Note 3: When it is required that pressure difference between Pd (discharge pressure) and Ps (suction pressure) should be not greater than 0.49 MPa, oil pump needs to be installed.

If a combination of "NH_3 + compatible oil (PN46)" is used for working fluid (refrigerant) and lubricating oil, oil pump must be installed.

CAUTION

- **If operation at partial load, which is not greater than 30 % of the indicated load, is continued for a long time except when starting up the machine, abnormal noises or vibration may be generated. So avoid such operation.**
- **Repeated startup and stop in a short period is harmful not for the startup devices and electric machinery but also for the compressor itself. For information on the start/stop limitations, refer to each instruction manual. Wait at least 15 minutes after stopping the compressor before restarting it.**

2.3.3 Outer Dimensions

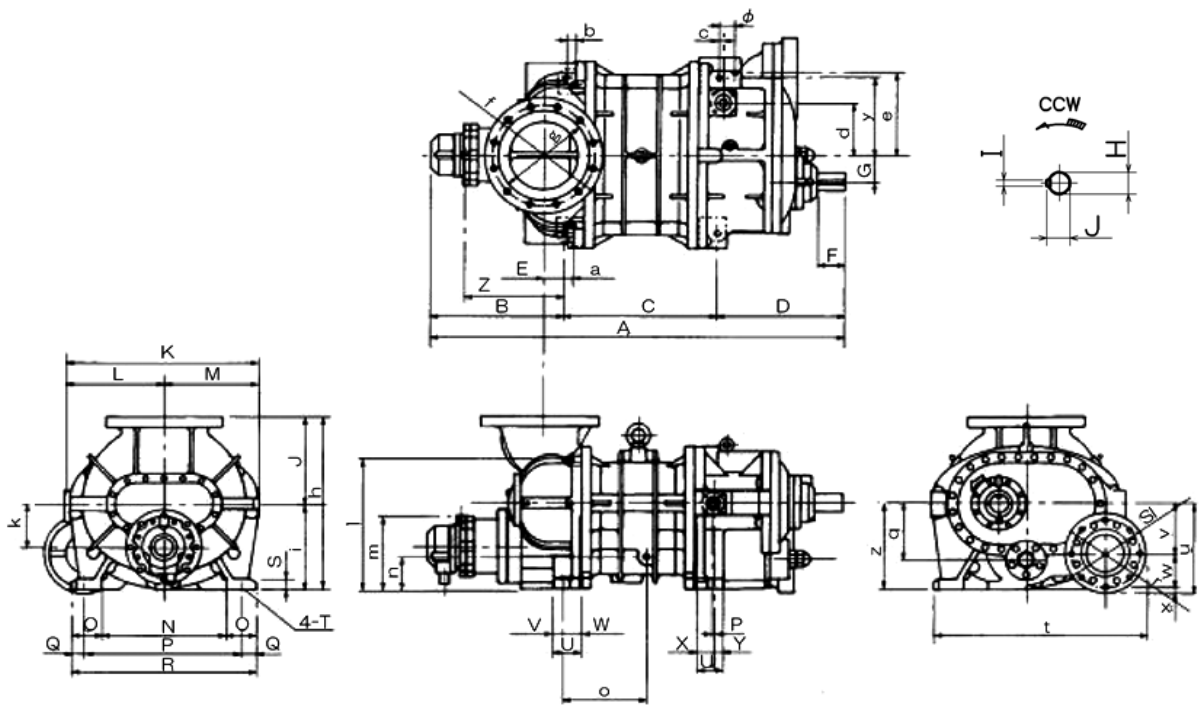


Figure 2-1 Outer Dimensions 160V*D, 200V*D, 250V*D, 250VLLD (Sideways discharge type)

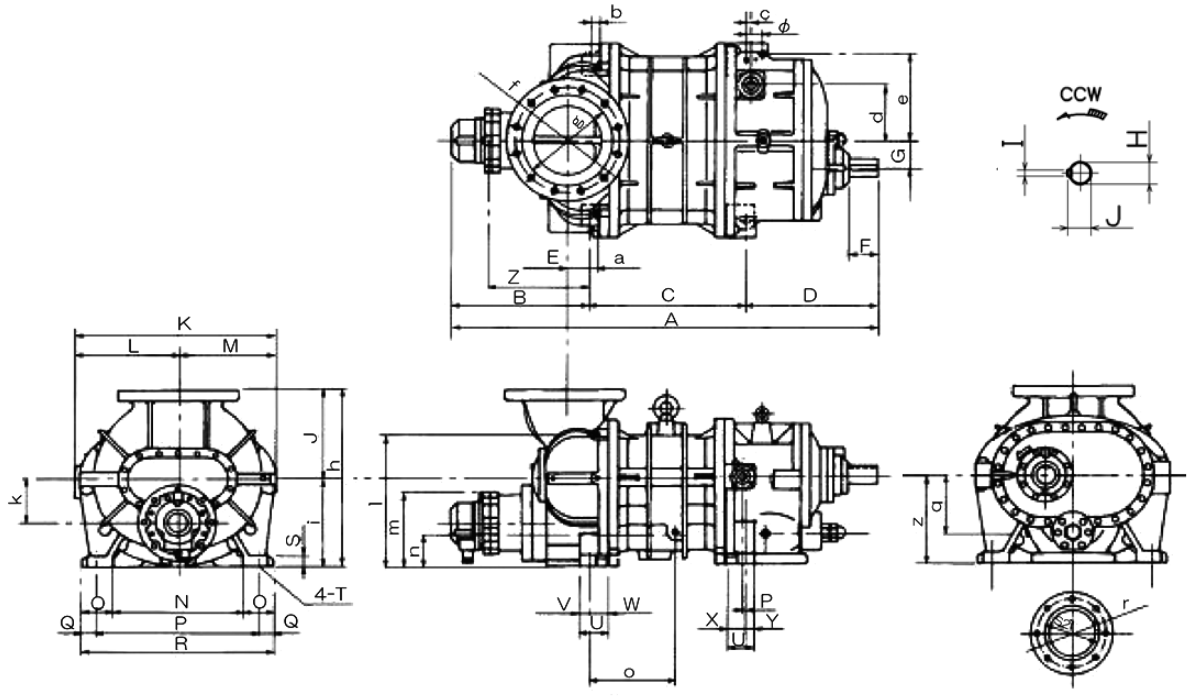


Figure 2-2 Outer Dimensions 160V*G, 200V*G, 250V*G, 250VLLG (Down discharge type)

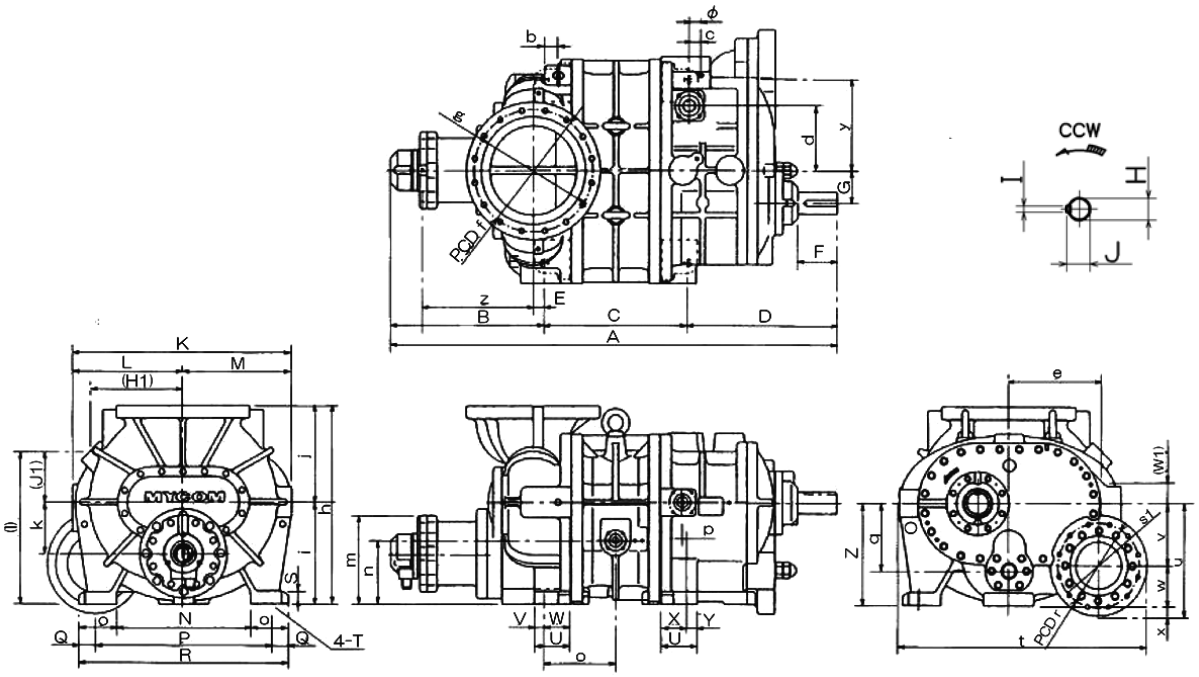


Figure 2-3 Outer Dimensions 320V*D

Table 2-7 Outer Dimensions (1/2)

(mm)

MODEL	A	B	C	D	E	F	G	H	I	J	K
160VS*	1027	387	280	360	40.5	91	64	45 +0.011 −0.005	12 +0.027 0	48.5	470
VM*	1072		325								
VL*	1117		370								
200VS*	1199	429	363	407	40.5	100	80	55 +0.012 −0.007	15 +0.027 0	60	570
VM*	1256		420								
VL*	1311		475								
250VS*	1395	495	430	470	80.5	104	100	67 +0.012 −0.007	18 +0.027 0	73	715
VM*	1467		502								
VL*	1535		570								
VLL*	1612.5		647.5								
320VSD	1796	620	576	600	45	156	126	85 +0.011 −0.011	24 +0.043 0	93	890
VMD	1884		664								
VLD	1971		751								

MODEL	L	M	N	O	P	Q	R	S	T	U	V	W
160VS*	240	230	300	80	370	45	480	25	φ19	65	22.5	39.5
VM*												
VL*												
200VS*	290	280	360	100	460	50	560	30	φ23	95	30.5	64.5
VM*												
VL*												
250VS*	385	350	460	110	580	50	680	40	φ23	100	30.5	69.5
VM*												
VL*												
VLL*												
320VSD	450	440	540	155	720	65	850	50	φ33	145	40	105
VMD												
VLD												

Table 2-7 Outer Dimensions (2/2)

(mm)

MODEL	X	Y	Z	a	b	c	d	e	f	g	h	i
160VS*												
VM*	40	25	210	24.5	24.5	5	127	216	230	174	410	210
VL*												
200VS*												
VM*	63	30	260	39.5	39.5	15	160	251.5	248	199	510	260
VL*												
250VS*												
VM*												
VL*	70	30	320	34.5	34.5	15	198	307	375	331	640	320
VLL*												
320VSD												
VMD	105	40	400	–	55	5	255	376	480	422	780	400
VLD												

MODEL	j	k	l	m	n	o	p	q	r	s1	s2	t
160VS*						140						
VM*	200	102.5	302	187.5	70	162.5	10	132.5	190	111	144	450
VL*						207						
200VS*						184.5						
VM*	250	128	381.5	224.5	145	241.5	18	168	230	146	174	657
VL*						296.5						
250VS*						215						
VM*	320	160	482	257	120	256.5	10	210	248	176	199	779
VL*						314.5						
VLL*						349.5						
320VSD						288						
VMD	380	202	597	348	250	431	20	264	330	234	–	996
VLD						394						

MODEL	u	v	w	x	y	z	ϕ	HI	JI	WI
160VS*										
VM*	225	130	80	5	125	261	34	–	–	–
VL*										
200VS*										
VM*	280	143	117	15	240	303	36	–	–	–
VL*										
50VS*										
VM*										
VL*	335	186	134	20	290	388	57	–	–	–
VLL*										
320VSD										
VMD	436	240	160	36	280	494	51	376	197	83
VLD										

2.4 Compressor Structure and Mechanism

2.4.1 Overview of SCV-series Screw Compressor

SCV-series Screw Compressors are rotary compressors falling into the category of the positive displacement compressor. The compressor sucks refrigerant gas into a cavity, gradually reduces the volume of the cavity, and discharge the refrigerant as a high-pressure gas. More specifically, a sealed cavity is formed by a casing and a pair of intermeshing rotors (called the male = M and female = F rotors) in the casing. The rotors are different in lead and number of screw lobes. The volume of the sealed cavity gets reduced as the rotors rotate. The gas trapped in the cavity is thus compressed before it is discharged.

The SCV-series models feature a mechanism for readily changing the internal volume ratio Vi, which refers to the ratio between the volume of the cavity just before the start of compression and the volume of the cavity just before the discharge of the compressed gas.

In addition, the SCV-series compressors employ O-profile screw lobes for the rotors, which minimize leaks and thus enhance the compression efficiency.

【POINT】

- For names and positions of each part of the compressor, refer to Section 7.1 "Exploded Views, Sectional Views ", and Section 7.2 "Parts Configuration Table" in this manual Chapter 7.

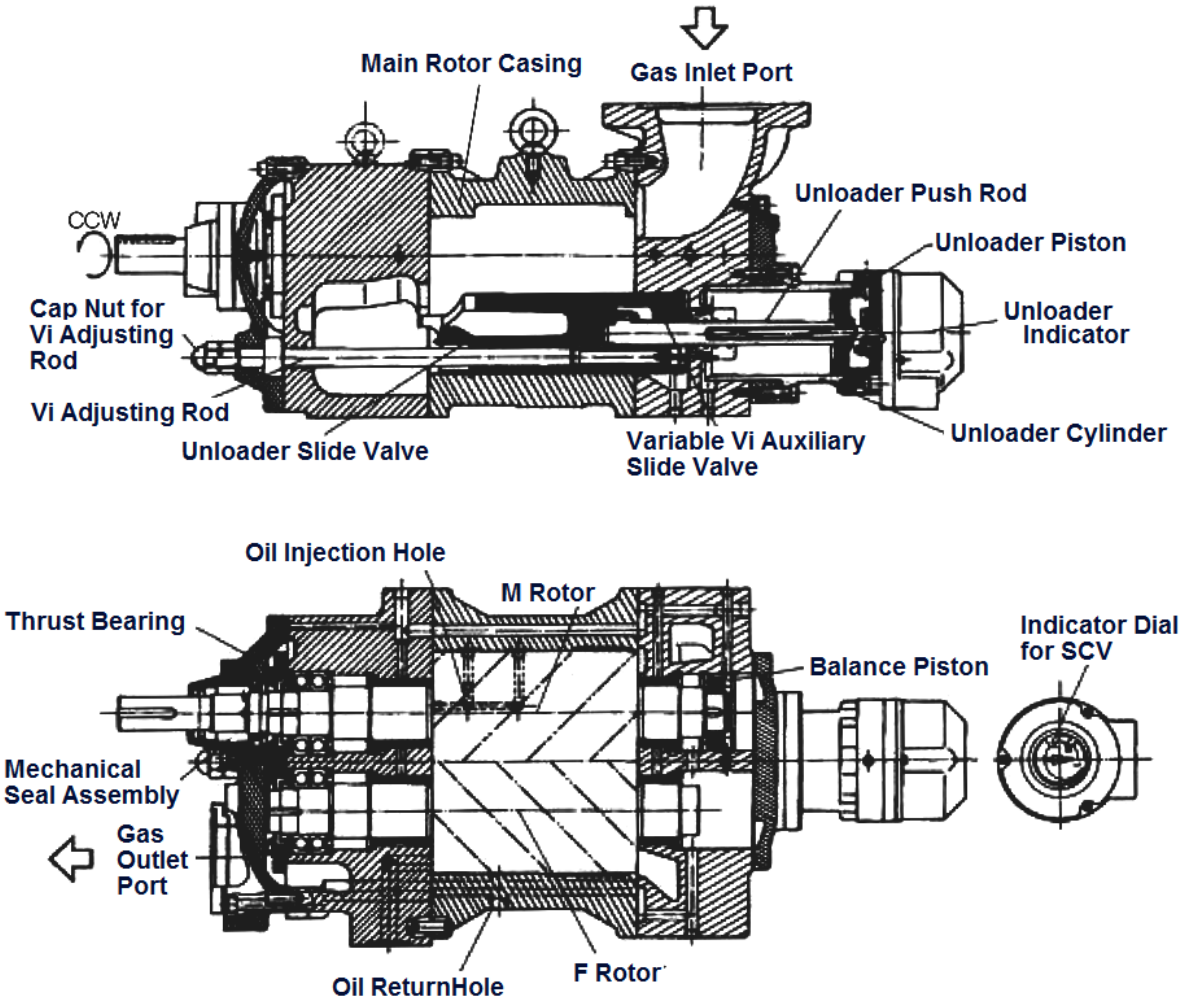


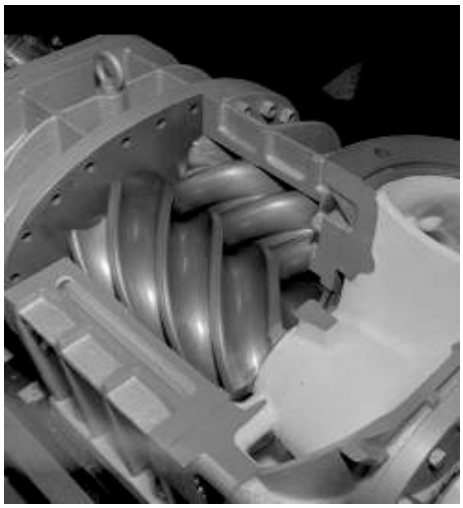
Figure 2-4 Compressor Structure (Representative View of Sideways Discharge Type)

2.4.2 Refrigerant Gas Compression Mechanism

Inside the main rotor casing, there are the M rotor (number of screw lobes: 4) and F rotor (number of screw lobes: 6), intermeshing and rotating in the opposing directions each other. Together with the rotor casing, these two rotors constitute the essential elements of the compressor for sucking and compressing the refrigerant gas.

The M rotor is directly coupled to a two-phase electric motor and driven at a standard speed of 2950 min^{-1} (with a 50 Hz power supply) or 3550 min^{-1} (with a 60 Hz power supply). If necessary, the speed may be changed using an inverter or a gear set.

One end of each rotor constitutes the gas suction end, while the other end the compressed gas discharge end. While the rotors are rotating over a certain angular range, their suction ends open the suction port; the suction ends close the port while the rotors are rotating over another angular range. This is also true with the discharge ends and the discharge port (see Figure 2-5).



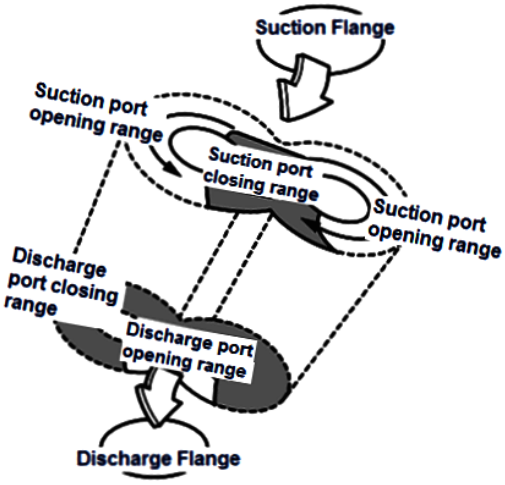
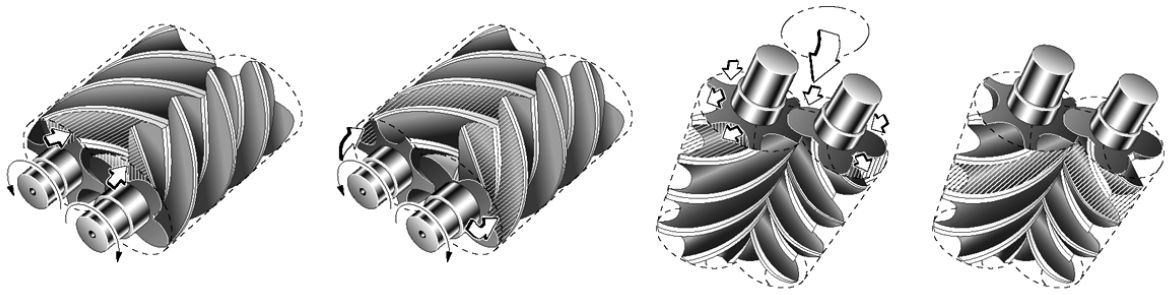


Figure 2-5 Suction and Discharge Port

■ Gas Suction Phase

As shown in Figure 2-8, the rotors with different tooth profiles are engaged. As the rotors turn, the volume between the M and F rotor tooth profiles and the compressor casing gradually increases starting from the suction side.

As the rotation continues, at a certain point when the volume reaches its maximum, the rotors isolate the gas (volume), which is enclosed by the rotors and the compressor casing, from the suction port and then continues rotation.



(1) Gas Suction Started | **(2) Gas Suction in Progress** | **(3) Gas Suction Phase about to End** | **(4) Suction Port Closed**

Figure 2-6 Gas Suction Phase

■ Compression Phase

As the rotors rotate further, the volume between the rotor lobes and grooves decreases while the sealing line moves toward the discharge side, which compresses the trapped refrigerant gas.

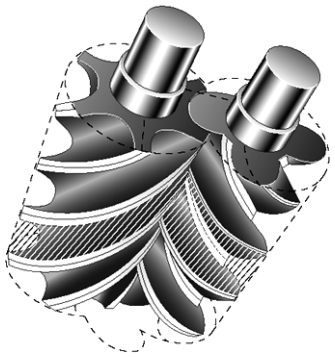


Figure 2-7 Compression Phase

■ Discharge Phase

The volume between the rotor lobes and grooves decreases to a level predetermined by the discharge port. With the rotations of the rotors, the compressed refrigerant gas is pushed out to the discharge port.

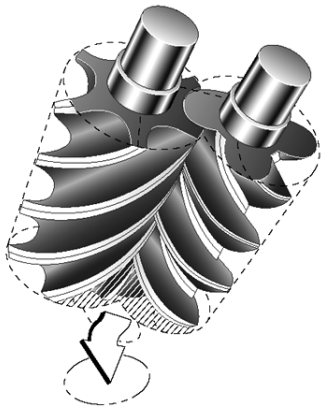


Figure 2-8 Discharge Phase

2.4.3 Internal Volume Ratio Vi

■ What is the Internal Volume Ratio Vi ?

In the case of reciprocating compressors, the refrigerant compression capacity is controlled by setting the pressure attained by piston displacement to an optimum level for the intended application.

With screw compressors, on the other hand, the compression capacity is controlled by setting the extent to which the volume of the sucked refrigerant gas is to be reduced. In other words, the compression capacity control applied to the screw compressor is a volumetric ratio control.

This volumetric ratio is called the 'internal volume ratio Vi' and defined by the following formula:

$$Vi = \frac{\text{Volume of suction refrigerant gas just before start of compression}}{\text{Volume of refrigerant gas just before opening of discharge port}}$$

In the case of the screw compressor without the Vi variable mechanism, Vi values are fixed at a specific value for each compressor.

For example, the Vi value is fixed at 2.63, 3.65, or 5.80 for MYCOM UD/G-series compressor; compressors with Vi at 2.63 are called the L-port compressors, those with Vi at 3.65 are called the M-port compressors, and those with Vi at 5.80 are called the H-port compressors.

Also, the Vi of SCV-series compressors with variable Vi mechanism are these three types i.e. L port, M port, H port.

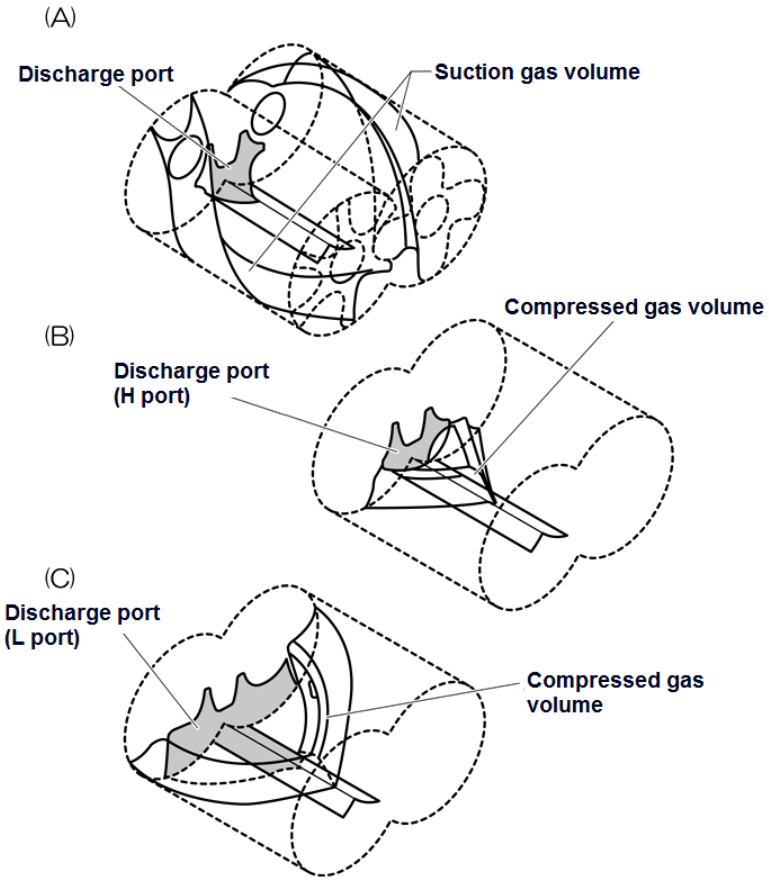


Figure 2-9 Internal Volume Ratio Vi

■ Variable Vi Mechanism

The combination of the following two factors determines the Vi value:

[1] The size of the axial port in the bearing head (port extending in the rotor axis direction)

[2] The size of the radial port in the unloader slide valve (port extending in the direction perpendicular to the rotor axis direction)

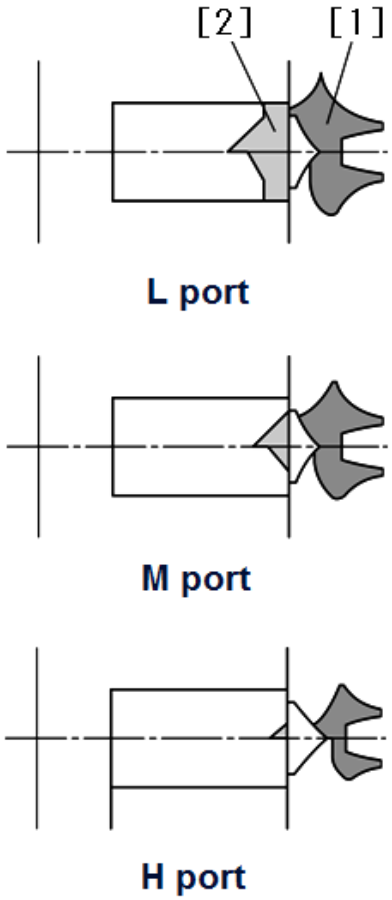
The conventional fixed-Vi MYCOM compressors have axial and radial ports both fixed to the sizes corresponding to the L, M, or H port.

The SCV-series compressors also have a fixed axial port of the size corresponding to Vi = 5.1, but the radial port in the unloader slide valve is made variable to constitute a variable Vi mechanism. This is achieved by making the full-load end of the unloader slide valve, which is fixed with the conventional models, variable as necessary.

Figure 2-10 compares the discharge ports or the fixed and variable Vi compressors.

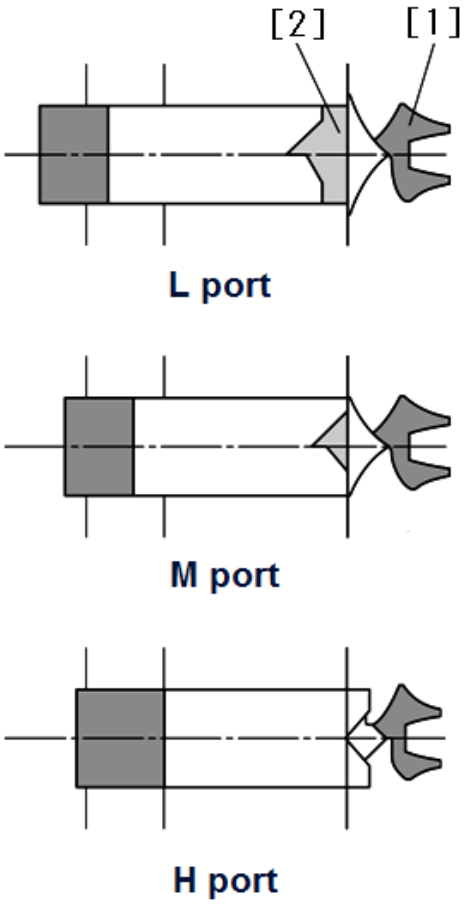
Conventional compressors (fixed Vi)

• Both axial and radial ports fixed



SCV Series compressors (variable Vi)

• Axial port fixed, radial port variable



[1]: The size of the axial port in the bearing head

[2]: The size of the radial port in the unloader slide valve

Figure 2-10 Discharge Ports of Variable and Fixed Vi Compressors

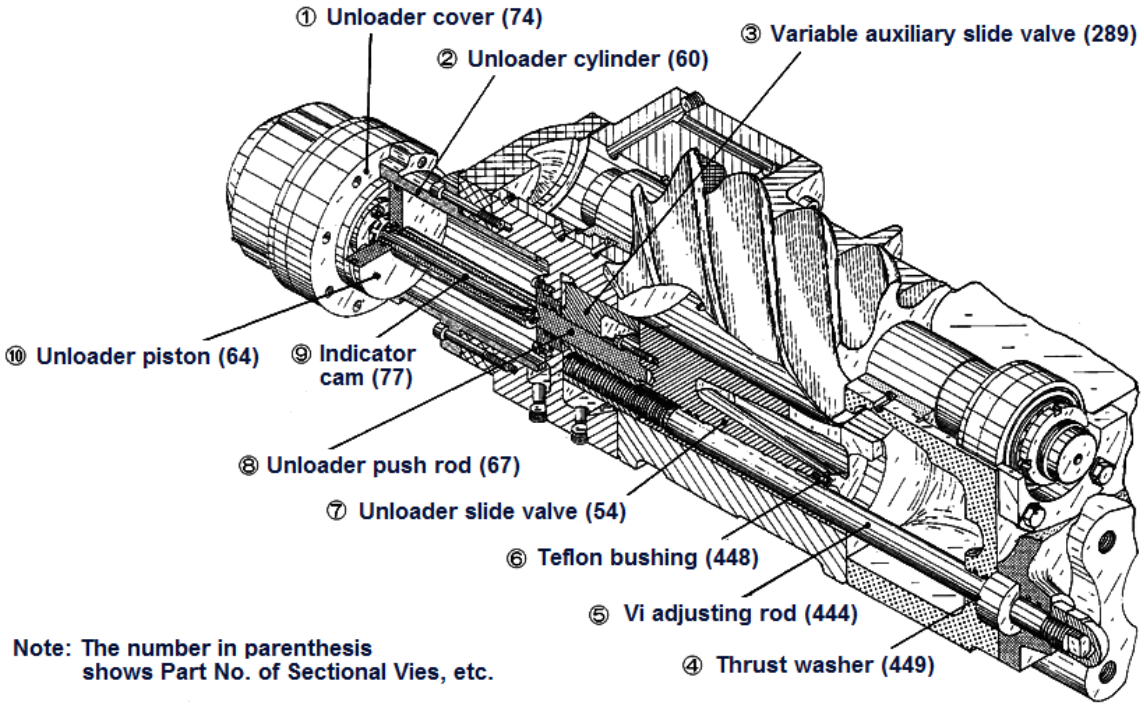


Figure 2-11 Variable Vi Mechanism of SCV-series

■ Why the Vi Needs to Be Changed?

The advantages that can change the Vi settings of the compressor are as follows:

[1] You ca set the Vi that is suitable for use refrigerant.
Internal volume ratio Vi is expressed as follows with the compression ratio.

$$Vi = \left(\frac{Pd}{Ps}\right)^{\frac{1}{\kappa}} \quad \text{or} \quad Vi^{\kappa} = \frac{Pd}{Ps}$$

Pd: discharge pressure, Ps: suction pressure,
κ: ratio of specific heats (a constant specific to each refrigerant).

As seen from the formula, the Vi corresponding to a certain pressure ratio varies with the type of refrigerant gas. If you can change the Vi settings, you will be able to apply to a variety of refrigerant using a single compressor.

[2] You can operate the compressor most efficiently under varying conditions.

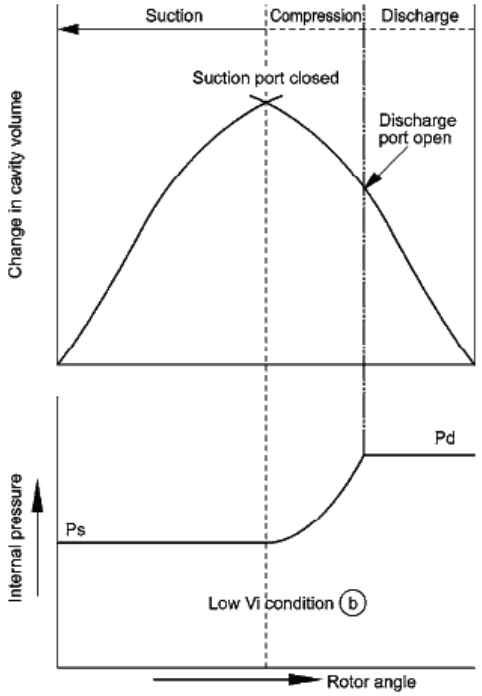
Compressors of the same model will be used for a variety of applications whose load conditions are different, e.g. air conditioning, cold storage, and freezing. The compressor, however, can be operated most efficiently when the Vi is matched with the load condition.

For example, if a conventional M port compressor with the fixed Vi is used for a low compression ratio application (an application with small difference between suction and discharge pressures), a pressure higher than the necessary pressure will be reached before the discharge port opens as shown in the lower right graph of Figure 2-12 in next page. This means that power will be used wastefully for unneeded compression.

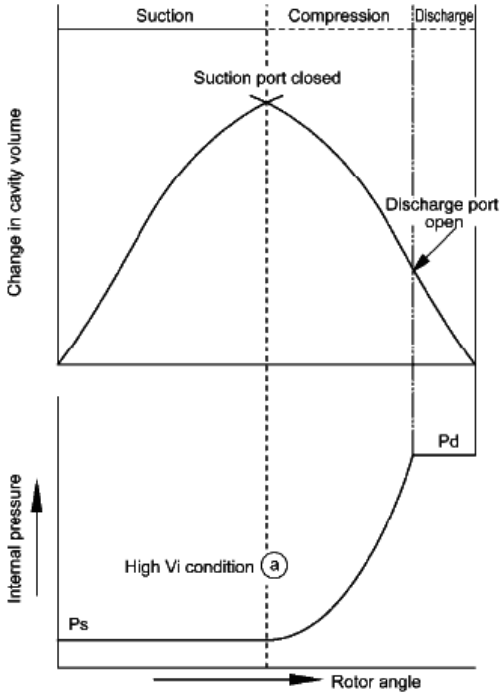
Conversely, if the same compressor is used for a high compression-ratio application (an application with large difference between suction and discharge pressures), the discharge port will open before the refrigerant gas pressure has risen to the necessary level. This would cause the refrigerant gas in the outlet piping to flow back through the discharge port as shown in the lower left graph of Figure 2-12 unless the flowing-back gas is overcome by driving the compressor using extra power.

In summary, the greatest benefit provided by properly setting the Vi value is that the rotor driving power (brake horse power) is made optimum for the load. The refrigeration capacity generally changes little even if the Vi is varied. However, the efficiency of the brake horse power becomes the maximum and the loss of power is minimized if the Vi is optimally adjusted.

(A) Properly adapted Vi to load condition

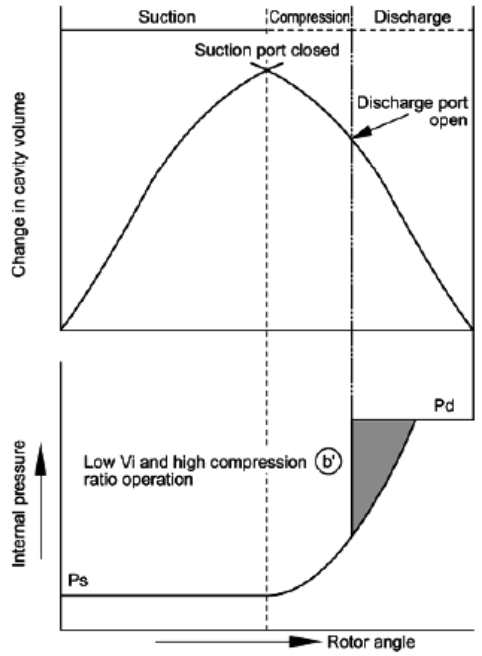


Necessary compression ratio and Vi are both low

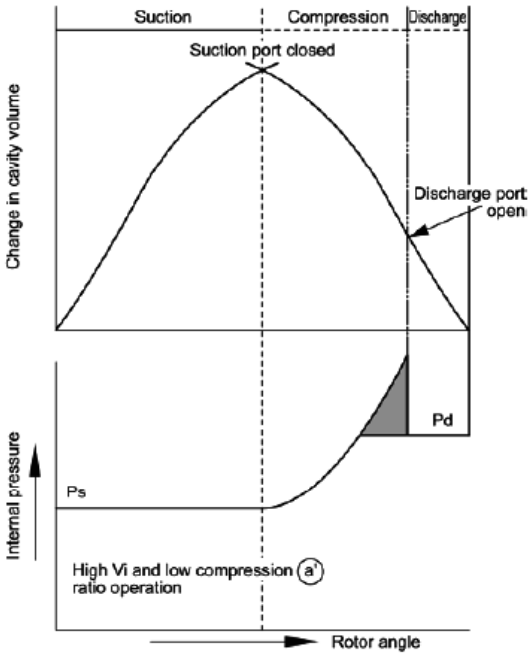


Necessary compression ratio and Vi are both high

(B) Improperly adapted Vi to load condition



Too low Vi compared with necessary compression ratio



Too high Vi compared with necessary compression ratio

Figure 2-12 Proper and Improper Adaptation of Vi to Load Condition

2.4.4 Bearings and Balance Piston

The M rotor and F rotor are supported at their both ends by the side bearings in the suction cover and the main bearings in the bearing head. These bearings use sleeve type white metal lined bearings.

In addition, the thrust bearings located outside the main bearings support the thrust loads working on the rotors, which result from both the rotation of the rotors and the difference in refrigerant gas pressure that takes place during the compression process. For the thrust bearing, SCV-series compressors use the angular contact ball bearing.

In particular, because the M rotor is a kind of helical gear and also because the thrust force produced by discharge pressure is larger than that for F rotor. To reduce the load acting on the thrust bearing of the male rotor, a hydraulic piston (balance piston is provided in the suction cover.

2.4.5 Shaft Seal

To prevent refrigerant gas leakage, a reliable mechanical seal assembly is used for the shaft seal of the male rotor, which is the compressor's drive shaft.

Mechanical seal assembly is mainly composed of "rotating ring" installed on the rotor shaft and "stationary ring" installed in the seal cover. Rotating ring rotates with the shaft, and slides each other with the stationary ring while maintaining a micron class gap. The sliding each other place is called as the sliding surface.

For example, the BBSE (Balance Bellow Single Seal) which is currently used as standard seal, employs a stationary ring (mating ring) made of special cast steel, a rotating ring made from carbon, and O-rings for the packing.

2.4.6 Capacity Control

The unloader slide valve, which is activated hydraulically via the unloader cylinder and the unloader piston, automatically carries out capacity control (suction gas amount control) of each SCV-series compressor.

The unloader indicator assembly is connected to the unloader cylinder via the indicator cam, allowing the indicator to indicate the positions of both the variable Vi auxiliary slide valve and the unloader slide valve. The indicator cam has a spiral groove, in which the guide pin implanted in the unloader slide valve push rod is movably inserted. As this pin and cam combination converts a linear displacement of the unloader slide valve into an angular displacement, the pointer of the indicator indicates the position of the slide valve.

In addition to the visual reading of the position of the unloader slide valve, the unloader indicator assembly can also provide the following electric signals for output to external devices: ON/OFF signals produced by the cam mechanism contacts and resistance signals produced by a potentiometer. Mechanisms

2.4.7 Oil Supply Route

Depending on applications, the SCV-series compressors use either of the following types of oil supply system.

- **Forced oil supply system:**

  This system uses pump-pressurized oil for both the lubrication and capacity control purposes.

- **Differential pressure oil supply system:**

  This system supplies lubrication oil under the effect of the differential pressure, but uses pump pressurized oil as the capacity control oil and as the lubrication oil during startup of the compressor.

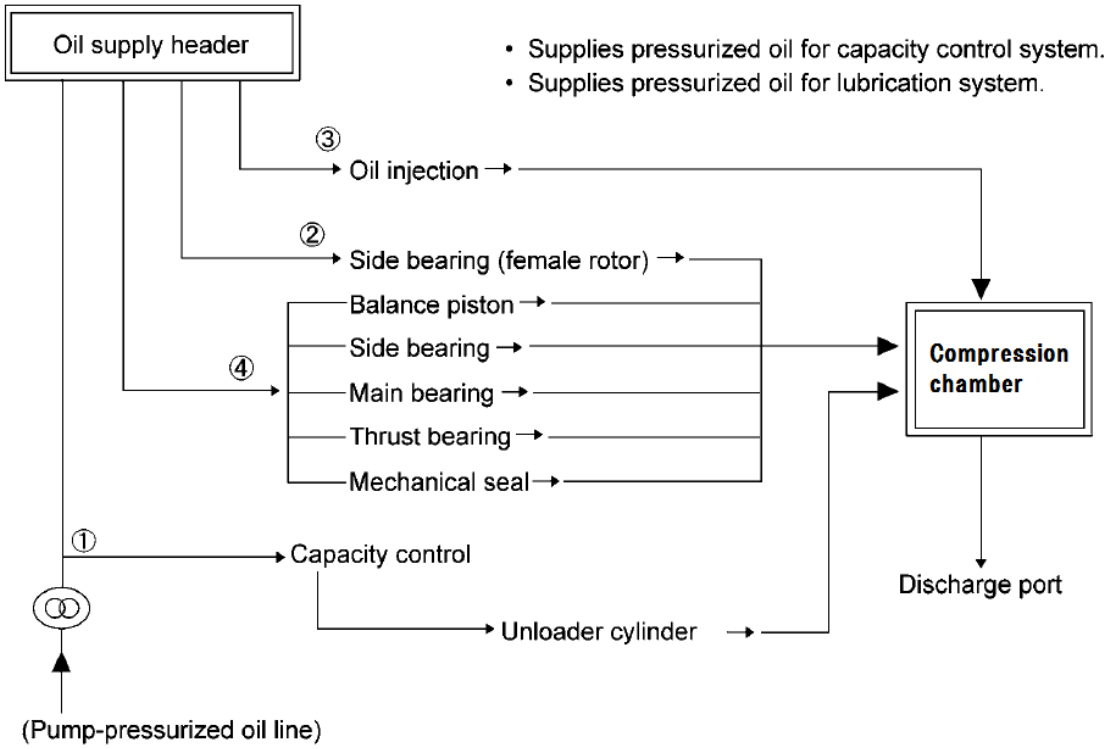


Figure 2-13 Oil Supply Route of Forced Oil Supply System

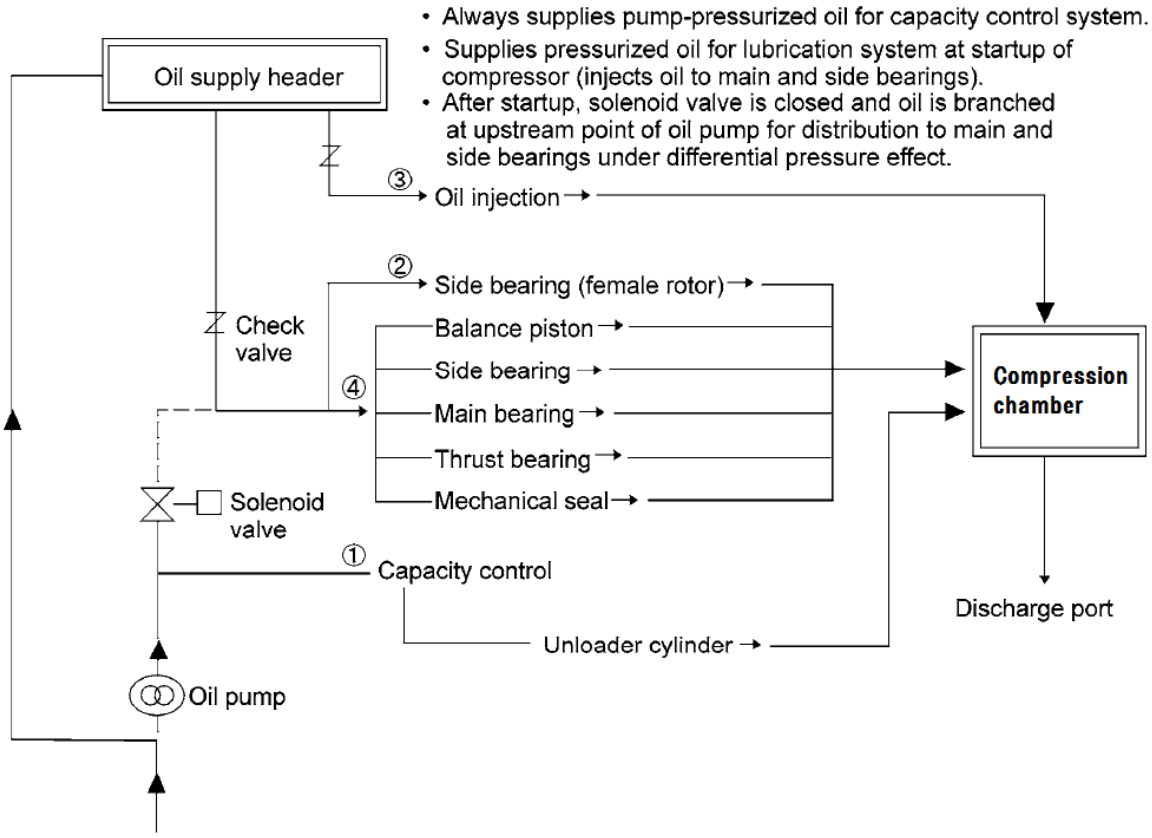


Figure 2-14 Oil Supply Route of Differential Pressure Oil Supply System

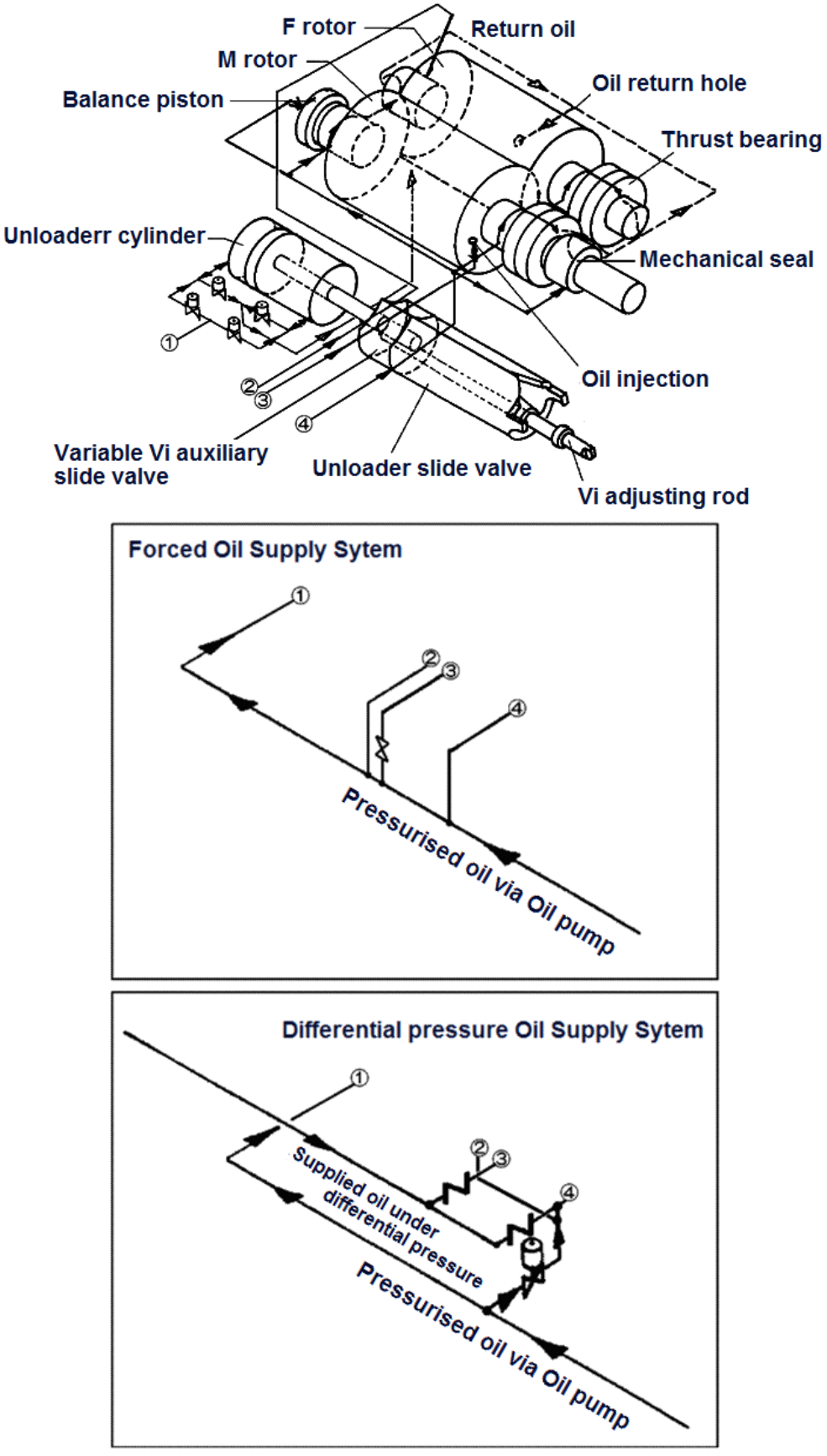


Figure 2-15 Oil Supply Route

Chapter 3 Installation

3.1 General Precautions for Installation

【POINT】

- This chapter (Installation) assumes that the compressor is installed to a standard refrigeration / cold storage package unit.
  If the unit you are actually using is not the standard type refrigeration/cold storage package unit, prepare a proper installation manual by referring to the description in this chapter and paying due consideration to safety, before installing the compressor.
  If there are any questions, please contact our local sales offices or service centers.

- In some cases, it may be required that installation is performed by qualified personnel. Make sure that the work is performed by qualified personnel in compliance with local laws, ordinances and other regulations/requirements.
- Before installing the compressor, please read this chapter and related documents attentively and fully understand their contents.
- Electrical works should be performed only by electrical engineers.

3.2 Installation Works

3.2.1 Unpacking

Confirm whether a compressor does not have abnormality including the damage.

【POINT】

- If there are abnormalities or deficient parts on the compressor, please contact our sales offices or service centers immediately.
- Unnecessary packing materials should be discarded according to the laws and ordinances, or your company's rules.

3.2.2 Storage

Perform the followings to store the compressor before installation.

- Store it indoors.
- Infuse nitrogen gas into the compressor and seal it. (Pressure: Approximately 0.15 Mpa)

3.2.3 Transportation

DANGER

- **Dropping of the lifted compressor may cause death or serious injury. Do not stand under the lifted compressor.**

1. At first, mass and dimensions of the compressor should be confirmed referring to Section 2.3.1 "Standard Specifications" and Section 2.3.3 "Outer Dimensions" in this manual Chapter 2.

   For lifting the compressor within the safety limit, use lifting equipment and tools appropriate for the mass of the compressor.
2. Secure sufficient space for safe lifting.

3. Always check the wire ropes before using them. Thoroughly check the wire ropes for problems such as kinks, knots and broken strands. Do not perform lifting before confirming the safety of the wire ropes. If you cannot make a correct evaluation or judgment, entrust an expert to check.
4. To lift the compressor, attach the wire ropes to the appended eye bolts by using appropriate shackles and hooks.
   Use the eye bolts only for lifting the compressor. Do not use the eye bolts when lifting the compressor together with additive equipment.

CAUTION

- **The compressor eye bolts must not be used for lifting the package unit. To lift the unit, use the lifting chains provided around the base or other lifting means provided on the base.**

5. Check path of compressor installation to make sure it is free of obstacles in consideration of the compressor size.
6. Before lifting, check that the hook is located above the gravity center of the compressor.
7. Direct all the workers to stay clear of the work site before lifting.
8. Before lifting the compressor, alert all workers in area of dangers during lifting process by signal (such as calling at the beginning of the work or making a signal by hand). Do not lift the compressor unless the signals (such as calling out or hand signals) are completely understood by the workers at site.
9. Slowly wind up the wire ropes until immediately before the compressor leaves the ground.
10. Then, wind up the wire ropes a little further until the compressor is slightly up away from the ground. Check that the compressor is not tilted. If the compressor is tilted, return the compressor to the ground and correct the tilt by adjusting the wire ropes. After that, restart the lifting operation.
11. Be sure to lift up the compressor slowly. If it is lifted rapidly, it may damage the lifting tools such as wire ropes or a part of the compressor.
12. When the lifting work starts, observe to see if wire ropes and lifting tools are normal. Be sure that the compressor is not tilted.
13. When moving the lifted compressor, always use guiding ropes.
14. When moving the compressor, turn away workers from the movement direction and check safety.
15. Do not lift the compressor above the safety passage unless absolutely necessary.
16. Do not lower the compressor on the safety passage. Always keep the safety passage free of obstacles.
17. Remove any obstacles before lowering the compressor onto the ground. The compressor should not be tilted or unstable.
18. Before lowering the compressor, announce to the workers around the working area in advance.
19. When lowering the compressor onto two or more blocks, align the tops of blocks so that the compressor becomes stable horizontally on them.
20. Slowly lower the lifted compressor so that it is not damaged by shock.

3.2.4 Preparation for Installation

■ Installation Space

Secure sufficient working space for easy operation, cleaning, maintenance, and inspection.

■ Illumination

Prepare illumination devices which allow easy operation, cleaning, maintenance, and inspection.

■ Ventilation

If natural ventilation is insufficient, install ventilation fans according to the relevant regulations.

■ Connecting Port of Compressor

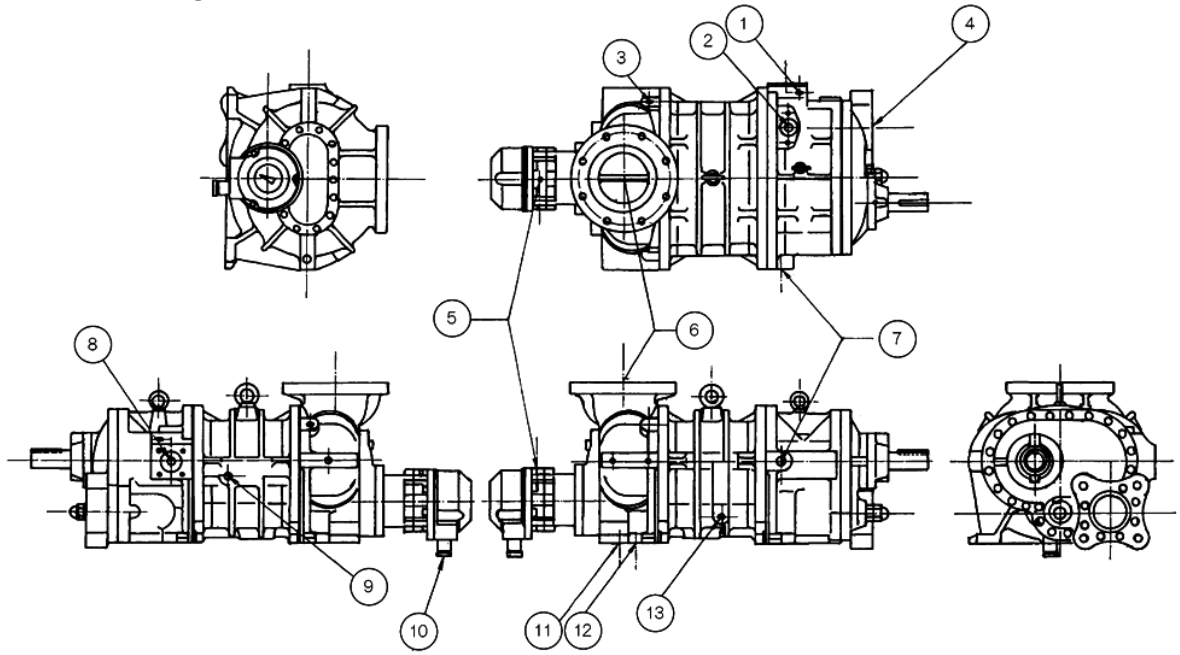
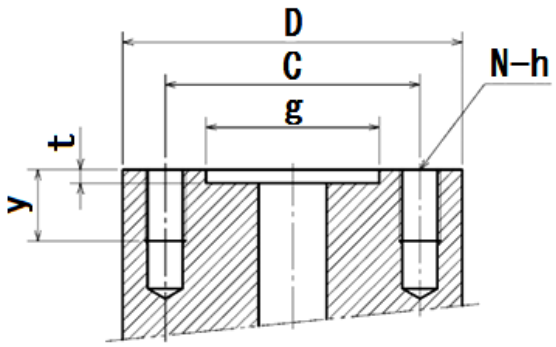


Figure 3-1 Connecting Port of Compressor

Table 3-1 Connecting Port of Compressor

No.	Item	Compressor Model			
		160V**	200V**	250V**	320V*D
1	Connecting port for liquid injection 2	Rc3/8	Rc1/2	Rc1/2	Rc3/4
2	Connecting port for liquid injection 1	MYK 20A	MYK 25A	MYK 32A	MYK 50A
3	Oil supply port for F rotor side bearing	Rc1/4	Rc3/8	Rc3/8	MYK 20A
4	Discharge gas outlet (type D)	MYK 100CD	MYK 125CD	MYK 150CD	MYK 200CD
	Discharge gas outlet (type G)	MYK 100A	MYK 125A	MYK150A	-
5	Unloader control (increase)	Rc3/8	Rc3/8	Rc3/8	Rc3/8
6	Suction gas inlet	MYK 125A	MYK 150A	MYK 250A	MYK 350A
7	Lubricating oil main supply port (journal)	Rc1/2	MYK 20A	MYK 25A	MYK 40A
8	Economizer connecting port	MYK 25A	MYK 32A	MYK 50A	MYK 80A
9	Plug for (oil return)	-	-	-	-
10	Control wiring connector for indicator	-	-	-	-
11	Unloader control (decrease)	Rc3/8	Rc3/8	Rc1/2	Rc1/2
12	Oil drain port	Rc3/8	Rc1/2	Rc1/2	Rc1/2
13	Connecting port for oil injection	Rc3/8	Rc1/2	Rc1/2	MYK 25A



	D	t	g	C	N-h	y
☐ 20A	110	4.5	45	76	2-M12×P1.75	24
☐ 25A	91	4.5	52	83	4-M12×P1.75	18
☐ 32A	98	4.5	60	95	4-M12×P1.75	18
☐ 40A	108	4.5	68	108	4-M12×P1.75	22
☐ 50A	120	4.5	84	116	4-M16×P2	24
☐ 80A	160	4.5	119	158	4-M20×P2.5	30
☐100A	192	4.5	144	190	4-M22×P2.5	30
100CD	190	4.5	111	190	4-M22×P2.5	33
125A	270	5	174	230	8-M20×P2.5	27
125CD	274	5	146	230	8-M20×P2.5	25
150A	300	5	199	248	8-M22×P2.5	30
150CD	298	5	176	248	8-M22×P2.5	35
200CD	392	5	234	330	12-M20×P2.5	40
250A	435	5	331	375	12-M24×P3	34
350A	540	5	422	480	16-M24×P3	40

Figure 3-2 Dimensions of the MYK Flange Joint Part (Compressor)

3.2.5 Installation

■ Placement

Check that the surface of the package unit, where the compressor is to be installed, is even and horizontal. If it is uneven and non-horizontal, tightening the bolts may lead to compressor deformation, which may prevent normal operation.

■ Shaft Alignment between the Compressor and Driving Machine

⚠ DANGER

- **Turn off the main power and control power of the driving machine before shaft alignment work between the compressor and the driving machine. Be careful so that the power of instruments does not turn on during shaft alignment work. If the power turns on during shaft alignment work, the driving machine starts moving and there is a risk of being entangled with the rotating shaft.**
- **At the time of turning ON/OFF each electric power breaker, make sure to prevent electric shock.**

⚠ CAUTION

- **For shaft alignment work between the compressor and driving machine, use designated tools in normal condition. If a worn or damaged tool or a tool unsuitable for the work is used, there is a risk of being injured.**

In the case shaft alignment between this product and the driving machine, be sure that the deviations within the range shown in the Table 3–2. However, if alignment tolerance of the driving machine side is more stringent than Table 3-2, please adjust to the request within the allowable value of the driving machine side.

Table 3–2 Tolerance of Misalignment

	Tolerance
Offset	6/100 mm
Angularity	3/100 mm (reference: Φ100 mm)

The Figure 3–3 and 3–4 show how to measure offset and angularity when performing the centering of the shafts of the driving machine and this product using a dedicated hub, a dial gauge and a magnet stand.

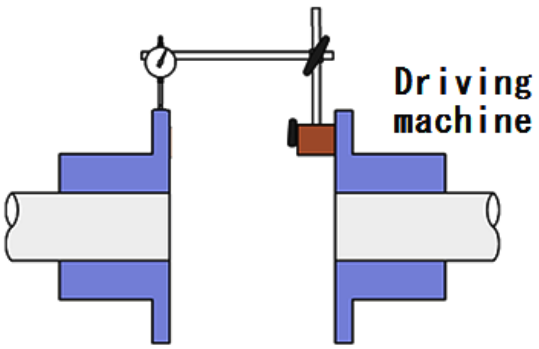


Figure 3-3 Measurement of Offset

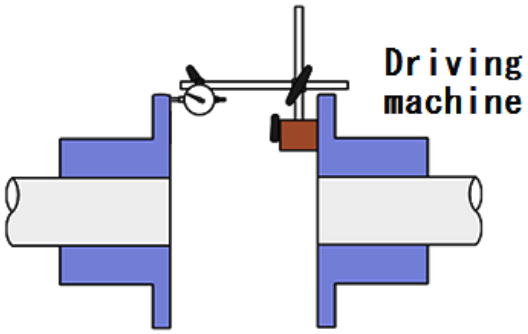


Figure 3-4 Measurement of Angularity

Piping Connection

■ Refrigerant Piping

Observe the following when connecting the refrigerant piping to the compressor.

- The compressor is one of the few devices installed within the package unit that have moving components. These moving components are adversely affected by foreign substances within the system (scale, dust, spatter, etc.). Therefore, when connecting the piping, do not allow any of such foreign substances to enter inside.
- Some compressors (mainly those for export) are charged with nitrogen gas to prevent rust. Be sure to release the pressure before starting piping work.
- Be sure not to allow moisture to enter the piping. There is a high probability that it will cause trouble after the start of operation. Be sure to assemble piping when it is dry.
- Improper piping may cause operating problems such as oil not returning to the compressor or liquid flow-backs.
- When connecting the piping to the compressor, use piping that is the same size as the compressor connection port. If the pipe size of the piping is smaller than the compressor connection port, the flow of lubricating oil or refrigerant will be obstructed leading to problems.
- Do not let the mass of the piping connected to the compressor applied onto flanges or joints. Be sure to prepare proper supports for piping.
- When performing welding work, make sure to disconnect wiring described below. If welding work is performed with wiring connected, the compressor parts may be damaged.

  1) Wirings of the capacity control and potentiometer for Vi changing

  2) Wirings of the solenoid valves for 170J/220J

Equipment and Devices for Protection of the Compressor

■ Oil Filter

According to the requirements of the use of the package unit or the standard to apply, install an oil filter of appropriate filtration precision in the lubrication system of the compressor.

In the case of general applications such as closed-cycle refrigeration systems, we recommend to use an oil filter with beta ratio in the range of $\beta_{20} \geq 150$ that conforms to requirements of NAS 1638 class 8 or ISO 4406 20/17/14.

When the package unit requires API 619 4th/5th edition conformity, use an oil filter with beta ratio in the range of $\beta_{10} \geq 200$.

The oil filter may be clogged just after commissioning. We recommend installing two oil filters in parallel. This will enable replacement of either filter during operation.

■ Oil Heater for Oil Separator

To preserve the temperature of the lubricating oil before starting the compressor, install an oil heater on the oil separator. Make sure to install a protection function (thermostat, or like) to prevent overheating.

■ Suction Strainer

When inter-soluble oil is used, the mesh size of suction strainer should be not less than 200 meshes. When non-miscible oil is used, it should be not less than 100 meshes.

For details about inter-soluble and non-inter-soluble oils, see Section 4.1 "Lubricating Oil (Refrigerant Oil)" in this manual.

During the commissioning, small particles and scale may come from the system. We recommend installing a finer filter temporarily.

■ Compressor Protective Devices (Safety Devices)

To protect the compressor, install the necessary protective devices as described in Section 1.4.3 "Compressor Protective Devices" in this manual.

3.2.6 Airtightness Test

Perform an airtightness test on the package unit before starting commissioning. To prevent water entry in the package unit, use nitrogen gas or dry air for the airtightness test.

3.2.7 Vacuuming

CAUTION

- **Do not turn the compressor rotor shaft during vacuuming.**

Vacuuming involves discharging the air in the unit before the refrigerant and oil are charged in the unit. Always use a vacuum pump when vacuuming.

3.2.8 Lubricating Oil Charge

CAUTION

- **TO select the lubricating oil to be used, refer to Section 4.2 "Lubricating Oil (Refrigerant Oil)" in this manual.**
- **When refilling lubricating oil, ensure that it is clean and does not contain foreign matters.**
- **Be careful that air and water are not mixed in when refilling.**
- **To ensure that the lubricating oil does not absorb air moisture, keep it indoors in an airtight container until use.**

■ Initial Charge of Lubricating Oil

Depending on the package unit configuration and operating condition, specify the procedure, method and amount of the initial charge of lubricating oil, and make sure to provide users of this product with such information.

In determining the procedure and work procedure, please care oil is to be filled in the oil filter and oil cooler always.

■ Additional Charge of Lubricating Oil

Specify the procedure of the additional filling of lubricating oil based on the configuration of the package unit, and make sure to provide users of this product with the information.

3.2.9 Charge of Refrigerant

Depending on the use working fluid and equipment configuration of your package unit, specify the work procedure that considered safety enough, and conduct the refrigerant initial filling work accordingly.

In addition, specify the procedure of the additional filling of refrigerant, make sure to provide users of this product with the information.

3.2.10 Check after Installation

Depending on the package unit to which this product is installed, formulate the necessary confirmation items and methods for package unit after installation and conduct them accordingly before the commissioning. In addition, make sure to record and keep the results of your confirmation.

Chapter 4 Compressor and Package Unit Operation

4.1 Adjustment of Vi

4.1.1 Overview

The internal volume ratio Vi of SCV-series screw compressors has been adjusted as H port (5.8) at the time of shipping.

Before starting the commissioning of the package unit, confirm the appropriate Vi of the compressor for customer's operating conditions and change the Vi setting if necessary.

When changing of the intended use of the compressor and/or there are large temperature changes of seasons in usual operation of the package unit, confirm the properly of the Vi setting and change it if necessary.

Changes in operating condition experienced in daily operation have no significant influence on the shaft power. Therefore, it is not necessary to change the Vi setting that adjusted once to operating conditions.

In addition, with a compressor that is used for a freezing system in which the evaporation temperature varies between 0 and -30 °C as time passes, the Vi setting should not be changed according to the change resulting from rises in compression ratio. In this example case, the compressor should be used with the Vi fixed at M port setting.

CAUTION

- **Fix the Vi setting and do not adjust it while the compressor is in operation. In the case of a special application that requires frequent adjustment of the Vi to match it with varying operating condition, it is recommended to use a MYCOM Maximizer screw compressor (produced by MAYEKAWA as another series product) that incorporates a mechanism for hydraulically adjusting the position of the variable Vi auxiliary slide valve.**
- **Do not operate the compressor with the Vi at any other setting than the L, M or H port setting.**
- **In case of considering change from L port to H port or reverse, be sure to consult us beforehand because it will be necessary detailed examination due to specification of compressor's unloader slide valve.**

4.1.2 How to adjust the Vi setting

DANGER

- **Never perform Vi adjustments while the compressor is in operation. Perform Vi adjustments only after stopping the compressor. Because the rotary shafts are near the Vi adjustment location, there is an increased risk of personal injury or death as clothing can be caught in rotating shafts or tools may get in touch with them.**

Numbers enclosed in [ ] in following instructions means the part number in Section 7.1 "Exploded Views and Sectional Views" and Section 7.2 "Parts Configuration Table" in this manual Chapter 7.

a) First, determine the expected operating condition of the system and work out the Vi value under the condition thus determined (use the formula shown in Section 2.4.3 "Why the Vi Needs to Be Changed?" for the calculation) in this manual Chapter 2.
Next, select the L, M, or H port setting, whichever is the closest to the calculated Vi value. The compressor is set to the "H" port position before shipment.

b) From the table 4-1 “Number of Turns of Vi Adjusting Rod for Individual Models”, determine how many turns the adjusting rod [444] should be rotated in order to set to the port selected in Step a) above.

Table 4-1 Number of Turns of Vi Adjusting Rod for Individual Models

(The unit of "Displacement distance" is "mm".)

From H port to M port					From H port to L port				
	–	160VL	160VM	160VS		–	160VL	160VM	160VS
Displacement distance	–	27	23	18	Displacement distance	–	55	45	37
Number of turns of rod	–	10.8	9.2	7.2	Number of turns of rod	–	22	18	14.8
	–	200VL	200VM	200VS		–	200VL	200VM	200VS
Displacement distance	–	34	28	23	Displacement distance	–	69	57	46
Number of turns of rod	–	9.7	8.0	6.6	Number of turns of rod	–	19.7	16.3	13.1
	250VLL	250VL	259VM	250VS		250VLL	250VL	250VM	250VS
Displacement distance	52	43	36.5	29	Displacement distance	–	87	72.5	58
Number of turns of rod	13	10.8	9.1	7.3	Number of turns of rod	–	21.8	18.1	14.5
	–	320VL	320VM	320VS		–	320VL	320VM	320VS
Displacement distance	–	47	50	59	Displacement distance	–	105	98	98
Number of turns of rod	–	10	11	13	Number of turns of rod	–	23	21.5	21.5

Note 1: Prior consultation to MAYEKAWA is necessary prerequisite as mentioned in CAUTION in the previous page when the port is changed from H port to L port.

Note 2: The travel distance and the rotation number of "From H port to M port" on 320V* have different tendency of change compared with those of other types. The reason can be found in design difference of variable Vi auxiliary slide valve.

Note 3: If the evaporating temperature of your system exceeds 0 °C under the L port condition, select a grooved slide valve for the compressor.
In addition, note that grooved slide valve is available to even less than 0 °C evaporating temperature under the L port condition.

Table 4-2 Screw Thread Specifications of Vi Adjusting Rod

160V**	200V**	250V**	320V*D
M20×P2.5	M30×P3.5	M36×P4.0	M42×P4.5

Number of turns x Pitch (mm) = Displacement distance of variable Vi auxiliary slide valve

c) If Vi settings are the initial settings before commissioning, set the position of the slide valve at the no load point, that indicates 0 % in unloader indicator, by driving the oil pump alone after adjusting the position 0 % to 100 % of the unloader indicator pointer.

If Vi adjusting work is conducted as a change during usual operation, stop the compressor operation after slide valve reaches 0 % position.

d) Shut off the electric main power source and control power source of the package unit.
In addition use lockout/tagout to prevent power from being reconnected accidentally during the Vi setting operation.

WARNING

- **Take care to the electric shock accident at the time of conducting the electric power ON/OFF.**

e) Remove the domed cap nut [522] at the end of the Vi adjusting rod, then loosen the hexagon nut [453] used as a lock nut. On the compressors produced after March in 2005, a conical spring washer is provided between the hexagon nut and domed cap nut to prevent detachment of the cap nut.

f) Turn the Vi adjusting rod clockwise until it stops.
The position where the rod stops corresponds to the H port position the setting before shipment.
Do not turn the rod any further as applying undue force will break the rotation stopping mechanism.
This position corresponds to that in Sequence (2) in Figure 4-3.

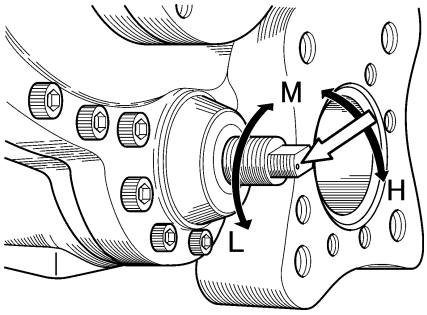


Figure 4-1 Vi Adjusting Rod

CAUTION

- **Do not turn the Vi adjusting rod any further as applying undue force will break the rotation stopping mechanism.**

g) Check the inscribed mark (small black point indicated by the white arrow in Figure 4-1) on the Vi adjusting rod, which should be used as a reference point when counting the number of turns of the rod.

h) Turn the Vi adjusting rod counterclockwise by the number of turns determined in step (3). The Vi setting will be changed from the H port setting to the M port setting as shown in Sequence (3) in Figure 4-3.

i) While holding the Vi adjusting rod against rotation, lock the rod by tightening the lock nut.

j) Install the domed cap nut to the end of the Vi adjusting rod and tighten it. Do not fail to install the conical spring washer between the hexagon nut and domed cap nut to prevent detachment of the cap nut due to vibration, or like.

Figure 4-2 Conical Spring Washer

k) By releasing lockout/tagout of the electric power breaker temporarily, and then turn on the control power and the oil pump power.

m) Supply oil pressure to increase the capacity control by individual oil pump operation until the slide valve stops at the full loaded position.

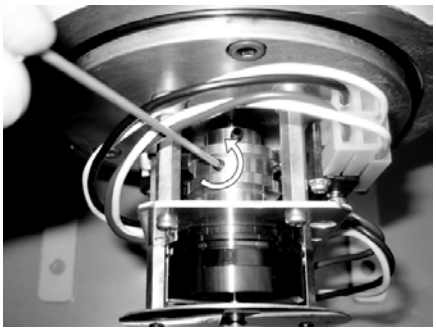
n) If the pointer of the unloader indicator aligns with the 100 % graduation for the port in question on the dial, the Vi is correctly adjusted to that port. This is the Sequence (4) in Figure 4-3.

The M and H graduation marks are rather large in width.

This is because there is a slight difference in indication of the M and H positions among the 13 compressor models, i.e. 160S/M/L, 200S/M/L, 250S/M/L/LL, and 320S/M/L, due to difference in rotor length. The setting may be considered correct if the needle pointer indicates any point in the width of the graduation mark.

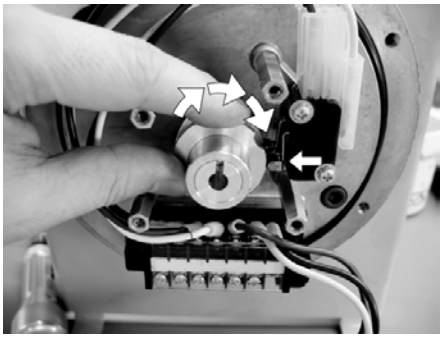
o) Adjust the position of micro switch cam No.2.

Remove the cover and loosen the micro switch cam set screw.

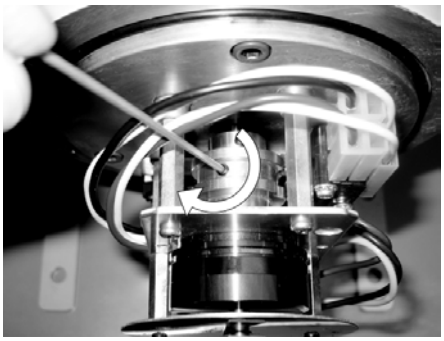


p) Turn counterclockwise until the micro switch lever is raised.

q) Slowly turn clockwise, and stop turning when the micro switch lever is lowered.



r) While holding the micro switch cam stationary, tighten the micro switch cam set screw.



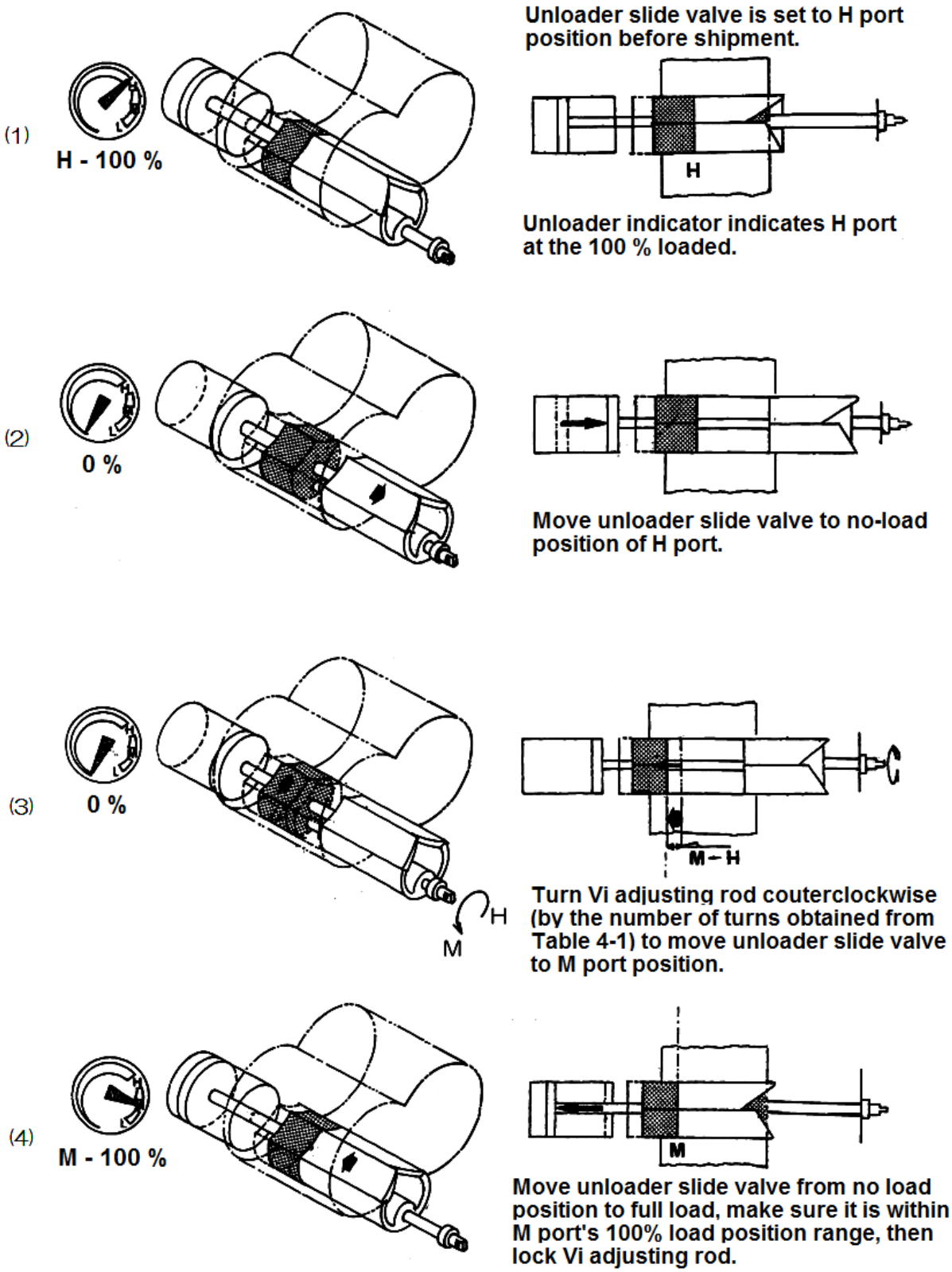


Figure 4-3 Vi Changing Sequence from H port to M port

4.2 Lubricating Oil (Refrigerant Oil)

Selecting and managing lubricating oil (refrigerant oil) is very significant to keep the compressor in a good operating condition.

Take the following notes when selecting and managing lubricating oil.

4.2.1 Precautions for Selecting the Lubricating Oil

- Selection of the lubricating oil should depend on the type of the refrigerant, the type of the evaporator used with the compressor, and the conditions under which the compressor is operated. Also to be considered when selecting lubricating oil are the properties of the oil that include not only the viscosity but also such characteristics as solubility in refrigerant, separability from refrigerant, low temperature fluidity, high temperature thermal stability, etc. We therefore recommend contacting our sales offices or service centers for choice of a specified brand for your system.
- Lubricating oil used for compressors must have a viscosity appropriate for lubricating the bearings and other components in the compressors. The viscosity to be considered in this case should be the viscosity the oil shows at the oil inlet of the compressor. The viscosity of the lubricating oil significantly changes depending on the type of the refrigerant used in combination with the oil. If the refrigerant dissolves in the oil (or the oil and refrigerant are compatible), the viscosity of the oil drops to a level remarkably below the level required for operation of the compressor under some operating conditions. On the contrary, if the refrigerant does not dissolve in the oil (or the oil and refrigerant are incompatible), the viscosity may become too high when the supply oil temperature is low. For this reason, the lubricating oil must be selected such that it is supplied to the compressor with an appropriate viscosity (kinematic viscosity of 13 - 40 mm^2/s) in the operating state.
- In a refrigeration system using a screw compressor, the lubricating oil supplied to compressor is discharged together with the compressed refrigerant gas and separated from the refrigerant by an oil separator. However, the oil cannot be separated completely in the oil separator, so very small part of the oil enters the condenser and can remain there. Part of the oil can also enter the evaporator. For this reason, the lubricating oil must be thermally stable under high temperatures, be separable from the refrigerant gas, and maintain adequate fluidity under low temperatures.
- Note that some lubricating oils are incompatible with a certain type of refrigerant.
  The caution below is an example case that is required especially attention.

CAUTION
● **Be careful since polyolester synthetic oil (POE) cannot be used with ammonia refrigerant.**

4.2.2 Recommended Lubricating Oils

When selecting lubricating oil, not only compatibility with refrigerant but also effects on O-rings must be considered. To prevent compressor malfunctions, we recommend the lubricating oil described below.

■ Recommended Lubricating oil for Ammonia Refrigerant

Polyalkylene Glycols (PAG) Based Synthetic Oils

Brand	Kinematic viscosity (40 °C) mm^2/s	Manufacturer	Type
JOMO Freol PN46	46	JX	PAG

Mineral Oils (incompatible oils)

Brand	Kinematic viscosity (40 °C) mm^2/s	Manufacturer	Type
SUNISO 3GS	30	Sun Oil	Naphthenic base
SUNISO 4GS	55	Sun Oil	
REFOIL NS 3GS	30	JX	
GARGOYLE ARCTIC C HEAVY	46	Exxon Mobil	
GARGOYLE ARCTIC 300	68	Exxon Mobil	
CAPELLA WF46	46	Texaco	
CAPELLA WF68	64	Texaco	
CP-1009-32	34	CPI	Hydrotreated paraffinic base
CP-1009-68	69	CPI	
REFLO 46A	46	Petro Canada	
REFLO 68A	58	Petro Canada	
CAPELLA PREMIUM	67	Texaco	
RHT-68	68	Kluber	
REFLO XL	59	Petro Canada	

Synthetic Oils (incompatible oils)

Brand	Kinematic viscosity (40 °C) mm^2/s	Manufacturer	Type
Acemire 300	59	Acemire	AB
Mycold AB68	53	BVA	
ZERICE S46	46	Exxon Mobil	
ZERICE S68	68	Exxon Mobil	
BERREL FREEZE 46S	46	Matsumura Oil Co., Ltd.	
CP-4700-32	31	CPI	
CP-4700-68	56	CPI	
Gold-Cold 300	53	Golden West	
GARGOYLE ARCTIC NH68	64	Exxon Mobil	PAO+AB
REFLO SYNTHETIC 68A	62	Petro Canada	
Gargoyle arctic SHC 224[Note]	30	Exxon Mobil	PAO
Gargoyle arctic SHC 226(E)[Note]	68	Exxon Mobil	

Note: Use only a mechanical seal assembly of the standard BBSE type.

■ Oils for Systems Using Hydrofluorocarbon (HFC) Refrigerants

Polyolester synthetic oil (POE) for R404A, R507A and R410A: (compatible synthetic oils)

Brand	Kinematic viscosity (40 °C) mm^2/s	Manufacturer	Type
SL-68S	67	Sun Oil	POE
EMKARATE RL68H	72	Lubrizol	

Polyolester Synthetic Oil (POE) for R134a (incompatible synthetic oil)

Brand	Kinematic viscosity (40 °C) mm^2/s	Manufacturer	Type
JOMO Freol α100	107	JX	POE

CAUTION

- **When using lubricating oil of a brand not described in this section, or when using lubricating oil along with refrigerants or gases not described in this Section, please contact us.**

4.2.3 Change of Lubricating Oil Brand

CAUTION

- **The change of lubricating oil brand may cause problems in operating conditions and the compressor. When changing the lubricating oil brand in use, make sure to contact us because appropriate steps must be surely followed.**
- **Package unit composition differs depending on the characteristics of lubricating oil (compatible/incompatible with refrigerant).**
  As a general rule, changing compatible oil to incompatible oil or vice versa is not allowed.

- Lubricating oil contains various additives to fulfill necessary lubricating conditions. Types of additives and their mixing ratio depend on each oil brand. We, therefore, recommend to avoid mixed use of different brands of lubricating oil. If mixed brands of lubricating oil are used, the different additives in the lubricating oil may react with each other and produce foreign substances like slurry.
- If it is necessary to change the brand of lubricating oil, collect as much as oil as possible from the compressor as well as from the condenser, evaporator, and all other refrigerating unit components before charging the new lubricating oil. After 100 to 200 hours of operation, replace the oil again.
- If lubricating oil manufacturers differ, contact both of them and inquire whether the changing is appropriate. The same confirmation is required for changing the brand even if it is of the same manufacturer.
- There is no problem in changing the viscosity level within the same brand. However, make sure that the viscosity grade will not cause problems during operation. (Example : SUNISO 3GS→SUNISO 4GS)

4.2.4 Precautions for Handling lubricating Oil

- When refilling lubricating oil, ensure that it is clean and does not contain foreign matters.
- Be careful that air and water are not mixed in when refilling.
- To ensure that the lubricating oil does not absorb air moisture, keep it indoors in an airtight container until use.

■ Precautions for Handling Polyalkylene Glycol (PAG)

PAG oil is much more hygroscopic than mineral oils and any moisture mixed in the oil may lead to rust, corrosion and wear within the package. When handling PAG oil, pay special attention to the following points.

- Do not perform oil charging in rainy weather or at a place with high humidity to prevent absorbing moisture.
- Before charging, remove as much moisture as possible from the system by exhausting it with a vacuum pump for a sufficient length of time and leaving the system in vacuum condition overnight.
- Do not open the lid of pail (oil container) until just before charging. Once the can is opened, finish the oil charge as quickly as possible. (Finish the charge of a single can of oil within 15 minutes.)
- Cover any gaps between the pail opening and the charge hose so that foreign substances or moisture cannot enter. A more effective way is to substitute any space inside the pail with nitrogen gas .
- Always charge all oil from the pail. Even if some oil remains, do not use it subsequently.
- If any oil drops on a painted surface, wipe it away as soon as possible. Otherwise the paint may come off.

■ Precautions for Handling Polyolester (POE) Oil

This type of oil has high hygroscopicity as polyalkylene glycol, and also exhibits hydrolyzability under high temperature environments. Moisture entry must be avoided. Therefore, special attention must be paid as with PAG when handling POE.

- Finish the charging in as short a time as possible after opening the pail to minimize exposure to air.
- Make sure that all oil in a pail is used in a single charging. Any remaining oil must be stored indoors with the can lid closed tightly. Do not attempt to store it for a long time.
- Because POE can hydrolyze, make sure to perform an oil analysis regularly in the package to see if any abnormal conditions are present.

4.2.5 Lubricating Oil Control Criteria

Lubricating oils that are controlled by the criteria are classified into the following categories:

(1) Synthetic oils: Polyalkylene glycols (PAG)
(2) Mineral oils: Naphthenic base oils and paraffinic base oils
(3) Synthetic oils: Alkylbenzene (AB) and Polyalphaolefine (PAO)
(4) Synthetic oils: Polyolesters (POE)

- **Oil sampling and analysis is recommended every six months.**
- **If the following control criteria are not satisfied, replace the oil.**
  - ◆ Note that the water content of PAG shall be excluded from the above oil replacement criteria. Refer to the Note *1 in the table below.

The analysis items and the criteria are shown in the following tables. Please note that these control criteria may be changed without notice.

Table 4-3 Synthetic Oil (PAG)

Item	Criteria
(a) Color phase	ASTM color scale: 4.0 or less
(b) Total acid number (TAN)	0.1 mg KOH/g or less
(c) Kinematic viscosity	Within ±10 % from that of fresh oil
(d) Water content	2000 mass ppm or less **Note1**
(e) Degree of contamination	Degree of contamination measured by mass method (Millipore value) shall be 15 mg/100 mL or less

Table 4-4 Mineral Oil and Synthetic Oil (AB, PAO)

Item	Criteria
(a) Color phase	ASTM color scale: 6.0 or less
(b) Total acid number (TAN)	0.3 mg KOH/g or less
(c) Kinematic viscosity	Within ±15 % from that of fresh oil
(d) Water content	100 mass ppm or less
(e) Degree of contamination	Degree of contamination measured by mass method (Millipore value) shall be 15 mg/100 mL or less

Table 4-5 Synthetic Oil (POE)

Item	Criteria
(a) Color phase	ASTM color scale: 4.0 or less
(b) Total acid number (TAN)	0.2 mg KOH/g or less
(c) Kinematic viscosity	Within ±10 % from that of fresh oil
(d) Water content	200 mass ppm or less
(e) Degree of contamination	Degree of contamination measured by mass method (Millipore value) shall be 15 mg/100 mL or less

Note 1: Synthetic oils (compatible with ammonia) are so highly hygroscopic that they can absorb moisture at the time of sampling. In addition, the ammonia content they have absorbed may be detected as the water content at the time of the analysis, making it difficult to precisely measure the water content. Thus, use the criterion value only as a reference.

4.2.6 Lubricating Oil Replacement Timing

■ After Starting the Initial Operation

As the oil can easily be contaminated and degraded relatively quickly during the initial operation due to scales and deposits remaining in piping and vessels, be sure to sample and analyze the oil after 500 hours of operation.

If it is found as a result of the analysis that the criteria given in Tables 4-3 to 4-5 are not satisfied, the oil must be replaced.

■ During Normal Operation

Lubricating oils will degrade gradually as the system is operated over time.

The rate of degradation depends on the operating condition, type of oil and amount of foreign matters and moisture contained in the oil. The lubricating oil must be sampled and analyzed every six months. If it is found as a result of the analysis that the control criteria given in Tables 4-3 to 4-5 are not satisfied, the oil must be replaced.

If the oil filters are frequently clogged or the oil color quickly becomes darker and unclear, replace the oil after removing the cause of the problem.

4.3 Precautions for Operation

If the package unit is used in the refrigeration cycle, please keep in mind the contents of this section in particular.

4.3.1 Prevention of Liquid Flow-back Operation

Liquid flow-back is a phenomenon where refrigerant that did not completely evaporate with the gas reaches the compressor. Liquid flow-back may cause insufficient lubrication of the compressor, abnormal vibrations and noises, and abnormal foaming of lubricating oil (too much oil loss).

To prevent liquid flow-back, appropriately adjust the expansion valve to the evaporator and/or liquid cooler. In addition, special attention must be paid to the suction pipe line connection way to the system and means of starting up the compressor after a long time of stoppage.

4.3.2 Purging of Non Condensable Gases

Any non condensable gas in the system may cause the compressor discharge pressure to rise higher than the refrigerant saturation pressure that depends on cooling water temperature of condenser. This is caused by the non condensable gas staying in the condenser which deteriorates the heat exchange performance.

If the vacuum pumping performed upon initial installation or maintenance is insufficient or the suction pressure is lower than the atmospheric pressure to suck air if the suction pipe had a leak, non condensable gases accumulate in the condenser.

When a considerable amount of non condensable gases accumulate in the condenser, the compressor load increases and finally the motor overcurrent alarm may occur.

In such a case, purge any non condensable gas from the condenser.

⚠ WARNING

- **Some types of refrigerants may have bad smell, toxicity, and/or flammability. In a airtight space such as a machine room, oxygen shortage may occur due to high concentration of the refrigerant gas. Maintain sufficient ventilation while working.**
- **When handling fluorocarbon refrigerants, remember that they are prohibited from being purged into air by law..**

1. When the compressor is stopped, allow the cooling water to flow to the condenser and check that there is no difference in water temperature between the inlet and outlet. If any difference is present between the inlet and outlet water temperatures, keep the cooling water flowing until the temperature difference is eliminated.
2. Measure the pressure of the condenser and compare it with the refrigerant saturation pressure depending on the cooling water temperature.
3. If the condenser pressure is higher than the refrigerant saturation pressure by 0.05 MPa or more, purge any non condensable gases.

4.4 When Stopping the Compressor for a Long Time

Before stopping the compressor for a long time, make sure to perform the following steps.

- Turn off the motor main power.
- Turn off the oil heater power and the control power.
- Close the suction stop valve and discharge stop valve.
- If an economizer and/or liquid injection is (are) used, close the (each) stop valve(s) located at the compressor inlet.

If the operation stop period is 1 month or longer, perform the following checks every month.

- Operate the oil pump for 10 seconds per week.
  After that, rotate the compressor shaft (10 rotations or more).
- Measure the system pressure once per month.
- Check for refrigerant leak once per month.

When restarting the compressor after an operation stop period of 1 year or longer, check the system for refrigerant leak and analyze the lubricating oil. If it is found as a result of the analysis that the control criteria given in Section 4.3.1 Tables 4-3 to 4-5 are not satisfied, the oil must be replaced.

Also check the motor insulation resistance.

Supply power to the oil heater at least 1 day before operation start. Before starting the operation, confirm that the refrigerant is not condensed in the package by checking the package temperature and pressure.

Chapter 5 Maintenance and Inspection

5.1 Precautions for Maintenance and Inspection

When reading this Section, also refer to Section 1.1 in this manual Chapter 1.

DANGER

- **When entering the machine room for maintenance services, ensure that sufficient ventilation has been started and measure the oxygen concentration so that there is no risk of oxygen deficiency. The ventilation must be continued steadily until the work is completed.**
- **For performing the inspection work, be sure to prepare safety shoes, protective glasses, gas mask and other proper protective equipment and do not fail to use them whenever they are required.**
- **After stopping the machine and before working on a periodic inspection or overhaul, be sure to shut off the main motor power, control power, and other power to each equipment and valve. After they are shut off, be sure to make the switches inoperable by others. Also, be sure to attach notification tags to prohibit operation (lock-out/tag-out).**
- **When any manual stop valve has been closed, be sure to make the valve inoperable by others and put a notification tag to prohibit the operation (tag-out).**
- **When the compressor is to be overhauled, check that the internal pressure of this product is at the atmospheric pressure before starting the work.**
- **When using lifting devices, e.g. a crane, etc. and/or lifting tools, ensure that they can sufficiently withstand the load.**
- **When lifting a heavy load object, do not allow anyone's body to put under it.**
- **The work to turn each power supply ON/OFF or operate a lifting unit must be exclusively performed by qualified personnel.**
- **When using electric tools, ensure that they are properly managed in accordance with each instruction manual. Especially before using and while using, be sure to follow the care instructions on the safety of each instruction manual.**

WARNING

- **Be sure to use only MYCOM genuine parts for replacement. Using parts that are not genuine can cause damage to this product or other devices during operation.**
- **Do not convert or modify this product or its components without prior permission from MAYEKAWA. Otherwise, it can lead to an unexpected accident.**
- **Exercise sufficient care for handling a heavy load, and use such a lifting device as a crane or work with an adequate number of personnel commensurate with the magnitude of the weight. Also, be sure to use stud bolts (safety retention bolts) and other support tools for the work. Neglecting the above warning can lead to low back pain of the worker or injury due to dropping of the parts.**
- **If two or more people are to work together, be sure to clearly define the work procedures to share a common understanding among all workers before performing the work.**
- **Not only the work to turn each power supply ON/OFF or operate a lifting device, but also any type of work requiring qualification must be exclusively performed by qualified personnel.**

CAUTION

- **When checking the operation data of units and executing other daily maintenance services, pay particular attention to avoid touching the area heated to a high temperature causing skin burns or inadvertently moving the handle of a valve leading to an erroneous operation.**
- **In the disassembly/inspection workplace, secure a sufficient space for temporary storage of the removed parts and tools, replacement parts, and for the disassembling work as well as safety passages, and then put up necessary off-limit signs.**
- **In the workplace, secure a sufficient space and refrain from putting tools directly on the floor or from haphazardly laying wires.**
- **Keep the floor clean all the time. Leaving the floor smeared with oil and the like causes it to be slippery and may result in the fall and injury of personnel. Thus, do not leave it but wipe it off right away.**
- **Make sure that the temperature of the high temperature sections such as bearing head and discharge lines has been cooled down to normal ambient temperature, before working on them.**
- **When disassembling and reassembling the compressor, use the specified tools properly. Before starting to use those tools, gain the full understanding of their characteristics and the method for use.**
- **During the maintenance service, keep the tools clean all the time. Using those tools smeared with oil increases the risk of slip and fall, leading to an injury. Also during the service, there is a risk of foreign matters intruding inside the compressor to cause its damage.**
- **Parts are slippery with oil. Fully watch out for the risk of any object falling down. Pay attention to any parts falling down, which could lead to personal injury.**

CAUTION

- **Before disassembly, inspections, and handling of the compressor, sufficiently understand the disassembly and assembly procedures.**
  This manual is not intended to provide complete disassembly and assembly procedures for the compressor. Instead, it describes only the important points in relation to the maintenance service of the compressor.
- **If complete disassembly and assembly of the compressor are required, please contact your nearest sales office or service center of MAYEKAWA.**
- **When removing a part, be careful not to damage it.**
- **Place the removed parts on a clean workbench in an orderly manner.**
- **For cleaning parts, use kerosene and/or machine parts cleaner.**
- **Washed parts shall be dried by compressed air or wiped up using clean cloth. Do not use synthetic textiles or woolen textiles to prevent fibers from attaching the parts.**
- **When separating the assembled compressor casings, sometimes it is difficult to separate them due to the gasket stuck. In such a case, never hammer in a screw driver or flat chisel into the gap. Screw jack bolts using the screw holes to separate the casing each other. When some gap is observed between them, use a scraper to remove one side of the gasket from the surface.**
- **Removed bolts from each part should be classified into each used section to prevent confusion.**

5.2 Maintenance and Inspection List

5.2.1 Daily Management

For the purpose of daily maintenance, check the items listed in Table 5-1 "Daily Inspection Items" and record the results.

These operation data should be recorded in an operating log book on a daily basis. This practice is significantly effective and helpful in finding out any abnormal condition of the compressor and prevents possible compressor failures.

In particular, it is important to confirm the absence of any abnormality between the temperature and pressure correlations related to the refrigerant evaporation and condensation. It is possible to find any abnormal condition in the compressor or the system quickly by monitoring the evaporation and condensation temperature and pressure.

If any compressor/system failure or operating accident occurs, the operating log book will help the cause to be clear and take appropriate measures promptly.

Table 5-1 Daily Inspection Items

Inspection item			Inspection details	Checkpoints and actions
Compressor	Operating hours	hr.	Total operating hours	• Judgment of periodic maintenance timing
	Suction pressure	MPa	Difference from the set value of evaporation temperature equivalent pressure	• Contamination in the evaporator • Temperature, flow rate, etc. of the object to be cooled
	Discharge pressure	MPa	Difference from cooling water temperature equivalent condensing pressure	• Contamination on condenser cooling pipes • Non-condensable gases mixed into the system • Quantity, temperature, etc. of cooling water
	Oil supply pressure	MPa	Difference from discharge pressure	• Whether differential pressure is decreasing • Operation with liquid flow-back • Whether compressor parts are worn
	Oil filter pressure loss	MPa	Pressure difference between oil filter inlet and outlet	• Contamination of the lubricant • Clogged of oil filter
	Suction temperature	°C	Whether within upper and lower limits	• Temperature, flow rate, etc. of the object to be cooled
	Degree of suction superheat	°C	Whether degree of superheat is proper	• Adjust expansion valve • Insufficient refrigerant flow
	Discharge temperature	°C	Whether within upper limit	• Non-condensable gases mixed into the system • Oil supply temperature, insufficient oil supply • Compressor failure
	Oil supply temperature	°C	Whether within upper and lower limits	• Contamination on cooling pipes of oil cooler
	Operation check of Slide valve	%	Whether operation is normal	• Damage to solenoid valve coil • Adjustability of manual control(needle) valve for Solenoid valve assembly
	Leak from mechanical seal	mL/h	Leak per hour	• Damage to mechanical seal assembly
	Noise and vibration	-	Abnormal noise/vibration	• Compressor failure

Table 5-1 Daily Inspection Item (continued)

Inspection item			Inspection details	Checkpoints and actions
Others	Motor current	A	Whether it is higher than the current at test run	• Compressor failure • Motor failure
	Oil level of oil separator	-	Oil level	• Oil loss • Replenish oil
	Fluid level in the receiver	-	Fluid level	• Replenish refrigerant
	Check for refrigerant leak	-	Leak or not	• The machine room and the load side facilities(Cold storage etc)

■ Unless otherwise noted, the pressure unit MPa represents the gauge pressure in this manual.

■ Daily Maintenance Items

1. Lubrication oil level
When the oil level in the oil separator reaches the lower limit, charge lubricant by referring to the instruction manual of the compressor package.

2. Replacing Oil Filter
When the differential pressure between oil filter inlet and outlet is higher than specified by the manufacture, replace the oil filter element. The oil filter differential pressure may increase for a short time during startup.

3. Cleaning of Suction Strainer
After 500h of operation inspect the suction strainer. Also remove the temporary filter(suction cloth bag) if it was supplied with the package.
At the beginning of operation or just after the periodical maintenance, the differential pressure of the suction strainer may increase in a short time. If the differential pressure increases, inspect and clean the suction strainer.

4. Oil Leak from Mechanical Seal
If there is a significant increase of oil leak from the mechanical seal, confirm the rate of the leakage per hour. The table below specifies the allowable leak rate and the upper limit for inspection. If any damage is found in the mechanical seal during inspection, replace the mechanical seal.

Table 5-2 Reference values for Leak Rate from Mechanical Seal

	Model of SCV-series			
	160V**	200V**	250V**	320V*D
Acceptable leakage amount (mL/h)	≤ 3	≤ 3	≤ 3	≤ 6
Inspection is required (mL/h)	≥ 9	≥ 9	≥ 9	≥ 18

Note: The specifications above are just for reference. They are not guaranteed values.

5. Contamination of Condenser and Oil Cooler Tubes.
The degree of clogging and contamination of the cooling tubes is mostly affected by the cooling water quality. If the oil temperature and discharge pressure increase gradually in an initial period of operation, inspect and clean the cooling water side of the oil cooler and condenser even when the inspection time has not come.

5.2.2 Periodic Inspection

Inspect the following points at specified intervals.

Table 5-3 Periodic Inspection Items

Item	Inspection interval	Remarks
Pressure sensors	Annually	
Temperature sensors	Annually	
Protection devices and safety valves	Annually	
Suction strainer	Inspection after the first 500h of operation	If the differential pressure between the front and back of the suction strainer increses, inspect and clean the suction strainer
	Inspect and clean annually	
Lubricant	Replace after the first 500h of operation	If the analysis results do not satisfy the management criteria provided in" 4.2.5 Mngement of Lubricant, in this manual, replace oil.
	Analyze lubricant at intervals of 6 months	
Oil filter	Replace annually	Replace the filter element if the pressure difference between the inlet and outlet ports of the oil filter exceeds 0.1 MPa.
Cooling water side of oil cooler	Annually	Clean the oil cooler if it is confirmed that it is heavily contaminated.
Cooling water side of condenser	Annually	Clean the oil cooler if it is confirmed that it is heavily contaminated.
Mechanical seal	Annually or every 8,000 operating hours *	To be replaced if any abnormality is found. However, in the case that it is difficult to stop the operation not at regular inspection replace the mechanical seal assembly at every inspection.
Coupling	Annually or every 8,000 operating hours *	

Note*: Inspect the machine per period or operating hours, whichever comes first.

5.2.3 Guidelines for Compressor Overhaul Frequency

When servicing or overhauling the compressor, follow the instructions and guidelines described below. The compressor inspection frequency significantly differs depending on the operating conditions, refrigerant in use, type and condition of lubricant, and the system in which the compressor is operated. The table below indicates the overhaul frequency recommended by MYCOM based on the operating conditions of the compressor.

Table 5-4 Standard Package Operaion Conditions and Overhaul Frequency Guidelines

Conditions of use	Example application	Guideline for the overhaul timing
Relatively stable operating conditions	Cold storage and refrigeraion	Every 5 years or 40,000 operating hours
Relatively changing operating condition	Ice maker/Chiller	Every 4 years or 30,000 operating hours
Frequent started/stoped, and relatively changing operating conditions	Heat pump	Every 3 years or 20,000 operating hours

Note 1: The above guidelines are only applicable when the compressor is operated within the operation limits which are specified separately. (See Chapter 2, Section 2.3.2 "Operation Limits" in this manual.)

Note 2: The above guidelines are only applicable when the compressor undergoes daily and periodical inspections specified separately. (See 5.2.1 "Daily Management" in this manual.)

Note 3: Inspect the compressor at the intervals ofspecified period or operating hours, whichever comes first.

Note 4: The above guidelines do not constitute any warranty.

5.3 Compressor Disassembly Preparation

Although screw compressors are very reliable machines, it is still necessary to perform overhaul to inspect internal parts after a certain period of operation.

This chapter 5 explains the essential points of disassembly methods, where to inspect on parts, and reassembly procedure.

In principle, compressor overhaul that require complete disassembly should be performed in the maintenance factory. If you must do the overhaul work at the installation site due to unavoidable reasons, use the methods described in the following paragraphs.

However, please note that regular overhaul work requires removal of the compressor from the base frame. And then, the compressor should be placed on a work bench which has properly size area to disassembling the compressor.

When moving the compressor from the unit base to the workbench, be sure to follow the instructions given in Chapter 3, Section 3.1 "General Installation Precautions" and Section 3.2.3 "Transportation" of this manual.

Carefully read this manual and fully understand the details before starting to work.

Note that some parts name given in the text of this manual is followed by a number enclosed in square brackets [ ], which indicates the part identification number given in assembly sectional views or parts configuration table.

5.3.1 Tools for Disassembly and Workplace

Prepare all the required tools as mentioned in “ 7.6 Tools for Disassembly" in this manual Chapter 7.

It is also recommended to prepare general hand tools, green silicon carbide grinding stone, emery paper (#80 - #100), empty paper (#400 to #800) parts cleaning oil, lubrication oil, a lubricator, an oil can for oil sump, waste cloth and so on

When removing the compressor from the installation flame for an overhaul, foresee enough space on the workbench to perform the task.

To safely reach the bolts and plugs used on the lower side of the compressor, place the compressor on an additional frame. Consult article 5.3.5 in this chapter for more information.

Perform the work in a dry place with as little sand, dust or any other contamination as possible.

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5.3.2 Replacement Parts

Prepare the MYCOM genuine parts for replacement.

Parts listed in Table 5-5, we recommend to be replaced on the occasion of each compressor overhaul.

For each part size and code No. of each compressor model, refer to Section 7.2 "Parts Configuration Table" in this manual Chapter 7.

When ordering parts, be sure to inform the (a) model name, (b) serial number, (c) part name, (d) code No. and (e) quantity required, to our sales offices or service centers.

In particular, if the serial number (b) is unknown, the details of the applicable design and manufacturing specifications cannot be identified, and thus it becomes difficult to choose correct parts.

Table 5-5 Replacement Parts of SCV-series Compressor Overhauling

P/N	Part Name	Remarks	Q'ty.			
			160	200	250	320
6	Gasket, Suction Cover		1	1	1	1
9	O-ring, Suction Cover		1	1	1	1
12	Gasket, Bearing Head		1	1	1	1
23	Gasket, Balance Piston Cover		1	1	1	1
27	Main Bearing	with O-ring	2	2	2	2
28	Side Bearing	with O-ring	2	2	2	2
30	Balance Piston	To be replaced if any abnormality is found.	1	1	1	1
33	Balance Piston Sleeve		1	1	1	1
35	O-ring, Balance Piston Sleeve		1	1	1	1
38	Thrust Bearing		2	2	2	2
39	Lock Nut	To be replaced if any abnormality is found.	2	2	2	2
40	Lock Washer		2	2	2	2
49	O-ring, Oil Seal Retainer		1	1	1	1
50	Oil Seal		1	1	1	1
52	Gasket, Seal Cover		1	1	1	1
63	O-ring, Unloader Cylinder		1	1	1	1
65	O-ring, Unloader Piston		1	1	1	1
66	Cap Seal		1	1	1	1
68	Guide Pin (Grooved Pin)		1	1	1	1
69	Lock Nut, Unloader Piston	To be replaced if any abnormality is found.	1	1	1	1
70	Lock Washer, Unloader Piston		1	1	1	1
73	O-ring, Unloader Push Rod		1	1	1	1
75	O-ring, Unloader Cover		1	1	1	1
78	Ball Bearing, Unloader Cylinder Cam	#6000	1	1	1	1
79	Retaining Ring	CE-EX10 (S10)	1	1	1	1
82	V-ring, Unloader Cylinder Cam		1	1	1	1
93	Gasket, Suction Flange		1	1	1	1
96	Gasket, Discharge Flange (1)	It is not necessary for CD flange of sideways discharge type.	1	1	1	1
100	Mechanical Seal Assembly	BBS-E as standard	1	1	1	1
125	Micro Switch	To be replaced if any abnormality is found.	2	2	2	2
129	Potentiometer	To be replaced if any abnormality is found.	1	1	1	1

P/N	Part Name	Remarks	Q'ty.			
			160	200	250	320
150	O-ring, Thrust Bearing Gland 320	for 320V*D	-	-	-	2
216	Gasket, Lubricating Oil Inlet Flange	Journal inlet	-	1	1	1
219	Gasket, Oil Injection Inlet Flange	for 320V*D	-	-	-	1
236	Gasket, Discharge Flange Spacer	for Sideways discharge type	1	1	1	1
237	Torsional Slip Washer		2	2	2	2
255	Gasket, Liquid Injection Inlet Flange		1	1	1	1
325	O-ring, Unloader Push Rod	JIS B 2401 P46	2	2	2	-
421	O-ring, Unloader Spacer	for only VS* type	2	2	2	-
421	O-ring, Unloader Spacer	for 320V*D	-	-	-	2
432	O-ring, Main Bearing		4	4	4	4
433	O-ring, Side Bearing		4	4	4	4
448	Teflon Bushing	To be replaced if any abnormality is found.	1	1	1	1
449	Thrust Washer	To be replaced if any abnormality is found.	1	1	1	1
450	O-ring, Bearing Cover		2	2	2	2
451	O-ring, Vi Adjusting Rod		1	1	1	1
523	O-ring, Vi Adjusting Rod (in Slide Valve)		1	1	1	1
701	Backup Ring		1	1	1	1

5.3.3 Refrigerant Gas Recovery

At the time the compressor operation is stopped, the pressure inside the compressor is still high. As such, it is necessary to drop the pressure down to the atmospheric pressure before starting the disassembly process. To do this, there are the following methods for example. Perform your recovery work in an appropriate manner considering site conditions, requirements of regulatory laws and regulations.

- Use the bypass valve to release the high pressure gas in the unit into the low pressure side.
- If there is an adjacent compressor to which a bypass line is connected from this compressor, run the adjacent compressor to drop the internal pressure of this compressor through the bypass line.
- Operate the refrigerating system and close the supply source valve to turn the gas into liquid, and recover the liquid at the receiver.
- Use a refrigerant recovery machine to recover the liquid at the receiver.

In using either method, prepare a working flow sheet of the system beforehand. Check the valves to be controlled during the recovery work, according to the method to be used, by comparing them with the ones in the flow sheet, and clearly note the valves to be operated, other connected devices, and tubes on the flow sheet.

Two flow sheets must be prepared: one at the foreman and the other for posting in the workplace.

In addition, prepare a work procedure document for the refrigerant recovery work to reflect the actual conditions of the workplace, and sufficiently share the work details among all the coworkers through checking and confirmation before actually starting the work.

WARNING

- **Before the work, be sure to check and communicate the work details and procedure among all coworkers, and carry out hazard prediction activities based on the information shared. Neglecting to do this will increase the risk of on-the-job accidents and injuries to a considerable level.**
- **All the valves that have been opened or closed during the work must be prevented from accidental operation through proper lock-out and tag-out procedures.**

5.3.4 Removal of Connections to the Unit

DANGER

- **If high-pressure refrigerant gas or refrigerant-mixed lubricating oil remains inside the compressor, a gas and oil under pressure will gush out as soon as a sealed part is opened and cause injury to the operator such as frostbite or loss of eyesight. Be sure the check that there is no residual pressure before disconnecting any pipe joint.**
- **Before opening the sealed part, make sure to reconfirm that ventilation of the workplace is appropriate.**
- **Wear the appropriate preventive gear before opening the sealed part.**

【POINT】

When oil lines are removed from the compressor, any residual oil in the pipe can flow out. To be prepared for this, either check the amount of oil outflow by slightly loosening the pipe joint or drain the oil from the oil temperature gauge at the oil supply header before removing the pipe.

As the unloader cylinder is filled with oil, have an oil pan ready to catch the oil when the pipe is disconnected. An empty 18-liter can for lubricating oil is suitable as the oil pan.

For easy reconnection, disconnected electric wires should be properly marked for identification. Any wrong reconnection may result in a startup failure or inability to operate the capacity control mechanism.

When removing the compressor from the mounting base frame, the following parts must be disconnected beforehand in numeric order of Figure 5-1:

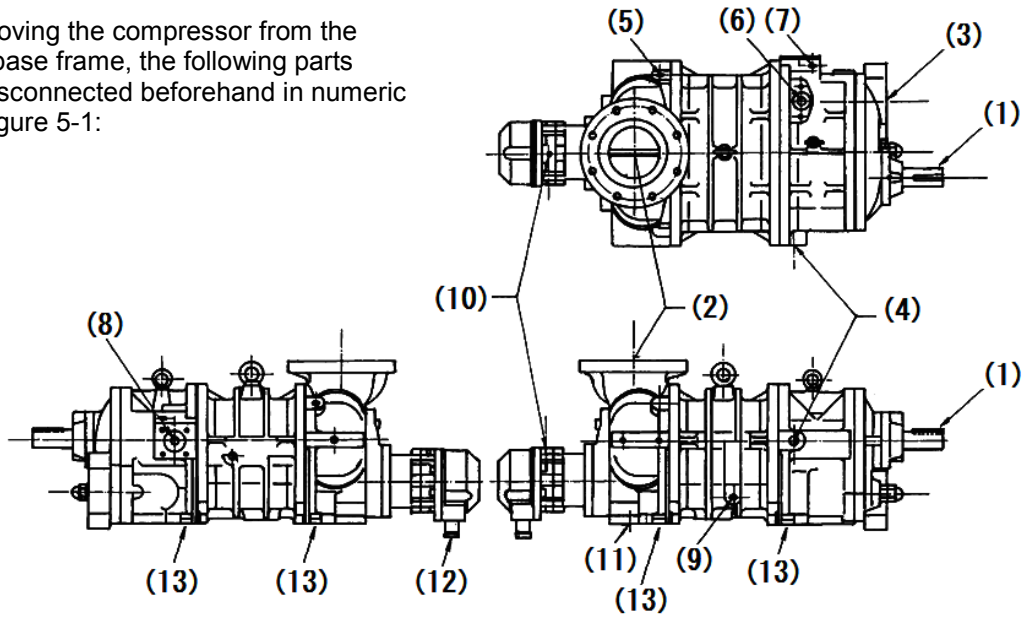


Figure 5-1 Disconnecting Parts

(1) Coupling to connect the compressor to the driving machine;

(2) Suction piping of the compressor.
If the suction strainer is directly connected to the compressor, also remove the strainer;

(3) Discharge piping of the compressor;

(4) Oil supply piping to the compressor (Journal oil inlet port);

(5) Oil supply piping to the side bearing of compressor F rotor side;

(6) Liquid injection (Aquamizer) 1 piping to the compressor;

(7) Liquid injection (Aquamizer) 2 piping to the compressor;

(8) Economizer (Electromizer) piping to the compressor

(9) Oil injection piping to the compressor

(10) Oil piping connection 2 for the capacity control (unload)

(11) Oil piping connection 1 for the capacity control (load)

(12) Electric wiring for capacity control operation (In some cases, the unloader indicator assembly may be removed without removing the wiring. Refer to Section 5.5.1.1 in this chapter.);

(13) Compressor mounting bolts (foot bolts); and

After performing work of (1) to (13), the openings of the flanges and screwed connections on the compressor should be prevented from entering foreign matters inside the compressor, by using cover flanges and plugs.

5.3.5 Removal of the Compressor from Base Frame

WARNING

- **The work to lift up or move the compressor must be performed by a qualified operator. If the work is done by an unqualified operator, it may result in a dropping accident.**
- **Never try to perform disassembly or assembly while the compressor is lifted in the air. The main body or some part of the compressor can drop down on people below.**

【POINT】

As the suction piping is located immediately above the compressor, lift up or partially remove the piping such that it will not interfere with the lifting device.
After lifting up the compressor, place it on a special stand to remove hexagon head cap screws around the bottom flange part. Instead of using the special stand, you can use the temporally stand which has same height as the workbench, i.e., place the leg part of the suction cover on the workbench and place the leg part of bearing head on the temporally stand as shown in Figure 5-2.

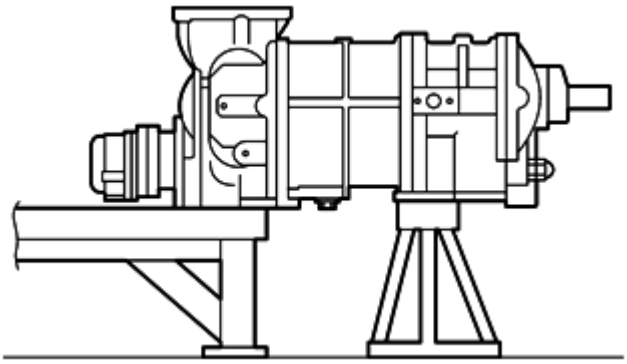


Figure 5-2 In case of using temporary stand

a) Place the compressor on the special stand or use a temporary stand as shown in Figure 5-2.
Then remove 6 to 8 hexagon head cap screws around the bottom flange part tightened rotor casing [1] to suction cover [5] / bearing head [11].
Note: After placing the compressor on the workbench, it is impossible to remove these lower bolts.

b) Remove the compressor onto the workbench. How to place the compressor on the workbench varies according to the compressor models described below;
In case of a V*G type which has a discharge port facing sideways, the entire compressor can be placed on the workbench without doing any special arrangement, as the flange is on the same plane as the legs of the suction cover and bearing head.
In case of a V*D type which has a discharge port facing down and thus a discharge port flange extending downward from the leg plane of the suction cover and bearing head, place the compressor with the flange part outside of the workbench edge (see Figure 5-3 in next page).

Alternatively, place wooden blocks high enough to provide the flange with clearance from the workbench surface below the legs of the suction cover and bearing head and lower the compressor on the wooden blocks as shown in below picture to the right.

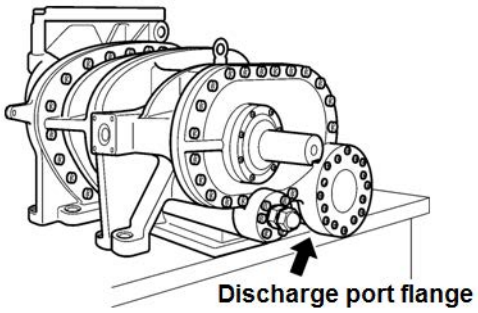
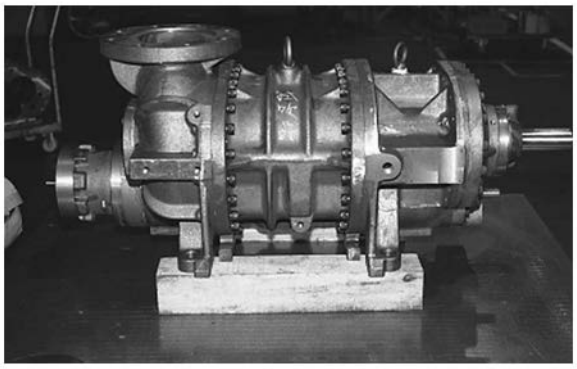


Figure 5-3



5.3.6 Compressor Disassembly Order

The disassembly order of the SCV-series compressor is general as described below.

Generally SCV-series compressors are disassembled in the order described below. But this order is just an example and the actual order may differ according to individual situations.

Depending on the situation, please complete the work in a safe and appropriate procedure.

a) Unloader indicator block
   (n some cases, the unloader indicator assembly may be removed without removing the wiring.)
b) Mechanical seal block
c) Unloader cover block
d) Unloader cylinder and Balance piston cover
e) Balance piston block
f) Bearing cover
g) Suction cover and Side bearings
h) Thrust bearing block
i) Rotor and Main rotor casing
j) Variable Vi auxiliary slide valve
k) Bearing head and Main bearing

5.4 Disassembly and Inspection

5.4.1 Unloader Indicator Block

The SCV-series unloader indicator has been changed to the new type indicator (right picture) with the protection grade IP66 by improving the performance of the dust and water proof from December 2014 Moriya factory production.

This new indicator IND-052WP and IND-062WP are nearly same to the traditional indicator in the following items: outer dimensions, mounting method to the compressor, signal output of the loaded capacity 0 % to 100 % by using a potentiometer, and contact output function by using micro-switches.

Major changes (improvements) are described in Table 5-6.

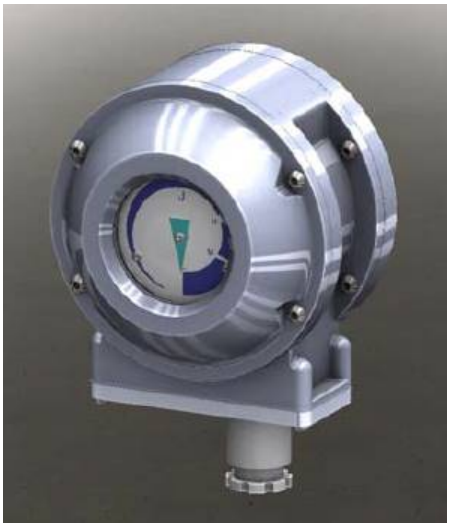


Table 5-6 Difference of Unloader Indicator between old type and new type

Item	Traditional type	New type
Dust and water proof	Equivalent to protection grade IP20	Protection grade IP66
Quantity of housing parts	2	4
Potentiometer	Wire wound type	Conductive plastic
Micro-switch	Wiring is screwed.	Wiring is connected with connector
Terminal block	6P terminals	7P terminals

For more details of the new type indicator IND-052WP, refer to the another dedicated instruction manual.
The traditional type indicator is described as the target.

Disassembly

■ **In the Case of Removing the Wiring only**

When removing the wiring of the unloader indicator upon removing the compressor, it is necessary to remove the cover as the indicator has a terminal block for the wiring. Perform the work according to the following procedure, and after removing the wires, attach the cover to them for protection.

a) By removing the three hexagon socket head cap screws [147] that are used to fasten the indicator cover [146], the cover can be removed.
b) The indicator cover will be removed with the glass [141] and spacer [142] attached. While the glass and spacer are glued, be careful not to drop these as they may be separated from the cover.
c) Remove the wiring. Be careful not to lose the phillips screws [133] of the terminal block [132].

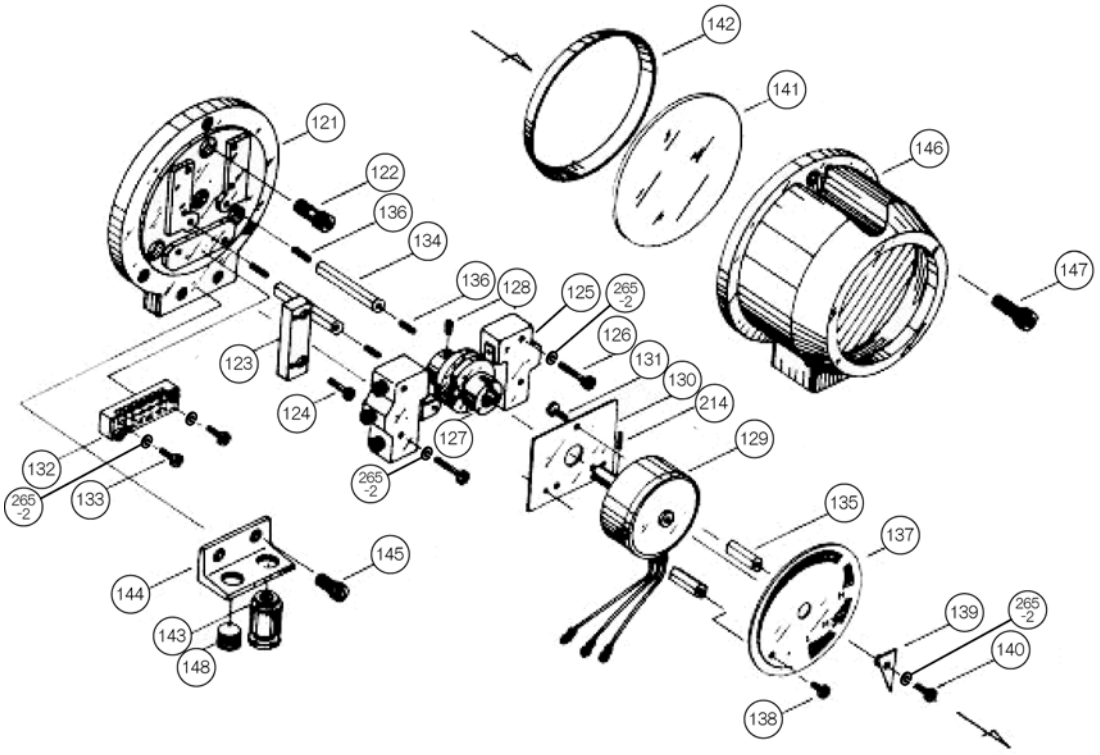


Figure 5-4 Traditional Standard type Unloader Indicator Assembly

Removal of the Indicator Cover

■ **For Further Disassembly (In the case of Removing as Unloader Indicator Assembly)**

As the indicator is an assembly to be removed as a whole, no further disassembly should be made unless the purpose of the disassembly is to disassemble this part.

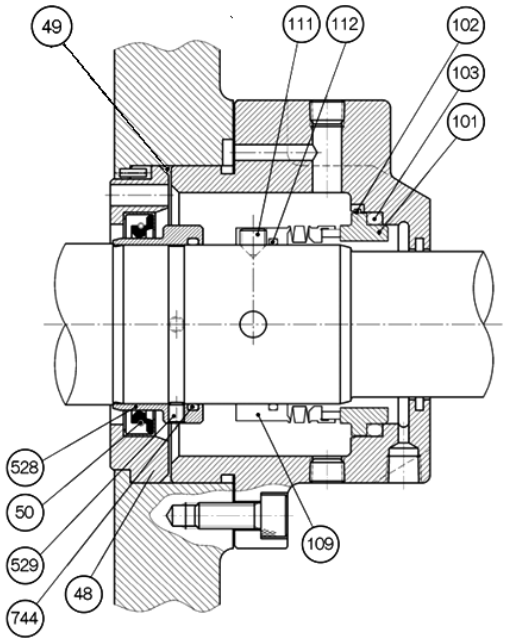
a) As a result of the previous disassembly process, the micro switch base plate [121], which is mounting the potentiometer [129], micro switches [125], and micro switch cam [127], can be removed.
b) Unscrew and remove three hexagon socket head cap screws [122].
c) Loosen the set screw [128] of the micro switch cam.
d) After that, the assembly can be removed by pulling it in the axial direction.

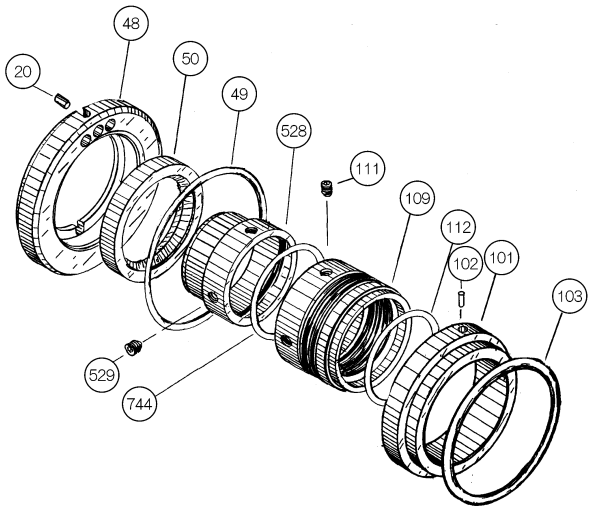
Loosen the Set Screw of the Micro Switch Cam

Inspection

The inspection procedure is described in the "Reassembly" section of this chapter, as it is often the case that the unloader indicator block is removed as an assembly and later inspected and adjusted after the overhauled compressor is reassembled and installed on the mounting base. Refer to Section 5.5.12 "Unloader Indicator" for details.

5.4.2 Shaft Seal Block





Mechanical Seal assembly

P/N		Part Name	
101	100	Mating ring	Stationary rings
102		Insert lock pin	
103		O-ring	
109		Seal collar	Rotating rings
111		Seal collar set screw	
112		O-ring	
528 **Note**		Oil seal sleeve	
529 **Note**		Set screw for oil seal sleeve	
744 **Note**		O-ring	
48		Retainer, oil seal	
49		O-ring	
50		Oil seal	
20		Spring pin	

Note: [528], [529], [744] are not used to 160V** models.

Figure 5-5 Details of BBSE-type Mechanical Seal Assembly and Related Parts

Disassembly

a) Of the eight hexagon socket head cap screws [53] securing the seal cover [51], remove six bolts leaving two diagonally opposite bolts.

b) Loosen the remaining two screws alternately and evenly, a little at a time. When the screws are loosened to some extent, the seal cover will be pushed by the spring force of the seal to create a gap under the cover. The gap will not be created if the gasket is sticking to both surfaces. In this case, free the cover by screwing M8 eye bolts into the jacking screw threads on the seal cover to separate it.

c) As the oil inside will flow out through the gap, be ready to receive the oil with a container.

d) Pull out the seal cover in the direction of the rotor shaft axis. Inside the cover, there is the mating ring fitted with the O-ring. In this, carefully remove the seal cover for the mating ring not to be damaged by touching the shaft.

e) Remove the O-ring [49] between the seal cover and oil seal retainer [48].

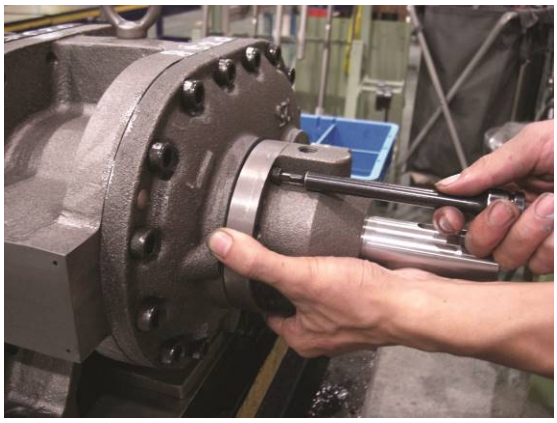
f) After the seal cover has been removed, wipe clean the shaft and then check its surface. If any flaw is found, use a fine sandpaper to smoothen the surface. This correction is intended to prevent possible damage of the internal O-ring when the mechanical seal is pulled out.

g) Loosen the set screws [111] securing the seal collar [109] about three turns. Do not remove the set screws completely. Loosen them such that their ends are retracted from the surface of the seal collar. These two screws are located 90° apart from each other.

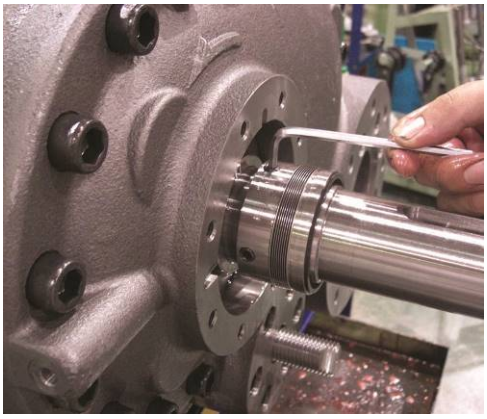
h) Pull out the mechanical seal assembly by holding the seal collar with your fingertips. While removing the assembly, make sure that the ends of the set screws do not touch the shaft surface. Any scratch on the shaft will cause leakage.

i) Pull out the oil seal sleeve [528] after removing the two set screws [744] (except for 160V* type).

j) Screw two M8 eye bolts into the jacking screw holes in the seal retainer and pull out the seal retainer while keeping it in the right angle with the shaft.



Removing the seal cover



Loosen the set screw of the seal collar

Inspection

a) Although it is instructed that the mechanical seal must be replaced after abnormality is found in the inspection, only visually checking the sliding surface may be insufficient in determining any abnormality. It is thus recommended to always replace it with a new one, similarly to the case of O-rings and gaskets, if the inspection is done in such a way.
However, even if the assembly is to be replaced without exception, it is still necessary to visually check the condition of the sliding surface between the mating ring and the seal collar. If any unevenness or flaw is observed on the sliding surface, analyze the condition to determine whether it is due to aging, overheating, or other reasons in order to take necessary corrective actions.

b) Replace the O-rings every time the mechanical seal assembly is inspected because they normally swell and deform over time.

c) Check the wear of the oil seal sleeve in the area it rubs against the oil seal lip.
If wear is evident, replace both the oil seal [50] and oil seal sleeve [528] with new parts. Since the oil seal is made of a special material, only genuine oil seals must be used for the replacement.

Information on the O-ring [744] for the oil seal sleeve

In March 2010, the design of O-ring [744] was changed on the inner circumference of the oil seal sleeve.

5.4.3 Unloader Cover

The unloader cover [74] is mounted with the indicator cam [77] which converts the linear motion of the unloader slide valve to a rotational motion, and their mounting parts.

The indicator cam is supported by the ball bearing [78] and fixed to the cover with a bearing gland [80].

To make it airtight, the V-ring [82], spring [83], and spring retainer [84] are also attached.

The indicator cam has a spiral groove of 340° to cover the moving range of the unloader slide valve. The indicator cam shaft is rotated being pushed by the guide pin [68] on the top end of the unloader push rod [67].

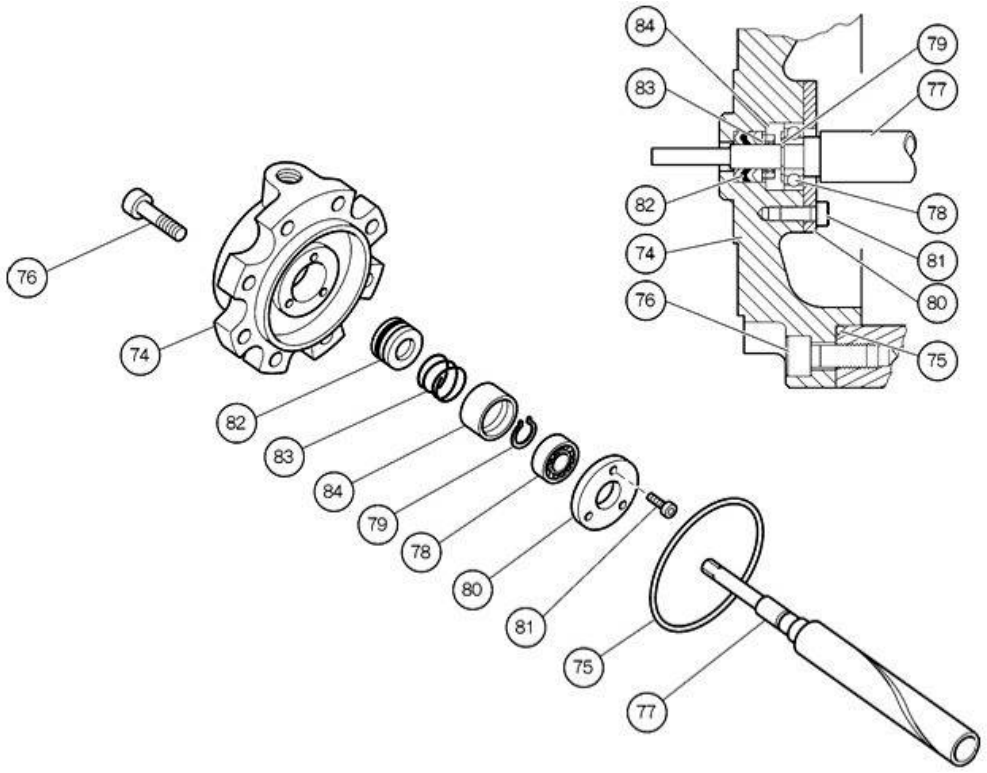


Figure 5-6 Unloader Cover Block

Disassembly

a) Unscrew and remove the unloader cover mounting hexagon socket head cap screws [76].

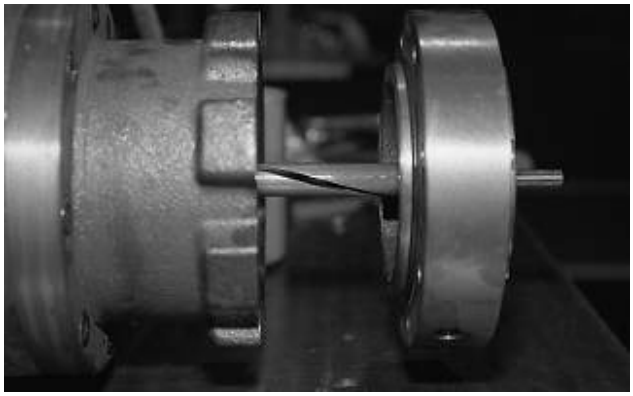
b) Pull the cover out in the direction parallel to the axis of the push rod in the unloader cylinder. Carefully pull it straight, because if the unloader cover is pulled sideways, the shaft of the indicator cam may be bent.

c) If the indicator cam will not move normally, check the groove of the indicator cam, bearing, and guide pin. The disassembly sequence is as follows:

   c-1) As the bearing gland [80], which fixes the indicator cam in place, is secured by three hexagon socket head cap screws [81] on the cylinder side of the unloader cover, unscrew and remove these bolts.

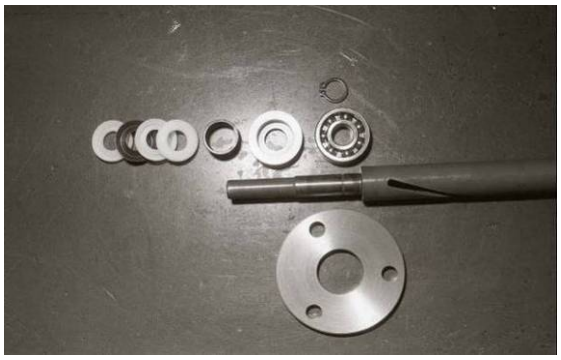
   c-2) Then, the indicator cam can be pulled out with the ball bearing [78] and the retaining ring [79] attached to the shaft.

   c-3) Inside the unloader cover, the spring retainer [84], spring [83], and then V-ring [82] are assembled in this order. Because the V-ring is tightly engaged with the bore of the unloader cover, the lip of the V-ring will be damaged when it is once removed, making it unusable again. Therefore, be sure to replace it with a new one once it is disassembled.



Removing the Unloader Cover

Ball Bearing for the Indicator Cam



Indicator Cam Mounting Parts

V-ring (The black part is NBR/FKM)

Inspection

a) Check the packing of the indicator cam shaft for any flaw. If the refrigerant leaks without any flaw observed in this part, it should be due to a defect of the V-ring or installing the V-ring without sufficient oil.

   In this case, replace the V-ring.

b) Check the spiral groove of the indicator cam. If an abnormal flaw or wear is observed, replace it with a new one.

5.4.4 Unloader Cylinder and Balance Piston Cover

Inside the unloader cylinder [60] is an unloader piston [64] around which the cap seal [66] and O-ring [65] are fitted. The unloader piston is assembled to the unloader push rod [67], which operates the unloader slide valve, with the lock nut [69].
Unloader cylinder is secured to the balance piston cover [22] with two short hexagon head cap screws 61] and to the suction cover with six log hexagon head cap screws [62].

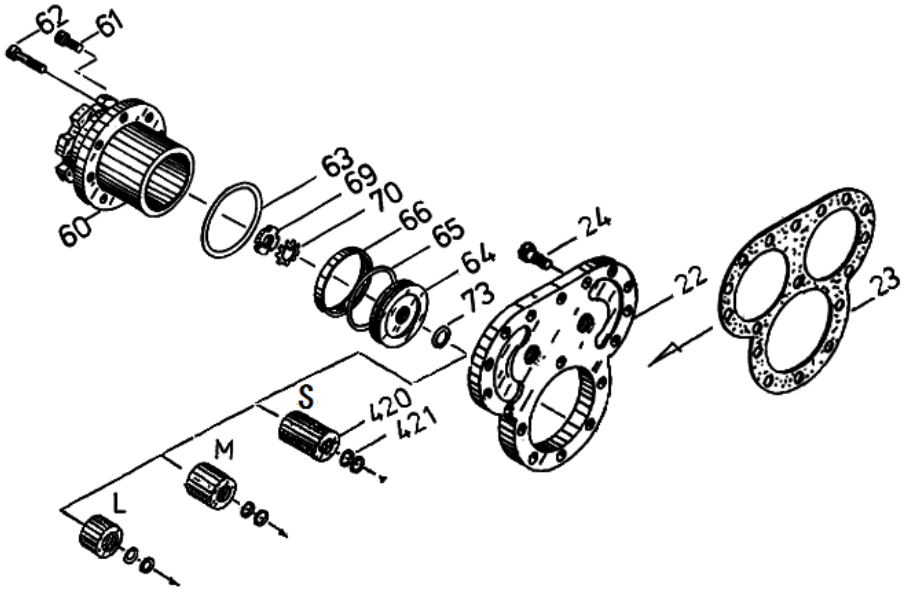


Figure 5-7 Unloader Cylinder Block and Balance Piston Cover (Example: 320V*D)

Disassembly

a) Remove the cap nut [522] on the bearing head side of the Vi adjusting rod [444], loosen the hexagon nut [453], and set the variable Vi auxiliary slide valve to the L port position (by turning the Vi adjusting rod counterclockwise until it stops).

b) Screw the eye bolts into the two screw holes in the unloader piston [64] to move the piston toward the indicator to the full-load position.

c) Unbend the claws of the lock washer [70] on the lock nut [69] that is securing the piston to the push rod [67].

d) Loosen the lock nut using the lock nut wrench. Remove the unloader piston from the push rod using the eye bolts again.

e) Remove the balance piston cover [22] fastening bolts (hexagon head cap screws) [24] and the hexagon head cap screws [62] fastening the unloader cylinder [60] to suction cover.

   After that, pull out the unloader cylinder with balance piston cover.

   At this time, as oil remains in the balance piston and side bearing block, be careful of the oil that will flow out when the balance piston cover is removed.

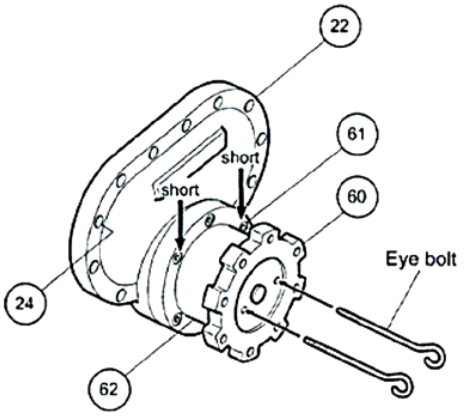


Figure 5-8 Removing the Unloader Piston

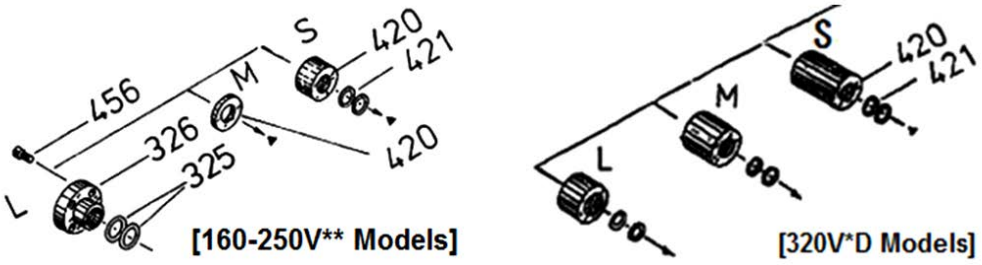
f) Screw in two M8 eye bolts to the two jacking bolt threads on the balance piston cover, and separate the balance piston cover with unloader cylinder from the suction cover.

g) Remove two fastening bolts [61], and separate the unloader cylinder and balance piston cover.

h) In case of SCV-series 320 models, i.e., VL* type, VM* type and VS* type are installed the unloader piston spacer [420] with two O-rings [421].

In case of 160 to 250V**, VM* type is installed the unloader piston spacer [420] without O-ring [421], VS* type is installed unloader piston spacer with two O-rings [421].

If your compressor is applicable above description, remove each part at this point.



, Figure 5-9 Unloader Piston Spacer and O-rings

Inspection

a) Both the O-ring [65] and cap seal [66] that are on the periphery of the unloader piston [64] must be replaced by new ones.

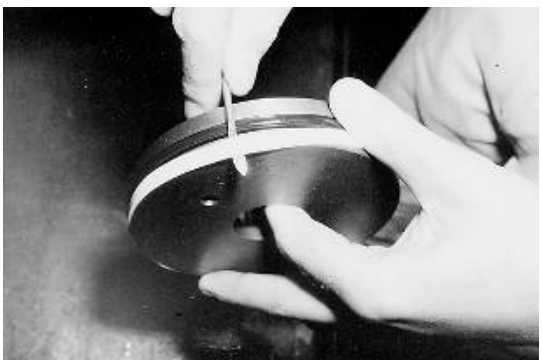
b) As it is often seen that the inside of the unloader cylinder has flaws or is contaminated by oil residue, thoroughly clean the area and use fine sandpapers to finish the surface.

c) Inspect the guide pin [68] on the tip of unloader push rod and replace it with a new one if scratches and/or wear are found.

d) Replace the O-rings [421] for unloader piston spacer, [73] at the tip of unloader push rod, [63] at the connection between the balance piston cover and unloader cylinder.

Also, replace the lock washer [70] for fastening the unloader piston to unloader push rod and the balance piston cover gasket [23].

e) When large deformation is found in the lock nut [69] grooves which may be hit by a lock nut wrench, replace the lock nut with a new one.



Removing the Cap Seal

O-ring [63] at the tip of Unloader Push Rod

5.4.5 Balance Piston Block

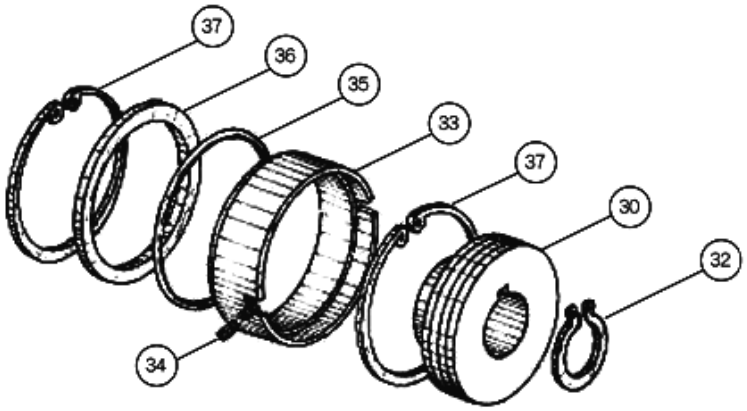


Figure 5-10 Exploded View of Balance Piston Block

Disassembly

a) Remove the retaining ring [32] that secures the balance piston [30] on the M rotor shaft using external retaining ring pliers.

b) Screw in two M8 eye bolts to the hole in the balance piston and pull out the piston in parallel with the axis of the shaft (see right picture). It is not necessary to remove the balance piston key [31] embedded in the rotor axis.

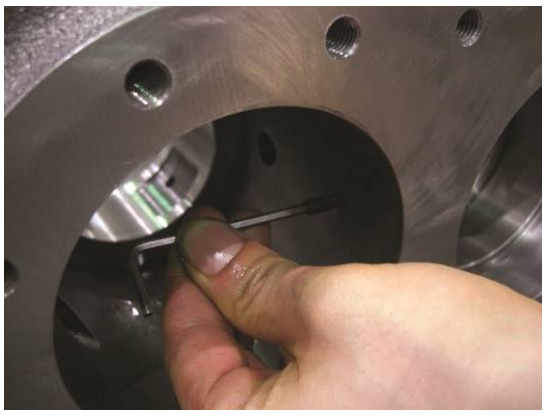
c) The balance piston sleeve is locked by either of the following methods:

Type 1 (following picture to the left) for 160 to 250V** models:

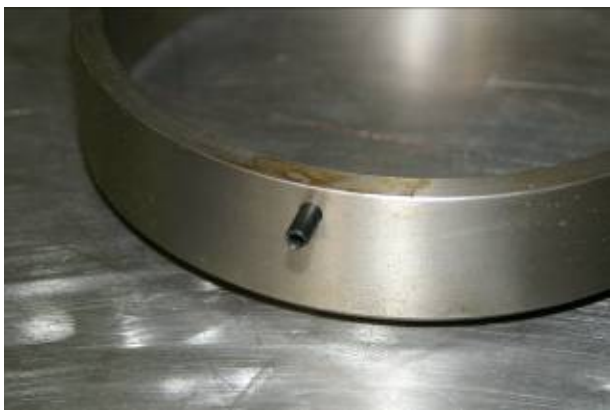
Locked by a screw at the notch in the balance piston sleeve

Type 2 (following picture to the right) for 320V*D models:

Locked by a spring pin by driving the pin into the sleeve and fitting it into the suction cover groove



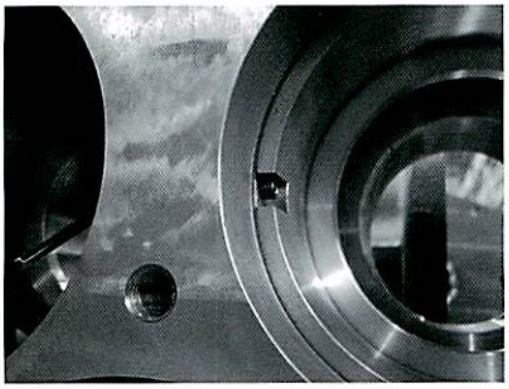
Type 1: Locked by a Screw



Type 2: Locked by a Spring Pin

With the balance piston sleeve [33] locked using the Type 1 method, the sleeve has a notch using which it is locked by screwing two hexagon socket head cap screws into a threaded hole, one from the notch side (M rotor side) and the other from the opposing side (F rotor side).
To undo the lock of the sleeve, either remove the M rotor side screw or loosen the F rotor side screw and screw in the M rotor side screw.

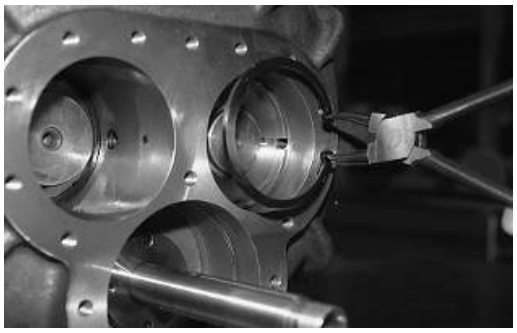
With the balance piston sleeve locked by the Type 2 method, simply remove the retaining ring of the sleeve to undo its locking.



d) Remove the retaining ring [37] that secures the balance piston sleeve by using internal retaining ring pliers.
Since the retaining ring is pushed out by the inner O-ring [35], it can be removed easily by pushing gently.

e) Pull out the balance piston sleeve. The sleeve is loose fitted, so it can be removed easily.

f) Remove the O-ring [35] and O-ring spacer [36] behind the sleeve.



Inspection

While you will be able to find some trace of wear on the inside surface of the balance piston sleeve, such wear is not abnormal as it is caused because the clearance between the balance piston and the sleeve is narrower than the clearance between the rotor shaft and the bearing.

Because enough clearance is given to the outside of balance piston sleeve in order not to apply the bearing load to the balance piston, no further development of the wear is expected.

However, you should still carefully check the condition because when the side bearing is significantly worn, the balance piston may also be worn.

Make sure to replace the O-ring [35] with a new one.
By its elasticity, the O-ring work to center the clearance round the periphery of the balance piston sleeve on the center of the balance piston.

5.4.6 Bearing Cover

The bearing cover differs in shape between the D type models (with a bearing head for sideways discharging) and the G type models (with a bearing head for downward discharging). The discharge port is in an unsymmetrical location with the D type models, so the bearing cover has imbalanced weight distribution between the right and left; this requires careful handling of the bearing cover during its removal.

WARNING

- **Make sure to take sufficient care to handle the heavy objects, and make better use of a crane or chain block, etc., if necessary.**
  Dropping heavy objects may cause a large damage to workers and goods

Disassembly

a) Apply protective tape or cloth, etc. on the rotor axis surface to prevent from any damage during the work.

b) Remove the domed cap nut [522] and hexagon nut [453] of the Vi adjusting rod [444].

c) Of the hexagon socket head cap screws fastening the bearing cover [18-1], [18-2], [18-3], replace the two screws at the upper side of the bearing cover with stud bolts (headless safety bolts) and then remove all the other screws.

d) Jacking bolt holes are provided at the 2 o'clock and 8 o'clock positions on the bearing cover (these holes are plugged with vinyl caps at the time of shipment from the factory).
First place a container for catching oil under the bearing cover and then install the two of the removed hexagon socket head cap screws into the jacking bolt holes and screw in them alternately to create and widen the clearance between the bearing head and bearing cover. Oil will flow out as the clearance is widened.

e) The cover will come off the alignment pins located near the screws being turned in as the clearance increases.

CAUTION

- **At this point, if the bearing cover is not properly supported, it may fall or drop down onto the rotor shaft to cause damage on it.**
- **On the 200, 250, 320 models, there are threaded holes at the top of the bearing cover's flange. As the bearing cover is heavy, install the eye bolts in these threads to lift the cover using a crane or a chain block with lifting tools to removing work.**

Inspection

a) Check the alignment pins as they would have been bent when removing the bearing cover.

b) Inspect the thrust washer [449] (as the white ring part shown in following picture to the left) of the Vi adjusting rod. Replace the washer if it is defective.

c) Always replace the bearing cover gasket [17] and the bearing cover side two O-rings [450] (following picture to the right) of the Vi adjusting rod.

5.4.7 Suction Cover and Side Bearings

If the work sequence is such that the thrust bearing block is disassembled first and then the suction cover is removed, there is a risk that, when the suction cover is separated from the rotor casing, the rotor may also be pull out and dropped. As such, in the procedure described in this manual, the suction cover is removed first, and then the thrust bearing is disassembled.

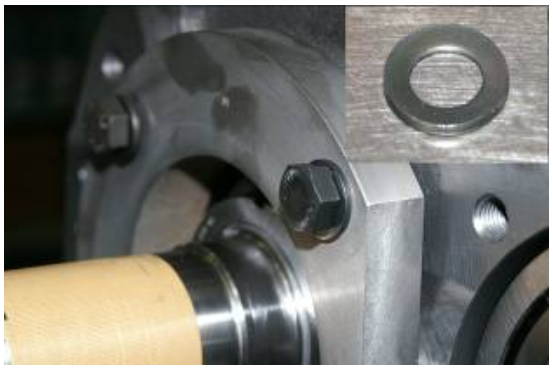
CAUTION

- **In this procedure to remove the suction cover before disassembling the thrust bearing block, it is necessary to sufficiently loosen the lock nut that are securing the thrust bearing while the rotor is supported by both the main and side bearings, in order not to damage the rotor during the disassembly process.**

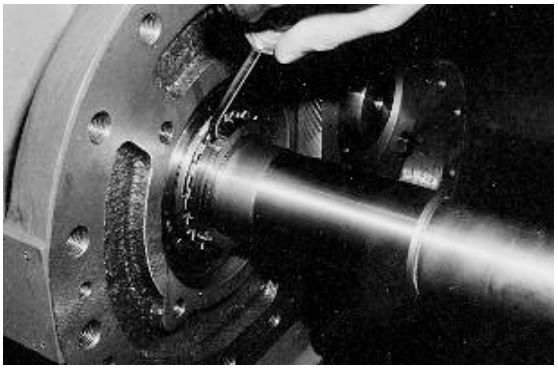
Disassembly

a) Remove the hexagon head bolts [45] and conical spring washers [46] that fasten the thrust bearing gland [43]. Then, remove the thrust bearing gland.

b) Unbend the claws of the lock washer [40] holding the lock nut [39], which retains the inner race of each thrust bearing on the rotor shaft and loosen the lock nut using a lock nut wrench.



Removing the Thrust Bearing Gland

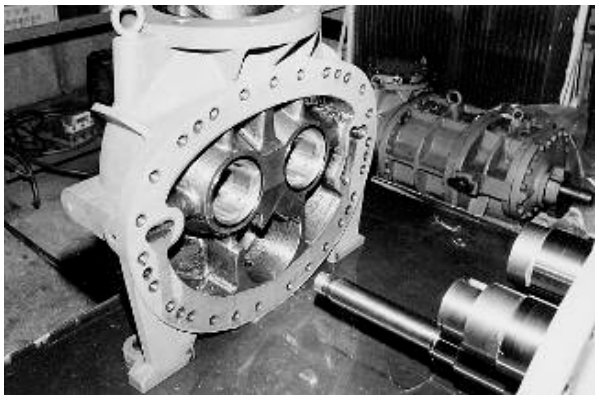


Unbend the Claw of the Lock Washer

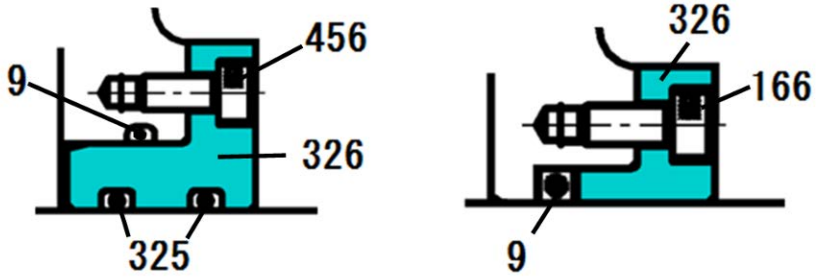
c) Loosen and remove the hexagon socket head cap screws [2] securing the suction cover [5] to the rotor casing [1].

d) As the gasket [6] of the suction cover is sticking to the surface of the flange, screw two hexagon socket head cap screws [2] that have been removed into the jacking threads in the rotor casing flange to evenly push the suction cover. When some gap is observed between them, use a thin knife or spatula to remove one side of the gasket from the surface.

e) When it comes to the position the alignment pins are disengaged, pull out the suction cover at once along the shaft axis.



f) The O-ring and O-ring gland [326] are mounted in the unloader push rod passes part of the suction cover. Remove them. At this time, take care not to lose the four fastening screws for O-ring gland due to their smallness (M5). The structure and part No. of around the O-ring gland are slightly different between 320V*D models and other models as shown in Figure 5-11.

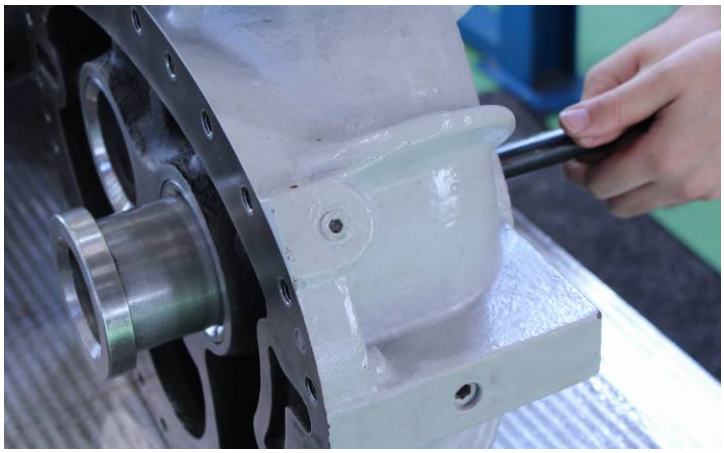


[160 to 250 V]** **[320V*D]**

Figure 5-11 Difference around the O-ring gland

g) The side bearing [28] has been press fit from the balance piston cover side of the suction cover. Remove the retaining ring [29] using internal retaining ring pliers.

h) Either push out the side bearing from the rotor casing side using some block or pull it out using a special tool such as shown in following picture.



Inspection

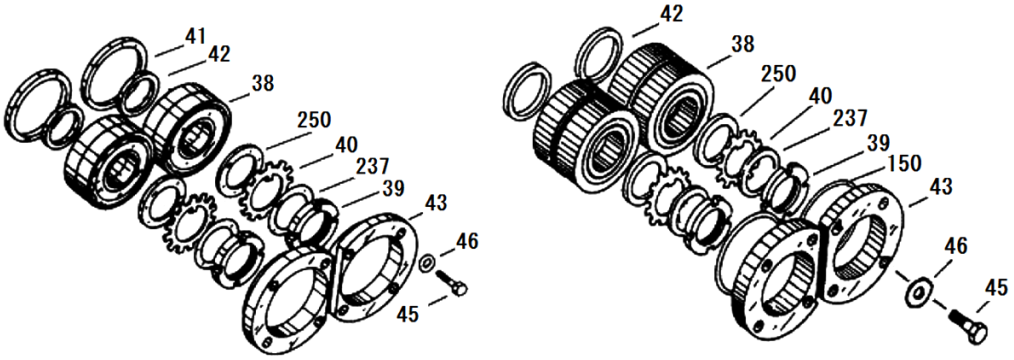
a) Check the oil inlet path to the balance piston part of the suction cover by spraying air, etc.

b) We recommend unconditional exchange of the side bearings on the occasion of the compressor overhaul, but for confirmation of the compressor condition and system operating condition, carefully check the sliding part metal surface of the side bearings.

If the metal surface is gray or any foreign matter is buried, also carefully check the wear of the rotor shaft.

c) The inside surface of the rotor casing should have no problems because sufficient clearance is provided. However, if any trace of scraping by the end of the rotor is found, it should be determined that the thrust bearing is defective.
It is also necessary to check the operational condition, such as whether the system is operated for a long time with a high intermediate pressure.

5.4.8 Thrust Bearing Block



[160 to 250V]** **[320V*D]**

Figure 5-12 Exploded Views of Thrust Bearing Block

Table 5-7 Parts Configuration of Thrust Bearing Block

P/N	Part Name	Qty			
		160V	200V	250V	320V
38	Thrust bearing	2	2	2	2
39	Lock nut	2	2	2	2
40	Lock washer	2	2	2	2
41	Spacer, Thrust bearing outer race	2	2	-	-
42	Spacer, Thrust bearing alignment	2	2	2	2
43	Thrust bearing gland	2	2	2	2
45	Hexagon head bolt	8	8	8	8
46	Conical spring washer	8	8	8	8
150	O-ring	-	-	-	2
237	Torsional slip washer	2	2	2	2
250	Thrust washer	2	2	2	2

【POINT】

- The thrust bearing block of 250V** models and 320V*D models have no spacer for the thrust bearing outer race. While the thrust bearing outer race spacer [41] is used to support (i.e., ensure a sufficient support width for) the outer race of the thrust bearing, 250 or higher models use no spacer for the thrust bearing outer race because the bearing head has sufficient margin to the support it.
- The thrust bearing block of 320V*D models is using an oil supply spacer for the combined surface. This is to facilitate lubrication of the ball bearing because as the rotor diameter becomes larger, the rotor shaft diameter become larger. Thus, a larger thrust bearing is required and the ball rotation speed increases accordingly.
- Only 320V*D models employ O-ring [150] to thrust bearing gland.

Disassembly

a) Remove the lock nut [39] that has been loosened. Then, remove the torsional slip washer [237], lock washer [40], and thrust washer [250].

b) The clearance fit is applied to two gaps between the outer race of the thrust bearing and the bearing head, between the inner race of the thrust bearing and the rotor shaft.

Prepare a 1 or 2 mm diameter wire, make the tip of the wire flat by hammering, and slightly bend the tip to make a hook. Then, insert the tip of the wire between the outer race and the ball retainer of the thrust bearing [38] to hook and pull out the bearing. In this way, the bearing can be easily removed.

c) The whole thrust bearing will be removed helped by the surface tension of the oil on the side face. If you have failed to remove the whole bearing at once, put the components in the order of the removal.

d) Inside the thrust bearing is an alignment spacer [42] for the inner race on the rotor shaft side. Also, 160V** models and 200V** models are used the thrust bearing outer race spacer [41] on the bearing head side. Each spacer has a marking to identify where to set, i.e., the M rotor side has a stamped marking of "M", and the F rotor side has a stamped marking of "F".

Neatly arrange the parts removed, i.e., the thrust bearing gland, thrust washer, thrust bearing, thrust bearing alignment spacer, and thrust bearing outer race spacer separately for the M rotor and F rotor as shown in right picture. You must be very careful because if an assembly error is made to result in a wrong combination of parts after failing to neatly arranging and separating the parts, it can lead to performance degradation and/or dragging accident due to overheating caused by excess tightness, for example.

Inspection

a) The thrust bearing is normal if the bearing balls are found fully glossy after the thrust bearing has been fully washed and cleaned. It is abnormal if the ball surface is tarnished or has some streaky pattern.

b) Support the inner race with your hand and rotate the outer race. If you feel abnormal vibration on the hand, the rolling contact surface of the inner or outer race or some balls may be in an abnormal condition. So, carefully check the conditions. You could feel some irregular click even with a small amount of foreign matter that has entered during the removal process. In such a case, it should return to the normal condition when high pressure air is used to blow out the foreign matters after washing and cleaning the unit. If the bearing is determined to be defective, it must be replaced with new ones.

c) If the inner race and outer race can be easily separated, the wear is considered excessive. If so, you cannot reuse the bearing.

d) After washing the bearing, you should be able to hear a clattering sound when the bearing is rotated y hand. Such a sound is due to the motion of the ball within the backlash or play, or the gap between the retainer and the ball. Such a sound will not be heard if the bearing is held horizontal and turned. If some lubricating oil is applied after washing the bearing, the sound should not be heard when the bearing is turned. If you can still hear the sound, you should check further details.

e) If the compressor has been operated for more than 20,000 hours, please replace the thrust bearing with a new one for safely continuing the operation until the next overhaul, even if no abnormality is found in the above described inspection.

CAUTION

- **As the bearing used for the compressor is a specially designed combined-type bearing, the accuracy and material are different from normal ones of the same part number that may be found in the catalogue of a bearing manufacturer.**
  Be sure to use only MYCOM genuine parts for replacement. Otherwise, it will not be covered by the warranty.

5.4.9 Rotors and Main Rotor Casing

Disassembly

a) The rotor can be easily pulled out. While you can pull out the rotor either from the M or F side, you should be very careful in the work as either rotor is very heavy.
When pulling out the M rotor (or F rotor) first, pull out about 2/3 of the full length of the rotor by holding the shaft upward and turning it in the CW (or CCW) direction.

CAUTION

- **You should carefully note that the rotor must be rotated in the specified direction while pulling it out. If the M (F) rotor is not turned during the pulling out process, the F (M) rotor can also be pulled out together.**

b) As a preparation, use a nylon belt or other lifting belt that will not blemish the lifting surface to support the center of the rotor. Then, pull out the rotor while slightly lifting up the rotor using the belt.

c) The pulled out rotor should not be directly placed on the floor. Use appropriate wood boards to support the rotor as a cushion to prevent blemishing or use V-blocks to support the shaft to prevent blemishing of the outer surface.

Inspection

a) No abnormality should be observed on the surface of the rotor lobes under normal operations. Regarding the contact surface of the lobes, black luster should be seen on the root area of the M rotor lobes and on the tip area of the F rotor lobes.

In other cases, when the suction gas or oil is contaminated by fine dust, there may be fine linear scratches on the shaft surface, in the direction perpendicular to the shaft axis. If any such flaw is found, use a fine sandpaper or grindstone to smooth the surface.

b) In case of ammonia refrigerant or gas compressor, the non-contact surface of the rotor may be discolored by rust or deposits. Use sandpapers or others to finish the surface according to the degree of the problem.

c) Then, check the bearing areas of the rotor shaft. Two types of finishing are used: one is the induction hardening (polish finishing) for the standard specification, and the other is the hard chrome plating (polish finishing), as a special specification. The most suitable finish is selected according to the type of refrigerant and operation conditions.

Very little wear will be present unless the compressor is operated for a long time using dirty oil or any hard matter is buried in the metal of the inner circumference of the bearing.

d) Check the portion of the shaft on which the thrust bearing is mounted for any trace to show that the inner race of the bearing has rotated.
If the lock nut that fastens the inner race of the thrust bearing is loosened, or if the bearing is abnormally worn, the inner race will become loose and rotate. If any trace of rotation is seen, correct the problem as appropriate.

e) Check the portion of the shaft on which the mechanical seal is mounted for any scratches and/or trace to show that the oil seal lip has hit strongly. Particularly, damage in axial direction may cause the oil and/or gas leakage from the shaft seal part, if it is not disappeared in hand finishing, repairing the rotor is required.
In this case, contact our sales offices or service centers.

f) Check the inner surface of the rotor casing.
There is a narrow clearance between the periphery of the rotor and the rotor casing. Any slight flaw present on the tip of the rotor lobes or on the inner surface of the rotor casing, due to small foreign matters, will not be a problem.
If there is any trace to show that the tips of the rotor lobes have hit the inner surface of the rotor casing, it is an abnormal condition. In such a case, the possible cause is that the bearing is worn out. Take proper actions by finding the cause of the problem, such as contamination of the lubricating oil or entrance of foreign matters.

5.4.10 Variable Vi Auxiliary Slide Valve and Unloader Slide Valve

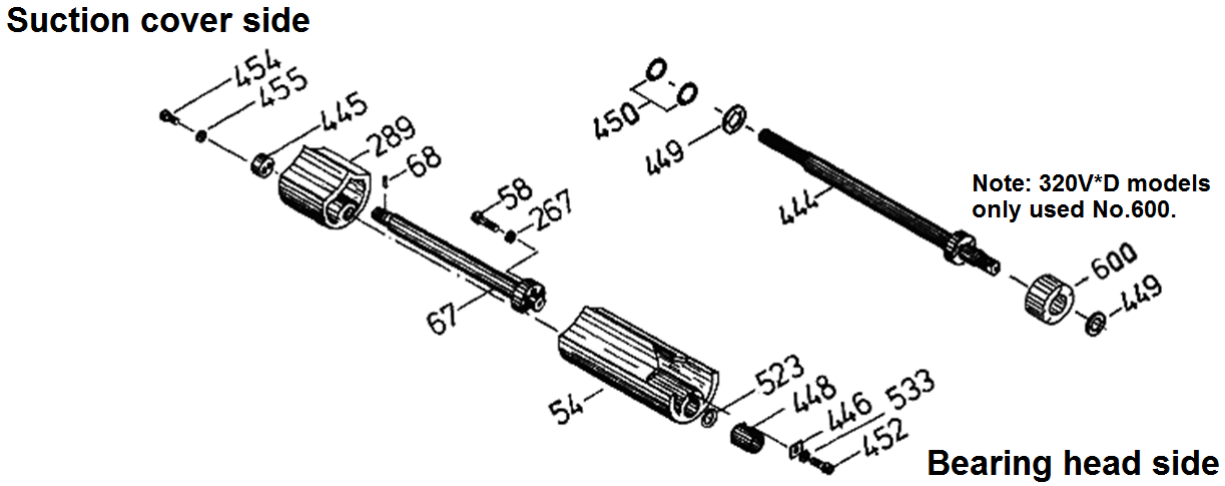


Figure 5-13 Variable Vi Auxiliary Slide Valve, Unloader Slide Valve and Vi Adjusting Rod

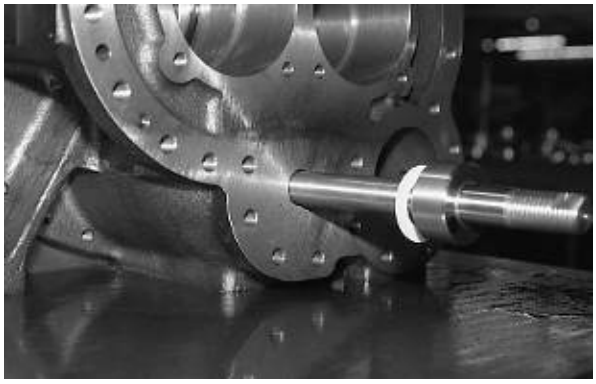
Disassembly

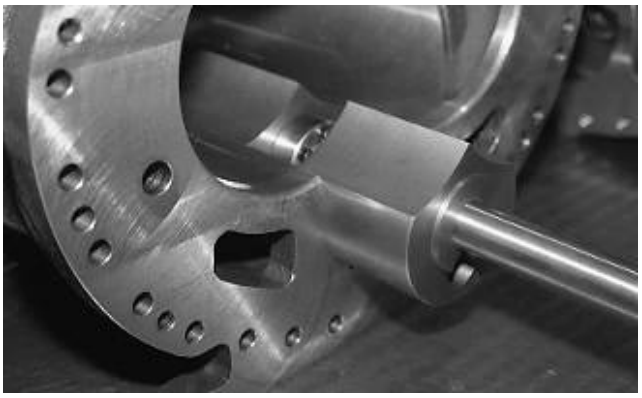
a) Remove the hexagon head socket cap screws [454] fastening the lock washer [445] on the tip of the suction cover side of Vi adjusting rod [444] and remove the spring washer [455] (following picture to the left).

Note: The lock washer [445], spring washer [455] and hexagon head cap screws [454] are not used on the products manufactured in and after 2003.

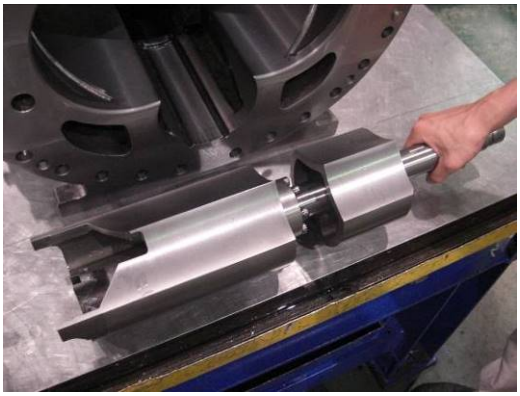
b) Turn the Vi adjusting rod in the bearing head counterclockwise until its end disengages from the variable Vi auxiliary slide valve and then pull the rod out of the bearing head (following picture to the right). Keep the thrust washer [449] together with the Vi adjusting rod.

c) Return to the suction cover side. Pull the unloader slide valve and the variable Vi auxiliary slide valve out of the main rotor casing by holding the unloader push rod.
Then hold the variable Vi auxiliary slide valve to pull out the unloader push rod and separate the variable Vi auxiliary slide valve and unloader slide valve.





Pulling out the Unloader Slide Valve and Variable Auxiliary Slide Valve



Separating the Unloader Slide Valve and Variable Auxiliary Slide Valve

Inspection

a) With the unloader slide valve and variable Vi auxiliary slide valve mounted in position, check the step height between the slide valves and the rotor casing surfaces. Generally, the surface of the slide valves should be lower than the surface of the rotor casing. If the top surface of the slide valves has a trace of hitting the rotor, the probable cause is that the slide valves are worn or the rotor shaft/bearing is worn. Please contact our sales offices or service centers

b) Inspect the sliding surfaces of the unloader slide valve and variable Vi auxiliary slide valve that rub against the main rotor casing. If any scratch and/or contact mark of casing with slide valve is found, the compressor is in bad condition. Examine their causes, e.g., lubricating oil contamination, entering foreign materials, and loosening of fastening portion. After identify the cause, take necessary measures.

c) If there is a discoloration like oil burned around the discharge port of the slide valve, oil compression operation may be occurring. In this case, please contact our sales offices or service centers, too.

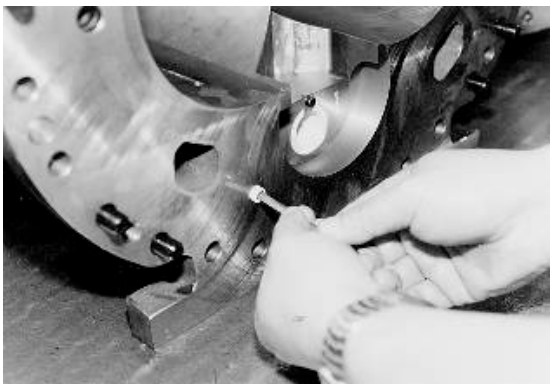
d) Replace the two O-rings [450] and O-ring [523] with new ones.

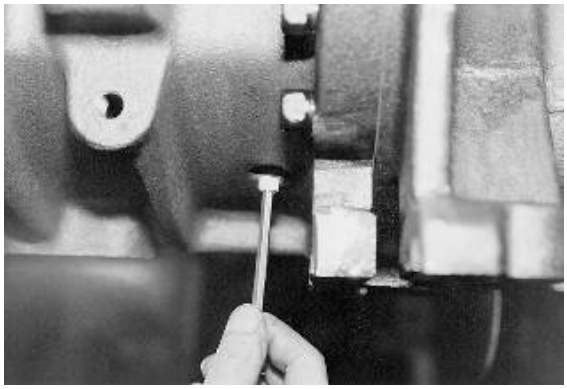
e) Replace the Teflon bushing [448], if any wear is found.

【POINT】

- Two O-rings [450] are fitted on the following portions.
  - 160 to 250V** models: on the Vi adjusting rod
  - 320V*D models: on the O-ring groove located at the Vi adjusting rod passes part in the bearing cover

f) Remove oil injection line plugs on the rotor casing, and confirm those oil lines are not clogged by using the compressed air and like. After confirming and cleaning the oil lines, do not forget to attach the plugs to the original positions.





Oil Injection line Plugs

5.4.11 Bearing Head and Main Bearings

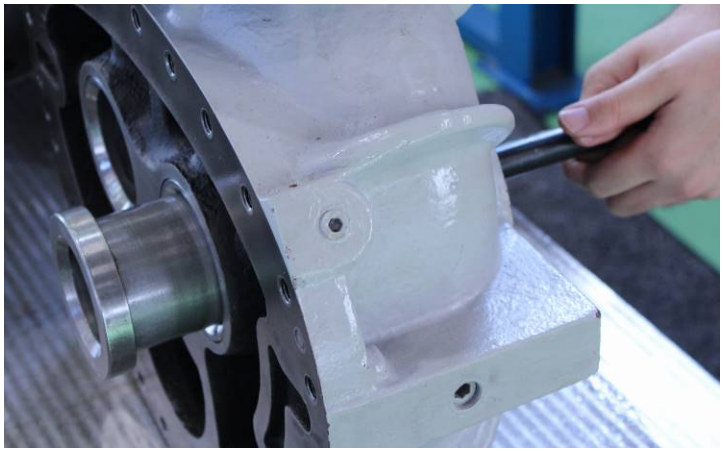
Disassembly

a) Unscrew and remove all the hexagon socket head cap screws [2] fastening the main rotor casing [1] and bearing head [11] .

b) Screw in two removed hexagon head cap screws to the jacking threads on the main rotor casing flange, and evenly screw them little by little.
Once some gap is produced between the main rotor casing and the bearing head, use a knife or a spatula like tool to detach the gasket from one side to other side.

When the alignment pins are disengaged, the bearing head is separated from the main rotor casing.

c) The main bearing [27-2] is lightly press fit.
To remove each main bearing, remove the retaining ring [29] using internal retaining ring pliers (following picture to the left). And then, push out the main bearing from the rotor side using a hammer through a plastic block or pull it out using a special tool such as shown in following picture.



Inspection

a) We recommend as well as the side bearings, unconditional exchange of the main bearings on the occasion of the compressor overhaul, but for confirmation of the compressor condition and system operating condition, carefully check the sliding part metal surfaces of the main bearings.

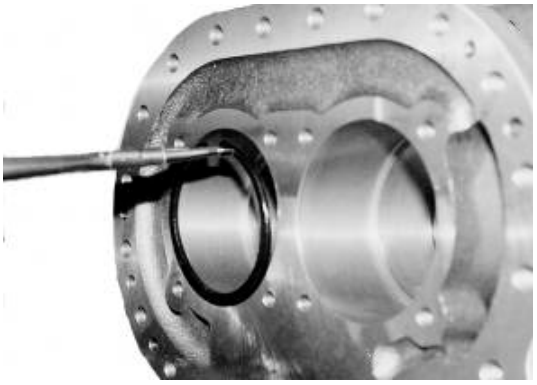
   If the metal surface is gray or any foreign matter is buried, also carefully check the wear of the rotor shaft.

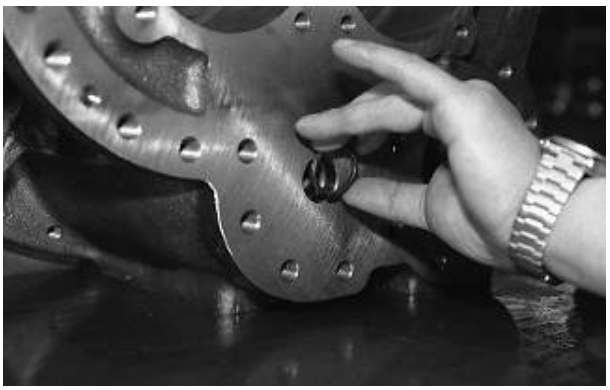
b) Check the condition of the surface of the bearing head on the rotor side, where the discharge port is.

   Properly mend the surface if any flaw is observed. If the entire surface has significant flaws, either the thrust bearing is defective or the end clearance adjustment is poor.

   If oil compression has been caused during the operation, carefully and thoroughly check the area of the discharge port in particular. If the continued use is in doubt at all, perform the penetrant testing to determine if it can be used or not.

c) Replace the O-ring [451] for the Vi adjusting rod (following picture to the right).





5.5 Reassembly

CAUTION

- **During the reassembly work, be very careful in selecting the correct replacement O-rings of the specified standard, not to make a mistake regarding the size, material, for fixed use, for sliding use, etc. Using a wrong O-ring can lead to oil leak or other problems.**
- **Some gaskets are not symmetrically shaped. In such a case, be careful not to misplace the gasket. If the gasket is misplaced, it can lead to a significant problem such as blocking any oil supply route on the casing.**

After completing the disassembly and inspection procedures, start the assembly process.

Before starting the assembly, check the replacement parts once again.

Like gaskets, all O-rings that have been removed during the compressor disassembly must be replaced with new ones.

The assembly sequence is mostly the reverse of the disassembly sequence. First of all, clean the work bench and the tools to be used.

Immediately prior to the assembly, use wash oil to clean the parts to be assembled, dry them with compressed air, and sufficiently apply lubricating oil, etc. For this, prepare a sufficient amount of clean lubricating oil for the reassembly. Also, apply oil on both sides of the gasket..

Please fully understand the details in this Section 5.5 for correct assembly work.

Table 5-8 Tightening Torques for Hexagon Socket Head Cap Screws

Torque Unit	M4	M5	M6	M8	M10	M12	M14	M16	M20	M24
N·m	2.8	6	10	25	50	90	140	240	450	750
kgf·cm	28	60	100	250	500	900	1400	2400	4500	7500

When fastening each hexagon head cap screw, use the tightening torque specified in the above table.

For other tightening torques of hexagon head bolts and lock nuts needed specified tightening torque, refer to Section 7.3 in this manual Chapter 7.

5.5.1 Bearing Head and Main Bearings

The main bearing (O-ring type) [27] is installed by a light press fit.

a) Align the notch on the main bearing [11] with the spring pin [14] that is driven in into the bearing head [11], and then drive it in with a pad. For the alignment, it is convenient to use a tool such as a guide bar (see the picture in Section 5.5.4).

b) After the bearing has been inserted, install the retaining ring [29] to retain the bearing in position. Securely install the retaining ring to be fully seated in the ring groove, by pushing the retaining ring with a guide bar or the like, or by lightly hitting the guide bar with a hammer while placing the guide bar on the retaining ring.

c) Install the O-ring [451] to the O-ring groove which located inside the hole to which is attached to the Vi adjusting rod of bearing head.

【POINT】

When press fitting the bearing, it is recommended to prepare a collared plastic cylinder (spacer) that exactly fits inside the inner diameter of the bearing and also a collared weight that fits inside the plastic cylinder as shown in Figure 5-14. Then, hit the top of the weight for easy press fitting of the bearing. Instead of the above, special tools are also available from us for the main and side bearings. These tools are similar to the above described weight, and the surface finish of which is improved to eliminate the need of a plastic spacer (Refer to Chapter 7, Section 7.6). You are welcome to place an order if necessary.

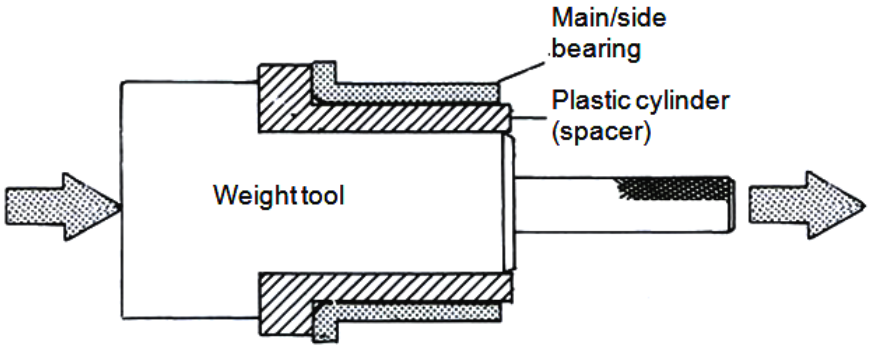


Figure 5-14 Example Tool for Press Fitting the Bearing

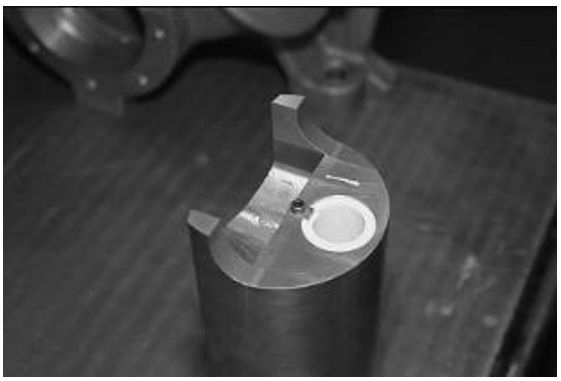
5.5.2 Unloader Slide Valve

a) Check that the O-ring [523] fitted in the Vi adjusting rod hole of the unloader slide valve has replaced, and check that the Teflon bushing [448] for the Vi adjusting rod has no defects.

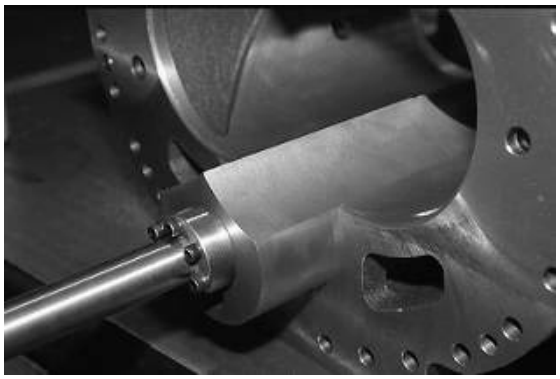
b) Check that all removed plugs for oil injection circuit, etc. of the main rotor casing are fitted into the original holes.

c) Install the unloader slide valve to the main rotor casing and confirm that the unloader slide valve moves smoothly.

d) Install the variable Vi auxiliary slide valve and confirm that is moves smoothly.



Teflon Bushing



Install the Unloader Slide Valve

e) Apply sufficient oil or like to both sides of the bearing head gasket [12] and attach it to the main rotor casing. Screw in the stud bolts to the main rotor casing to hold the gasket.

CAUTION

- **As the bearing head gasket [12] is not symmetrically shaped, carefully check the orientation when attaching the gasket.**
- **If you place the bearing head gasket by just hanging it on the stud bolts, the gasket will protrude into the inside of the rotor casing when the casing is assembled. Apply sufficient amount of oil, etc. to the gasket to make it fully attached to the surface to prevent protruding upon the assembly.**

f) Combine the flange surfaces of the main rotor casing and the bearing head.

g) After lightly fastening two bolts, drive in the alignment pins [3] to fix the position by using a copper or an aluminum hammer.

h) Tighten the hexagon socket head cap screws in a diagonal sequence, a little at a time, and finally tighten them to the specified torque using a torque wrench. The bottom bolts that cannot be fastened on the workbench are to be fastened later on.

i) After tightening the bolts, check that the gasket is not protruding into the inside of the casing. If any part of the gasket is extending into the bores, there is a possibility that the performance of the compressor is deteriorated.

j) Also check that the unloader slide valve and variable Vi auxiliary slide valve can be moved smoothly along the surface of the port section in the bearing head.

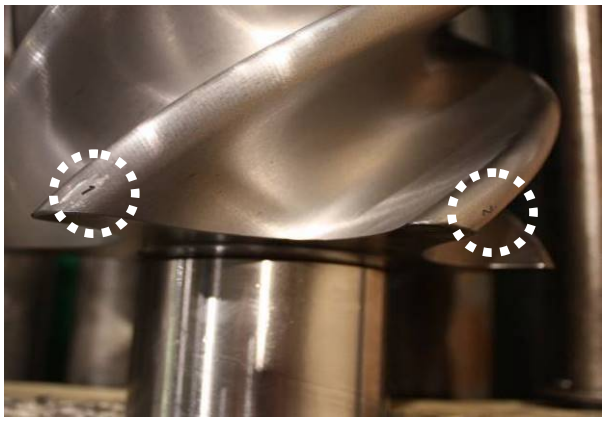
k) Install the Vi adjusting rod from the bearing head side, and screw in it to the screw thread of the variable auxiliary slide valve. Do not forget attaching the thrust washer.

5.5.3 Installing the Rotors

The rotor must be sufficiently reworked. If any slight flaw is observed on the shaft surface in the area of attaching the bearing or seal, use a sand paper to correct and finish the surface. After finishing the surface to attach the seal, apply protective tape on the surface.

Both the M rotor and F rotor have a specific engagement position, and the position is marked by carving.
In order to make it easier to match the positions when installing the rotor into the rotor casing, a number is marked on the lobe tip of the discharge and suction both sides.

Mating Mark on the M Rotor



Mating Mark on the F Rotor

a) Apply sufficient amount of lubricating oil on the main bearing in the bearing head and on the bearing area of the rotor shaft.

b) Lift up the rotor's midpoint using a crane or a chain block with a belt sling, and insert the rotor into the casing halfway along its length while keeping it balanced on the belt sling.

   Then detach the belt sling from the rotor and push the rotor fully into the casing.

【POINT】

While it is easier to mate the markings if the F rotor is first installed into the casing, it is not a mistake to install the M rotor first.
Regardless of which rotor is installed first, the lobe of the M rotor with the carved marking of "1" must be set in between the F rotor's lobes that are marked "1" and "2". As it affects smooth engagement of the teeth as well as the balance, be sure to mate the markings as describes here.

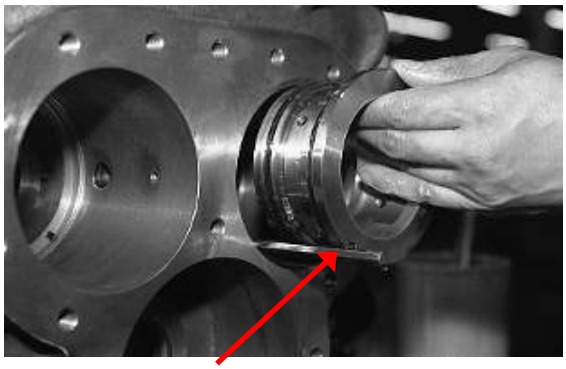
CAUTION

- **As the circumference of the rotor is touching the rotor casing in this condition, any rotation of the rotor should be kept to the minimum required. Otherwise, the lobes tip of the rotor may be worn.**

5.5.4 Suction Cover and Side Bearings

a) Similarly to the main bearing, the side bearing (O-ring type) [28] is machined to the size that will allow light press fitting to the suction cover.
Press fit the bearing by aligning the notch position of the bearing with the spring pin [8] for positioning the bearing driven-in on the suction cover. During the press fitting process, check that the notch position of the bearing is at the pin position. If the position has been shifted, pull out the bearing and try the press fitting process again.

b) After installing the bearing, insert the retaining ring [29] to retain the bearing. Make sure that the retaining ring is fully seated in the ring groove either by pushing the ring with a guide bar or tapping the head of the guide bar while applying the bar on the ring.



Aligning the Bearing position using Guide Bar

Installing the Bearing using the Jig

c) In case of 160 to 250V** models, after attaching the O-ring [9] to the O-ring groove located on the unloader push rod passes parts of the suction cover, attach O-ring gland [326] with two O-rings [326] at inner diameter.

In case of 320V*D models, attach the O-ring [9] and O-ring gland [326] after assembling the suction cover and main rotor casing.

5.5.5 Balance Piston Sleeve

Install the balance piston sleeve to the M rotor side of the suction cover.

a) First, install the retaining ring for the O-ring spacer [37], and then install the O-ring spacer [36].

b) After fitting the O-ring [35] in position, install the balance piston sleeve [33].
Insert the chamfered side of the balance piston sleeve towards the O-ring already placed.

c) In case of 160 to 250V** models, align the notch of the balance piston sleeve with the thread hole on the suction cover. And then, screw the set screw [34] for the balance piston sleeve detent, and attach a remaining set screw from the opposite side (F rotor side) to secure the set screw which is attached earlier.

In case of 320V*D models, fit the spring pin provided on the outside diameter of the balance piston sleeve into the notch in the suction cover for the balance piston sleeve detent.

d) Insert the retaining ring [37] to retain the balance piston sleeve. As it should be difficult to fit the retaining ring into the groove due to the elastic force of the O-ring, either push the side of the ring by a guide bar or tap the head of the guide bar to fit the ring securely into the groove.

5.5.6 Installing the Suction Cover

a) Turn the Vi adjusting rod counterclockwise to set it to the L port position.

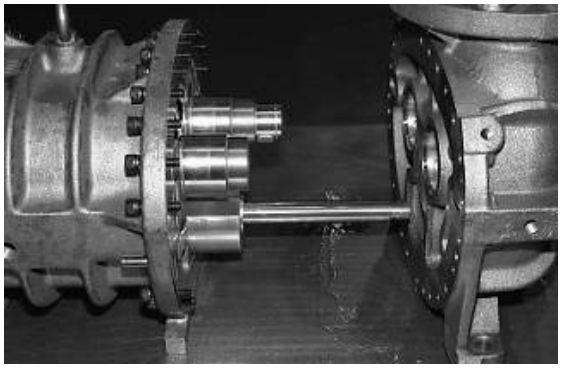
b) Apply oil on both sides of the gasket [6], and attach it to the main rotor casing [1] while carefully checking the position of oil supply holes. Screw in stud bolts to the main rotor casing to retain the gasket in position.

CAUTION

- **As the gasket of the suction cover is not symmetrically shaped, take care the gasket direction when attaching to the main rotor casing.**

c) Slide (or use a lifting device to move) the suction cover [5] in parallel along the shaft axis, and align the unloader push rod [67] with the O-ring gland [325] in the suction cover.

d) Then, engage the shaft ends of the rotors with the side bearings while pushing the suction cover gradually. At this time, be careful not to damage the inner surfaces of the side bearings.



Sliding the Suction Cover on the Workbench

Using a Crane and pushing to ・・・

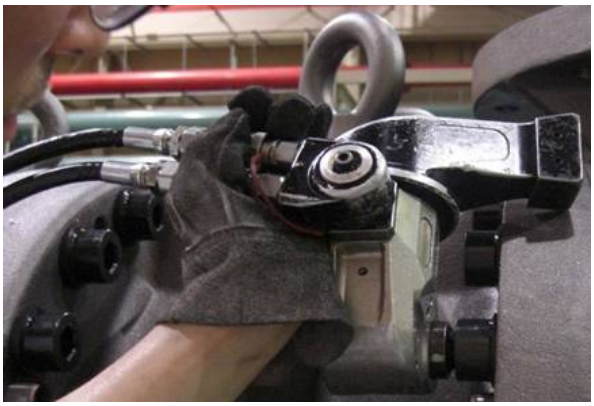
e) After the suction cover has been pushed in up to the flange surface of the main rotor casing, lightly fasten some of the hexagon socket head cap screws [2].

f) Using a copper hammer or an aluminum hammer, drive in the alignment pins [3].

g) Tighten the hexagon socket head cap screws evenly up to the specified tightening torque. The bolts on the bottom side (about 6 bolts) are to be tightened during the final assembly stage, on the special stand used in the disassembly process.

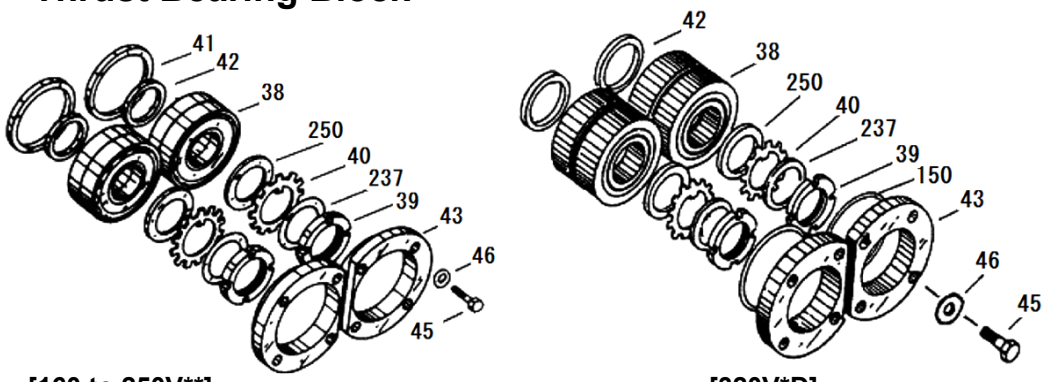
h) Check that the unloader slide valve and variable Vi auxiliary slide valve can be moved smoothly. Also, hold and rotate the M rotor shaft to check if it works normally.
In addition, check that the rotor has an axial play (i.e., the rotor can move in the axial direction).

Tightening the Bolts using a Torque Wrench



In case of Large sized Models, use a Hydraulic Torque Wrench

5.5.7 Thrust Bearing Block



[160 to 250V]** **[320V*D]**

Note: 250V models do not use the No.41.**

Figure 5-15 Exploded View of the Thrust Bearing Block

CAUTION

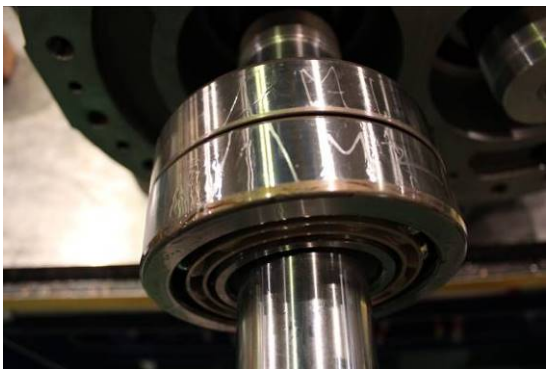
- **The torsional slip washer [237] and lock washer [39] must be replaced with new ones.**
- **If the removed thrust bearing is to be installed as it is, check the marking of "M" or "F" on the thrust bearing outer race spacer [41] (160V**, 200V** models) and alignment spacer [42], and assemble them in the same combinations as they ware disassembled. This is important in controlling the end clearance on the discharge side of the rotor.**
- **Even if the same bearing is installed, the work must be very carefully done as the dimension can change if any foreign matter such as a chip of paint or dust is pinched by the thrust bearing outer race spacer and/or alignment spacer.**
- **In determining the installation direction of the thrust bearing, there are two methods depending on the existence of an alignment "V" marking on the outer circumference of the bearing. Install the bearing according to the following procedure provided for each case.**

The assembly sequence for this part is as illustrated in Figure 5-15. The important points to be noted in the procedure are described below:

a) Check the marking of either "M" or "F" on the thrust bearing outer race spacer and alignment spacer to ensure that the units are assembled in the same combination of parts.

   The front and back of the outer race spacer and alignment spacer must be distinguished when it is installed. The larger chamfering side is on the machine side, and the smaller chamfering side is on the thrust bearing side.

b) If thrust bearing has a "V" marking on the outer circumference, it means that the installation direction of the bearing will sensitively affect the end clearance adjustment. In this case, the bearing must be installed with the pointed end of the marking pointed toward the inside of the machine.

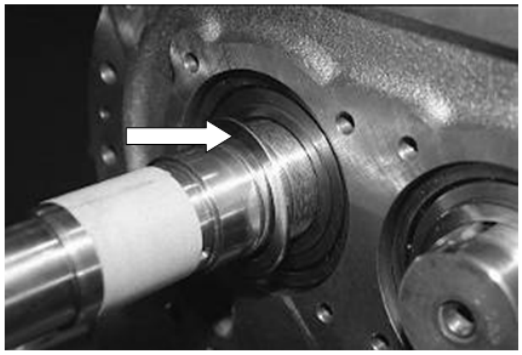


   If there is no "V" marking, it means that the direction of the bearing installation will not affect the end clearance adjustment. However, in order to clearly determine the orientation (whether it is on the inside or outside of the machine), first combine both bearings with the bearing number carving facing the outside of the machine. Then, use a blue whetstone to write the above "V" marking on the bearing to show the inside direction of the machine (see above picture). Then, install the bearing

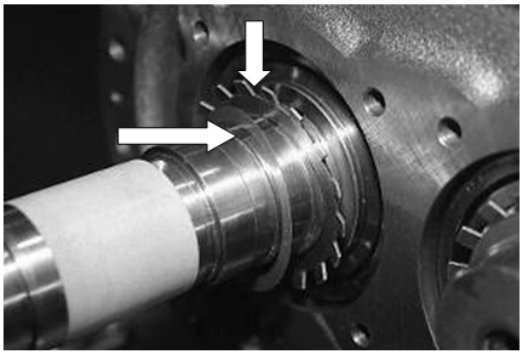
.

c) After installing the thrust bearing, attach the thrust washer [250], lock washer [40], and torsional slip washer [237]. Then, tighten the lock nut [39] at the specified torque or within the specified range of the tightening angle (refer to Chapter 7, Section 7.3 "Tightening Torques for Bolts and Nuts" in this manual) to secure the inner race of the thrust bearing on the rotor shaft.

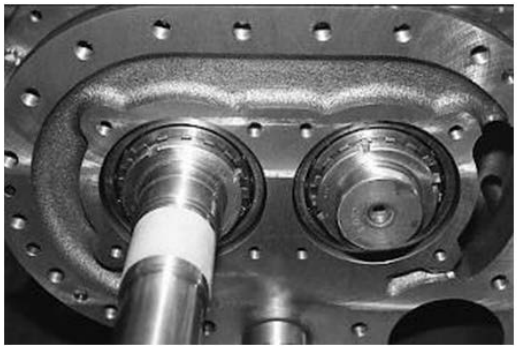
d) After tightening the lock nut, turn the M rotor shaft by hand to make sure that rotation of rotors is smooth.



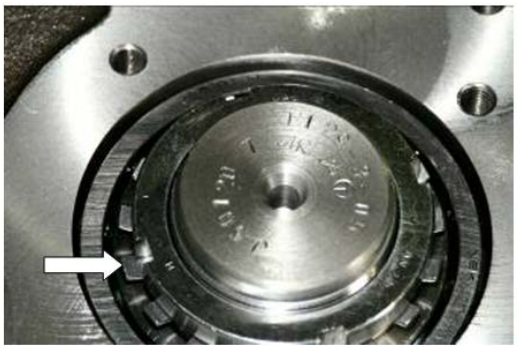
Thrust Washer



Lock Washer and Torsional Slip Washer



After titeging the Lock Nut



Claw for rotation stop

【POINT】

Tightening the lock nut while keeping the setting position between the lock nut wrench hooks and the lock nut notches may cause to make the rotor run-out to enlarge due to uneven tightening forces. Change the setting position between the lock nut wrench hooks and lock nut notches about four times when fastening the lock nut.

CAUTION

- **As clearance fit is used for the inner race of the thrust bearing, this tightening work is very important because the bearing is secured only by the tightening force of the lock nut.**
- **When the thrust bearing has been replaced, the dimensional difference between the sides of the inner race and outer race varies even if it is within the tolerance of the applicable standard specification. As such, if the thickness of the thrust bearing alignment spacer that has been used is insufficient, and if the lock nut is securely tightened from the first, the end clearance between the rotor shaft end and the end face of the discharge side bearing head will be lost. Furthermore, as the balls are pressed against the rolling contact surface to create impression on the surface, it will damage the bearing. To avoid this, gradually tighten the lock nut while rotating the rotor to make sure the outer race is free, until the lock nut is fully tightened. If it comes to require more force to turn the rotor while the lock nut is being tightened, the thickness of the spacer is considered insufficient.**

■ End Clearance Measurement

At this point (i.e., after the thrust bearing block has been fully assembled), measure the end clearance of the rotor on the discharge side.
In particular, this measurement must be made when the thrust bearing has been replaced. Even if the same bearing is used, the measurement should be made for verification.
If the measured clearance does not satisfy the range specified in Table 5-9, proper adjustment must be made.

Table 5-9 Specified Limits of End Clearance (unit: mm)

Model	for Single Stage (High Stage) Use				for Booster (Low stage) Use			
	S	M	L	LL	S	M	L	LL
160V**	0.04～0.06			-	0.20～0.22	0.22～0.24	0.24～0.26	-
200V**	0.05～0.07			-	0.26～0.30	0.28～0.32	0.31～0.35	-
250V**	0.08～0.11				0.40～0.44	0.45～0.49	0.50～0.54	0.55～0.59
320V*D	0.17～0.21	0.20～0.24	0.23～0.27	-	0.70～0.76	0.73～0.79	0.77～0.83	-

a) For pressing the rotor shaft on to the discharge side, hit the rotor shaft strongly from the suction side while putting a jig (Teflon block or like).
b) Prepare the thrust bearing gland to be readily mounted. Mount a dial gauge on the axial end of the rotor, and set the indication needle to zero point while the rotor is fully pressed onto the discharge end face.

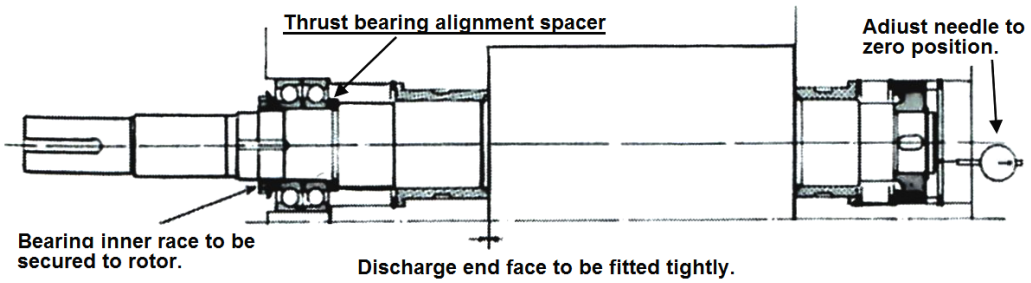


Figure 5-16 End Clearance Measurement Preparation

c) Without inserting the conical spring washer [46], tighten the four fastening bolts [45] of the bearing gland sequentially and evenly up to the specified tightening torque. Tightening each bolt at once at the specified torque must be avoided because it will result in uneven tightening. So Tighten with the procedure shown in 7.3.4.

Table 5-10 Tightening Torques of Thrust Bearing Gland

Model	Bolt Size	Tightening Torque	
		N·m	kgf·cm
160V**	M10x30	40	400
200V**	M12x35	50	500
250V**	M16x45	60	600
320V*D	M20x55	120	1200

d) Then, read the dial gauge indication. This value shows the actual end clearance. If the end clearance is outside the specified value, perform the adjustment work described in the next section. If the end clearance is within the specified value, turn the M rotor shaft by hand and confirm the smooth turning without uneven tightening. And then perform the measurement of the run-out of the rotor shaft described in next section (3).

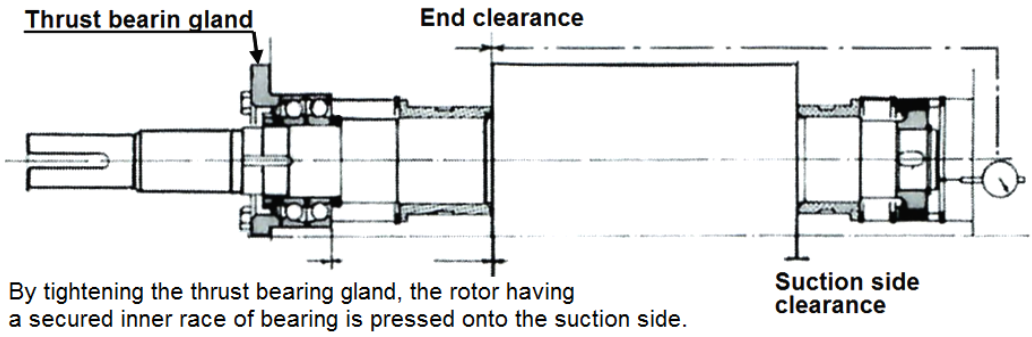


Figure 5-17 Measurement of the End Clearance

■ End Clearance Adjustment Procedure

(1) When the end clearance is less than the specified value
In this case, a shim (thrust adjustment liner) must be inserted between the thrust alignment spacer [42] and the inner race of the thrust bearing to increase the end clearance.
The thickness of the shim must be determined by the difference between the specified end clearance and the measured value.

- ◆ Although the thrust adjustment liner is not shown in the exploded view, you can place an order to us indicating the model name.

Also, in case of 160V** or 200V** models, using a highly accurate surface grinding machine or asking professional service vendors to grind, grind the surface of thrust bearing outer race spacer [41] by the difference from the specified value.
After grinding the flat surface, measure the whole circumference of the outer race spacer by using a micrometer, and check that the thickness is even.

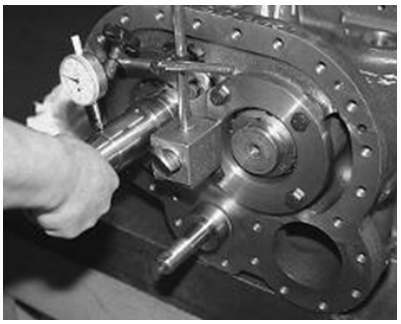
(2) When the end clearance exceeds the specified value
If any shim (thrust adjustment liner) has been inserted between the thrust bearing alignment spacer and the inner race of the thrust bearing, and the thickness corresponds to the difference between the measured end clearance and the specified value, just remove the shim.

If no shim is used or the thickness of the shim is insufficient to compensate for the excess end clearance, use a surface-grinding machine (or ask a vendor) to make the thrust bearing alignment spacer [42] thinner by the amount of the end clearance difference between the measured and specified values. After the surface grinding is done, use a micrometer to measure the thickness of the spacer for the entire circumference to make sure the thickness is even.

(3) Measuring the run-out of the rotor shaft

If the end clearance adjustment has been successfully completed, then measure the run-out of the I M rotor shaft using a dial gauge at the point of the mechanical seal attachment and turning the shaft by hand (see following picture).

A run-out of up to 0.03 mm is acceptable for all models. The run-out occurs if the thickness of the thrust alignment spacer is not even or the marking on the thrust bearing is not properly positioned. And it occurs if fastening the lock nut performed without changing the position of the lock nut wrench. The run-out also becomes significant if any small foreign matter is present in between relevant parts.



If the run-out exceeds the allowable value, disassemble this block again even if the end clearance is within the specified limits, and adjust the relative position of the outer race spacer, alignment spacer and thrust bearing.

This adjustment is very important as any run-out affects the function and service life of the mechanical seal.

■ Tightening after Finishing the End Clearance Adjustment

(1) In case of 160 to 250V** models:

a) Remove a hexagon head bolt [45] which is used to fasten thrust bearing gland [43], and insert the conical spring washer [46] to prevent the bolt loosening. Then, screw and tighten the hexagon head bolt again up to the specified tightening torque. Tighten the rest of bolts [45] in the same manner.

b) Bend the claw of lock washer [40] to the notch of lock nut [39], which tightens the thrust bearing inner race, to prevent the lock nut loosening.

Steps a) and b) can be reversed.

(2) In case of 320V*D models:

a) Remove the fastening bolts [45] and the thrust bearing gland [43].

b) Attach the O-ring [150] to removed thrust bearing gland. Without inserting the conical spring washers in the same manner as in the case of the end clearance measurement/alignment, tighten the hexagon head bolts i n a diagonal sequence, a little at a time, and finally tighten them to the specified torque. (See 7.3.4)

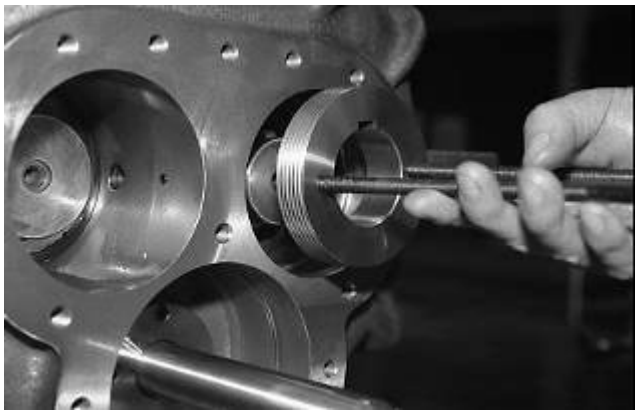
The procedures after this are same step (1) above.

【POINT】

Conical spring washer has been adopted instead of the plate type lock washer from October, 2001. When using the conical spring washers for the compressors produced before this modification, the hexagon head bolt heads may interfere with the bearing cover inner face. In case of overhauling the compressor produced before October, 2011, do not change the lock washer to the conical spring washer.

■ Installing the Balance Piston

Install the balance piston [30] on the M rotor shaft (suction cover side).
Then, use the external retaining ring pliers to install the retaining ring [32], and fix it in position.
Check that the retaining ring is fully seated in the groove.



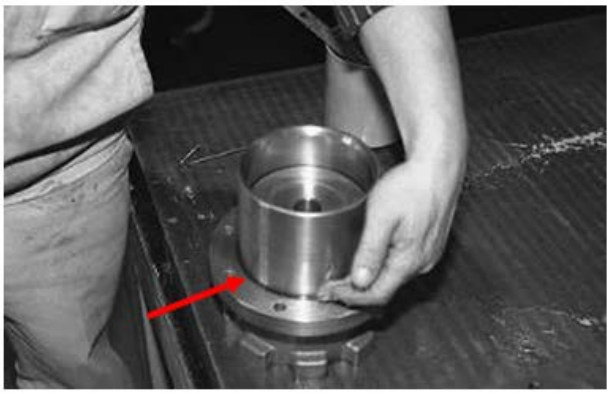
5.5.8 Balance Piston Cover and Unloader Cylinder

The assembly work of this block will become easier if the unloader cylinder is first installed on the balance piston cover [22] and then the resulting assembly is installed on the suction cover [5].

a) Install the O-ring [63] in the O-ring groove on the machined surface of the balance piston cover along which the unloader cylinder is installed.

【POINT】

The fitting position of this O-ring [63] has been changed in Oct. 1996 to the current position shown in following picture to the right from the previous flange surface of the unloader cylinder (following picture to the left).



b) Align the position of the balance piston cover with the unloader cylinder. As no gasket is used on the mating flange between the balance piston cover and unloader cylinder, evenly and thinly apply liquid gasket (made of special synthetic rubber) on the surface of the flange of the unloader cylinder inside from the center of the bolt holes.

c) As the O-ring of the balance piston cover is already installed, lightly tap the flange surface with a soft hammer to install it.

d) When joining the flanges, also align the bolt hole positions if any positioning steel rod is not used. Then, insert two hexagon socket head cap screws [61] in the positions shown in the picture to the right and to fasten the unloader cylinder to the balance piston cover.

e) Install the O-ring [73] in the O-ring groove on the tip of the unloader push rod [67], at the position where the unloader piston is installed.

f) Install the unloader positioning spacer [420] in the unloader push rod [67], and push it to the bottom. How to install the unloader positioning spacer varies depending on the compressor models as shown in Table 5-11 in next page.

Table 5-11 Unloader Positioning Spacer with Model

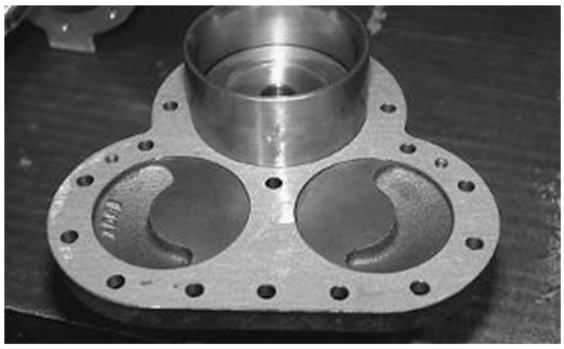
Model	Quantity	
	Positioning Spacer【420】	O-ring【421】
250VLL*	-	-
160 to 250VL*	-	-
160 to 250VM*	1	2
160 to 250VS*	1 (PTFE)	-
320VLD	1	2
320VMD	1	2
320VSD	1	2

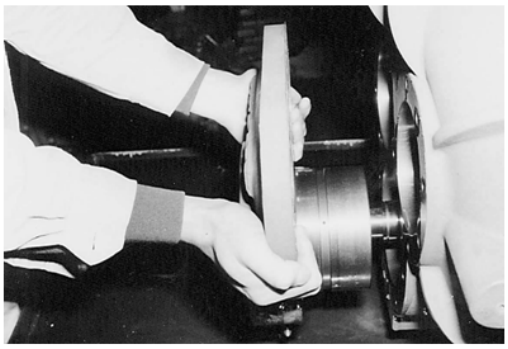
g) Attach the O-ring [65] without lubricating oil on the unloader piston [64], and then install the cap seal [66] on it. It can be smoothly installed by slightly folding the cap seal along the circumferential direction. Also, using a small and smooth spatula (following picture to the left) will facilitate the assembling work.

h) Install the unloader piston fitted with the O-ring and cap seal in the unloader cylinder. One side of the unloader piston is with screw holes for eye bolts, while the other side does not have such holes. First, to make it easier to fit the cap seal on the wall, lightly press one side of the piston onto the chamfered area of the unloader cylinder by hand, changing the side of the piston for several times. Finally, apply lubricating oil to the unloader cylinder, then, push and install the piston with the screw holes side of the piston facing the unloader cover. After the installation, check that the cap seal is not broken or pinched.

i) Push the unloader piston into the unloader cylinder and set it in the middle of the cylinder, pull the unloader push rod [67] toward yourself, and install the balance piston cover with the gasket fitted as shown in following picture to the left onto the suction cover (following picture to the right).

Pushing the piston into the push rod and temporarily fastening the lock nut [69] in the course of the work will make later work easier.





j) After setting the flanges of the suction cover and balance piston cover together, tighten the hexagon socket head cap screws [24] for the balance piston cover and the same ones [62] for the unloader cylinder, the specified torque respectively.

k) Use the eye bolts to pull the piston toward yourself, once remove the temporarily fastened lock nut, install the lock washer [70] and lock nut [69], and then tighten the lock nut at the specified torque.
To prevent loosening, bend the claw of the lock washer at the notch of the lock nut.

m) Lastly, use the M8 eye bolts to check the smooth movement of the piston (slide valve).

5.5.9 Unloader Cover

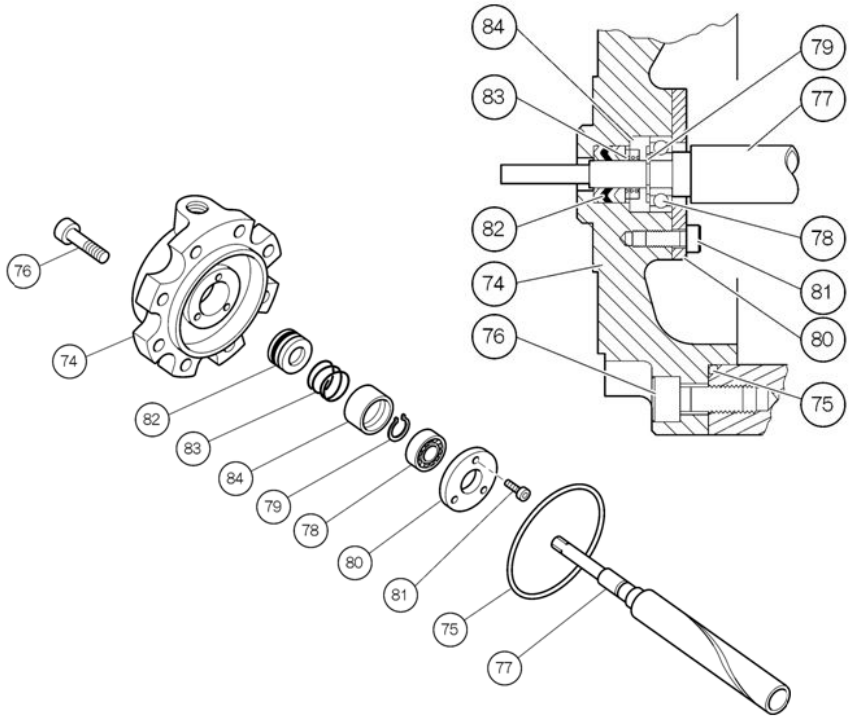


Figure 5-18 Unloader Cover Block

a) Use eye bolts to move the unloader piston back and forth to check the normal operation again.

b) Assemble the ball bearing [78] on the shaft portion of the indicator cam [77]. When fitting the bearing onto the shaft, push the inner race of the bearing. Pushing the outer race may damage the bearing. Push the bearing to the stepped portion of the indicator cam and retain the bearing with the external retaining ring [79].

c) Sufficiently apply oil on the unloader cover [74], and install the V-ring set [82] in it. One of the rings of the V-ring set (i.e., dark colored one) is made of rubber to improve the sealing performance, and is placed as the second item from the outside as shown in Figure 5-18.

   The orientation of the V-ring must be such that the apex of the V-shape faces the outside and the lips face inside.

d) Install the spring [83] and the spring retainer [84] into position. Then, insert the shaft of the indicator cam assembled in Step b) above into the V-ring. Lastly, fasten the bearing gland [80] onto the unloader cover to retain the bearing.

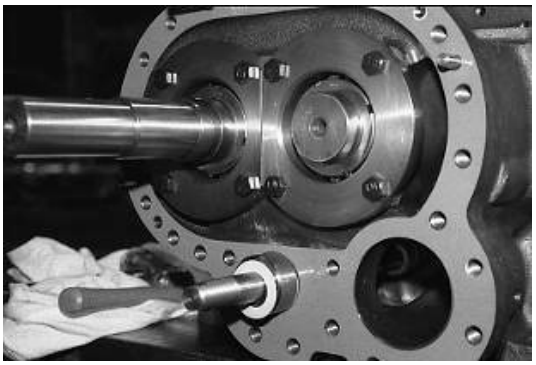
e) After making sure that the indicator cam rotates smoothly, attach the O-ring [75] to the unloader cover.

f) Install the unloader cover on the unloader cylinder [60]. Making sure that the guide pin [68] of the unloader push rod [67] is well engaged in the spiral groove of the indicator cam, push-in the unloader cover.

   With the oil supply hole for the unloader operation up, secure the unloader cover by fastening the hexagon socket head cap screws [76] at the specified torque.

5.5.10 Bearing Cover

a) Install the thrust washer [449], as shown a red arrow in following picture to the left, on the Vi adjusting rod. In case of 320V*D models except other models are installed the Vi adjusting rod retainer [600] as shown in following picture to the right.



b) Before installing the bearing cover [16], check that the claw of the lock washer of the thrust bearing block have been properly bent to prevent rotation and that the hexagon head bolts fastening the thrust bearing gland are with conical spring washers.

c) For ensuring the safety, screw two stud bolts in the upper bolt holes on the flange of the bearing head [11].

d) After applying sufficient amount of oil, etc. on the flange surface of the bearing head as well as on both sides of the gasket [17] for the bearing cover, attach the gasket onto the flange surface, and retain the gasket by hanging at the upper stud bolts.

CAUTION
● **The bearing cover gasket is not symmetric because there is a hole for lubricating oil line to the mechanical seal block in the left (seal) side. Be careful that do not mistake the direction of the gasket when attaching onto the bearing head flange surface. Mistaken the direction of the gasket causes the lubrication failure to the mechanical seal block.**

e) In case of 160V** and 200V** models, holding the bearing cover by your hand and install it on the bearing head. Sideways discharge type compressors have uneven balance so care must be taken when working on them.

For the 250V* and 320V*D models, the bearing cover has a threaded hole for installing a eye bolt in its center-of-gravity position. Screw an eye bolt into this threaded hole, and lift up and install the bearing cover to the bearing head. At this time, while keeping the clearance between the two components' peripheries, make sure not to damage the M rotor's installation area of the Mechanical seal assembly.

f) After correctly setting the position of the alignment pins, lightly tap the flange at different places alternately using a copper hammer or soft hammer to install the cover in position.

g) When the cover has come to the position the bolts can be screwed in, screw in two or three hexagon socket head cap screws and evenly tighten them to reduce the clearance and make the cover contact the bearing head. Then, tighten all the bolts at the specified torque.

CAUTION
● **Since fastening bolts for the bearing cover are used two or three kinds of bolt lengths depending on the models and fitting positions, make sure to confirm the bolt differences in your assembly work of this block.**

5.5.11 Shaft Seal Block

The BBSE (balance bellows single) type of the mechanical seal assemblies used in current standard MYCOM screw compressors as standard specification.

There are other cases where the BOS (balance O-ring single) type seals are used, according to the specification by the customer.

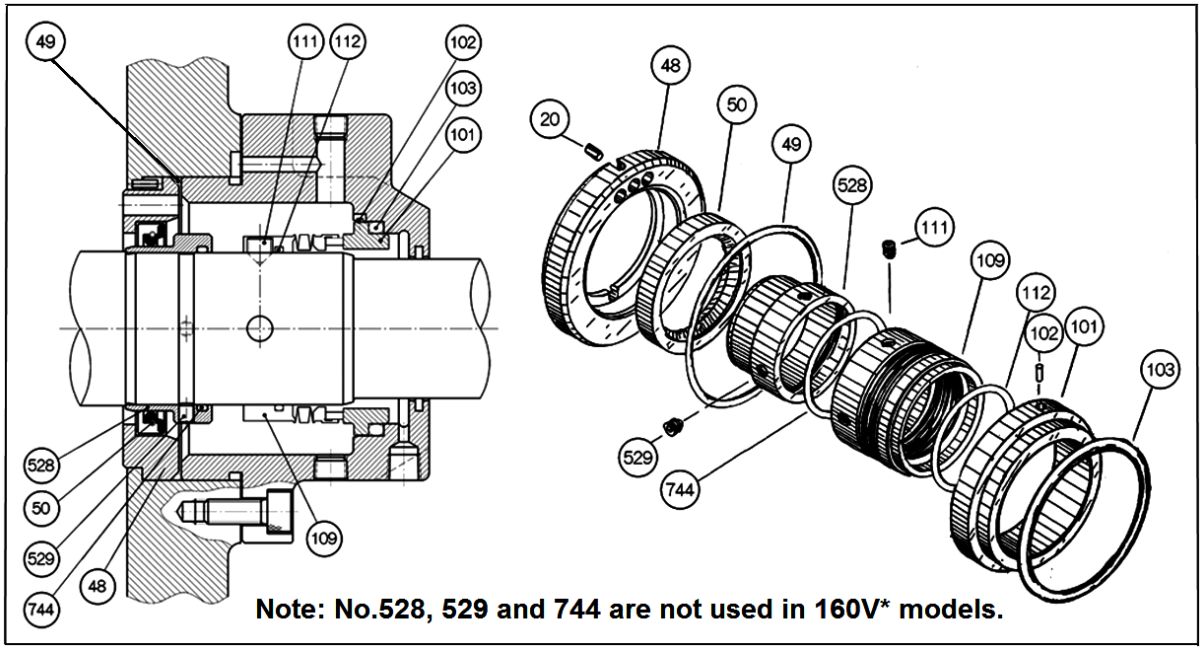


Figure 5-19 BBSE type Mechanical Seal Assembly and Related Parts

a) Before installing the mechanical seal, clean the seal installation area on the rotor shaft. In particular, immediately prior to the assembly, check again that no flaw is present on the step area of the shaft where the seal is to be installed.

b) Install the oil seal [50] on the seal retainer [48]. The installation orientation of the oil seal has been reversed in November 2002 as a design change. While the oil seal had been installed with the oil seal lip facing the direction of the atmosphere, the direction was reversed. This is because excessively high pressure should be avoided by helping the escape of oil from the seal box.

Using a Teflon block or the like as a pad (right above picture), lightly hit the pad to push the oil seal evenly into the retainer until it is fully seated. Once the oil seal is fully inserted, you can easily sense it as the hitting sound as well as the response will change.

After the installation, check that the level difference with the retainer is uniform and that the oil seal is evenly inserted by observing the condition from the opposite side.

c) Insert the O-ring [744] into the inner circumference of the oil seal sleeve [528], and install the sleeve into the oil seal retainer with an O-ring inserted as shown in the right picture.

Note: The oil seal sleeve is not used in 160V** models.

d) Install the oil seal retainer with the oil seal and sleeve (in case of 160V** models, install the oil seal retainer with the oil seal) along the rotor shaft using two M8 eye bolts. At this time, position the oil escape hole of the oil seal retainer on the upper side of the rotor shaft, and accurately align the notch in the retainer with the position of the spring pin [20] that is driven in into the bearing cover to prevent its rotation.

   After the installation, check that it is securely fixed by trying to rotate the retainer with the eye bolts. If the position is correct, the retainer will not rotate.

e) Secure the oil seal sleeve using two set screws [529] on the rotor shaft.

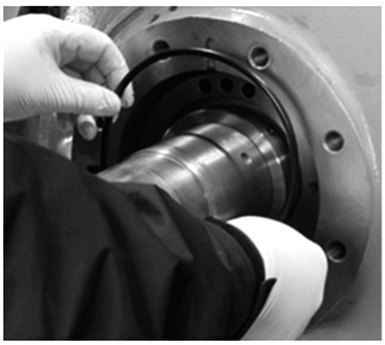
f) Then, insert the O-ring [49] for the oil seal retainer (following picture to the left).

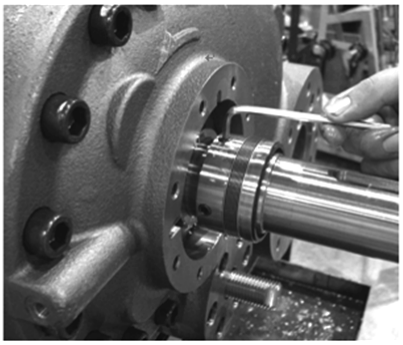
CAUTION

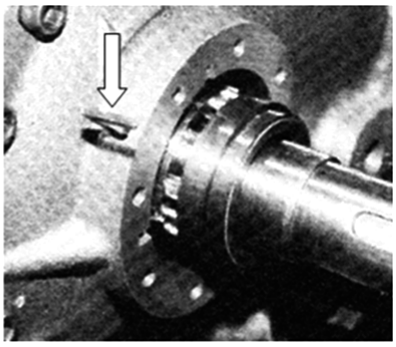
- **You should be particularly careful on this point, as the O-ring [49] for the seal retainer is often forgotten to be installed.**

g) Insert the O-ring [112] on the inner circumference of the seal collar [109], and install the seal collar on the rotor shaft. Before the assembly, apply sufficient lubricating oil onto the rotor shaft and the seal in such a way to wash out dust and stains. Push in the O-ring [112] carefully not to damage it by the step on the rotor shaft (following picture to the left).

h) Fasten the seal collar on the rotor shaft by screwing the two seal collar set screws [111] at the countersinks on the rotor shaft (following picture to the middle and the right). Failing to fasten the screws at the countersink positions will damage the rotor shaft, and it can cause a leakage.



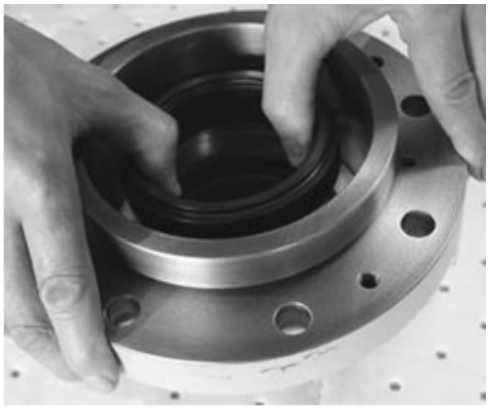




CAUTION

- **Fastening the set screws for the 160V** models seal collar using the machining hole of the bearing cover (see the white arrow part in the picture above to the right) . After fastening the set screws, do not forget fitting the plug.**

i) Install the O-ring [103] for the mating ring and the mating ring [101] on the seal cover [51] (right picture).



j) Apply oil on the seal cover gasket [52] and attach it to the seal cover flange by carefully aligning the oil hole position on the gasket and the one on the flange.

- ◆ In case of the standard internal oil supply system for the shaft seal block, oil is first sent from the bearing cover to the seal cover through the oil supply hole machined on them, then from the notch in the seal cover to the upper part of the seal cover through a groove, and lastly supplied from the oil supply hole in the seal cover to the upper part of the sliding surface of the mechanical seal.

k) Apply and flow sufficient lubricating oil on the sliding surface of the mechanical seal assembly.

m) Install the seal cover with the gasket such that the oil drop tube comes to the bottom side.
At this time, carefully install the seal cover not to hit the mating ring in the seal cover with the rotor shaft. For this, hold the seal cover at the right angle to the rotor shaft or only slightly incline it such that the top side follows the bottom side.

n) At a midway point, the sliding surface of the seal ring comes in contact with that of the mating ring. At this point, use a taper gauge (right picture) to check the clearance between the surfaces of the seal cover gasket and the bearing cover flange.

This clearance is called "fastening margin" of the seal, and is used as a guideline in determining the sliding surface pressure between the rotating ring and stationary ring of the seal. In case of the BBSE type seals for SCV-series, make sure that this value is in the range shown in Table 5-12.

Table 5-12 Fastening Margin of the Seal （mm）

Seal type	160V**	200V**	250V**	320V*D
BBSE	2.0 to 3.0	2.0 to 3.0	3.0 to 4.0	3.5 to 4.5

o) If it is confirmed that the fastening margin of the seal is appropriate, firmly press the seal cover onto the bearing cover. While you will feel the reaction of the seal bellows, keep pressing the cover and fasten two hexagon socket head cap screws [53] evenly to secure the seal cover at opposite positions separated by 180°. When there is no clearance between the surface of the flange and gasket, tighten all other bolts at the specified torque.

p) After tightening the seal cover, supply oil into the seal cover while rotating the rotor shaft (right picture).

After this, do not forget attaching the plug for the oil supply hole of the seal cover.

5.5.12 Unloader Indicator

The specifications of the unloader indicator for SCV-series has been changed from December 2014 Moriya factory production.

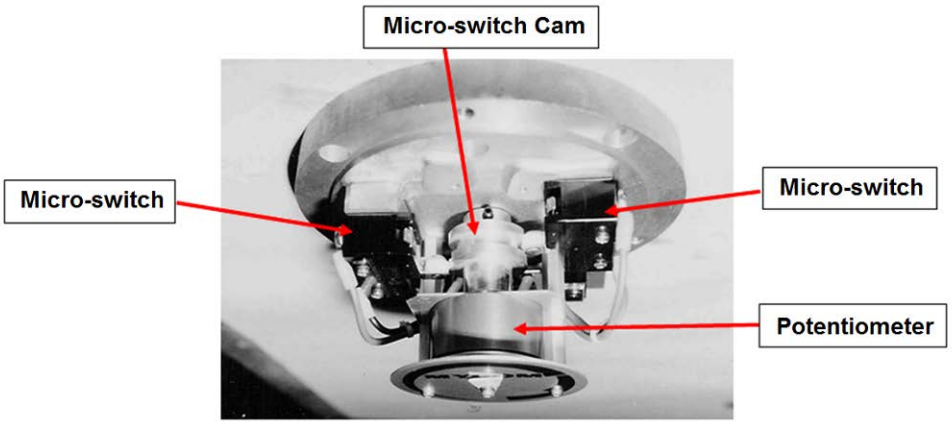
For details of the new indicator specifications indicator after change, refer to the separately dedicated manual. In this manual, previous standard type indicator is the described.

The unloader indicator is implemented with micro switches, micro switch cam, and potentiometer. These parts are used to detect the change in the rotation angle of the indicator cam shaft, which converts the axial position change of the unloader slide valve into rotational position change, convert the change into an electric signal, and send the signal to the package unit and/or the controller of the refrigeration system.

To check the unloader indicator after inspection, adjustment, or parts replacement, coordination with the controller side will be required. Even in a case where the compressor is carried out of the installation site for overhaul, the indicator assembly is often removed from the compressor (to be kept at the site) and the inspection/adjustment and parts replacement are performed at the site. Thus, this section provides a detailed procedure, which may be helpful after the reassembly work.

WARNING

- **When removing the indicator block or performing inspection/adjustment or parts replacement, be sure to shut down the control power and use lock-out and tag-out procedures. If the power is not shut down, there is a risk of electric shock.**



■ Potentiometer

The potentiometer of the indicator is a full-turn potentiometer, and it is used to feedback the unloader slide valve position, in the form of electric signal, to the control system of the package unit or refrigerator system to complete the feedback control system to enable non-incremental, indicated load 0 to 100% continuous control of the load. While the expected service life of the potentiometer will significantly vary depending on the installation environment of the compressor (e.g. corrosive gas atmosphere, moisture, etc.) and operational conditions (e.g. frequent partial load operations, frequent start/stop operation, vibration, etc.), the potentiometer is a consumable part that requires regular replacement according to the situation.

■ Inspection

a) Check at the terminal block that the lead wires of the potentiometer are not loosened.

b) Check for any crack or other defects in the soldering of the lead wires of the potentiometer.

c) Manually rotate the shaft of the potentiometer and measure the resistance value using a circuit tester to check that the resistance value changes smoothly.

■ Micro-switches and Micro-switch Cam

The traditional standard unloader indicator uses two micro-switches and one micro-switch cam to detect the indicated 0 % and 100 % capacity control positions of the unloader slide valve.

If the micro-switch fails or any of these connections becomes loose for some reason, correct position detection cannot be made, and it causes a problem in the operation control of the compressor.

■ Inspection

a) In the normal condition where the hydraulic line for the capacity control of the compressor is not opened, set the unloader piston to the no load and full load positions from the manual capacity control circuit and check the operation of the control circuit to see if the micro-switch can detect the 0 % and 100 % positions of the micro-switch cam (i.e., by checking the operation of the relevant relays and contacts).

b) After shutting down the control power and carrying out the lock-out and tag-out procedures, remove the indicator glass and check that the micro-switch mounting screws [126] are not loosened.

c) Check that the hexagon socket head cap screw (set screw) securing the micro-switch cam [127] are not loosened.

d) After checking that the wiring for the micro-switch has been removed, turn on and off the switch to check the normal switching operation of the micro switch using a circuit tester.

e) If the hydraulic line for the capacity control of the compressor is opened for overhaul or other work, use nitrogen gas or compressed air to set the unloader piston to the no-load and full load positions and check if the micro-switch can detect the 0 % and 100 % positions of the micro-switch cam.

f) Carry out other visual inspection including any indication of water intrusion in the indicator, any rust on switch terminals, any wear of the switch roller or micro-switch cam, and so on.

■ Reassembly

To carry out the reassembly, follow the disassembly procedure in reverse. Lastly, correctly adjust the indicator needle position according to the following procedure:

a) If the hydraulic line for the capacity control of the compressor is opened for the purpose of overhaul or other work, use nitrogen gas or compressed air to set the unloader piston to the no-load position. Then, set and fix the indicator needle to the origin of the figure to show the rotation on the dial.

   Next, set the piston to the full load position. Make sure the indicator needle points to the end point of the figure on the dial.

b) In the normal condition where the hydraulic line for the capacity control is not opened, use the manual capacity control circuit to move the piston.

   While the control power is turned on, the indicator cover must be mounted to prevent possible electric shock.

   Then, after the piston position is fixed, control power is turned off, and the lock-out and tag-out procedures are completed, remove the indicator cover and secure the indicator needle in position.

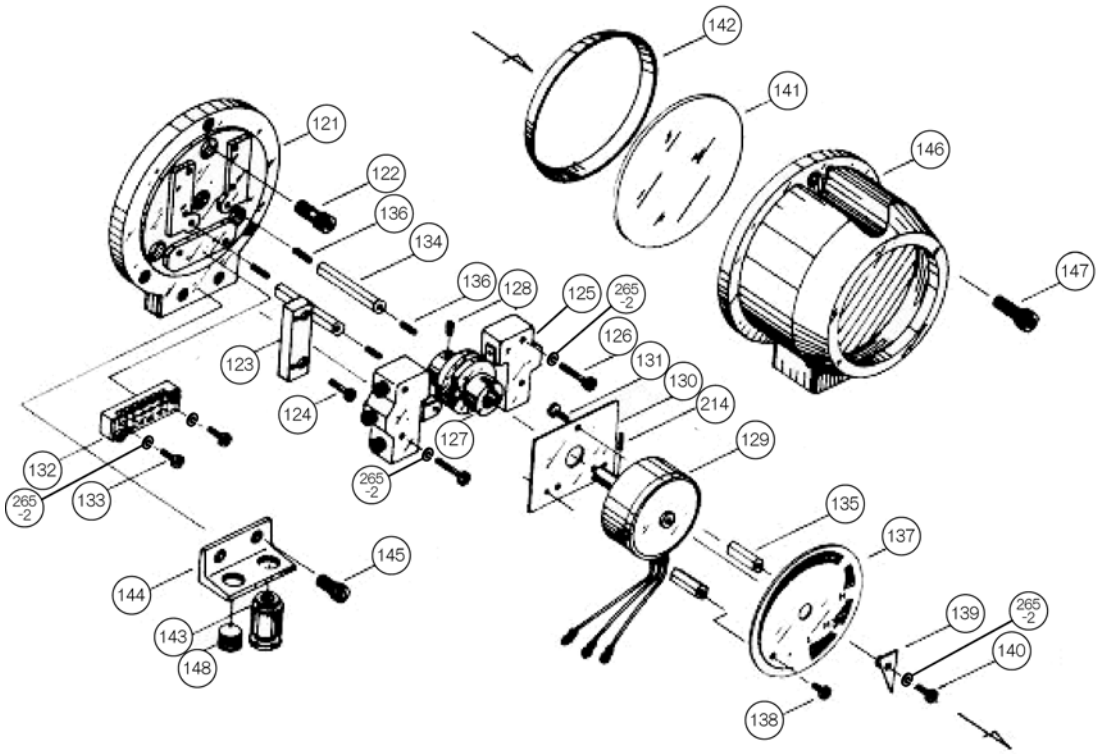


Figure 5-20 Exploded View of the Unloader Indicator (Traditional standard type)

Table 5-13 Component Parts of the Unloader Indicator (Traditional standard type)

P/N	Part Name	Q'ty	P/N	Part Name	Q'ty
121	Micro-switch base plate	1	136	Hexagon socket set screw, M3×14	3
122	Hexagon socket head cap screw, M6×20	3	137	Dial, SCV	1
123	Micro-switch base plate	1	138	Phillips Screw, M3×5	2
124	Phillips Screw, M3×10	2	139	Indicator needle	1
125	Micro-switch	2	140	Phillips Screw, M3×10	1
126	Phillips Screw, M3×25	4	141	Indicator glass	1
127	Micro-switch cam, 0 to 100%	1	142	Indicator glass spacer	1
128	Hexagon socket set screw, M4×8	1	143	Electric cable gland	1
129	Potentiometer	1	144	Bracket	1
130	Potentiometer mounting plate	1	145	Hexagon socket head cap screw, M6×15	2
131	Phillips Screw, M3×5	3	146	Unloader indicator cover	1
132	Terminal block	1	147	Hexagon socket head cap screw, M6×15	3
133	Phillips Screw, M3×20	2	148	Plug	1
134	Dial plate support [2]	2	214	Spring pin 2 dia. ×8	1
135	Dial plate support [1]	2	265-2	Spring washer, M3	7

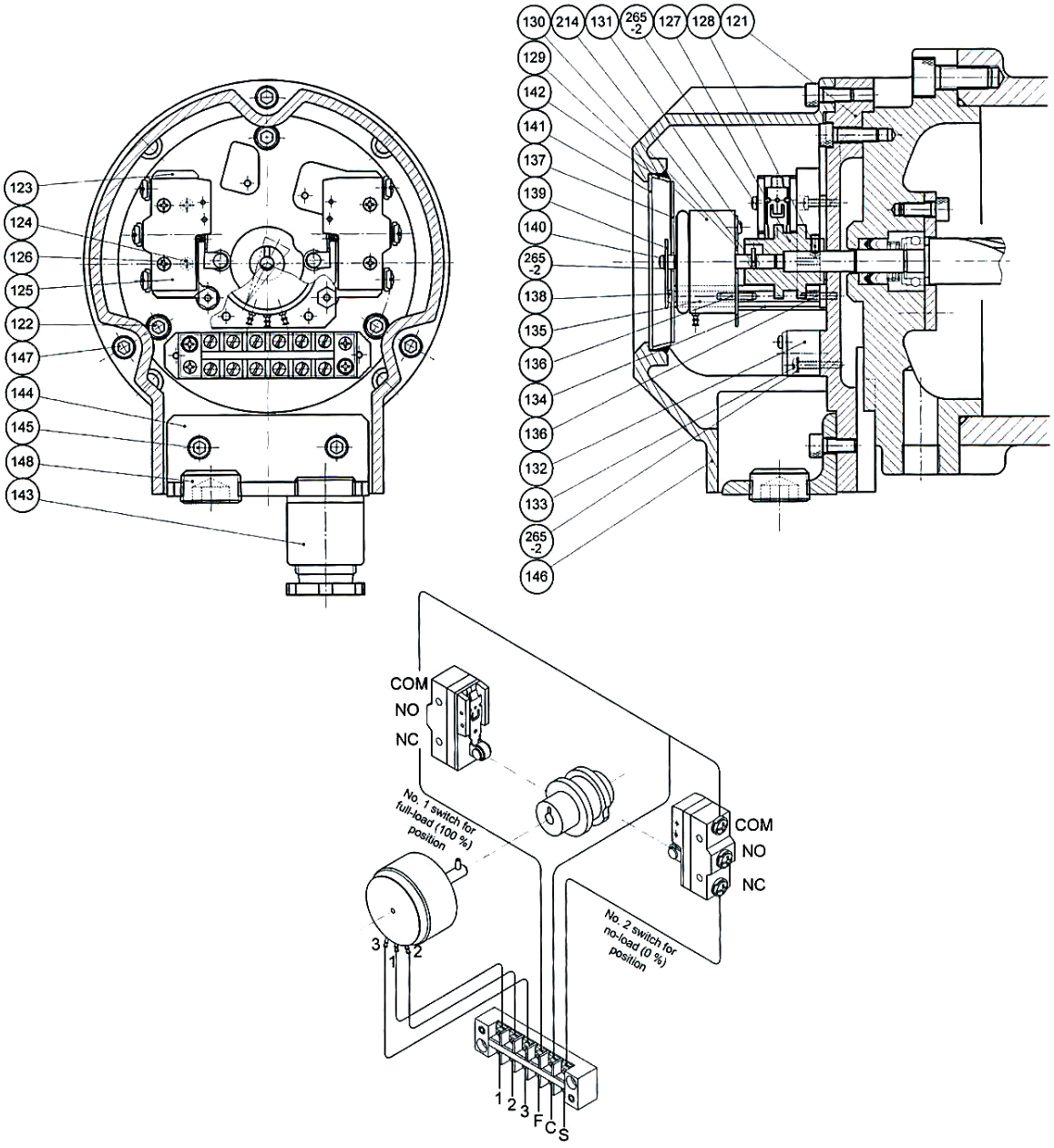
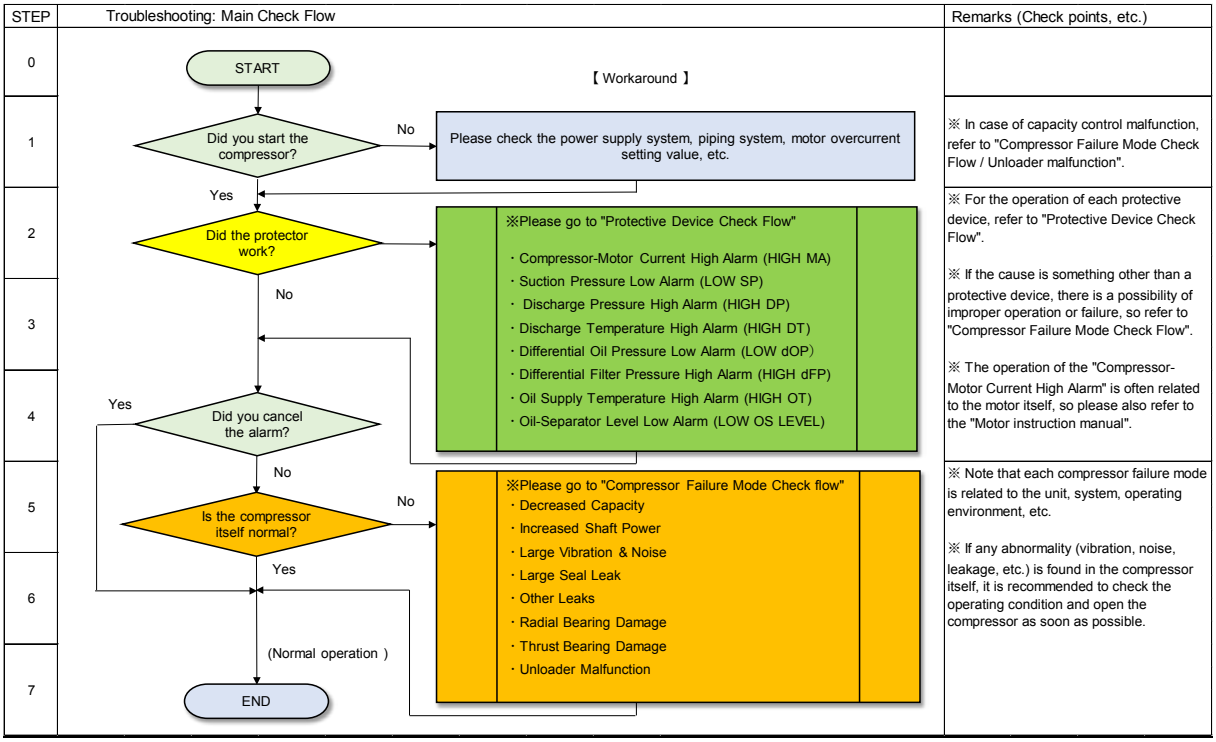


Figure 5-21 Sectional Views of SCV-series Unloader Indicator (Traditional standard type)

Chapter 6 Troubleshooting

6-1 Main Check Flow



Note 1) Please note that this troubleshooting is based on the assumption of our standard compressor unit for freezing and refrigerating, and the contents of the protective device may differ for other units.

Note 2) Explanation of protective device (The name of the protective device below is based on our controller / "MYPRO TOUCH")
Compressor-Motor Current High Alarm: HIGH MA
Suction Pressure Low Alarm: LOW SP
Discharge Pressure High Alarm: HIGH DP
Discharge Temperature High Alarm: HIGH DT
Differential Oil Pressure Low Alarm : LOW dOP
Differential Filter Pressure High Alarm : HIGH dFP
Oil Supply Temperature High Alarm : HIGH OT
Oil-Separator Level Low Alarm : LOW OS LEVEL

Note 3) The oil separator liquid level low protection alarm is applied as necessary.

6-2 Protective Device Check Flow

STEP	Troubleshooting：Compressor-Motor Current High Alarm (HIGH MA)	Remarks (Check points, etc.)
0	START (HIGH MA)	● Detection method: "HIGH MA" alarm activated
1	Isn't the supply voltage fluctuation large? Yes → Please after checking, implement necessary measures (Improvement of voltage fluctuation, etc.)	※ Voltage fluctuation (reference value): Normally, "Motor rated voltage within ± 10%" is recommended.
2	Is the motor overcurrent setting value appropriate? No → Please after checking, implement necessary measures (Review of overcurrent setting value, etc.)	※ Motor overcurrent set value (reference value): Normally, "Motor rated current value x 1.0" is recommended.
3	Isn't the shaft power of the compressor high? Yes → Please after checking, implement necessary measures (Operation adjustment, etc.)	※ Factors: High discharge pressure, Vi mismatch, Excessive oil viscosity, etc. ※ In case of compressor abnormality, refer to "Compressor failure mode check flow / shaft power increase".
4	Are the protective devices and sensors normal? No → Please after inspection, take necessary measures (Replacement, etc.)	※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
5	Is the compressor itself normal? No → Please go to "Compressor failure mode check flow / High Vibration & Noise"	※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
6	Did the problem go away? No → Please contact our sales office or service base	
7	To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Suction Pressure Low Alarm (LOW SP)	Remarks (Check points, etc.)
0	START (LOW SP)	● Detection method: "LOW SP" alarm activated
1	Is the intake valve fully open? No → Please after checking, fully open the suction valve	※ Please thorough check of valve opening before starting compressor
2	Is the suction filter clogged? Yes → Please after inspection, take necessary measures (Cleaning, etc.)	※ Please check the pressure difference before and after the suction filter
3	Is there a shortage of refrigerant circulation? Yes → Please after inspection, take necessary measures (Refrigerant leakage prevention, Refrigerant replenishment, etc.)	※ Factors: Insufficient refrigerant charge, Refrigerant leakage, etc.
4	Is liquid supply (expansion valve) control appropriate? No → Please after inspection, take necessary measures (Optimization of liquid supply control, etc.)	※ Factors: Inappropriate control parameters for liquid supply (expansion valve)
5	Is the evaporator heat transfer tube dirty? Yes → Please after inspection, implement necessary measures (Cleaning, etc.)	※ Please checking the approach temperature of the evaporator (Cooling water outlet temperature-Evaporation temperature)
6	Are the protective devices and sensors normal? No → Please after inspection, take necessary measures (Replacement, etc.)	※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
7	Is the compressor itself normal? No → Please go to "Compressor failure mode check flow / High Vibration & Noise"	※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
8	Did the problem go away? No → Please contact our sales office or service base	
9	To "Main Check Flow"	

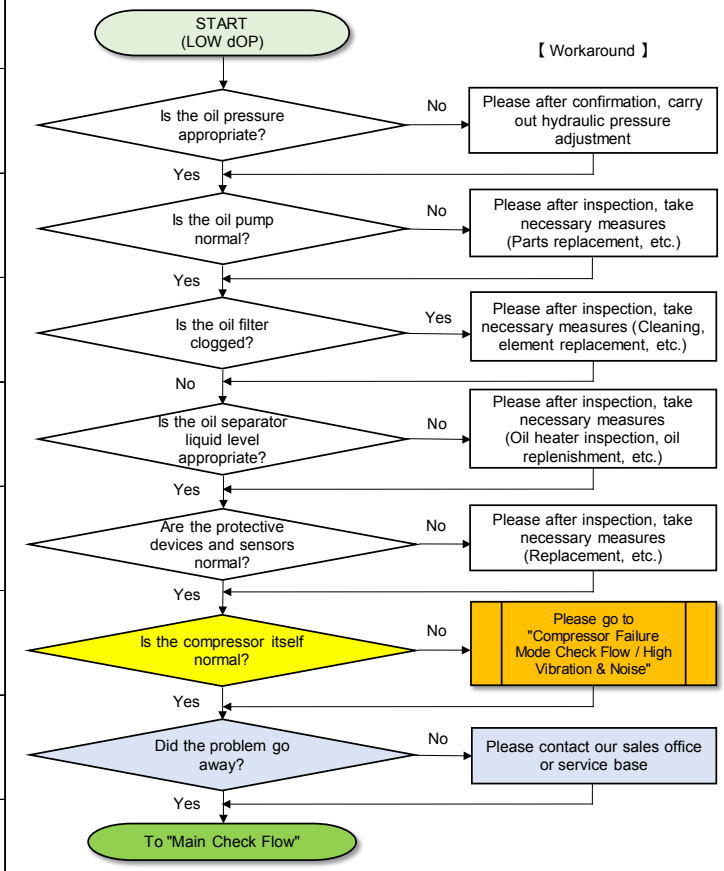
【 Workaround 】

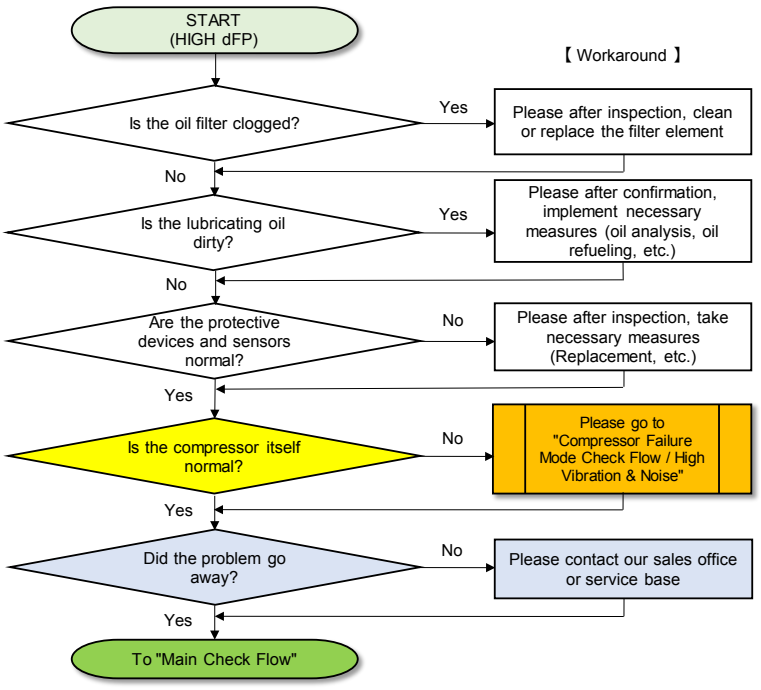
STEP	Troubleshooting：Discharge Pressure High Alarm (HIGH DP)	Remarks (Check points, etc.)
0	START (HIGH DP)	● Detection method: "HIGH DP" alarm activation
1	Is the oil separator outlet valve fully open? — No → Please after checking, fully open the oil separator outlet valve. — Yes	※ Please thoroughly check the valve opening before starting the compressor.
2	Is there a refrigerant overfill? — Yes → Please after confirmation, adjust the amount of refrigerant (liquid level) — No	※ Please note that insufficient cooling is not necessarily a shortage of refrigerant.
3	Is there any non-condensed gas mixed in? — Yes → Please check the condenser purge, suction line leaks — No	※ It is necessary to identify the air mixing location (suction line)
4	Is there a shortage of circulation in the condenser cooling medium? — Yes → Please check the flow path of the cooling medium and take necessary measures (Adjustment, Cleaning, etc.) — No	※ Factors: Inappropriate flow rate adjustment of cooling water and brine, Insufficient circulation, etc.
5	Is the condenser heat transfer tube dirty? — Yes → Please after inspection, take necessary measures (Cleaning, etc.) — No	※ Please check the approach temperature of the condenser (Condensation temperature-Cooling medium outlet temperature)
6	Are the protective devices and sensors normal? — No → Please after inspection, take necessary measures (Replacement, etc.) — Yes	※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
7	Is the compressor itself normal? — No → Please go to "Compressor Failure Mode Check Flow / High Vibration & Noise" — Yes	※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
8	Did the problem go away? — No → Please contact our sales office or service base — Yes	
9	To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Discharge Temperature High Alarm (HIGH DT)	Remarks (Check points, etc.)
0	START (HIGH DT)	● Detection method: "HIGH DT" alarm activation
1	Isn't the degree of suction superheat high? — Yes → Please check the amount of refrigerant circulation and cooling heat load, and implement necessary measures — No	※ Suction superheat degree (reference value): ・NH3：+5～+20℃ ・HFC：+10～+20℃
2	Is there any non-condensed gas mixed in? — Yes → Please check for leaks in the suction line, air purge in the condenser — No	※Confirmation of non-condensed gas contamination: Possible if the difference between "Condensation pressure-Condensation saturation pressure" at stop is large
3	Is the lubrication temperature high? — Yes → Please check the oil temperature setting and insufficient cooling of the oil cooler, and take necessary measures. — No	※ Factors (water-cooled oil cooler): Insufficient flow rate of cooling medium, Dirt on heat transfer tube, etc. ※ Factors (liquid oil cooler): Inappropriate control of liquid supply expansion valve
4	Is there a shortage of refueling? — Yes → Please adjust hydraulic pressure, check for excessive oil viscosity, and take necessary measures — No	※ Please refer to "Protective Device Check Flow / Differential Oil Pressure Low Alarm"
5	Is the discharge gas bypass amount excessive? — Yes → Plese after confirmation, take necessary measures — No	※ Factors: Inappropriate valve opening of start pressure equalizing line, Oil separator oil return line, etc.
6	Are the protective devices and sensors normal? — No → Pleaes after inspection, take necessary measures (Replacement, etc.) — Yes	※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
7	Is the compressor itself normal? — No → Please go to "Compressor Failure Mode Check Flow / High Vibration & Noise" — Yes	※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
8	Did the problem go away? — No → Please contact our sales office or service base — Yes	
9	To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Differential Oil Pressure Low Alarm (LOW dOP)	Remarks (Check points, etc.)
0		● Detection method: "LOW dOP" alarm activated
1		※ Appropriate hydraulic pressure (reference value)： ・Pressurized lubrication：Poil≒Pd+0.20MPa ・Differential pressure lubrication：Poil≧Pd−0.15MPa
2		※ If there is an abnormal noise, carry out an open inspection
3		※ In case of lubricating oil contamination, refueling is recommended ※ Especially when there is metal powder, there is a possibility of a malfunction inside the compressor, so be careful.
4		※ Factors: Refrigerant stagnation when stopped,Oil return, Oil leak, etc. ※ Please see "Protective Device Check Flow / Oil-Separator Low Level Alarm"
5		※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
6		※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
7		
8		

STEP	Troubleshooting：Differential Filter Pressure High Alarm (HIGH dFP)	Remarks (Check points, etc.)
0		● Detection method: "HIGH dFP" alarm activation
1		※ Especially at the beginning of system startup, it is recommended to check the oil filter.
2		※ In case of lubricating oil contamination, refueling is recommended ※ Especially when there is metal powder, there is a possibility of a malfunction inside the compressor, so be careful.
3		※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
4		※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
5		
6		

STEP	Troubleshooting：Oil Supply Temperature High Alarm (HIGH OT)	Remarks (Check points, etc.)
0	START (HIGH OT) 【Workaround】	● Detection method: "HIGH OT" alarm activation
1	Is the lubrication temperature high? Yes → Please after confirming the refueling temperature set value, take necessary measures No	※Refueling temperature (approximate value): ・Recommended 40～50 ℃ (Usage range: 20～70 ℃, but 20～55 ℃ when used in an explosion-proof area)
2	Is there insufficient cooling of the oil cooler? Yes → Please after confirmation, take necessary measures (Cleaning, etc.) No	※ Factors (Water-cooled oil cooler): Insufficient flow rate of cooling medium, Dirt on heat transfer tube, etc. ※ Factor (Liquid oil cooler): Inappropriate control of liquid supply expansion valve
3	Are the protective devices and sensors normal? No → Please after inspection, take necessary measures (Replacement, etc.) Yes	※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
4	Is the compressor itself normal? No → Please go to "Compressor Failure Mode Check Flow / High Vibration & Noise" Yes	※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
5	Did the problem go away? No → Please contact our sales office or service base Yes	
6	To "Main Check Flow"	

STEP	Troubleshooting：Oil-Separator Level Low Alarm (LOW OS LEVEL)	Remarks (Check points, etc.)
0	START (LOW OS LEVEL) 【Workaround】	● Detection method: "LOW OS LEVEL" alarm activated
1	Is there any refrigerant falling asleep when stopped? Yes → Please check the oil heater, replace it in case of failure No	※ Factors: Oil heater failure, Discharge check valve leak, Excessive solubility of refrigerant in oil, etc.
2	Is the oil return (device) normal? No → Refrigerant circulation amount, oil return line confirmation, optimization Yes	※ Factors: Insufficient refrigerant circulation, Blockage of oil return flow path, etc.
3	Are the protective devices and sensors normal? No → Please after inspection, take necessary measures (Replacement, etc.) Yes	※ If the cause is something other than a protective device, there is a possibility of improper operation or failure, so refer to "Compressor Failure Mode Check Flow".
4	Is the compressor itself normal? No → Please go to "Compressor Failure Mode Check Flow / High Vibration & Noise" Yes	※ Factors: Eigenvalue resonance, Alignment failure, Oil compression phenomenon, Bearing damage, etc.
5	Did the problem go away? No → Please contact our sales office or service base Yes	
6	To "Main Check Flow"	

6-3 Compressor Failure Mode Check Flow

STEP	Troubleshooting：Decreased Capacity	Remarks (Check points, etc.)
0	START (Decreased Capacity)	● Detection method: Freezing / refrigerating time
1	Is the suction filter clogged? Yes → Please after inspection, take necessary measures (Opening, cleaning, etc.)	※ Especially at the beginning of system startup, it is recommended to check the intake filter.
2	Is the suction check valve operating normally? No → Please after inspection, take necessary measures (Opening, parts replacement)	※ A malfunction of the suction check valve may cause a reverse rotation phenomenon of the drive shaft during the compressor stop operation, leading to a compressor failure.
3	Is there a possibility of a leak inside the compressor? Yes → Please after disassembling and inspecting the compressor, take necessary measures (Parts replacement, etc.)	※ Please inspect the oil filter ※ Factors: Increased end clearance, Increased rotor tooth clearance, etc.
4	Did the problem go away? No → Please contact our sales office or service base	
5	Yes → To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Increased Shaft Power	Remarks (Check points, etc.)
0	START (Increased Shaft Power)	● Detection method: Compressor motor current
1	Is the suction pressure high? Yes → Please after investigating the cause, take necessary measures (Reduction of suction pressure, etc.)	※ Factors: Excessive cooling load, Decrease in compression function, etc. ※ Suction pressure usage limit: Please see "2.3.2 Usage limit"
2	Is the discharge pressure high? Yes → Please after investigating the cause, take necessary measures (Reduction of discharge pressure, etc.)	※ Factors: Refrigerant overfilling, Condenser cooling insufficient, etc. ※ Please see "Protective Device Check Flow / Discharge Pressure High Alarm"
3	Isn't the oil viscosity high? Yes → Please after investigating the cause, take necessary measures (Oil viscosity optimization, etc.)	※ Factors: Low refueling temperature, Improper oil type selection, etc. ※ Recommended lubrication viscosity： 13～40mm^2/s
4	Is there a possibility of a leak inside the compressor? Yes → Please after disassembling and inspecting the compressor, take necessary measures (Parts replacement, etc.)	※ Factors: Increased end clearance, Increased rotor tooth clearance, etc.
5	Is the compressor itself normal? No → Please go to "Compressor Failure Mode Check Flow / Vibration & Noise"	※ Factors: Eigenvalue resonance, Poor alignment, Oil compression phenomenon, Bearing damage, etc.
6	Did the problem go away? No → Please contact our sales office or service base	
7	Yes → To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Large Vibration & Noise	Remarks (Check points, etc.)
0	START (Large Vibration & Noise) 【 Workaround 】	● Detection method: Vibration & Noise
1	Is there a misalignment? Yes → Please after checking, implement necessary measures (In the case of a monocoque unit, a hot alignment is implemented) No	※ Vibration frequency: Primary or secondary component of rotation
2	Is the support rigidity of the gantry insufficient? Yes → Please after confirming the eigenvalues, take necessary measures (Strengthening the rigidity of the gantry, etc.) No	※ It is necessary to check if there is eigenvalue resonance (rotational primary component, compression primary component, etc.)
3	Does the oil compression phenomenon occur? Yes → Please take necessary measures after confirming long-term low-load operation and high oil viscosity. No	※ Oil compression phenomenon: An abnormal compression phenomenon accompanied by high-frequency impact noise. ※ Factors: High-viscosity refueling, Excessive oil volume, Long-term low-load operation, etc.
4	Is there a possibility of bearing damage? Yes → Please after disassembling and inspecting the compressor, take necessary measures (Parts replacement, etc.) No	※Please see "Compressor Failure Mode Check Flow / Bearing Damage"
5	Is there a possibility of unbalance vibration? Yes → Please after disassembling and inspecting the compressor, take necessary measures (Rebalance adjustment, etc.) No	※ Vibration frequency: Primary rotation component
6	Did the problem go away? No → Please contact our sales office or service base Yes	
7	To "Main Check Flow"	

STEP	Troubleshooting：Large Seal Leak	Remarks (Check points, etc.)
0	START (Large Seal Leak) 【 Workaround 】	● Seal leakage amount (reference value)： ・Allowable leak amount≦3～ 6 mL/hour ・Inspection ieak amount＞9～18 mL/hour
1	Is it the initial familiar operation period? Yes → Please continuous monitoring up to about 200 hours of operation time No	※ The initial familiar operation time may vary depending on the mechanical seal model and rotation speed.
2	Is there excessive start / stop (≧ 4 times / hour)? Yes → Please after reexamining the operating conditions, control changes, etc. No	※ Continuing excessive start and stop may cause surface roughness of the seal sliding surface.
3	Is the lubricating oil (oil type, cleanliness, etc.) appropriate? No → Please after confirmation, take necessary measures (Oil filter cleaning, etc.) Yes	※ In particular, PAG-based synthetic oil needs to be handled with care. ※ Oil cleanliness (approximate value): NAS1638 8th grade (or ISO4406 20/17/14) or less
4	Isn't the refrigerant rich refueling? Yes → Please after checking, implement necessary measures (Liquid bag, improvement of refrigerant solubility in oil, etc.) No	※ Refrigerant solubility in oil (reference value): ≦15 wt% ※ Discharge superheat degree (reference value): ≧25℃
5	Is there a long-term suspension (≧ 1 week)? Yes → Please operate regularly or close the suction & discharge valve. No	※ In the case of long-term stop, oil may run out on the seal surface, so regular manual operation of the oil pump and turning of the drive shaft are recommended.
6	Is it a leak amount that can continue operation? No → Please after disassembling and inspecting the mechanical seal, take necessary measures. (Replacement, etc.) Yes	※ Mechanical seals need to be inspected for 8000 hours or annually in principle
7	Did the problem go away? No → Please contact our sales office or service base Yes	
8	To "Main Check Flow"	

STEP	Troubleshooting：Other Leaks	Remarks (Check points, etc.)
0	START (Other Leaks)	● Detection method: Visual confirmation, soapy water or gas leak detection spray, gas leak detector, etc.
1	Is it a leak in the screw joint / plug part? Yes → Please after inspection, take necessary measures (Reconstruction of sealing tape, etc.) / No	※ If there is oil leakage, it is recommended to use sealing tape + liquid gasket (ThreeBond TB1184) together.
2	Is it a leak in the O-ring? Yes → Please after disassembling and inspecting the compressor, take necessary measures (O-ring, parts replacement, etc.) / No	※ When installing the O-ring, it is recommended to apply a silicone sealant (Hermesir SS-60C).
3	Is it a leak in the gasket? Yes → Please after disassembling and inspecting the compressor, take necessary measures (Gasket / parts replacement, etc.) / No	※ Factors: Gasket assembly error, Gasket deterioration / damage, etc.
4	Is it an acceptable level of leakage? No → Please after inspection, take necessary measures / Yes	※ Overhaul is recommended if necessary
5	Did the problem go away? No → Please contact our sales office or service base / Yes	
6	To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Radial Bearing Damage (Main bearing, Side bearing)	Remarks (Check points, etc.)
0	START (Radial Bearing Damage)	● Detection method: Vibration & Noise, Oil filter drain (bearing metal powder), etc.
1	Is there any foreign matter mixed in the oil? Yes → Please after oil analysis, take necessary measures (Parts replacement, filter cleaning, etc.) / No	※ Recommended cleanliness: NAS1638 8th grade or less (or ISO4406 20/17/14) or less ※ Be careful especially when non-ferrous metal powder is found in the filter trap.
2	Is there an overload effect? Yes → Please after investigating the cause, take necessary measures (Oil compression, improvement of Vi mismatch, etc.) / No	※ Oil compression phenomenon: high-viscosity refueling, excessive oil volume, long-term low-load operation, etc. ※ Vi mismatch: Insufficient compression or overcompression with respect to the internal volume
3	Is the oil viscosity too low? Yes → Please after investigating the cause, take necessary measures (Oil type, solubility of refrigerant in oil, etc.) / No	※ Recommended lubrication viscosity：13～40mm^2/s ※ Refrigerant solubility in oil (reference)：≦15wt%
4	Is there a corrosive component (H_2S) in the oil? Yes → Please after investigating the cause, take necessary measures (Oil type, gas type, etc.) / No	※ Hydrogen sulfide (H_2S): Be careful because even a small amount of water will corrode and reduce the thickness of the bearing metal.
5	Is the damage level capable of continuous operation? No → Please after overhaul, take necessary measures (Parts replacement, etc.) / Yes	※ Vibration value evaluation by vibration survey by screw vibration diagnosis (V-DOC), etc.
6	Did the problem go away? No → Please contact our sales office or service base / Yes	
7	To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Thrust Bearing Damage (Angular contact ball bearing)	Remarks (Check points, etc.)
0	START (Thrust Bearing Damage)	● Detection method: Vibration & Noise, Oil filter drain (bearing metal powder), etc.
1	Is there any foreign matter mixed in the oil? Yes → Please after oil analysis, take necessary measures (Parts replacement, filter cleaning, etc.)	※ Recommended cleanliness: NAS1638 8th grade or less (or ISO4406 20/17/14) or less ※ Be careful especially when non-ferrous metal powder is found in the filter trap.
2	Is there an overload effect? Yes → Please after investigating the cause, take necessary measures (Oil compression, improvement of Vi mismatch, etc.)	※ Oil compression phenomenon: high-viscosity refueling, excessive oil volume, long-term low-load operation, etc. ※ Vi mismatch: Insufficient compression or overcompression with respect to the internal volume ratio, etc.
3	Is the oil viscosity too low? Yes → Please after investigating the cause, take necessary measures (Oil type, solubility of refrigerant in oil, etc.)	※ Recommended lubrication viscosity：13～40mm^2/s ※ Refrigerant solubility in oil (reference)：≦15wt%
4	Is there a corrosive component (H_2S) in the oil? Yes → Please after investigating the cause, take necessary measures (Oil type, gas type, etc.)	※ Hydrogen sulfide (H_2S): Be careful because even a small amount of water will corrode and reduce the thickness of the bearing metal.
5	Is the locknut for bearings loose? Yes → Please after overhaul and check, if there is any abnormality, take necessary measures (Parts replacement)	※ Signs of loose bearing locknuts: performance degradation, vibration & noise increase, etc.
6	Is the damage level capable of continuous operation? No → Please after overhaul and check, if there is any abnormality, take necessary measures (Component replacement)	※ Prediction of remaining life by vibration investigation with screw vibration diagnosis (V-DOC), etc. ※ Early overhaul is recommended as thrust bearing damage can lead to serious compressor failure.
7	Did the problem go away? No → Please contact our sales office or service base	
8	To "Main Check Flow"	

【 Workaround 】

STEP	Troubleshooting：Unloader Malfunction	Remarks (Check points, etc.)
0	START (Unloader Malfunction)	● Detection method: Load instruction value of compressor and controller (Load%)
1	Is the capacity control activated frequently? Yes → Please after investigating the cause, take necessary measures (Review of capacity control, etc.)	※ Capacity control operation frequency (reference): ≦20 times/hours
2	Is there a long time low road operation? Yes → Please after investigating the cause, take necessary measures (Review of capacity control, etc.)	※ Low load operation (approximate): Operation with an indicated load of less than 30% continues for 30 minutes or more except at startup.
3	Is it a malfunction of the solenoid valve for capacity control? Yes → Please after inspection, take necessary measures (Solenoid valve replacement, presence or absence of electric leakage, etc.)	※ Factors: Solenoid valve coil burnout / aging deterioration, Water wetting, etc.
4	Is the unloader piston malfunctioning? Yes → Please after overhaul, take necessary measures (Parts replacement, oil analysis, etc.)	※ Factors: Leakage in the cap seal, Gas accumulation in the unloader cylinder, etc.
5	Is it a malfunction of the unloader indicator? Yes → Please after overhaul, take necessary measures (Part replacement, control review, etc.)	※ Factors: Looseness of indicator needle tightening screw, Displacement of cylindrical cam, Wear of push rod grooved pin, Potentiometer failure, Terminal block corrosion, Micro switch failure, etc.
6	Did the problem go away? No → Please contact our sales office or service base	※ Operation check when stopped: Check if there is any mechanical abnormality (whether the dial hands move normally, etc.)
7	To "Main Check Flow"	

【 Workaround 】

Chapter 7 Related Documents

7.1 Exploded Views and Sectional Views

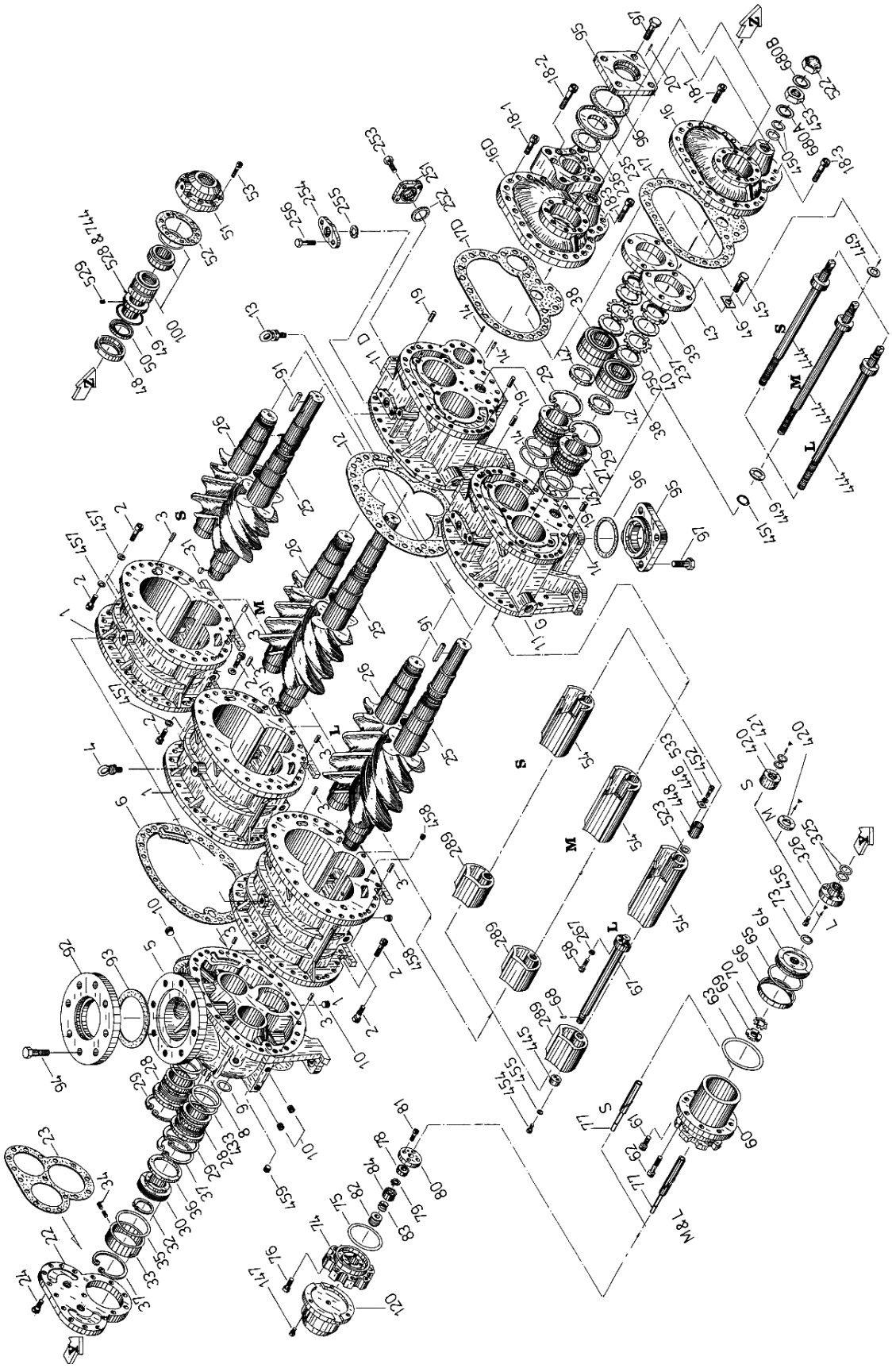


Figure 7-1 Exploded View (160 to 250V model)**

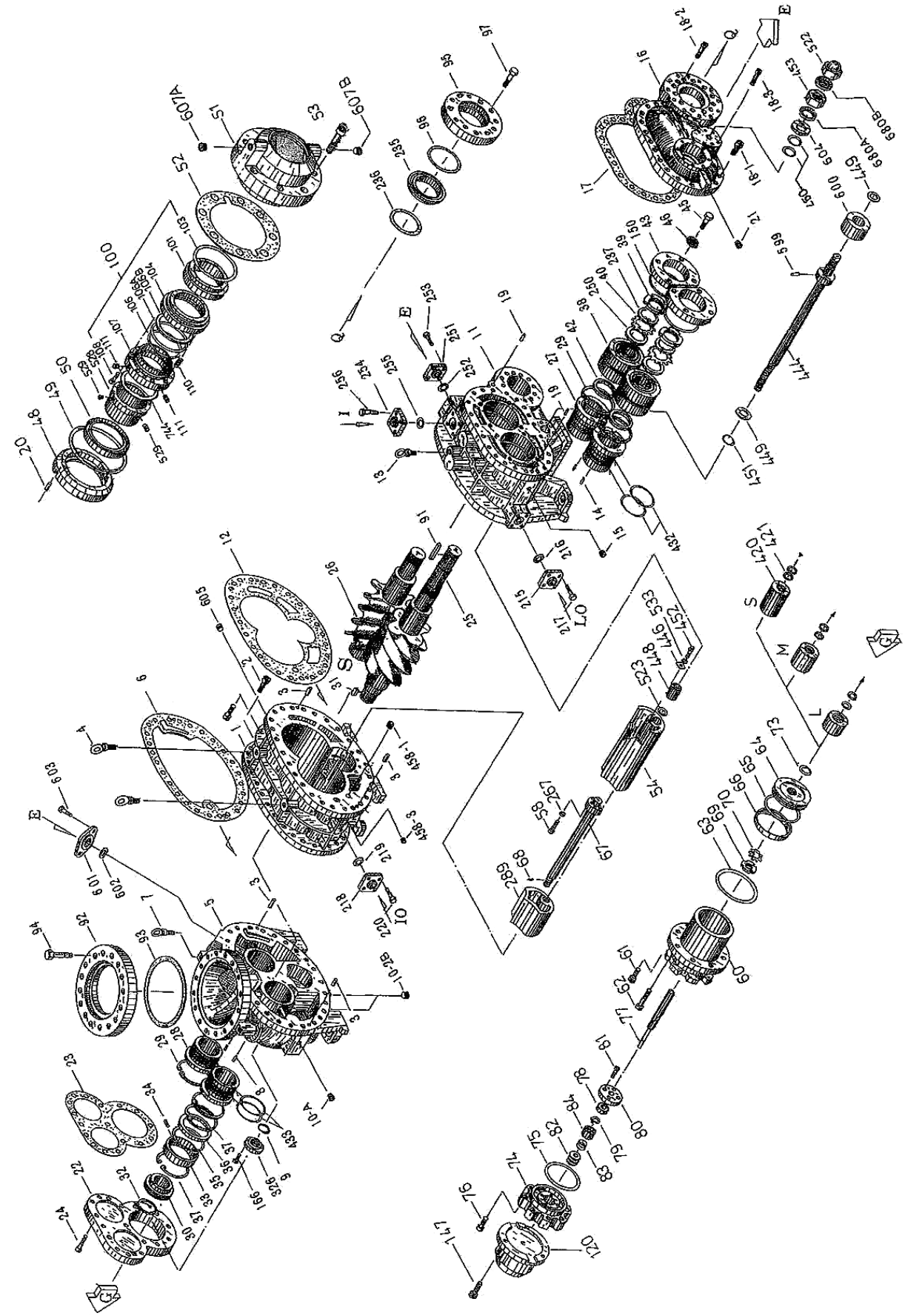


Figure 7-2 Exploded View (320V*D model)

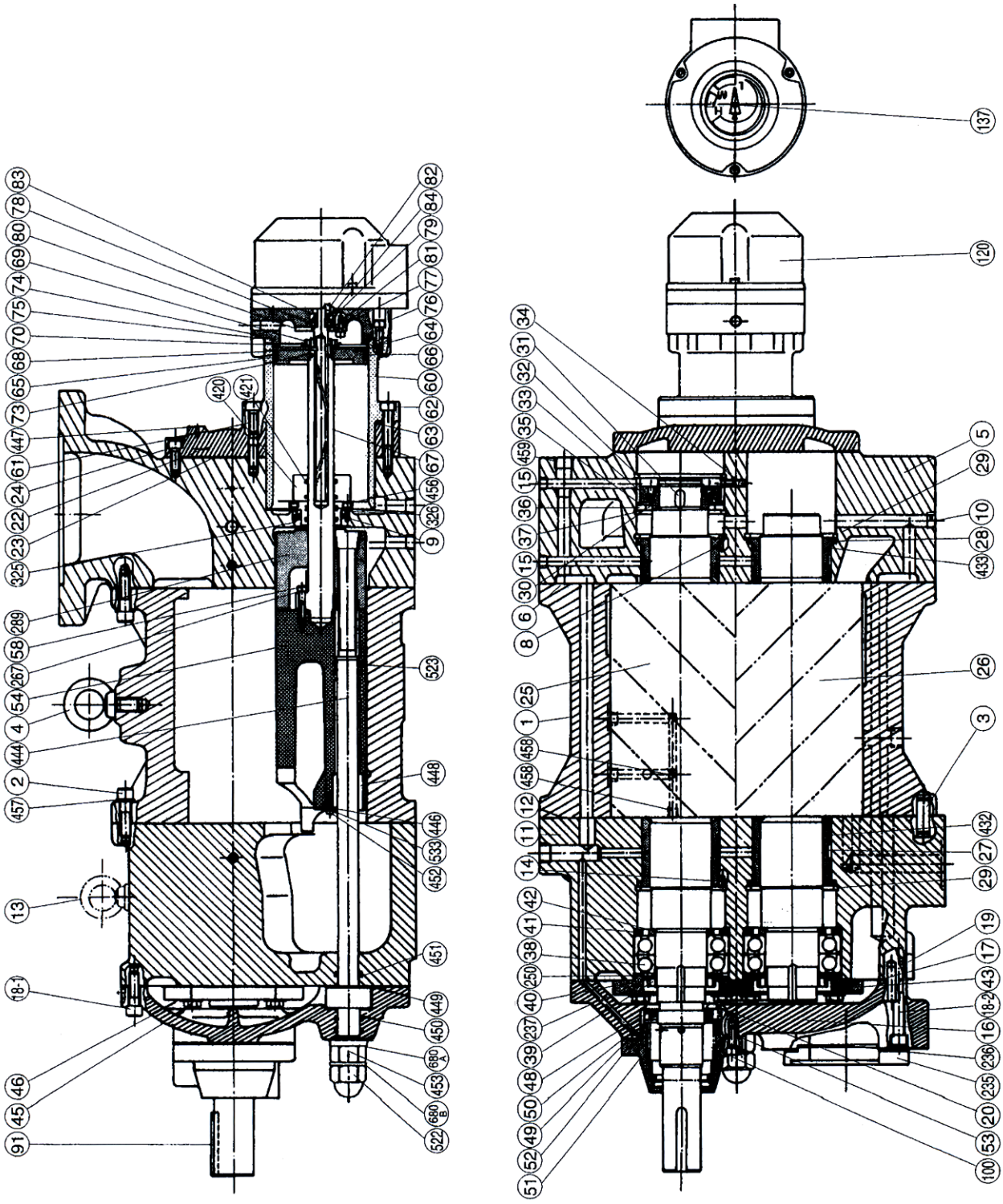


Figure 7-3 Sectional View (160 to 250V*D model)

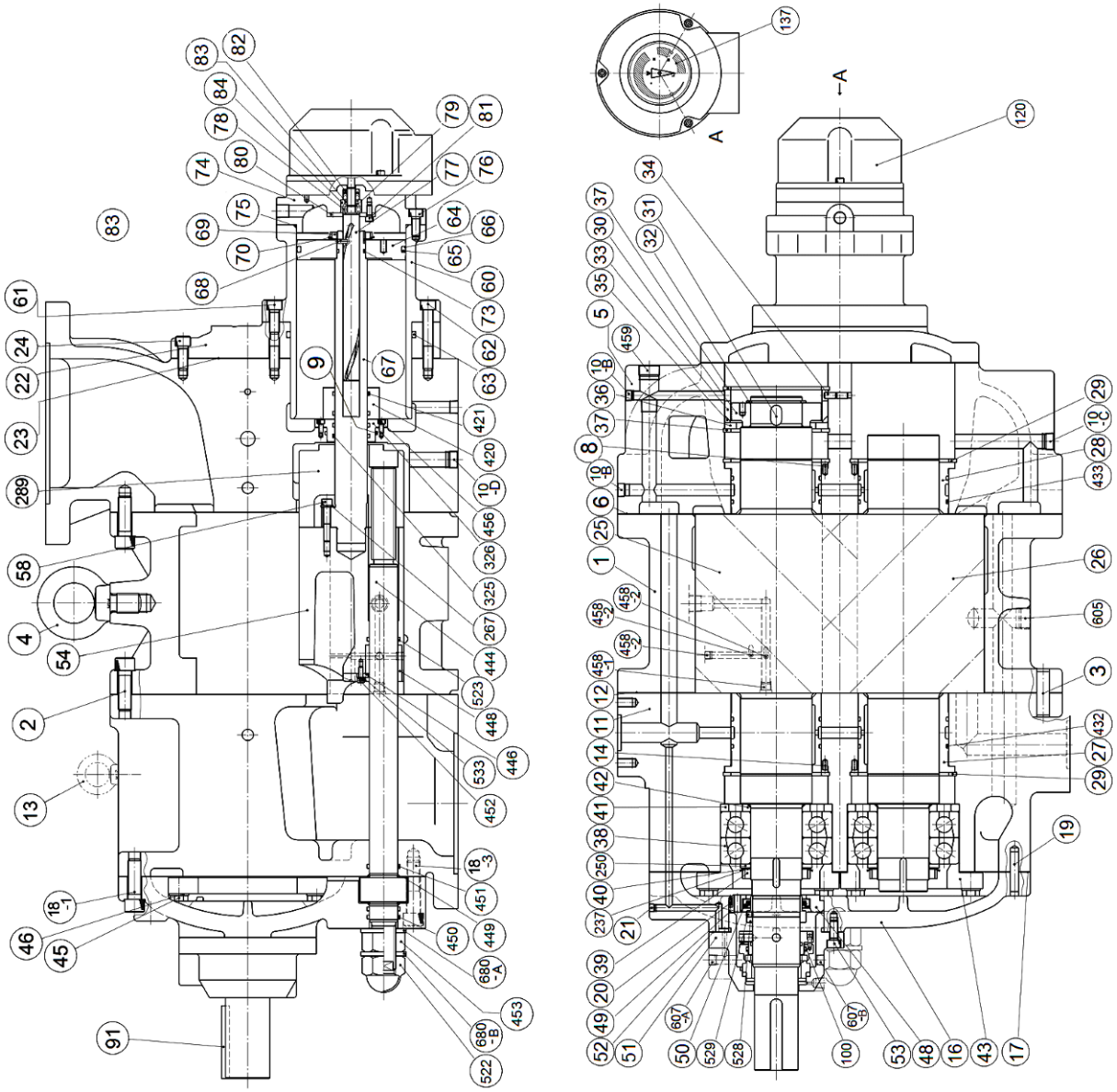


Figure 7-4 Sectional View (160 to 250V*G model)

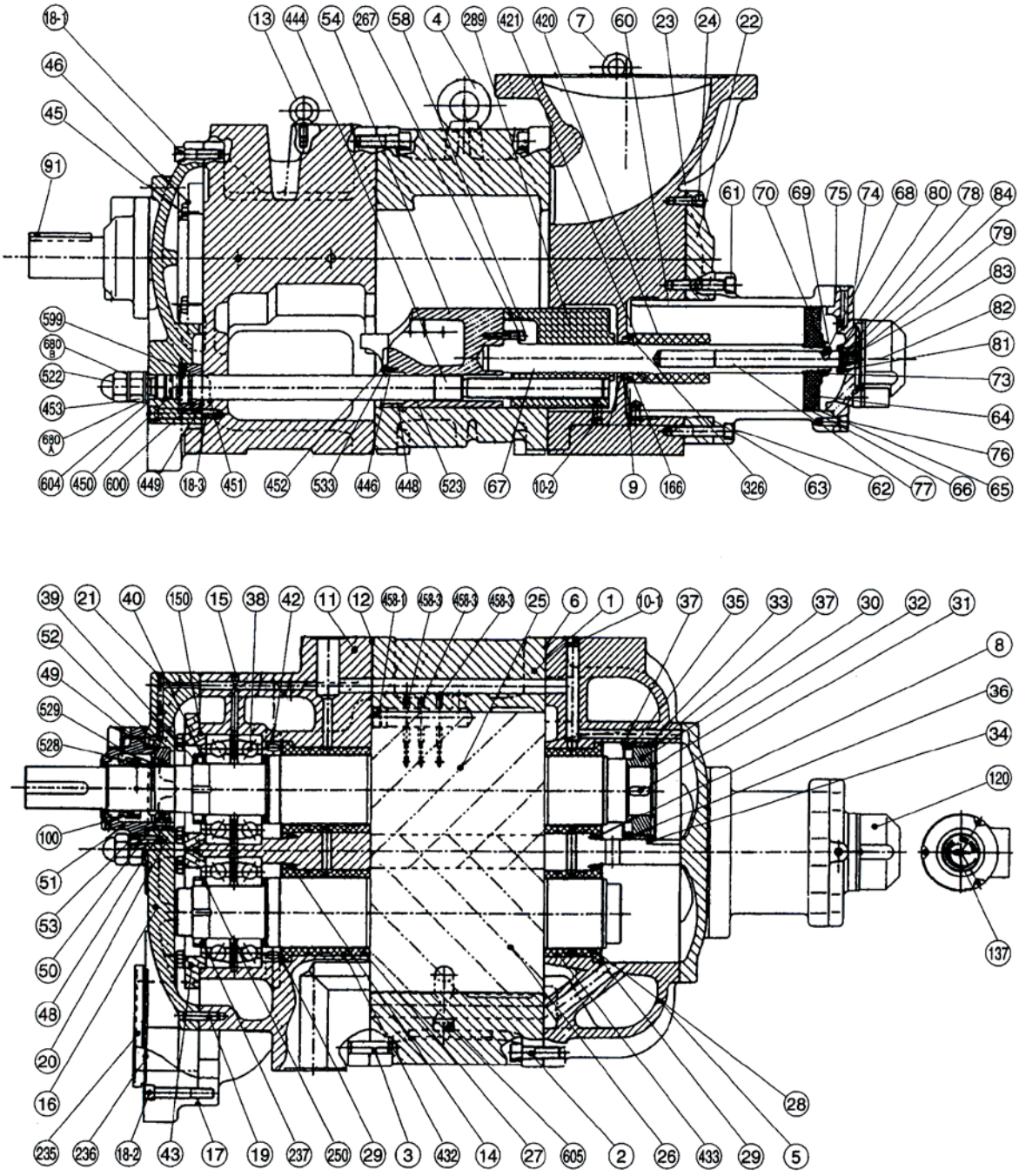


Figure 7-5 Sectional View (320V*D model)

7.2 Parts Configuration Table

Table 7-1 Parts Configuration Table of 160V models**

P/N		Part Name	Code No.	Remarks	Q'ty.
1		Main Rotor Casing	CS00100-160VXS	160VS*	1 (VS*)
1		Main Rotor Casing	CS00100-160VXM	160VM*	1 (VM*)
1		Main Rotor Casing	CS00100-160VXL	160VL*	1 (VL*)
2		Hexagon Socket Head Cap Screw	NB35412-040	M12 x 40	52
3		Parallel Pin	NE2013-040	Φ13 x 40	4
4		Eye Bolt	NB600-16	M16	1
5		Suction Cover	CS00500-160VX	160V**	1
6		Gasket, Suction Cover	CS00601-160VN	160LDV	1
8		Spring Pin	NE3204-010	Φ4 x 10	2
9		O-ring	PA11-046	JIS B 2401 P46	1
10	A	Plug	NF06-008	R 1/4	1
10	B	Plug	NF06-008	R 1/4	1
10	C	Plug	NF06-010	R 3/8	1
10	D	Plug	NF06-010	R 3/8	1
11		Bearing Head	CS01100-160VXG	160V*D	1 (V*D)
11		Bearing Head	CS01100-160VXD	160V*G	1 (V*G)
12		Gasket, Bearing Head	CS01200-160VN	160***	1
13		Eye Bolt	NB600-12	M12	1
14		Spring Pin	NE3204-010	Φ4 x 10	2
16		Bearing Cover	CS01600-160VXD	160V*D	1 (V*D)
16		Bearing Cover	CS01600-160VXG	160V*G	1 (V*G)
17		Gasket, Bearing Cover (D)	CS01700-160VD	160V*D	1 (V*D)
17		Gasket, Bearing Cover (G)	CS01700-160VG	160V*G	1 (V*G)
18	1	Hexagon Socket Head Cap Screw	NB35412-040	M12 x 40	19 (V*D) 24 (V*G)
18	2	Hexagon Socket Head Cap Screw	NB35412-080	M12 x 80	7 (V*D)
19		Parallel Pin	NE2010-040	Φ10 x 40	2
20		Spring Pin	NE3203-010	Φ3 x 10	1
22		Balance Piston Cover	CS02200-160VX	160V**	1
23		Gasket, Balance Piston Cover	CS02300-160N	160*	1
24		Hexagon Socket Head Cap Screw	NB35410-025	M10 x 25	11
25		Male Rotor	CS02500-160VS	160VS*	1 (VS*)
26		Female Rotor			
25		Male Rotor	CS02500-160VM	160VM*	1 (VM*)
26		Female Rotor			
25		Male Rotor	CS02500-160VL	160VL*	1 (VL*)
26		Female Rotor			
27		Main Bearing O-ring type	CSH02700-160	160***	2
28		Side Bearing O-ring type	CSH02800-160	160***	2
29		Retaining Ring	NG11-102	CE-IN102(H102)	4
30		Balance Piston	CS03000-160H	160**H	1
31		Key, Balance Piston	CS03100-160	160**	1
32		Retaining Ring	NG12-050	CE-EX50(S50)	1
33		Sleeve, Balance Piston	CS03300-160H	160**H	1
34		Set Screw	NA83606-015	M6 x 15	2
35		O-ring	PA12-095	JIS B 2401 G95	1
36		O-ring Spacer	CS03600-160	160***	1
37		Retaining Ring	NG11-102	CE-IN102(H102)	2

P/N		Part Name	Code No.	Remarks	Q'ty.
38		Thrust Bearing	CS03800-160P	7212B	2
39		Lock Nut	NG31-012	AN12	2
40		Lock Washer	NG32-012	AW12	2
41		Spacer, Thrust Bearing Outer Race	CS04100-160	160***	2
42		Spacer, Thrust Bearing Alignment	CS04200-160	160***	2
43		Thrust Bearing Gland	CS04300-160	160***	2
45		Hexagon Head Bolt	NB15510-030	M10 x 30	8
46		Conical Spring Washer	ND150-010	M10	8
46		Lock Washer Set (old, plate type)	CS0469-D	160*** 8ps/set	-
48		Retainer, Oil Seal	CS04800-160	160***	1
49		O-ring	PA12-090	JIS B 2401 G90	1
50		Oil Seal	NB15510-030	SA1J55 x 70 x 9	1
51		Seal Cover	CS051000-160BBS	160***	1
52		Gasket, Seal Cover	CS05200-160N	160***	1
53		Hexagon Socket Head Cap Screw	NB35408-025	M8X25	8
54		Unloader Slide Valve	CS05400-160VSD	160VS*	1 (VS*)
54		Unloader Slide Valve (with groove)	-	160VS*	1 (VS*)
54		Unloader Slide Valve	CS05400-160VMD	160VM*	1 (VM*)
54		Unloader Slide Valve (with groove)	-	160VM*	1 (VM*)
54		Unloader Slide Valve	CS05400-160VLD	160VL*	1 (VL*)
54		Unloader Slide Valve (with groove)	-	160VL*	1 (VL*)
58		Hexagon Socket Head Cap Screw	NB35406-030	M6 x 30	5
60		Unloader Cylinder	CS06000-160VX	160V**	1
61		Hexagon Socket Head Cap Screw	NB35410-025	M10 x 25	2
62		Hexagon Socket Head Cap Screw	NB35410-065	M10 x 65	6
63		O-ring	PA12-125	JIS B 2401 G125	1
64		Unloader Piston	CS06400-160S	160***	1
65		O-ring	PA11-100	JIS B 2401 P100	1
66		Teflon Cap Seal	CS06600-160-1		1
67		Push Rod, Unloader Slide Valve	CS0671-DV	160V**	1
68		Guide Pin	NE2503-008	Φ3 x 8	1
69		Lock Nut	NG31-005	AN05	1
70		Lock Washer	NG32-005	AW05	1
73		O-ring	PA11-021	JIS B 2401 P21	1
74		Unloader Cover	CS07400-160	160*	1
75		O-ring	PA12-110	JIS B 2401 G110	1
76		Hexagon Socket Head Cap Screw	NB35408-025	M8 x 25	8
77		Indicator Cam	CS07700-160VXS	160VS*	1 (VS*)
77		Indicator Cam	CS07700-160VXML	160VM*160VL*	1 (VM*) 1 (VL*)
78		Ball Bearing	CS07800-200	#6000	1
79		Retaining Ring	NG12-010	CE-EX10(S10)	1
80		Bearing Gland	CS08000-200	200***	1
81		Hexagon Socket Head Cap Screw	NB35406-015	M6 x 15	3
82		V-ring	CS08200-200B	20 x 10 x 12	1
83		Spring	CS08300-200	200***	1
84		Retainer, Indicator Cam Spring	CS08400-200	200***	1

P/N		Part Name	Code No.	Remarks	Q'ty.
91		Shaft Key	CS09100-160	160***	1
92		Suction Flange (for Piping)	CS71400-T125A	MYK125A Male	1
92		Suction Cover Flange	CS71400-125MK	MYK125A Male	1
93		Gasket, Suction Flange	CR72000-125N	MYK125A	1
94		Hexagon Head Bolt	NB111020-055	M20 x 55 10.9T	8
95		Discharge Flange (for Piping)	CS71400-T100CD	MYK100CD Male	1
95		Discharge Cover Flange	CS71400-100CDMK	MYK100CD Male	
96		Gasket, Discharge Flange (for the case V*G model or V*D model used No.235)	CR72000-100N	MYK100A	1
97		Hexagon Head Bolt (for the case that is not using No.235 Discharge flange spacer)	NB111022-055	M22 x 55 10.9T	4
97		Hexagon Head Bolt (for the case using No.235 Discharge flange spacer)	NB111022-080	M22 x 80 10.9T	4
100		Mechanical Seal Assembly (BOS-T1)	CS10000-160BT	160V** BOS Type	1
100		Mechanical Seal Assembly (BBSE)	CS10002-160EBS	BBS-E	1
100		Mechanical Seal Assembly (BBSⅢ)	CS10001-160BBS	BBSⅢ	1
100		Mechanical Seal Assembly (UV-4)	CS10009-160-F70	UV-4)	1
120		Unloader Indicator Assembly	CS120-IND062WP-VP	V-series 0-100%	1
125		Micro-Switch	CS12501-IND06P	200*** Z15GW	2
127		Micro-Switch Cam	CS1279-200V	200VS\L	1
129		Wire wound type Potentiometer	CS1299-E10	with Wires	1
129		Conductive Plastic type Potentiometer	CS12900-INDO6P	with Wires	-
137		Indicator Dial	CS13700-200VD	200VL*	1
235		Spacer, Discharge Flange (This spacer is not necessary for CD flange.)	FX101-160		1 (V*D)
236		Gasket, Discharge Flange Spacer	CS23600-160N		1 (V*D)
237		Torsional Slip Washer	CS23700-160	160***	2
250		Thrust Washer	CS25000-160	160***	2
251		Flange (for Economizer)	FA1322-025T	MYK25A	1
252		Gasket, Flange (for Economizer)	CR72000-025N		1
253		Hexagon Head Bolt	NB15512-035	M12 x 35	4
254		Flange (for Liquid injection 1)	FA1322-020T	MYK20A	1
255		Gasket, Flange (for Liquid injection 1)	CR72000-020N		1
256		Hexagon Head Bolt	NB15512-035	M12 x 35	2
267		Spring Washer for Hexagon Socket Head Cap Screw	ND330-06	M6	5
289		Variable Vi auxiliary Slide Valve	CS28900-160VSD	160VS*	1 (VS*)
289		Variable Vi auxiliary Slide Valve	CS28900-160VMD	160VM*	1 (VM*)
289		Variable Vi auxiliary Slide Valve	CS28900-160VLD	160VL*	1 (VL*)
325		O-ring	PA11-030	JIS B 2401 P30	2
326		O-ring Gland	CS32600-160VD		1
420		Spacer, Unloader Positioning	CS42000-160VSD	160VS*	1 (VS*)
420		Spacer, Unloader Positioning	CS42000-160VMD	160VM*	1 (VM*)
421		O-ring	PA11-030	JIS B 2401 P30	2 (VS*)
432		O-ring	PA12-085	JIS B 2401 G85	4
433		O-ring	PA12-085	JIS B 2401 G85	4
444		Vi Adjusting Rod	CS44400-160VSD	160VS*	1 (VS*)
444		Vi Adjusting Rod	CS44400-160VMD	160VM*	1 (VM*)
444		Vi Adjusting Rod	CS44400-160VLD	160VL*	1 (VL*)
445		Lock Washer, Variable Vi Auxiliary Slide Valve	CS44500-160VD	160V**	1

P/N		Part Name	Code No.	Remarks	Q'ty.
446		Vi Square Washer, Teflon Bushing	CS44600-160VD		1
448		Teflon Bushing	CS44800-160VD		1
449		Thrust Washer	CS44900-160VD		2
450		O-ring	PA11-025	JIS B 2401 P25	2
451		O-ring	PA11-025	JIS B 2401 P25	1
452		Hexagon Socket Head Cap Screw	NB35404-010	M4 x 10	1
453		Hexagon Nut	NC140-24	M24	1
454		Hexagon Socket Head Cap Screw	NB35404-020	M4 x 20	1
455		Spring Washer for Hexagon Socket Head Cap Screw	ND330-04	M4	1
456		Hexagon Socket Head Cap Screw	NB35405-010	M5 x 10	2
458		Plug	NF06-004	R 1/8	4
459		Plug	NF06-015	R 1/2	1
522		Domed Cap Nut	NC921-24	M24	1
523		O-ring	PA11-025	JIS B 2401 P25	1
533		Spring Washer, Hexagon Socket Head Cap Screw	ND330-04	M4	1
605		Plug	NF06-015	R 1/2	1
607	A	Plug	NF06-008	R 1/4	1
607	B	Plug	NF06-008	R 1/4	1
607	C	Plug	NF06-008	R 1/4	1
680	A	Conical Spring Washer, Vi Adjusting Rod	ND160-024	M24	1
680	B	Conical Spring Washer, Vi Adjusting Rod	ND160-024	M24	1
701		Backup Ring	PBP11-045		1

CAUTION

- **The part code of the O-ring is the one assigned to NBR which is standard material. When the material of the O-ring is other than NBR, a different part code is used for each material.**
  If you are using O-rings made from other than the standard material, please contact MAYEKAWA when placing an order.

CAUTION

- **The Code No. of parts shown in parentheses below is applied to the product until the end of November, 2014:**
  (P/N 120 Unloader Indicator Assembly, P/N 125 Micro-Switch, P/N 129 Potentiometer)
- **For the Code No. of new type indicator part, refer to the separately dedicated Instruction manual for it.**

Table 7-2 Parts Configuration Table of 200V models**

P/N		Part Name	Code No.	Remarks	Q'ty.
1		Main Rotor Casing	CS00100-200VXS	200VS*	1 (VS*)
1		Main Rotor Casing	CS00100-200VXM	200VM*	1 (VM*)
1		Main Rotor Casing	CS00100-200VXL	200VL*	1 (VL*)
2		Hexagon Socket Head Cap Screw	NB35416-050	M16X50	50
3		Parallel Pin	NE2016-055	Φ16X55	4
4		Eye Bolt	NB600-20	M24	1
5		Suction Cover	CS00500-200VX	200V**	1
6		Gasket, Suction Cover	CS00601-200VN	200V***	1
8		Spring Pin	NE3206-012	Φ6X12	2
9		O-ring	PA12-060	JIS B 2401 G60	1
10	A	Plug	NF06-010	R3/8	1
10	B	Plug	NF06-008	R1/4	1
10	C	Plug	NF06-015	R1/2	1
10	D	Plug	NF06-015	R1/2	1
11		Bearing Head	CS01100-200VXD	200V**	1 (V*D)
11		Bearing Head	CS01100-200VXG	200V*G	1 (V*G)
12		Gasket, Bearing Head	CS01200-200VN	200***	1
13		Eye Bolt	NB600-12	M12	1
14		Spring Pin	NE3206-012	Φ6X12	2
16		Bearing Cover	CS01600-200VXD	200V**	1 (V*D)
16		Bearing Cover	CS01600-200VXG	200V*G	1 (V*G)
17		Gasket, Bearing Cover (D)	CS01700-200VD	200V**	1 (V*D)
17		Gasket, Bearing Cover (G)	CS01700-200VG	200V*G	1 (V*G)
18	1	Hexagon Socket Head Cap Screw	NB35416-050	M16X50	15 (V*D) 18 (V*G)
18	2	Hexagon Socket Head Cap Screw	NB35416-075	M16X75	8 (V*D)
18	3	Hexagon Socket Head Cap Screw	NB35416-065	M16X65	6
19		Parallel Pin	NE2010-050	Φ10X50	2
20		Spring Pin	NE3203-010	Φ3X10	1
21		Plug	NF06-004	R1/8	1
22		Balance Piston Cover	CS02200-200VX	200V**	1
23		Gasket, Balance Piston Cover	CS02300-200N	200V**	1
24		Hexagon Socket Head Cap Screw	NB35412-030	M12X30	11
25		Male Rotor	CS02500-200VS	200VS*	1
26		Female Rotor			
25		Male Rotor	CS02500-200VM	200VM*	1
26		Female Rotor			
25		Male Rotor	CS02500-200VL	200VL*	1
26		Female Rotor			
27		Main Bearing O-ring type	CSH02700-200	200***	2
28		Side Bearing O-ring type	CSH02800-200	200***	2
29		Retaining Ring	NG11-130	CE-IN130(H130)	4
30		Balance Piston	CS03000-200H	200**LDH	1
31		Key, Balance Piston	CS03100-200	200V**	1
32		Retaining Ring	NG12-065	CE-EX65(S65)	1
33		Sleeve, Balance Piston	CS03300-200H	200**H	1
34		Set Screw	NA83608-015	M8X15	2
35		O-ring	PA11-120	JTS B 2401 P120	1
36		O-ring Spacer	CS03600-200	200***	1

P/N		Part Name	Code No.	Remarks	Q'ty.
37		Retaining Ring	NG11-130	CE-IN130(H130)	2
38		Thrust Bearing	CS03800-200P	200*** PPS	2
39		Lock Nut	NG31-013	AN13	2
40		Lock Washer	NG32-013	AW13	2
41		Spacer, Thrust Bearing Outer Race	CS04100-200	200***	2
42		Spacer, Thrust Bearing Alignment	CS04200-200	200***	2
43		Thrust Bearing Gland	CS04300-200	200***	2
45		Hexagon Head Bolt	NB155112-035	M12X35	8
46		Conical Spring Washer	ND150-012	M12 1L	8
46		Lock Washer Set (old, plate type)	CS0469-E	200*** 8p./set	-
48		Retainer, Oil Seal	CS04800-200VDS	200V**	1
48		Retainer, Oil Seal	CS04800-200S	200V**	1
49		O-ring	PA12-115	JIS B 2401 G115	1
50		Oil Seal	CS05010-200VD	SA1J65x85x12	1
51		Seal Cover	CS051000-200BBS	200V**	1
52		Gasket, Seal Cover	CS05200-200N	200V**	1
53		Hexagon Socket Head Cap Screw	NB35410-025	M10X25	8
54		Unloader Slide Valve	CS05400-200VSD	200VS*	1 (VS*)
54		Unloader Slide Valve (with groove)	-	200VS*	1 (VS*)
54		Unloader Slide Valve	-	200VS* K-port	1 (VS*)
54		Unloader Slide Valve	CS05400-200VMD	200VM*	1 (VM*)
54		Unloader Slide Valve (with groove)	-	200VM*	1 (VM*)
54		Unloader Slide Valve	CS05400-200VLD	200VL*	1 (VL*)
54		Unloader Slide Valve (with groove)	-	200VL*	1 (VL*)
58		Hexagon Socket Head Cap Screw	NB35408-045	M8X45	5
60		Unloader Cylinder	CS06000-200VX	200V**	1
61		Hexagon Socket Head Cap Screw	NB35412-030	M12X30	2
62		Hexagon Socket Head Cap Screw	NB35412-075	M12X75	6
63		O-ring	PA12-150	JIS B 2401 G150	1
64		Unloader Piston	CS06400-200S	200***	1
65		O-ring	PA11-125	JTS B 2401 P125	1
66		Teflon Cap Seal	CS06600-200-1		1
67		Push Rod, Unloader Slide Valve	CS0671-EV	200V**	1
68		Guide Pin	NE2505-012	Φ5X12	1
69		Lock Nut	NG31-007	AN07	1
70		Lock Washer	NG32-007	AW07	1
73		O-ring	PA12-030	JIS B 2401 G30	1
74		Unloader Cover	CS07400-200	200***	1
75		O-ring	PA12-135	JIS B 2401 G135	1
76		Hexagon Socket Head Cap Screw	NB35410-025	M10X25	8
77		Indicator Cam	CS07700-200VXS	200VS*	1 (VS*)
77		Indicator Cam	CS07700-200VXML	200VM* 200VL*	1 (VM*) 1 (VL*)
78		Ball Bearing	CS07800-200	#6000	1
79		Retaining Ring	NG12-010	CE-EX10(S10)	1
80		Bearing Gland	CS08000-200	200V**	1
81		Hexagon Socket Head Cap Screw	NB35406-015	M6X15	3

P/N		Part Name	Code No.	Remarks	Q'ty.
82		V-ring	CS08200-200B	20X10X12	1
83		Spring	CS08300-200	200V**	1
84		Retainer, Indicator Cam Spring	CS08400-200	200***	1
91		Shaft Key	CS09100-200	200***	1
92		Suction Flange (for Piping)	CS71400-T150A	MYK150A Male	1
92		Suction Cover Flange	CS71400-150MK	MYK150A Male	1
93		Gasket, Suction Flange	CR72000-150N	MYK150A	1
94		Hexagon Head Bolt	NB111022-055	M22X55 10.9T	8
95		Discharge Flange (for Piping)	CS71400-T125CD	MYK125CD Male	1
95		Discharge Cover Flange	CS71400-125CDMK	MYK125CD Male	1
96		Gasket, Discharge Flange (for the case V*G model or V*D model used No.235)	CR72000-125N	MYK125A	1
97		Hexagon Head Bolt (for the case that is not using No.235 Discharge flange spacer)	NB111020-055	M20X55 10.9T	8
97		Hexagon Head Bolt (for the case using No.235 Discharge flange spacer)	NB111020-080	M20X80 10.9T	8
100		Mechanical Seal Assembly	CS10002-200EBS	200BBSE	1
100		Mechanical Seal Assembly	CS10001-200BBS	200*** BBS3	-
100		Mechanical Seal Assembly	CS10000-200BE	200*** BOS TYPE	-
100		Mechanical Seal Assembly	CS10009-200-F70	200*** UV-4	-
120		Unloader Indicator Assembly	CS120-IND062WP-VP	V-series 0-100 %	1
125		Micro-Switch	CS12501-INDO6P	200*** Z15GW	2
127		Micro-Switch Cam	CS1279-200V	200VS\L	1
129		Conductive Plastic type Potentiometer	CS12900-INDO6P	with wires	-
137		Indicator Dial	CS13700-200VD	200V** L,M,H-port	1
215		Flange, Lubricating Oil inlet (Journal)	FA1322-020T	MM(MYK) 20A(3/4")	1
216		Gasket, Lubricating Oil inlet Flange	CR72000-020N	MYK20A	1
217		Hexagon Head Bolt	NB111012-035	M12 X35	2
235		Spacer, Discharge Flange (This spacer is not necessary for CD flange.)	FX101-200	200V**	1 (V*D)
236		Gasket, Discharge Flange Spacer	CS23600-200N	200V**	1 (V*D)
237		Torsional Slip Washer	CS23700-200	200***	2
250		Thrust Washer	CS25000-200	200***	2
251		Flange (for Economizer)	FA1322-032T	MM(MYK) 32A(l"1/4)	1
252		Gasket, Flange (for Economizer)	CR72000-032N	MYK32A	1
253		Hexagon Head Bolt	NB111012-040	M12X40	4
254		Flange (for Liquid injection 1)	FA1322-025T	MM(MYK) 25A(1")	1
255		Gasket, Flange (for Liquid injection 1)	CR72000-025N	MYK25A	1
256		Hexagon Head Bolt	NB15512-035	M12X35	4
267		Spring Washer for Hexagon Socket Head Cap Screw	ND330-08	M8	5
289		Variable Vi auxiliary Slide Valve	CS28900-200VSD	200VS*	1 (VS*)
289		Variable Vi auxiliary Slide Valve	CS28900-200VMD	200VM*	1 (VM*)
289		Variable Vi auxiliary Slide Valve	CS28900-200VLD	200VL*	1 (VL*)
325		O-ring	PA11-040	JIS B 2401 P40	2
326		O-ring Gland	CS32600-200VD	200V**	1
420		Spacer, Unloader Positioning	CS42000-200VSD	200VS*	1 (VS*)
420		Spacer, Unloader Positioning	CS42000-200VMD	200VM*	1 (VM*)
421		O-ring	PA11-040	JIS B 2401 P40	2 (VS*)
432		O-ring	PA62-022	AS568A-244	4

P/N		Part Name	Code No.	Remarks	Q'ty.
433		O-ring	PA62-022	AS568A-244	4
444		Vi Adjusting Rod	CS44400-200VSD	200VS*	1 (VS*)
444		Vi Adjusting Rod	CS44400-200VMD	200VM*	1 (VM*)
444		Vi Adjusting Rod	CS44400-200VLD	200VL*	1 (VL*)
445		Lock Washer, Variable Vi Auxiliary Slide Valve	CS44500-200VD	200V**	1
446		Vi Square Washer, Teflon Bushing	CS44600-200VD	200V**	1
448		Teflon Bushing	CS44800-200VD	200V**	1
449		Thrust Washer	CS44900-200VD	160V** to 320VD	2
450		O-ring	PA11-035	JIS B 2401 P35	2
451		O-ring	PA11-035	JIS B 2401 P35	1
452		Hexagon Socket Head Cap Screw	NB35405-015	M5X15	1
453		Hexagon Nut	NC140-30	M30	1
454		Hexagon Socket Head Cap Screw	NB35406-020	M6X20	1
455		Spring Washer for Hexagon Socket Head Cap Screw	ND330-06	M6	1
456		Hexagon Socket Head Cap Screw	NB35405-012	M5X12	2
458	1	Plug	NF06-008	R1/4	1
458	2	Plug	NF06-004	R1/8	3
459		Plug	NF06-020	R3/4	1
522		Domed Cap Nut	NC921-30	M30	1
523		O-ring	PA11-035	JIS B 2401 P35	1
528		Oil Seal Sleeve	CS52810-200VD	200V**	1
528		Oil Seal Sleeve with O-ring	CS52809-200VD	200V**	1
529		Set screw	NA83606-008	M6X8	2
533		Spring Washer, Hexagon Socket Head Cap Screw	ND320-05	M5	1
605		Plug	NF06-020	R3/4	1
607	A	Plug	NF06-008	R1/4	1
607	B	Plug	NF06-008	R1/4	1
680	A	Conical Spring Washer, Vi Adjusting Rod	ND160-030	M30 Type	1
680	B	Conical Spring Washer, Vi Adjusting Rod	ND160-030	M30 Type	1
701		Backup Ring	PBP11-055		1
715		Cover Plate, Lubricating oil inlet Flange	CS71500-020	20A	1
715		Cover Plate, Economizer inlet Flange	CS71500-032	32A	1
715		Cover Plate, Liquid injection Flange	CS71500-025	25A	1
744		O-ring	PA12-060	JIS B 2401 G60	1

CAUTION

- **The part code of the O-ring is the one assigned to NBR which is standard material. When the material of the O-ring is other than NBR, a different part code is used for each material.**
  If you are using O-rings made from other than the standard material, please contact MAYEKAWA when placing an order.

CAUTION

- **The Code No. of parts shown in parentheses below is applied to the product until the end of November, 2014:**
  (P/N 120 Unloader Indicator Assembly, P/N 125 Micro-Switch, P/N 129 Potentiometer)
- **For the Code No. of new type indicator part, refer to the separately dedicated Instruction manual for it.**

Table 7-3 Parts Configuration Table of 250V models**

P/N		Part Name	Code No.	Remarks	Q'ty.
1		Main Rotor Casing	CS00100-250VXS	250VS*	1 (VS*)
1		Main Rotor Casing	CS00100-250VXM	250VM*	1 (VM*)
1		Main Rotor Casing	CS00100-250VXL	250VL*	1 (VL*)
1		Main Rotor Casing	-	250VLL*	1 (VLLD)
2		Hexagon Socket Head Cap Screw	NB35420-060	M20×60	44
3		Parallel Pin	NE2016-070	Φ16×70	4
4		Eye Bolt	NB600-30	M30	1
5		Suction Cover	CS00500-250VX	250V**	1
5		Suction Cover	-	250WV*	1 (VLLD)
6		Gasket, Suction Cover	CS00600-250VN	250***	1
7		Eye Bolt	NB600-12	M12	2
8		Spring Pin	NE3206-012	Φ6×12	2
9		O-ring	PA12-065	JIS B 2401 G65	1
10	A	Plug	NF06-010	R3/8	1
10	B	Plug	NF06-008	R1/4	1
10	C	Plug	NF06-020	R3/4	1
10	D	Plug	NF06-015	R1/2	1
11		Bearing Head	CS01100-250VXD	250V**	1 (V*D)
11		Bearing Head	CS01100-250VXG	250V*G	1 (V*G)
12		Gasket, Bearing Head	CS01200-250N	250***	1
13		Eye Bolt	NB600-12	M12	1
14		Spring Pin	NE3206-012	Φ6×12	2
16		Bearing Cover	CS01600-250VXD	250V**	1 (V*D)
16		Bearing Cover	CS01600-250VXG	250V*G	1 (V*G)
17		Gasket, Bearing Cover (D)	CS01700-250VD	250V**	1 (V*D)
17		Gasket, Bearing Cover (G)	CS01700-250VG	250V*G	1 (V*G)
18	1	Hexagon Socket Head Cap Screw	NB35416-050	M16×50	18 (V*D) 22 (V*G)
18	2	Hexagon Socket Head Cap Screw	NB35416-090	M16×90	8 (V*D)
18	3	Hexagon Socket Head Cap Screw	NB35416-070	M16×70	5
19		Parallel Pin	NE2010-050	Φ10×50	2
20		Spring Pin	NE3203-010	Φ3×10	1
21		Plug	NF06-004	R1/8	1
22		Balance Piston Cover	CS02200-250VX	250V**	1
23		Gasket, Balance Piston Cover	CS02300-250N	250***	1
24		Hexagon Socket Head Cap Screw	NB35412-030	M12×30	11
25		Male Rotor	CS02500-250VS	250VS*	1 (VS*)
26		Female Rotor			
25		Male Rotor	CS02500-250VM	250VM*	1 (VM*)
26		Female Rotor			
25		Male Rotor	CS02500-250VL	250VL*	1 (VL*)
26		Female Rotor			
25		Male Rotor	-	250VLL*	1 (VLL*)
26		Female Rotor			

P/N		Part Name	Code No.	Remarks	Q'ty.
27		Main Bearing O-ring type	CSH02700-250	250VS*, VM*, VL*	2
27		Main Bearing O-ring type	CSH02700-250	250VLL*	4
28		Side Bearing O-ring type	CSH02800-250	250***	2
29		Retaining Ring	NG11-160	CE-IN160(H160)	4
30		Balance Piston	CS03000-250H	250**H	1
31		Key, Balance Piston	CS03100-250	250***	1
32		Retaining Ring	NG12-080	CE-EX80(S80)	1
33		Sleeve, Balance Piston	CS03300-250H	250**H	1
34		Set Screw	NA83608-020	M8×20	2
35		O-ring	PA11-150	JIS B 2401 P150	1
36		O-ring Spacer	CS03600-250	250***	1
37		Retaining Ring 250VS*, VM*, VL*	NG11-160	CE-IN160(H160)	2
37		Retaining Ring 250VLL*	NG11-160	CE-IN160(H160)	1
38		Thrust Bearing	CS03800-250P	250*** PPS	2
39		Lock Nut	NG31-017	AN17	2
40		Lock Washer	NG32-017	AW17	2
42		Spacer, Thrust Bearing Alignment	CS04200-250	250***	2
43		Thrust Bearing Gland	CS04300-250	250***	2
45		Hexagon Head Bolt	NB15516-045	M16×45	8
46		Conical Spring Washer	ND150-016	M16 1L	8
46		Lock Washer Set (old, plate type)	CS0469-F	250*** 8p./set	-
48		Retainer, Oil Seal	CS04800-250VDS	250V** BBSⅢ BBSE BOS	1
48		Retainer, Oil Seal	CS04800-250S	250V** UV-4 BBS Ⅰ He	1
49		O-ring	PA12-135	JIS B 2401 G135	1
50		Oil Seal	CS05010-250VD	SA1J 75×100×13	1
51		Seal Cover	CS05100-250BBS	250V** BBSⅢ BBSE BOS	1
52		Gasket, Seal Cover	CS05200-250N	250***	1
53		Hexagon Socket Head Cap Screw	NB35412-030	M12×30	8
54		Unloader Slide Valve	CS05400-250VSD	250VS*	1 (VS*)
54		Unloader Slide Valve	CS05400-250VMD	250VM*	1 (VM*)
54		Unloader Slide Valve	CS05400-250VLD	250VL*	1 (VL*)
54		Unloader Slide Valve	-	250VLL*	1 (VLLD)
58		Hexagon Socket Head Cap Screw	NB35410-055	M10×55	5
60		Unloader Cylinder	CS06000-250VX	250V**	1
61		Hexagon Socket Head Cap Screw	NB35416-040	M16×40	2
62		Hexagon Socket Head Cap Screw	NB35416-090	M16×90	6
63		O-ring	PA12-190	JIS B 2401 G190	1
64		Unloader Piston	CS06400-250S	250***	1
65		O-ring	PA11-155	JISB2401 1A P155	1
66		Teflon Cap Seal	CS06600-250-1		1
67		Push Rod, Unloader Slide Valve	CS0671-FV	250V**	1
67		Push Rod, Unloader Slide Valve	CS06700-250VLLD	250VLL*	1 (VLLD)
68		Guide Pin	NE2505-012	Φ5×12	1

P/N		Part Name	Code No.	Remarks	Q'ty.
69		Lock Nut	NG31-008	AN08	1
70		Lock Washer	NG32-008	AW08	1
73		O-ring	PA12-035	JIS B 2401 G35	1
74		Unloader Cover	CS07400-250	250***	1
74		Unloader Cover	CS07460-250	250*** Explosion proof	1
75		O-ring	PA12-170	JIS B 2401 G170	1
76		Hexagon Socket Head Cap Screw	NB35412-030	M12×30	8
77		Indicator Cam	CS07700-250VXS	250VS*	1 (VS*)
77		Indicator Cam	CS07700-250VXML	250VL*/VM*	1 (VM*) 1 (VL*) 1(VLLD)
78		Ball Bearing	CS07800-200	#6000	1
79		Retaining Ring	NG12-010	CE-EX10(S10)	1
80		Bearing Gland	CS08000-200	200V**	1
81		Hexagon Socket Head Cap Screw	NB35406-015	M6×15	3
82		V-ring	CS08200-200B	20×10×12	1
83		Spring	CS08300-200	200V**	1
84		Retainer, Indicator Cam Spring	CS08400-200	200***	1
91		Shaft Key	CS09100-250	250***	1
92		Suction Flange (for Piping)	CS71400-T250A	MYK250A Male	1
92		Suction Cover Flange	CS71400-250MK	MYK250A Male	
93		Gasket, Suction Flange	CS09300-250N	MYK250A	1
94		Hexagon Head Bolt	NB12024-065	M24×65	12
95		Discharge Flange (for Piping	CS71400-T150CD	MYK150CD Male	1
95		Discharge Cover Flange	CS71400-150CDMK	MYK150CD Male	1 (*UD)
96		Gasket, Discharge Flange (for the case V*G model or V*D model used No.235)	CR72000-150N	MYK150A	1
97		Hexagon Head Bolt (for the case that is not using No.235 Discharge flange spacer)	NB111022-055	M22×55 10.9T	8
97		Hexagon Head Bolt (for the case using No.235 Discharge flange spacer)	NB111022-085	M22×85 10.9T	8
100		Mechanical Seal Assembly	CS10000-250BE	BOS-E1	1
100		Mechanical Seal Assembly	CS10002-250EBS	BBS-E	1
100		Mechanical Seal Assembly	CS10001-250BBS	BBS3	1
100		Mechanical Seal Assembly	CS10009-250-F70	UV-4	1
120		Unloader Indicator Assembly	CS120-IND062WP-VP	200V** V-series 0-100%	1
125		Micro-Switch	CS12501-IND06P	200*** Z15GW	2
127		Micro-Switch Cam	CS1279-200V	200VS\L	1
129		Wire wound type Potentiometer	CS12900-INDO6P	with lead wire	1
129		Conductive Plastic type Potentiometer	CS12900-INDO6P	with lead wire	-
137		Indicator Dial	CS13700-200VD	200V** L,M,H-port	1
137		Indicator Dial	CS13700-200VD	250VLL*	1 (VLLD)
215		Flange, Lubricating Oil inlet (Journal) with hole	FA1322-025T	MYK25A Male	1
216		Gasket, Lubricating Oil inlet Flange	CR72000-025N	MYK25A	1
217		Hexagon Head Bolt	NB111012-035	M12×35	4

P/N		Part Name	Code No.	Remarks	Q'ty.
235		Spacer, Discharge Flange (This spacer is not necessary for CD flange.)	FX101-250	250***	1(V*D)
236		Gasket, Discharge Flange Spacer	CS23600-250N	250***	1(V*D)
237		Torsional Slip Washer	CS23700-250	250***	2
250		Thrust Washer	CS25000-250	250***	2
251		Flange(for Economizer)	CS74000-050	MYK50A Male	1
251		Flange(for Economizer)	CR74000-050	MYK50A Male	1
252		Gasket. Flange(for Economizer)	CR72000-050N	MYK50A	1
253		Hexagon Head Bolt	NB111016-045	M16×45	4
254		Flange (for Liquid injection 1) with hole	FA1322-032T	MYK32A Male	1
255		Gasket, Flange (for Liquid injection 1)	CR72000-032N	MYK32A	1
256		Hexagon Head Bolt	NB111012-040	M12×40	4
267		Spring Washer for Hexagon Socket Head Cap Screw	ND330-10	M10 TYPE	5
289		Variable Vi auxiliary Slide Valve	CS28900-250VSD	250VS*	1 (VS*)
289		Variable Vi auxiliary Slide Valve	CS28900-250VMD	250VM*	1 (VM*)
289		Variable Vi auxiliary Slide Valve	CS28900-250VLD	250VL*	1 (VL*)
289		Variable Vi auxiliary Slide Valve	-	250VLL*	1 (VLLD)
325		O-ring	PA11-046	JIS B 2401 P46	2
326		O-ring Gland	CS32600-250VD	250V**	1
420		Spacer, Unloader Positioning	CS42000-250VSD	250VS*	1 (VS*)
420		Spacer, Unloader Positioning	CS42000-250VMD	250VM*	1 (VM*)
421		O-ring	PA11-046	JIS B 2401 P46	2 (VS*)
432		O-ring	PA12-130	JIS B 2401 G130	4
433		O-ring	PA12-130	JIS B 2401 G130	4
444		Vi Adjusting Rod	CS44400-250VSD	250VS*	1 (VS*)
444		Vi Adjusting Rod	CS44400-250VMD	250VM*	1 (VM*)
444		Vi Adjusting Rod	CS44400-250VLD	250VL*	1 (VL*)
444		Vi Adjusting Rod	CS44400-250VLL	250VLL*	1 (VLLD)
445		Lock Washer, Variable Vi Auxiliary Slide Valve	CS44500-250VD	200V**	1
446		Vi Square Washer, Teflon Bushing	CS44600-250VD	250V***	1
448		Teflon Bushing	CS44800-250VD	250V**	1
449		Thrust Washer	CS44900-250VD	250V**	2
450		O-ring	PA11-040	JIS B 2401 P40	2
451		O-ring	PA11-040	JIS B 2401 P40	1
452		Hexagon Socket Head Cap Screw	NB35406-020	M6×20	1
453		Hexagon Nut	NC140-36	M36	1
454		Hexagon Socket Head Cap Screw	NB35406-035	M6×35	1
455		Spring Washer for Hexagon Socket Head Cap Screw	ND330-06	M6	1
456		Hexagon Socket Head Cap Screw	NB35405-010	M5×12	4
458	1	Plug	NFO6-015	R1/2	1
458	2	Plug	NFO6-004	R1/8	2
458	3	Plug	NFO6-008	R1/4	1
459		Plug	NFO6-015	R1/2	1
522		Domed Cap Nut	NC921-36	M36	1

P/N		Part Name	Code No.	Remarks	Q'ty.
523		O-ring	PA11-040	JIS B 2401 P40	1
528		Oil Seal Sleeve	CS52810-250VD	250V**	1
528		Oil Seal Sleeve with O-ring	CS52809-250VD	250V**	1
529		Set screw	NA83606-008	M6×8	2
533		Spring Washer, Hexagon Socket Head Cap Screw	ND330-06	M6	1
605		Plug	NF06-025	R 1"	1
607	A	Plug	NF06-008	R1/4	1
607	B	Plug	NF06-008	R1/4	1
680	A	Conical Spring Washer, Vi Adjusting Rod	ND160-036	M36	1
680	B	Conical Spring Washer, Vi Adjusting Rod	ND160-036	M36	1
701		Backup Ring	PBP11-065		1
715		Cover Plate, Lubricating oil inlet Flange	CS71500-025	25A	1
715		Cover Plate, Liquid injection Flange	CS71500-032	32A	1
744		O-ring	PA12-070	JIS B 2401 G70	1

CAUTION

- **The part code of the O-ring is the one assigned to NBR which is standard material. When the material of the O-ring is other than NBR, a different part code is used for each material.**
  If you are using O-rings made from other than the standard material, please contact MAYEKAWA when placing an order.

CAUTION

- **The Code No. of parts shown in parentheses below is applied to the product until the end of November, 2014:**
  (P/N 120 Unloader Indicator Assembly, P/N 125 Micro-Switch, P/N 129 Potentiometer)
- **For the Code No. of new type indicator part, refer to the separately dedicated Instruction manual for it.**

【POINT】

The sizes of O-ring No.432-2 and No.432-2 have been changed to G130 from G135 in October 2012 as a design change.

Table 7-4 Parts Configuration Table of 320V*D models

P/N		Part Name	Code No.	Remarks	Q'ty.
1		Main Rotor Casing	CS00100-320VXS	320VS*	1(VSD)
1		Main Rotor Casing	CS00100-320VXM	320VM*	1(VMD)
1		Main Rotor Casing	CS00100-320VXL	320VL*	1(VLD)
2		Hexagon Socket Head Cap Screw	NB35424-080	M24×80	52
3		Parallel Pin	NE2025-080	Φ25×80	4
4		Eye Bolt	NB600-30	M30	2
5		Suction Cover	CS00500-320VXD	320V*D	1
6		Gasket, Suction Cover	CS00600-320VD	320***	1
7		Eye Bolt	NB600-16	M16	2
8		Spring Pin	NE3206-018	Φ6×18	2
9		O-ring	PA11-058	JIS B 2401 P58	1
10	A	Plug	NF06-020	R3/4	1
10	B	Plug	NF06-015	R1/2	2
11		Bearing Head	CS01100-320VXD	320V*D	1
12		Gasket, Bearing Head	CS01200-320N	320***	1
13		Eye Bolt	NB600-16	M30 (from 2006.03.30)	1
14		Spring Pin	NE3206-018	Φ6×18	2
15		Plug	NF06-010	R 3/8	1
16		Bearing Cover	CS01600-320VXD	320V*D	1
17		Gasket, Bearing Cove	CS01700-320VD	320V*D	1
18	1	Hexagon Socket Head Cap Screw	NB35420-070	M20×70	19
18	2	Hexagon Socket Head Cap Screw	NB35420-120	M20×120	12
18	3	Hexagon Socket Head Cap Screw	NB35420-120	M20×120	6
19		Parallel Pin	NE2016-070	Φ16×70	2
20		Spring Pin	NE3203-016	Φ3×16	1
21		Plug	NF06-008	R1/4	1
22		Balance Piston Cover	CS02200-320	320***	1
23		Gasket, Balance Piston Cover	CS02300-320N	320***	1
24		Hexagon Socket Head Cap Screw	NB35416-045	M16×45	11
25		Male Rotor	CS02500-320VS	320VS*	1(VSD)
25		Female Rotor			
25		Male Rotor	CS02500-320VM	320VM*	1(VMD)
26		Female Rotor			
25		Male Rotor	CS02500-320VL	320VL*	1(VLD)
26		Female Rotor			
27		Main Bearing O-ring type	CSH02700-320	320***	2
28		Side Bearing O-ring type	CSH02800-320	320***	2
29		Retaining Ring	NG11-200	CE-IN200(H200)	4
30		Balance Piston	CS03000-320H	320**H	1
31		Key, Balance Piston	CS03100-320	320***	1
32		Retaining Ring	NG12-100	CE-EX100(S100)	1

P/N		Part Name	Code No.	Remarks	Q'ty.
33		Sleeve, Balance Piston	CS03300-320H	320**H	1
34		Spring Pin	NE3206-014	Φ6×14	1
35		O-ring	PA12-190	JIS B 2401 G190	1
36		O-ring Spacer	CS03600-320	320***	1
37		Retaining Ring	NG11-200	CE-IN200(H200)	2
38		Thrust Bearing	CS03800-320	320***	2
39		Lock Nut	NG311-021	AN21	2
40		Lock Washer	NG32-021	AW21	2
42		Spacer, Thrust Bearing Alignment	CS04200-320	320***	2
43		Thrust Bearing Gland	CS04300-320	320***	2
45		Hexagon Head Bolt	NB15520-055	M20×55	8
46		Conical Spring Washer	ND150-020	M20 1L	8
46		Lock Washer Set (old, plate type)	CS0469-G	320*** 8p./set	-
48		Retainer, Oil Seal	CS04800-320VDS	320***	1
48		Retainer, Oil Seal	CS04800-320P	320*** with Seal pot	1
49		O-ring	PA12-160	JIS B 2401 G160	1
50		Oil Seal	CS05010-320VD	SA1J 95×120×13	1
51		Seal Cover	CS051000-320BBS	320*** BBSⅢ, BOS	1
51		Seal Cover	CS05100-320UV4	320*** UV-4	1
52		Gasket, Seal Cover	CS05200-320N	320***	1
53		Hexagon Socket Head Cap Screw	NB35416-040	M16×40	8
54		Unloader Slide Valve	CS05400-320VSD	320VS*	1(VSD)
54		Unloader Slide Valve	CS05400-320VMD	320VM*	1(VMD)
54		Unloader Slide Valve	CS05400-320VLD	320VL*	1(VLD)
58		Hexagon Socket Head Cap Screw	NB35412-055	M12×55	5
60		Unloader Cylinder	CS06000-320V	320V*D	1
61		Hexagon Socket Head Cap Screw	NB35420-050	M20×50	2
62		Hexagon Socket Head Cap Screw	NB35420-110	M20×110	6
63		O-ring	PA12-240	JIS B 2401 G240	1
64		Unloader Piston	CS06400-320S	320***	1
65		O-ring	PA11-200	JIS B 2401 P200	1
66		Teflon Cap Seal	CS06600-320-1		1
67		Push Rod, Unloader Slide Valve	CS0671-GV	320V*D	1
68		Guide Pin	NE2506-016	Φ6×16	1
69		Lock Nut	NG31-010	AN10	1
70		Lock Washer	NG32-010	AW10	1
73		O-ring	PA11-044	JIS B 2401 P44	1
74		Unloader Cover	CS07400-320	320***	1
75		O-ring	PA12-210	JIS B 2401 G210	1
76		Hexagon Socket Head Cap Screw	NB35416-040	M16×40	8
77		Indicator Cam	CS07700-320VS	320VS*	1(VSD)
77		Indicator Cam	CS07700-320VM	320VM* 320VL*	1(VMD)

P/N		Part Name	Code No.	Remarks	Q'ty.
77		Indicator Cam	CS07700-320VL	320VL*	1(VLD)
78		Ball Bearing	CS07800-200	#6000	1
79		Retaining Ring	NG12-010	CE-EX10(S10)	1
80		Bearing Gland	CS08000-200	200V**	1
81		Hexagon Socket Head Cap Screw	NB35406-015	M6×15	3
82		V-ring	CS08200-200B	20×10×12 VH10 NBR	1
83		Spring	CS08300-200	200V**	1
84		Retainer, Indicator Cam Spring	CS08400-200	200***	1
91		Shaft Key	CS09100-320	320***	1
92		Suction Flange (for Piping)	CS71400-T350A	MYK350A Male	1
92		Suction Cover Flange	CS71400-350MK	MYK350A Male	
93		Gasket, Suction Flange	CS09300-320N	MYK350A	1
94		Hexagon Head Bolt	NB111024-075	M24×75 10.9T	16
95		Discharge Flange (for Piping)	CS71400-T200CD	MYK200CD Male	1
95		Discharge Cover Flange	CS71400-200CDMK	MYK200CD Male	1
96		Gasket, Discharge Flange (for the case V*G model or V*D model used No.235)	CR72000-200N	MYK200A	1
97		Hexagon Head Bolt (for the case that is not using No.235 Discharge flange spacer)	NB111020-055	M20×55 10.9T	12
97		Hexagon Head Bolt (for the case using No.235 Discharge flange spacer)	NB111020-085	M20×85 10.9T	12
100		Mechanical Seal Assembly	CS10000-320BE	BOS-E1	-
100		Mechanical Seal Assembly	CS10002-320EBS	BBS-E	1
100		Mechanical Seal Assembly	CS10001-320BBS	BBS3	-
100		Mechanical Seal Assembly	CS10009-320-F70	UV-4	1
120		Unloader Indicator Assembly	CS120-IND062WP-VP	200V** 0-100%	1
125		Micro-Switch	CS12501-INDO6P	200*** Z15GW	2
127		Micro-Switch Cam	CS1279-200V	200VS\L	1
129		Wire wound type Potentiometer	CS12900-IND06P	with Wires	1
129		Conductive Plastic type Potentiometer	CS12900-IND06P	with Wires	-
137		Indicator Dial	CS13700-200VD	320V*D	1
150		O-ring	PA12-220	JIS B 2401 G220	2
166		Hexagon Socket Head Cap Screw	NB35405-010	M5×10	4
215		Flange, Lubricating Oil inlet (Journal) without hole	CS71400-040	MYK40A	1
216		Gasket, Lubricating Oil inlet Flange	CR72000-040N	MYK40A	1
217		Hexagon Head Bolt	NB14012-040	M12×40	4
218		Flange, Oil Injection with hole	FA1322-025T	MYK25A	1
219		Gasket, Oil Injection Flange	CR72000-025N	MYK25A	1
220		Hexagon Head Bolt	NB14012-035	M12×35	4
235		Spacer, Discharge Flange (This spacer is not necessary for CD flange.)	-	320***	1
236		Gasket, Discharge Flange Spacer	CS23600-320N	320***	1
237		Torsional Slip Washer	CS23700-320	125～400	2

P/N		Part Name	Code No.	Remarks	Q'ty.
250		Thrust Washer	CS25000-320	320***	2
251		Flange(for Economizer)	CS71400-080	MYK80A Male	1
251		Flange(for Economizer)	CR74000-080	MYK80A Male	1
252		Gasket. Flange(for Economizer)	CR72000-080N	MYK80A	1
253		Hexagon Head Bolt	NB15520-055	M20×55	4
254		Flange (for Liquid injection 1)	CS71400-050	MYK50A Male	1
254		Flange (for Liquid injection 1)	CR74000-050	MYK50A Male	-
255		Gasket, Flange (for Liquid injection 1)	CR72000-050N	MYK50A	1
256		Hexagon Head Bolt	NB15516-045	M16×45	4
267		Spring Washer for Hexagon Socket Head Cap Screw	ND330-12	M12	5
289		Variable Vi auxiliary Slide Valve	CS28900-320VSD	320VS*	1(VSD)
289		Variable Vi auxiliary Slide Valve	CS28900-320VMD	320VM*	1(VMD)
289		Variable Vi auxiliary Slide Valve	CS28900-320VLD	320VL*	1(VLD)
326		O-ring Gland	CS32600-320	320***	1
420		Spacer, Unloader Positioning	CS42000-320VSD	320VS*	1(VSD)
420		Spacer, Unloader Positioning	CS42000-320VMD	320VM*	1(VMD)
420		Spacer, Unloader Positioning	CS42000-320VLD	320VL*	1(VLD)
421		O-ring	PA11-058	JIS B 2401 P58	2
432		O-ring	PA12-165	JIS B 2401 G165	4
433		O-ring	PA12-165	JIS B 2401 G165	4
444		Vi Adjusting Rod	CS44400-320VSD	320VS*	1(VSD)
444		Vi Adjusting Rod	CS44400-320VMD	320VM*	1(VMD)
444		Vi Adjusting Rod	CS44400-320VLD	320VL*	1(VLD)
446		Vi Square Washer, Teflon Bushing	CS44600-250VD	250V***	1
448		Teflon Bushing	CS44800-320VD	320V*D	1
449		Thrust Washer	CS44900-320VD	200V**	2
450		O-ring	PA11-044	JIS B 2401 P44	2
451		O-ring	PA11-050A	JIS B 2401 P50A	1
452		Hexagon Socket Head Cap Screw	NB35406-020	M6×20	1
453		Hexagon Nut	NC140-36	M36	1
458	1	Plug	NF06-015	R1/2	1
458	2	Plug	NF06-004	R1/8	2
458	3	Plug	NF06-008	R1/4	1
459		Plug	NF06-015	R1/2	1
522		Domed Cap Nut	NC921-36	M36	1
523		O-ring	PA11-050A	JIS B 2401 P50A	1
528		Oil Seal Sleeve	CS52810-320VD	320***	1
528		Oil Seal Sleeve with O-ring	CS52809-320VD	320***	1
529		Set screw	NA83606-010	M6×8	2
533		Spring Washer, Hexagon Socket Head Cap Screw	ND330-06	M6	1
599		Guide Pin	NE3206-016	Φ6×16	1
600		Retainer, Vi adjusting Rod	CS60000-320VD	320V*D	1

P/N		Part Name	Code No.	Remarks	Q'ty.
601		Flange, Lubricating Oil inlet (F Rotor side)	FA1322-020T	MYK20A	1
602		Gasket, Lubricating Oil inlet (F Rotor side) Flange	CR72000-020N	MYK20A	1
603		Hexagon Head Bolt	NB14012-035	M12×35	2
604		Vi Adjusting Rod Washer	ND160-036	JIS B 1256 36	1
605		Plug	NF06-032	R1 1/4	1
607	A	Plug	NF06-004	R1/4	1
607	B	Plug	NF06-004	R1/4	1
680	A	Conical Spring Washer, Vi Adjusting Rod	ND160-036	M36	1
680	B	Conical Spring Washer, Vi Adjusting Rod	ND160-036	M36	1
701		Backup Ring	PBP11-85		1
715		Cover Plate, Liquid injection Flange	CS71500-025	MYK25A	1
744		O-ring	PA12-090	JIS B 2401 G90	1

CAUTION

- **The part code of the O-ring is the one assigned to NBR which is standard material. When the material of the O-ring is other than NBR, a different part code is used for each material.**
  If you are using O-rings made from other than the standard material, please contact MAYEKAWA when placing an order.

CAUTION

- **The Code No. of parts shown in parentheses below is applied to the product until the end of November, 2014:**
  (P/N 120 Unloader Indicator Assembly, P/N 125 Micro-Switch, P/N 129 Potentiometer)
- **For the Code No. of new type indicator part, refer to the separately dedicated Instruction manual for it.**

7.3 Tightening Torques for Bolts and Nuts

7.3.1 Hexagon Head Bolts

Table 7-5 Hexagon Head Bolts Used and Each Tightening Torque

P/N	Tightening Location			Nominal Designation x Length mm (Qty) Tightening Torque N·m			
				160V	200V	250V	320V
45	Thrust Bearing Gland			M10x30 (8) 40	M12x35 (8) 50	M16x45 (8) 60	M20x55 (8) 120
94	Suction Flange			M20x55 (8) 140	M22x55 (8) 160	M24x65 (12) 200	M24x75 (16) 200
97	Discharge Flange	CD type	Sideways discharge	M22x55 (4) 160	M20x55 (8) 140	M22x55 (8) 160	M20x55 (12) 140
		A type	Sideways discharge	M22x80 (4) 240	M20x80 (8) 140	M22x85 (8) 160	M20x85 (12) 140
			Downward discharge	M22x55 (4) 160	M20x55 (8) 140	M22x55 (8) 160	—
217	Lubricating Oil inlet Flange			—	M12x35 (2) 40	M12x35 (4) 40	M12x40 (4) 40
218	Oil Injection inlet Flange			—	—	—	M12x40 (4) 40
253	Economizer inlet Flange			M12x35 (4) 40	M12x40 (4) 40	M16x45 (4) 110	M20x55 (4) 140
256	Liquid Injection inlet 1 Flange			M12x35 (2) 40	M12x35 (4) 40	M12x40 (4) 40	M16x45 (4) 110
603	Lubricating Oil inlet (F Rotor side) Flange			—	—	—	M12x35 (2) 40

Note: When MYK-A type flange is used as discharge flange for sideways discharge type compressor, the length of the fastening bolt [97] is longer than other type models due to using the discharge flange spacer [235].
Pay particular attention to the tightening the thrust bearing gland so that they are not partially tightened.
Tighten with the procedure shown in 7.3.4.

7.3.2 Hexagon Socket Head Cap Screws

Table 7-6 Hexagon Socket Head Cap Screw Used

P/N	Location	160V	200V	250V	320V
2	Main Rotor Casing	M12x45 (52)	M16x50 (50)	M20x60 (44)	M24x80 (52)
18-1	Bearing Cover	M12x40 (19) D M12x40 (24) G	M16x50 (15) D M16x50 (18) G	M16x50 (18) D M16x50 (22) G	M20x70 (19)
18-2	Bearing Cover	M12x80 (7)	M16x75 (8)	M16x90 (8)	M20x120 (12)
18-3	Bearing Cover	—	M16x65 (6)	M16x70 (5) D M16x70 (6) G	M20x120 (6)
24	Balance Piston	M10x25 (11)	M12x30 (11)	M12x30 (11)	M16x45 (11)
34	Balance Piston Sleeve	M6x15 (2)	M8x15 (2)	M8x20 (2)	—
53	Seal Cover	M8x25 (8)	M10x25 (8)	M12x30 (8)	M16x40 (8)
58	Unloader Push Rod	M6x30 (5)	M8x45 (5)	M10x55 (5)	M12x55 (5)
61	Unloader Cylinder	M10x25 (2)	M12x30 (2)	M16x40 (2)	M20x50 (2)
62	Unloader Cylinder	M10x65 (6)	M12x75 (6)	M16x90 (6)	M20x110 (6)
76	Unloader Cylinder Cover	M8x25 (8)	M10x25 (8)	M12x30 (8)	M16x40 (8)
81	Bearing Gland	M6x15 (3)	M6x15 (3)	M6x15 (3)	M6x15 (3)
166	O-ring Gland	—	—	—	M5x10 (4)
452	Unloader Slide Valve, Teflon Bushing	M4x10 (1)	M5x15 (1)	M6x20 (1)	M6x20 (1)
454	Variable Vi Auxiliary Slide Valve Lock Washer	M4x20 (2)	M6x20 (2)	M6x35 (2)	—
456	O-ring Gland	M5x10 (2)	M5x10 (2)	M5x10 (4)	—
529	Oil Seal Sleeve	—	M6x8 (2)	M6x8 (2)	M6x8 (2)

Note: The bolt types of No.34 and No.529 are hexagon socket head cap screw (set screw).
Note: No.454 bolt had been used in the products until 2002.

Table 7-7 Tightening Torques for Hexagon Socket Head Cap Screw

Torque Unit	M4	M5	M6	M8	M10	M12	M14	M16	M20	M24
N・m	2.8	6	10	25	50	90	140	240	450	750
kgf・cm	28	60	100	250	500	900	1400	2400	4500	7500

7.3.3 Lock Nuts

Table7-8 Lock Nut Used and Each Tightening Torque

P/N	Location	Nominal Designation of Lock Nut（Qty） Tightening Torque N·m			
		160V	200V	250V	320V
39	Thrust Bearing	AN12	AN13	AN17	AN21

When tightening a lock nut manage the tightening torque of the lock nut controlling the tightening angle range as explained below.

Tightening angle control method Ⅰ（Overhaul）

■ Distortion correction of slip washers and lock washers

a) Tighten the lock nut by hand.
b) Use a lock nut wrench and tighten until the rotor turns.
c) Use a lock nut wrench and a hammer, hit twice lightly.
d) Use a lock nut wrench and a hammer, loosen the lock nut.

■ Tightening Angle Range of Lock Nuts for Rotors

a) After tightening the lock nut by hand, further tighten the lock nut by using a lock nut wrench until the rotor starts to turn. Take care not to over-tighten.
b) Put a mark on the lock nut at the right side edge of the rotor groove where the stopper tongue of the lock washer fits in, as shown in Figure 7-6.
c) From this marking position, tighten the lock nut in such a way that rotation can be stopped within the tightening angle range shown in Table 7-9.
When measuring the angle, use an angle gauge which is set to the diameter of rotor shaft.

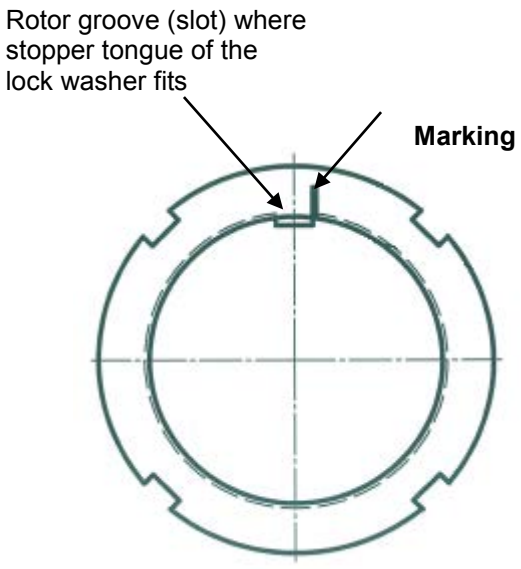
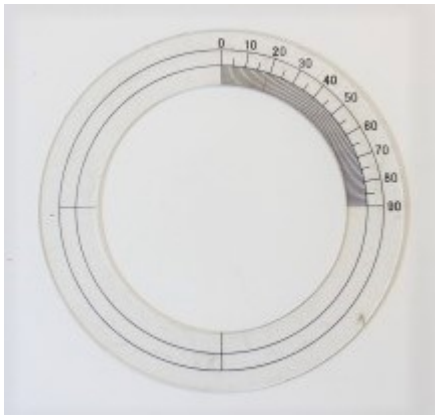


Figure 7-6 Position where mark is put "0 (zero) point setting"

Table 7-9 Tightening Angles Specified for Lock Nuts of Rotor

Model	Angle range
160V** - 320V**	15° to 30°



Angle gauge (Example)

Tightening control method Ⅱ（Factory production）

■ **Tightening of lock nuts by torque control**

To tighten the lock nut, perform "0 (zero) point tightening" to set the zero point by torque control.

■ **Lock nut tightening torque for rotor（Zero point setting）and tightening angle range**

a) To control the torque of the lock nut tightening, fix the rotor using the “rotor rotate stopping tools”
b) Tighten the lock nut with a “torque control lock nut wrench” and tighten the lock nuts of each size with a torque wrench with “zero point control torque” to control the torque.
c) After setting the “zero point position”, tighten the lock nut so that it can be stopped in the range of the tightening angle shown in Table 7-10. To measure the angle, an angle gauge that matches the rotor is required.

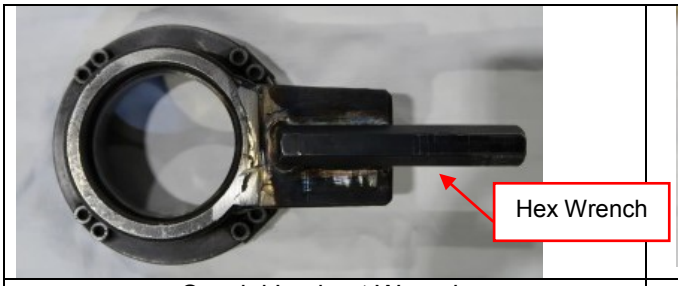
Table 7-10 Lock nut wrench tightening torque

Type of lock nut wrench	Torque wrench connection port hexagonal wrench size	Shape	Target model	Zero point control torque [N･m]	Tightening angle (°)
AN09	14M	Short	125	**90**	**7～12**
		Long	1612C(2)		
			170J(F)		
AN12	14M	Short	160	**170**	**7～12**
		Long	1612C(1)		
			2016C(2)		
			170J(M)		
			220J(F)		
AN13	17M	Short	200	**180**	**7～12**
		Long	2016C(1)		
			1612C(Increase)		
			2520C(2)		
AN14	17M	Long	1612C(1-M)(Increase)	**200**	**7～12**
AN16	19M	Long	220J(M)	**300**	**7～12**
			280J(F)		
AN17	19M	Short	250	**320**	**7～12**
		Long	2520C(1)		
			3225C(2)		
AN20	19M	Long	280J(M)	**370**	**7～12**

※Note

1. Type of torque wrench used
   AN09～AN12： Example CL280N×22D
   AN16～AN20： CL420N×22D
2. A connector is used to connect the torque wrench and the lock nut wrench for torque control.
3. The J-Series lock nut wrench uses a special J-type wrench.

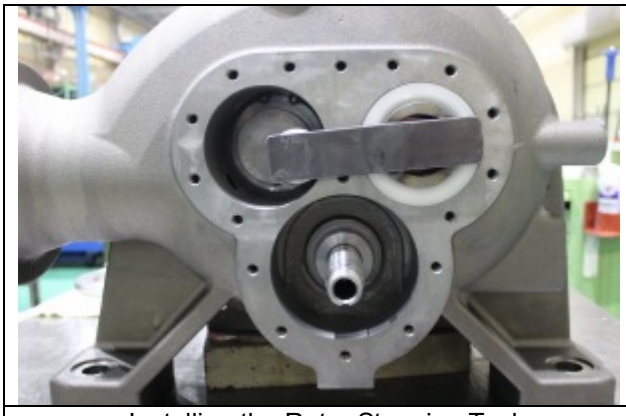
■ **Tools**

	
Special Locknut Wrench	Short type
Torque Wrench and Lock nut Wrench	Long type
Rotor stopping tool (Top view)	Rotor Stopping Tool (Side view)

■ **Tightening the locknut**

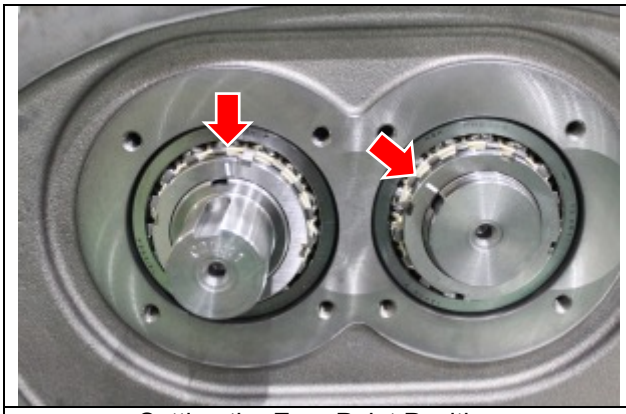
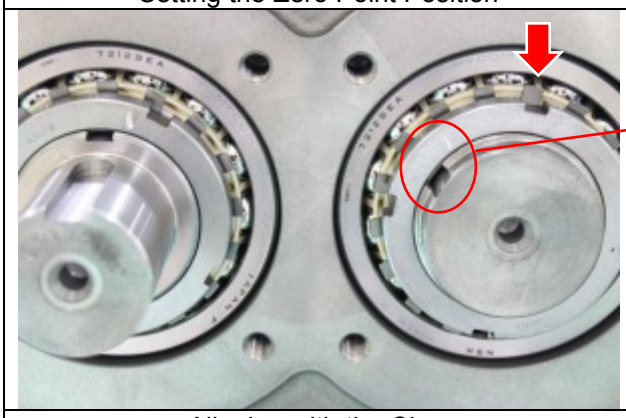
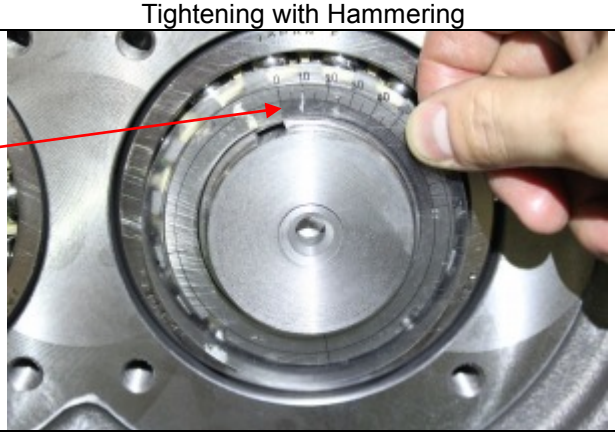
a) Install the rotor stopping tool to the balance piston insertion part of the M rotor or the intermediate gear hub (two-stage machine) mounting part.

b) Tighten the lock nut of the M and F rotors to the specified torque using the dedicated torque control lock nut wrench.

	
Installing the Rotor Stopping Tool	Tightening to specified torque

■ **Rotor lock nut tightening angle range**

a) The “zero point position” is set by tightening each lock nut to the specified torque.
b) Mark the position of the lock nut at this time by aligning it with the right side of the groove where the locking washer rotation stopping tongue of the rotor enter as shown in Fig. 7-6. (Confirmation of “zero point position”)
c) From this marking position, tighten the lock nut so that the lock nut can be stopped (aligned with the claw) within the range of the tightening angle shown in Table 7-10. To measure the angle, an angle gauge that matches the rotor shaft diameter is required.

<table>
<tr><td>  </td><td> </td></tr>
<tr><td>Setting the Zero Point Position</td><td>Tightening with Hammering</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Aligning with the Claw</td><td>Measurement of Tightening Angle</td></tr>
</table>

7.3.4 Thrust Bearing Gland

Standard tightening torque of thrust bearing gland bolt and its tightening method

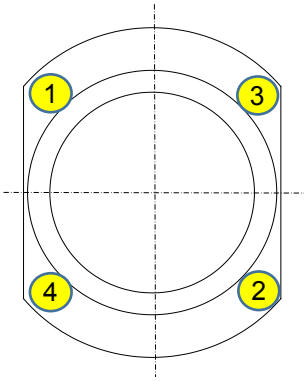
1. Introduction

Thrust bearing gland bolts for screw compressors are a very important task in assembling precision thrust bearings.
In this work, excessive tightening or partial tightening exceeding the specified torque may affect the bearing life, so be sure to use the specified torque and tightening method below.

2. Specified tightening torque and tightening method

STEP	Working procedure	Specified tightening torque (%)	Tightening torque at each STEP (N·m)			
			160	200	250	320
			4-M10	4-M12	4-M16	4-M20
1	First, tighten all bolts by hand. (①→②→③→④)	0 %	0	0	0	0
2	Next, temporarily tighten diagonally and uniformly with a snug torque (25 % x specified torque). (①→②→③→④)	25 %	10	13	15	30
3	Next, tighten uniformly diagonally with 50 % x specified torque. (①→②→③→④)	50 %	20	25	30	60
4	Next, tighten uniformly diagonally with 50 % x specified torque. (①→②→③→④)	100 %	40	50	60	120

Note 1) STEP1 and STEP2 in this procedure are intended to ensure that the bolt seating surface is securely and uniformly contacted with the object to be fastened without any gaps, thereby preventing one-sided tightening.
Note 2) STEP3 and STEP4 in this procedure are intended to fix the outer ring of the bearing, which is the object to be fastened, with uniform tightening.
Note 3) When tightening bolts, always use a torque wrench. If using a ratchet type torque wrench, be careful not to overtighten.



7.4 O-rings Used

7.4.1 List of O-rings Used

Table 7-11 List of O-rings Used (Quantity in parentheses)

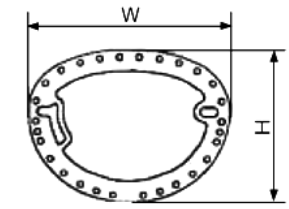
P/N	Location		160V	200V	250V	320V
9	Suction Cover		P46 (1)	G60 (1)	G65 (1)	P58 (1)
35	Balance Piston Sleeve		G95 (1)	P120 (1)	P150 (1)	G190 (1)
49	Seal Retainer		G90 (1)	G115 (1)	G135 (1)	G160 (1)
63	Balance Piston Cover		G125 (1)	G150 (1)	G190 (1)	G240 (1)
65	Unloader Piston		P100 (1)	P125 (1)	P155 (1)	P200 (1)
73	Unloader Push Rod		P21 (1)	G30 (1)	G35 (1)	P44 (1)
75	Unloader Cylinder Cover		G110 (1)	G135 (1)	G170 (1)	G210 (1)
103	Mechanical Seal（BOS type）		AS568A 332 (1)	AS568A 337 (1)	AS568A 340 (1)	P110 (1)
106-2			G55 (1)	AS568A 232 (1)	Φ79.6x3.5 (1)	Φ99.6x3.5 (1)
112			G50 (1)	G60 (1)	G70 (1)	G90 (1)
103	Mechanical Seal (BBS III type）		AS568A 230 (1)	AS568A 235 (1)	AS568A 238 (1)	AS568A 246 (1)
112			AS568A 226 (1)	AS568A 229 (1)	AS568A 232 (1)	AS568A 239 (1)
103	Mechanical Seal（BBSE type）	stationary	AS568A 332 (1)	AS568A 337 (1)	AS568A 340 (1)	P110 (1)
112		rotation	P50 (1)	Φ59.92x3.53 (1)	Φ69.52x2.62 (1)	Φ91.67x3.53 (1)
150	Thrust Bearing Gland		—	—	—	G220 (2)
325	O-ring Gland		P30 (2)	P40 (2)	P46 (2)	—
421	★Unloader Positioning Spacer used in only VS* models		P30 (2)	P40 (2)	P46 (2)	P58 (2)
432	Main Bearing		G85 (4)	AS568A 244 (4)	G130 (4)	G165 (4)
433	Side Bearing		G85 (4)	AS568A 244 (4)	G130 (4)	G165 (4)
450	Vi Adjusting Rod・Bearing Cover		P25 (2)	P35 (2)	P40 (2)	P44 (2)
451	Vi Adjusting Rod・Bearing Head		P25 (1)	P35 (1)	P40 (1)	P50A (1)
523	Unloader Slide Valve		P25 (1)	P35 (1)	P40 (1)	P50A (1)
744	Sleeve, Oil Seal		—	G60 (1)	G70 (1)	G90 (1)

7.4.2 O-ring Materials Used for Screw Compressor

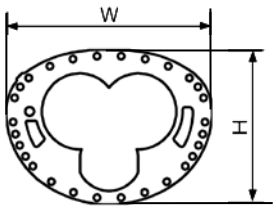
Table 7-12 List of O-ring Materials Used for Screw Compressor (excluding mechanical seal)

Working fluid	O-ring material
Ammonia	NBR
Hydrofluorocarbon (HFC)	
CO_2	FKM
	HNBR
R23	FKM
Propane	
Propylene	
Natural gas	
City gas	
Helium	

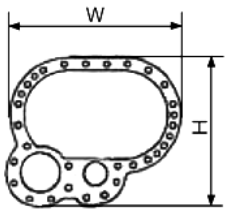
7.5 Gaskets Used



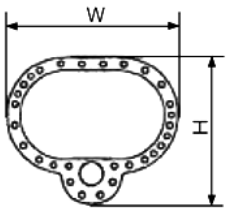
6. Suction Cover Gasket



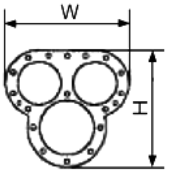
12. Bearing Head Gasket



17. Bearing Cover Gasket (D type)



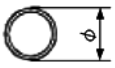
17. Bearing Cover Gasket (G type)



23. Balance Piston Cover Gasket

52. Seal Cover Gasket

93. Suction Flange Gasket



96. Discharge Flange Gasket

216. Lubricating Oil inlet Flange Gasket
219. Oil Injection Flange Gasket
236. Discharge Flange SpacerGasket

252. Economizer inlet Flange Gasket

255. Liquid Injection Flange Gasket

602. Lubricating Oil inlet (F Rotor side) Flange Gasket

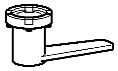
All flanges are produced to the MYCOM standards.

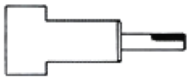
Table 7-13 Gasket Size (mm)

P/N	Location		160V	200V	250V	320V
6	Suction Cover	H	354	420	525	660
		W	460	560	700	880
12	Bearing Head	H	345	420	525	660
		W	460	560	700	880
17	Bearing Cover (D: Sideways discharge)	H	338	414	505	641
		W	397	591	709	887
17	Bearing Cover (G: Downward discharge)	H	332.5	380	463	—
		W	388	480	580	—
23	Balance Piston Cover	H	270	333	340	517
		W	283	350	420	532
52	Seal Cover	Φ	140	170	200	250
93	Suction Flange	Φ	173 (125A)	198 (150A)	325 (250A)	421 (350A)
96	Discharge Flange	Φ	143 (100A)	173 (125A)	198 (150A)	250 (200A)
216	Lubricating Oil inlet Flange	Φ	—	44 (20A)	51 (25A)	67 (40A)
219	Oil Injection Flange	Φ	—	—	—	51 (25A)
236	Discharge Flange Spacer	Φ	110 (100CD)	146 (125CD)	176 (150CD)	233 (200CD)
252	Economizer Flange	Φ	51 (25A)	59 (32A)	83 (50A)	118 (80A)
255	Liquid injection Flange	Φ	44 (20A)	51 (25A)	59 (32A)	83 (50A)
602	Lubricating Oil (for F Rotor side Bearing) inlet Flange	Φ	—	—	—	44 (20A)

7.6 Tools for Disassembly

Table 7-14 List of Tools for Disassembly (example)

Tool name	Illustration	size, etc.;		Parts Center Code No.
Ratchet wrench		1/4”		SG261-08
Adjustable wrench		250 mm		SG231-250
Screwdriver		Phillips	75 mm	SG112-075
			125 mm	SG112-125
Screwdriver		Flat blade	75 mm	SG111-075
			125 mm	SG111-125
Retaining ring pliers		External	ST-1	SG311-01
			ST-2N	SG311-02N
			ST-3	SG311-03
Retaining ring pliers		Internal	RT-4	SG312-04
			RT-5	—
Eye bolt		M8×200 two-peace-set		UHT0016
Allen wrench key		Across flats	2 mm	SG241-02
			3 mm	SG241-03
			4 mm	SG241-04
			5 mm	SG241-05
			6 mm	SG241-06
			8 mm	SG241-08
			10 mm	SG241-10
			12 mm	SG241-12
			14 mm	SG241-14
			17 mm	SG241-17
			19 mm	SG241-19
Lock nut wrench		AN-05		SAS111-05
		AN-07		SAS111-07
		AN-08		SAS111-08
		AN-10		SAS111-10
		AN-12		SAS111-12
		AN-13		SAS111-13
		AN-17		SAS111-17
		AN-21		SAS111-21

Tool name	Illustration	size, etc.;	Parts Center Code No.
Torque wrench for assembly		5-25 N·m	-
		20-100 N·m	SG132-0900
		60-420 N·m	SG132-4200
Assembly and Disassembly Tool, Main/Side Bearing		160V	CS70300-160
		200V	CS70300-200
		250V	CS70300-250
		320VL	CS70300-320

MAYEKAWA MFG. CO., LTD.

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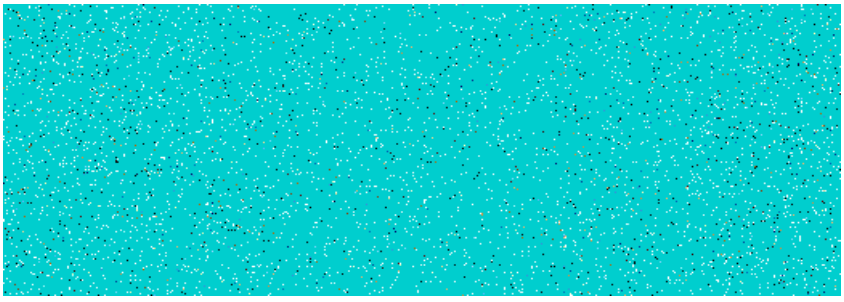

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POS	ITEM	QTY	PART CODE	DESCRIPTION	TECH.PAGES
1	SCREW COMPRESSOR	1	P160VSD	PROCESS BARE SCREW COMPRESSOR	SEE SECTION 3
1a	COUPLING COVER	1	COV-160/DD-AL	COUPLING COVER, 160V, ALU, EXT=115, ME-04928	NA
2	SUCTION STRAINER HOUSING	1	VES-SSD200-26/52-RM3-CE	SSD200 SUCTION STRAINER; 26/52 BARG ACC. CE-DESIGN	MYK
2a	SUCTION STRAINER ELEMENT	1	FG423-200	SCREEN, SUCTION STRAINER SSD200	SP19G143 R9
2b	SSD BOLT SET	1	BOL-SSD-160V/1612V-SET	SSD BOLT SET, 160V & 1612V, M20X180, 8PCS, 42EVZ	NA
3	SUCTION CHECK VALVE	1	CHV-M125-DUO	M125G25GCPF DUO-CHECK VALVE, 25G, -46/+260°C	SP20G766 R6
3a	MACHINING SUCTION CHECK VALVE	1	MCH-CHV125-S	MCH DUO CHECK VALVE, M125, IN N/OUT F, SUCTION	NA
4	OIL INJECTION REGULATING VALVE	1	REV-1/2"NPT-SB-ANG	1/2"NPT REG-SB, CONE B, ANGULAR	SP19G120 R10
4a	OIL INJECTION CHECK VALVE	1	KD122-16E	OIL CHECK VALVE KZC16-050E, 1/2" BSPT - 16mm	NA
4b	NIPPLE 100MM	1	FIT-OILINJ-160V	NIPPLE3/8"BSPTM-1/2"BSPTF L=100 ST52.0	NA
4c	I HALF UNION	3	NJ2-1604NE	STRAIGHT HALF UNION, JO-6190, 16mm*1/2" BSPT	NA
4d	ELBOW M-F	1	NN130-04	STREET ELBOW (HP), 1/2" M-F	NA
5	COMPRESSOR COUPLING	1	COU-SR52-225-E130-SPACER-KIT	SPACER FOR SR52 225, DBSE = 130MM + FLEX EL + KIT	SP20G971 R4
5a	COMPRESSOR HUB	1	COU-SR52-225-HUB-160V	COMPR. HUB WITH HOLE AND KEYWAY 45MM, 160V-I-FM	NA
5b	MOTOR HUB	1	COU-SR52-225-HUB-M65	MOTOR HUB WITH HOLE AND KEYWAY 65MM	NA
6	MAIN MOTOR (HELMKE 120KW)	1	DELIVERED BY CUSTOMER	PART PROCURED AND DELIVERED TO MAYEKAWA	NA
10	OIL PUMP	1	OILP-M50P-M-VT	M50P-M OIL PUMP ASSY (CW) VITON O-RING	SP21G396 R1
10a	BASEPLATE FOR M50P	1	FRA-BASEPLATE-M50P-4KW	BASE PLATE FOR M50P, MOTOR FRAME = 112	NA
10b	OIL PUMP FLANGE	2	FLG-M50P-DN050-265GH	FLG M50/60P PUMP I/O SLIP-ON DN50 P265GH	NA
11	OIL PUMP MOTOR	1	DELIVERED BY CUSTOMER	PART PROCURED AND DELIVERED TO MAYEKAWA	NA
12	OIL PUMP COUPLING	1	COU-5R-P20-M28	COUPL. 5R BORE PUMP 20 MM / MOTOR 28 MM	SP20G950 R8
13	COUPLING COVER OIL PUMP	1	COV-M50P-ALU	COUPLING GUARD M50P, 3MM, ALU W/EXT	NA
14	STOP VALVE	1	SOV-DN50-SVAS-ST-A	DN50 STRAIGHT STOP VALVE, WELD, 52 barG	SP21G162 R10
20	OIL COOLER	1	VES-KS12-FEH-113-L2200-CE	COOLER TYPE KS12-FEH-113 L2200 INCL.CNTR FL	SP20G262 R14
21	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
21a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
21b	ELBOW M-F	1	NN130-03	STREET ELBOW (HP), 3/8" M-F	NA
21c	BUSHING	1	NF031-0403	HEXAGONAL BUSHING, 1/2" MALE * 3/8" FEMALE	NA
23	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
23a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
30	OIL SEPARATOR	1	VES-HS6022V-160-A-26-39-CE	HS6022V-160 OIL SEPARATOR ACC 005220-0-ME-VD-61000	MYK
31	OIL HEATER	1	HEA-2000W-400	HEATER+THERMOSTAT 2kW, 3x 400V, L=700, 1½", IP65	SP19G057 R6
32	SIGHT GLASS	2	SIG-SW904610	FLANGED SIGHT GLASS SW 90.46.10, PE/NI-TUV	SP20G235 R3
33	FILTER ELEMENT	1	FC317-04	FILTER ELEMENT PS-KR1100-046P	SP21G523 R1
35	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	NA
36	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
36a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
36b	TEE	1	NN210-03	TEE, (HP) PT3/8" BSPT	NA

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POS	ITEM	QTY	PART CODE	DESCRIPTION	TECH.PAGES
36c	TEE	1	NJ4-0603NE	TEE, JO-4140, 3/8" BSPT(M) * 6 mm * 3/8" BSPT(M)	NA
38	OIL DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
38a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
39	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
39a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
39b	ELBOW M-F	1	NN130-03	STREET ELBOW (HP), 3/8" M-F	NA
39c	BUSHING	1	NF031-0403	HEXAGONAL BUSHING, 1/2" MALE * 3/8" FEMALE	NA
40	SAFETY VALVE	1	SAV-458-40/40/40-22.0G	SINGLE BPI SAFETY VLV DN40/40 PN40 22.0G	SP21G015 R7
41	DISCHARGE STOP/CHECK VALVE	1	CHV-DN50-SCAX-ANG-D	DN50 ANGULAR STOP/CHECK VALVE, WELD, 52 barG	SP21G159 R8
50	OIL FILTER	1	VES-OF50-26-39-CE	OIL FILTER OF50-26-39 CE	MYK
51	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
51a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
52	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
52a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
53	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
53a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
54	OIL FILTER ELEMENT	1	FG219-003	NYLON OIL FILTER ELEMENT, HC2003FN2T12HYR14-3, 20µ	SP21G160 R5
55	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	SP21G162 R10
56	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	SP21G162 R10
57	QUICK CLOSING DRAIN VALVE	1	QCV-1/2NPT-SSO-CS-ANG-40B	QUICK CLOSING VALVE, ½" NPT(F), ANG, 40G CS	SP21G276 R3
57a	STOP VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
57b	L HALF UNION	1	NJ3-0803NE	L TYPE HALF UNION, JO-4060, 8mm*3/8" BSPT	NA
57c	I HALF UNION	1	NJ2-0804NE	STRAIGHT HALF UNION, 8mm*1/2" BSPT	NA
60	OIL FILTER	1	VES-OF50-26-39-CE	OIL FILTER OF50-26-39 CE	MYK
61	DRAIN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
61a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
62	PURGE VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
62a	PLUG	1	NF02-03	PLUG w/ HEXAGONAL HEAD, 3/8" BSPT, JO-4542	NA
63	STOP VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
63a	L HALF UNION	1	NJ3-0803NE	L TYPE HALF UNION, JO-4060, 8mm*3/8" BSPT	NA
63b	I HALF UNION	1	NJ2-0803NE	STRAIGHT HALF UNION, JO-4040, 8mm*3/8" BSPT	NA
64	OIL FILTER ELEMENT	1	FG219-003	NYLON OIL FILTER ELEMENT, HC2003FN2T12HYR14-3, 20µ	SP21G160 R5
65	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	SP21G162 R10
66	STOP VALVE	1	SOV-DN50-SVAS-ANG-A	DN50 ANGULAR STOP VALVE, WELD, 52 barG	SP21G162 R10
81	VALVE TO PS	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
81a	I HALF UNION	1	NJ2-0603NE	STRAIGHT HALF UNION, JO-4020, 6mm*3/8" BSPT	NA
81b	NIPPLE 100MM	1	FIT-2X3/8"BSPTM-L100-A333G6	NIPPLE 2 X 3/8" BSPT-M L=100MM ASTM A333 SCHXXS	NA
81c	SOCKET	1	NN11ST-10	PT SOCKET S25C S80 RC 10A, 3/8" BSPT	NA

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POS	ITEM	QTY	PART CODE	DESCRIPTION	TECH.PAGES
81d	UNION	1	NJ1-06NE	UNION JOINT(NE) 6*6 JO4180	NA
82	VALVE TO PD	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
82a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	NA
83	VALVE TO POH	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
83a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	NA
84	VALVE TO PAOF	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
84a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	NA
85	VALVE TO PAFF	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
85a	L HALF UNION	1	NJ3-0603NE	L TYPE HALF UNION, JO-4690, 6mm*3/8" BSPT	NA
86	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	NA
88	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	NA
89	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	NA
90	VALVE TO CAPACITY CONTROL	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
90a	L HALF UNION	1	NJ3-1203KNNT	L TYPE HALF UNION JO-4990 NNT 12*3/8	NA
91	CAPACITY CONTROL BLOCK	1	SLV-ME-230V-50HZ-BLOCK	SOL VLV CAP BLOCK, 230V 50Hz, 1/2"BSPT IP65, 3MM	SP21G141 R7
91a	L HALF UNION	3	NJ3-1204NE	L TYPE HALF UNION, JO-4070, 12mm*1/2" BSPT	NA
91b	L HALF UNION	1	NJ3-1204NE	L TYPE HALF UNION, JO-4070, 12mm*1/2" BSPT	NA
91c	L HALF UNION	1	NJ3-1202KNNT	L TYPE HALF UNION 12*1/4 NNT	NA
91d	L HALF UNION	1	NJ3-1203KNNT	L TYPE HALF UNION JO-4990 NNT 12*3/8	NA
91e	L HALF UNION	1	NJ3-1203KNNT	L TYPE HALF UNION JO-4990 NNT 12*3/8	NA
100	OIL RETURN VALVE	1	SOV-3/8"-SNV	VALVE SNV 3/8" BSPTM-3/8" BSPTF, ANGLE, 52 barG	SP20G808 R8
100a	L HALF UNION	1	NJ3-0803NE	L TYPE HALF UNION, JO-4060, 8mm*3/8" BSPT	NA
100b	ELBOW M-F	1	NN130-03	STREET ELBOW (HP), 3/8" M-F	NA
102	OIL RETURN BLOCK	1	SLV-ME-230V-50HZ-RET-BLOCK-20B	RETURN BLOCK, 230V 50Hz, 3/8"BSPT IP65, 2.7MM	SP21G492 R1
102a	I HALF UNION	2	NJ2-0803NE	STRAIGHT HALF UNION, JO-4040, 8mm*3/8" BSPT	NA
103a	I HALF UNION	1	NJ2-0803NE	STRAIGHT HALF UNION, JO-4040, 8mm*3/8" BSPT	NA
103c	UNION	1	NJ1-08NE	UNION JOINT(NE) 8*8 JO5010	NA
104	PURGE VALVE	1	SOV-1/2"FPT-SVAS-ST	1/2"FPT STRAIGHT STOP VALVE, 52 barG (DN25 BW)	SP21G162 R10
104a	NIPPLE 100MM	1	FIT-2X1/2"BSPTM-L100-A333G6	NIPPLE 2 X 1/2" BSPT-M L= 100MM ASTM A333 SCHXXS	NA
104b	PLUG	1	NF02-04	PLUG w/ HEXAGONAL HEAD, 1/2" BSPT, JO-4543	NA
106	L HALF UNION	2	NJ3-1604NE	L TYPE HALF UNION, 16mm*1/2" BSPT	NA
130	TERMINAL BLOCK	1	MCH-SUC5264	TERMINAL BLOCK, 8X 1/4" NPT + 16X 1/4" BSPT	NA
130a	L HALF UNION	5	NJ3-0602KNNT	L TYPE HALF UNION JO-4080 NNT 6*1/4	NA
130b	PLUG	8	NF02-02	PLUG w/ HEXAGONAL HEAD, 1/4" BSPT, JO-4541	NA
130c	PLUG NPT	8	FIT-PLUG-1/4"NPT-CS	PLUG w/ HEXAGONAL HEAD, 1/4"NPTF-M, CARBON STEEL	NA
130d	ELBOW M-F	3	NN130-02	STREET ELBOW (HP), 1/4" M-F	NA
132	PRESSURE GAUGE SUCTION	1	GAU-63-10BAR	PRESSURE GAUGE 63MM, -1/10 Bar(g), ¼" BSPT	SP20G203 R10
133	PRESSURE GAUGE DISCHARGE	1	GAU-63-25BAR	PRESSURE GAUGE 63MM, -1/25 Bar(g), ¼" BSPT	SP20G203 R10

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134	PRESSURE GAUGE OIL HEADER	1	GAU-63-25BAR	PRESSURE GAUGE 63MM, -1/25 Bar(g), ¼" BSPT	SP20G203 R10
144	HIGH PRESSURE SAFETY SWITCH	1	CTR-HP-RT6AES-M-G3/8"	RT6AES SWITCH (NH3) MAN.RESET G3/8" IP54 10-28BAR	SP21G038 R4
144a	TEE	1	NJ4-06NE	TEE, JO-4110, 6*6*6 mm	NA
144b	EXTRA BACK PLATE	2	FRA-SUPP-CTR-RT-AL	SUPPORT PLATE RT SWITCHES	NA
144c	U BRACKET WELD	2	FRA-SUPP-CTR-KP/RT-U-CS	U-BRACKET FOR CTR RT/KP WELD	NA
145	HIGH PRESSURE LIMITER	1	CTR-HP-RT6AEB-M-G3/8"	RT6AEB SWITCH (NH3) MAN.RESET G3/8" IP54 10-28BAR	SP21G038 R4
199	*LD* SUCTION STOP VALVE	1	SOV-DN125-SVAS-ANG-B4	DN125 ANGULAR STOP VALVE, WELD, 52 barG	SP21G162 R10
200	OIL LEAK RECEIVER	1	OIL-LEAKRECEIVER	OIL SEAL LEAK RECEIVER + PLASTIC BOTTLE	NA
200a	I HALF UNION	1	NJ2-0602NE	STRAIGHT HALF UNION, JO-4010, 6mm*1/4" BSPT	NA
GAS	GASKET COMPRESSOR SUCTION	1	CR72000-125N	GASKET, MYCOM FLANGE 125A (ASBESTOS FREE)	NA
GAS	GASKET COMPRESSOR DISCHARGE	1	CS23600-160N	GASKET 100CD, DISCHARGE FLANGE SPACER (ASBESTOS FR	NA
GAS	GASKET COMPRESSOR ECONOMIZER	1	CR72000-025N	GASKET, MYCOM FLANGE 25A (ASBESTOS FREE)	NA
GAS	GASKET SUCTION STRAINER GAS INLET	1	GAS-FLT-GRO-125-MLGRA	GASKET DN125 TON-GRO (TG) (175X155X2) MLGRA	SP21G522 R1
GAS	GASKET SUCTION STRAINER GAS OUTLET	1	GAS-FLT-GRO-125-MLGRA	GASKET DN125 TON-GRO (TG) (175X155X2) MLGRA	SP21G522 R1
GAS	GASKET SUCTION STRAINER COVER	1	GAS-SSD200-COVER-MLGRA	GASKET SSD200/OF200 COVER (170X150X2) MLGRA	SP21G522 R1
GAS	GASKET OIL SEPARATOR HANDHOLE	1	GAS-HS-COVER-CIRC-12XM20-FIBGA	GASKET HANDHOLE CIRC 380X280 - 12XM20 - FIBGA	NA
GAS	GASKET OIL SEPARATOR INSPECTION HOLE	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	SP21G522 R1
GAS	GASKET OIL SEPARATOR GAS INLET	1	GAS-FLT-PN40-100-CORGR	GASKET DN100 PN25-40 CR/RF (170X115X2) CORGR	NA
GAS	GASKET OIL SEPARATOR GAS OUTLET	1	GAS-FLT-GRO-080-MLGRA	GASKET DN080 TON-GRO (TG) (120X106X2) MLGRA	SP21G522 R1
GAS	GASKET OIL SEPARATOR OIL OUTLET	1	GAS-FLT-GRO-050-MLGRA	GASKET DN050 TON-GRO (TG) (87X73X2) MLGRA	SP21G522 R1
GAS	GASKET OIL SEPARATOR SAFETY VALVE	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	SP21G522 R1
GAS	GASKET HORIZONTAL FINE FILTER	1	GAS-MBC9434-FNP	GASKET FINE FILTER (40x18x3) PREMIUM II	NA
GAS	GASKET OIL FILTER	2	FN14-150N	GASKET, REVERSE FLANGE GRA150 1.5TN	NA
GAS	GASKET DSV2 FLANGE	1	GAS-DAN-DSV2-IN-025-MLGRA	GASKET DANFOSS DSV2 IN DN25 (48X37X2) MLGRA	SP21G522 R1
GAS	GASKET PILOT BLIND FLANGE	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	SP21G522 R1
GAS	GASKET OIL PUMP	2	PL021-050	FLANGE GASKET V6502 20K RF 50A	NA
MMM	OIL FILTER SET	1	VES-OF50D5-SET-26-39-CE	OF50-26-39 DN50 OIL FILTER HOUSING ACC.CE-DESIGN	MYK
XXX	SUPPORT OIL RETURN BLOCK	1	FRA-SUPPORT-OILRETURN-BLOCK	FRAME SUPPORT OILRETURN BLOCK	NA
XXX	MOTOR ALIGNMENT BLOCK	4	ADJ-BLOCK-150X40X20-M16	MOTOR ALIGNMENT BLOCK, M16, ME-SUC1000	NA
XXX	SUPPORT FOR CAPACITY CONTROL BLOCK	1	FRA-CAPCON-BLK-SUPP-235JR	SUPPORT FOR CAPACITY CONTROL BLOCK - 235JR	NA
XXX	GASKET SAFETY VALVE INLET	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	SP21G522 R1
XXX	VES RES	1	VES-RESERVATION-FOR-WO	VES RESERVATION FOR WO	NA
YYY	*LD* GASKET SAFETY VALVE OUTLET	1	GAS-FLT-GRO-040-MLGRA	GASKET DN040 TON-GRO (TG) (75X61X2) MLGRA	SP21G522 R1
YYY	*LD* OIL FILTER ELEMENT	1	FG214-200	SS OIL FILTER ELEMENT ESD200, OF50, 44µ	SP19G044 R8
YYY	*LD* GASKET OIL FILTER	1	FN14-150N	GASKET, REVERSE FLANGE GRA150 1.5TN	NA

NA : NOT APPLICABLE : not considered as wear and tear parts or not considered as main parts.
Please consult Mayekawa Europe in case of questions.

MAYEKAWA Europe MYCOM

REPLACING
THE OIL FILTER ELEMENT

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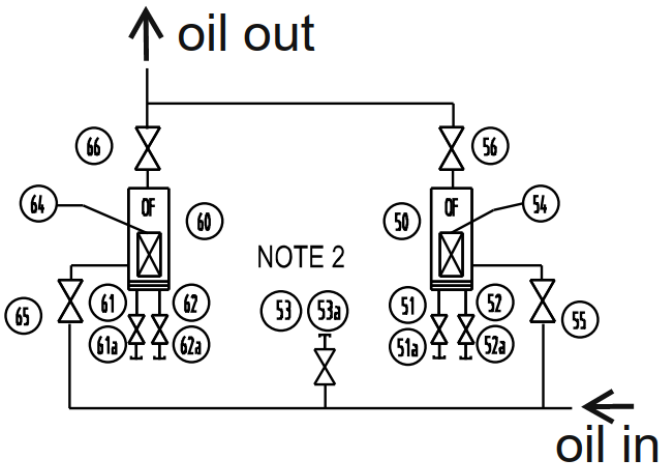
HOW TO REPLACE THE OIL FILTER ELEMENT WITHOUT EQUALISATION LINE

With reference to the figure, the workflow describes the steps to make when changing over to the standby filter, replacing and then putting back in operation the oil filter when there is no equalisation line installed between the two filters.



Make sure that the necessary personal protection is being used when performing the following actions. This description is considering operational filter #60 and standby filter #50. In practise it is also possible to work the other way around.

1. Slowly open the shut-off valve (#55) at the inlet of the stand-by oil filter or confirm that it was already correctly opened during the previous maintenance action.

2. Slowly open the shut-off valve (#56) at the outlet of the stand-by oil filter. The standby filter is now in operation which ensures that there is always an oil filter working when replacing/ cleaning / overhauling the other oil filter.

3. Isolate the oil filter (#60) by closing the shut-off valves at inlet & outlet (#65 and #66).

4. Depressurise the filter by opening the purge valve on the filter cover (#61). After depressurising, leave the purge valve open.

5. Drain oil by opening the drain valve on the filter cover (#62).

6. Remove the oil filter housing cover and remove the oil filter element by unscrewing the fixation bolt and by pulling it out.

7. Clean or replace (replace => if damaged or not cleanable) the existing oil filter element (#64).

8. Install the new or cleaned oil filter element into the oil filter housing (#60) by use of the new cover gasket and by tightening the oil filter cover bolts again. Close purge and drain valves on the cover.

9. Vacuum the oil filter housing to remove any non-condensable gas. In case there is no vacuum pump available, please proceed with the following action:

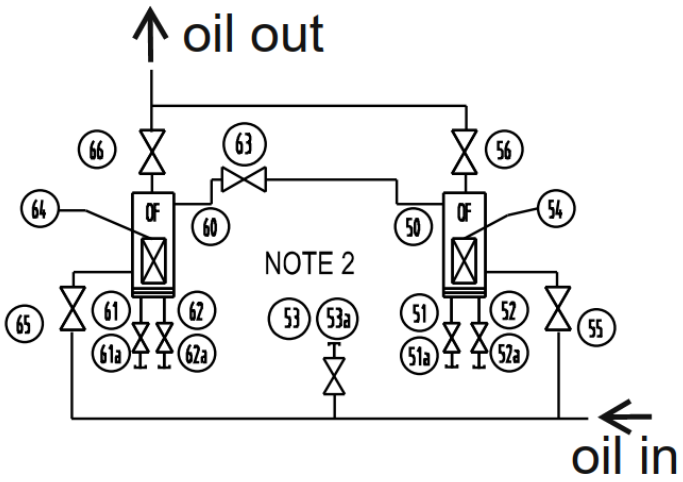
   - ➔ Open purge valve (#61) a little
   - ➔ Slowly open the shut-off valve at the filter inlet (#65) a little
   - ➔ Non-condensables are pushed out through the purge valve (#61)

➔ Once oil comes out of the purge valve (#61), close it.

10. Slowly open the shut-off valve at the inlet of the filter housing (#65) completely. The shut-off valve at the filter housing outlet (#66) should be closed. The filter is now in stand-by and ready to use as operational filter at the next overhaul.

HOW TO REPLACE THE OIL FILTER ELEMENT WITH EQUALISATION LINE

With reference to the figure, the workflow describes the steps to make when changing over to the standby filter, replacing and putting back in operation the oil filter when there is an equalisation line installed.



Make sure that the necessary personal protection is being used when performing the following actions. This description is considering operational filter #60 and standby filter #50. In practise it is also possible to work the other way around.

11. Replacing or cleaning the oil filter element (#64) starts with confirming that the standby filter (#50) was pressurized and correctly placed in stand-by position after the previous overhaul.
    ➔ Slowly open equalisation valve (#63) or confirm that it was already open

12. Open the shut-off valves (#55 and #56) at the inlet and outlet of the stand-by oil filter. This ensures that there is always an oil filter working when replacing/ cleaning / overhauling the other oil filter.

13. Isolate the oil filter (#60) by closing the shut-off valves at inlet & outlet (#65 and #66) and closing the equalisation valve (#63).

14. Depressurise the filter by opening the purge valve on the filter cover (#61). After depressurising, leave the purge valve open.

15. Drain oil by opening the drain valve on the filter cover (#62).

16. Remove the oil filter housing cover.

17. Remove the oil filter element by unscrewing the fixation bolt and by pulling it out.

18. Clean or replace (replace => if damaged or not cleanable) the existing oil filter element (#64).

19. Install the new or cleaned oil filter element (#64) into the oil filter housing (#60) by use of the new cover gasket and by tightening the oil filter cover bolts again. Close purge and

20. Vacuum the oil filter housing to remove any non-condensable gas and directly move to step 21. In case there is no vacuum pump available, please proceed with the following action:

    ➔ Open purge valve (#61) a little
    ➔ Slowly open the equalisation valve (#63)
    ➔ Non-condensables are pushed out through the purge valve (#61)
    ➔ Once oil comes out of the purge valve (#61) close it and proceed with step 22.

21. Pressurize the standby oil filter by slowly opening the equalisation valve (#63).

22. Once the pressure is equalised. Slowly open one of the shut-off valves at either the inlet or outlet of the filter (#56 OR #66).The filter is now back in stand-by and ready to use.

Notes:
The equalisation valve must remain open during normal operation. It is only to be closed for maintenance action on the oil filter, as described in this instruction.

FILTER ELEMENT INFORMATION

- Required element for OFC 50 type Oil filter:

  Stainless Steel Filter Element :

Element:	FG214-200*
Cover gasket :	FN14-150N

  Paper Filter Element:

Element:	FG213-200*
Cover gasket :	FN14-150N

  Nylon filter element

Element	FG219-003
Cover gasket:	FN14-150N

- Required element for OF 200 type Oil filter:

  Stainless Steel Filter Element:

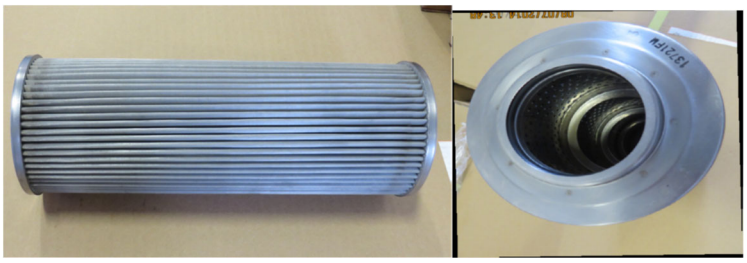
Element:	FG216-001*
Cover gasket :	GAS-SSD200-COVER

  Paper Filter Element:

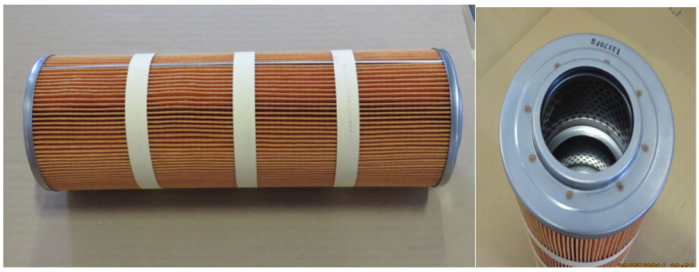
Element:	FG215-001*
Cover gasket :	GAS-SSD200-COVER

* The element is including the necessary O-ring

- Stainless Steel:



- Paper:



- Nylon

MAYEKAWA Europe MYCOM

DATASHEET HEATING ELEMENT

TYPE 2kW

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BELGIUM

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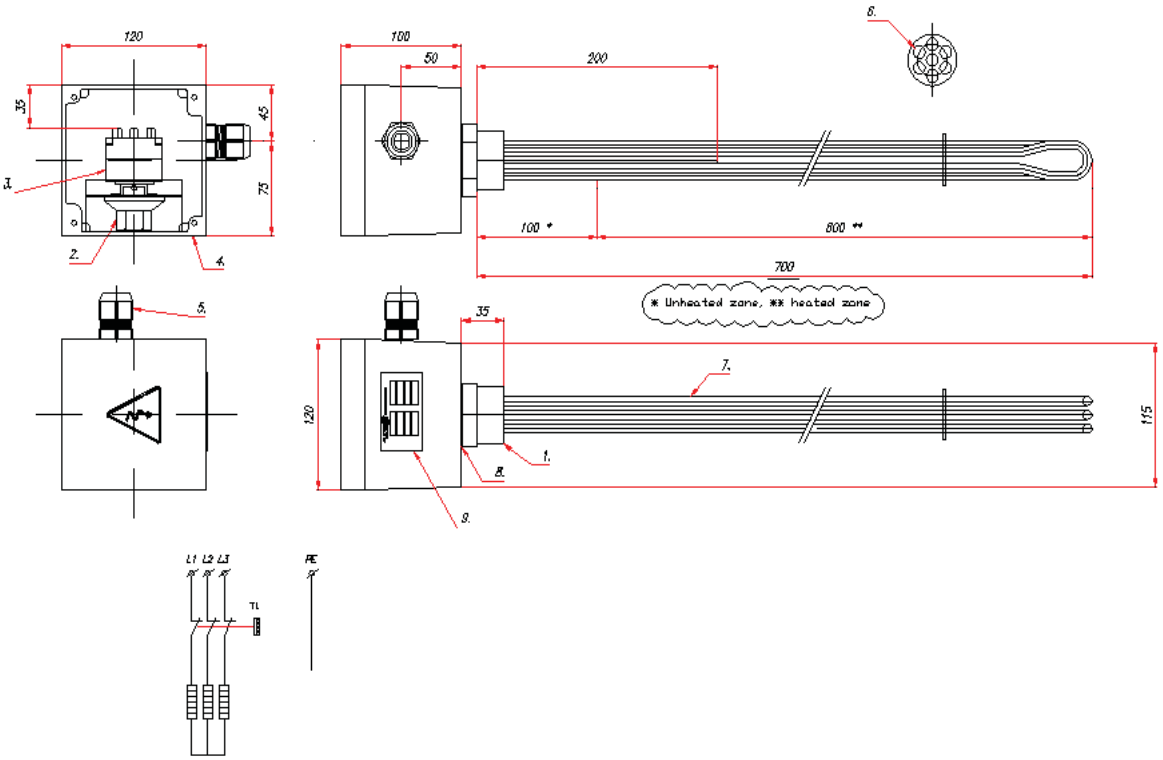
info@mayekawa.eu

DATASHEET HEATING ELEMENT

Part number Mayekawa	: HEA-2000W-….
Type	: ISE
Capacity	: 2kW
Design pressure	: 30 barG (standard) 35 barG (option)
Spec. surface load	: 2 W/cm²
Nominal voltage	: according tag plate
Drawing	: ISE2kW.700.400.G137

Mounting- and application instructions.

- Install the heating element according the local electrical rules.
- Check if the nominal voltage of the heating element is conform the connected voltage (see tag plate)
- Check if the used sheath material is suitable for the liquid to heat
- Make sure of the supply the liquid to heat and the total immersion of the heating element
- Protect the heating element against exceeding the maximum sheath temperature (350°C).



MAYEKAWA Europe MYCOM

REGULATING VALVES

TYPE REG-SA / REG-SB

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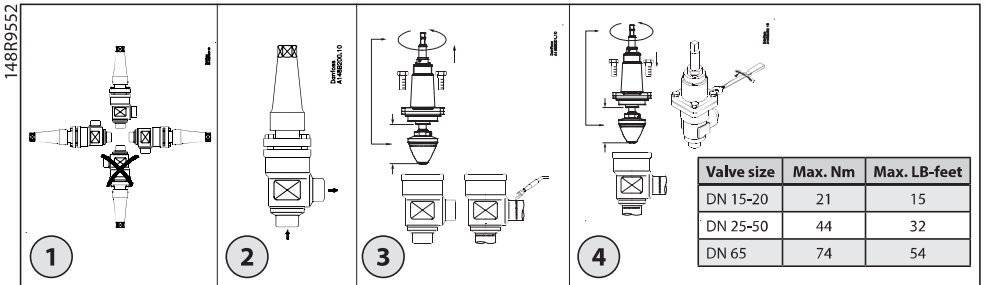
Installation guide

Hand operated regulating valves

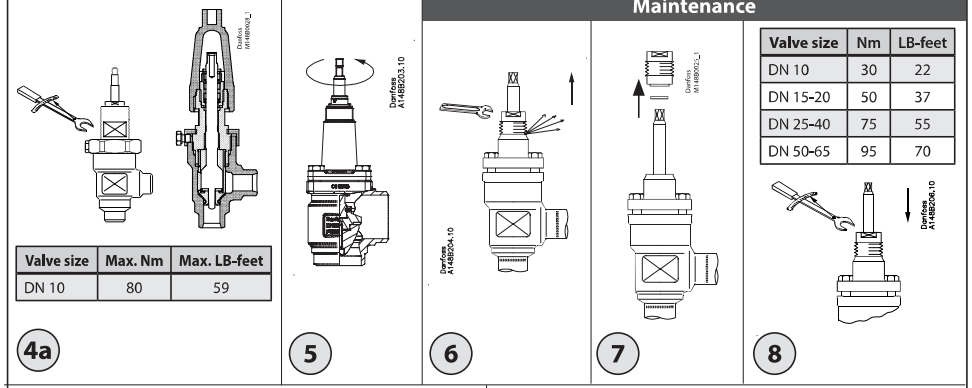
REG-SA, REG-SB

UK CA 089 0879

148R9552



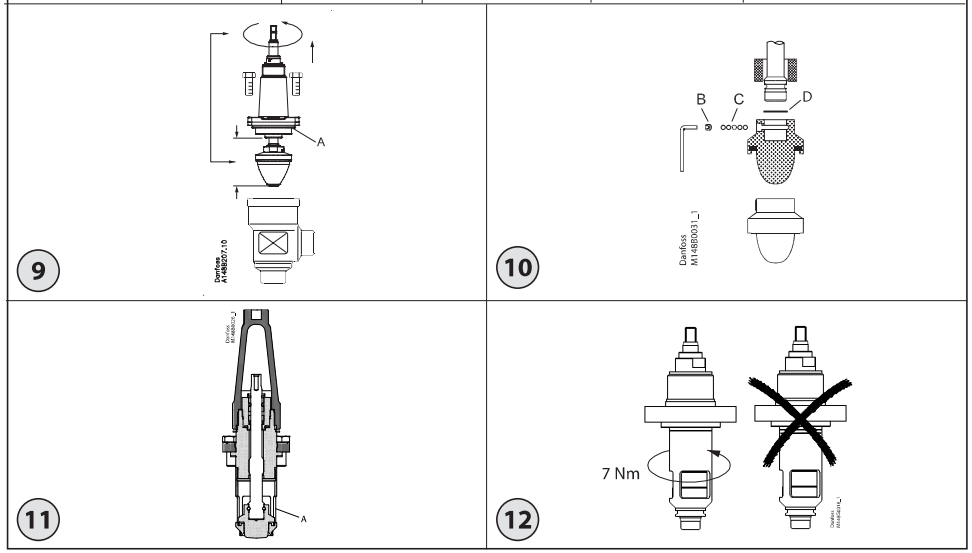
Valve size	Max. Nm	Max. LB-feet
DN 15-20	21	15
DN 25-50	44	32
DN 65	74	54



Valve size	Max. Nm	Max. LB-feet
DN 10	80	59

Maintenance

Valve size	Nm	LB-feet
DN 10	30	22
DN 15-20	50	37
DN 25-40	75	55
DN 50-65	95	70



Импортер:ТОВ з ii "Данфосс ТОВ" 04080, Київ 80, п/с 168, Україна

Info for UK customers only : Danfoss Ltd., 22 Wycombe End, HP9 1NB, GB

ENGLISH

Installation

Refrigerants

Applicable to HCFC, HFC, R717 (Ammonia), R744 (CO_2), Propane, Butane, Iso-Butane and Ethane.
The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range

–60/+150°C (–76/+302°F)

Max. working pressure

The valves are designed for a max. working pressure of 52 bar g (754 psi g).

Installation

The valve must be installed with the spindle vertically upwards or in horizontal position (fig. 1). Valves should be opened by hand. The valve is designed to withstand a high internal pressure. However, the piping system should be designed to avoid liquid traps and reduce the risk of hydraulic pressure caused by thermal expansion.
Please ensure that the valve is protected from pressure transients like "liquid hammer" in the system.

Recommended flow direction

Direct the flow towards the cone as indicated by the arrow placed on the valve housing (fig. 2). The force used to open and close the valve must not exceed the force of an ordinary handwheel.

Welding

Remove the bonnet before welding (fig.3) to prevent damage to the O-rings in the packing gland and between the valve body and bonnet, as well as the teflon gasket in the valve seat. Be careful not to damage the teflon cone ring and make sure the complete bonnet is protected from dirt and water while removed.

Removing the bonnet can be omitted provided that: The temperature in the area between the valve body and bonnet during welding does not exceed +150 °C/+302 °F. This temperature depends on the welding method as well as on any cooling of the valve body during the welding itself. (Cooling can be ensured by, for example, wrapping a wet cloth around the valve body.) Make sure that no dirt, welding debris etc. get into the valve during the welding procedure.
Only materials and welding methods, compatible with the valve housing material, must be applied to the valve housing. The valve housing must be free from stresses (external loads) after installation.
Clean the valve internally to remove welding debris at completion of welding and before the valve is reassembled. Avoid welding debris and dirt in the threads of the housing and the bonnet.
Do NOT remove or service the dark colored grease between the spindle thread and the bonnet. In case the grease has been contaminated with dirt, debris, particles or water the complete top part must be replaced.
Do not mount REG valves in systems where the outlet side of the valve is open to atmosphere. The outlet side of the valve must always be connected to the system or properly capped off, for example with a welded-on end plate.

Assembly

Remove welding debris and any dirt from pipes and valve body before assembly. Check that the cone has been fully screwed back towards the bonnet before it is repositioned in the valve body (REG DN 50-65) (fig. 4).

Tightening

Tighten the bonnet with a torque wrench, to the values listed in the table (fig. 4).

Colours and identification

The REG valves are painted with a red primer in the factory. Precise identification of the valve is made via the yellow ID ring at the top of the bonnet, as well as by the stamping on the valve body. The external surface of the valve housing must be protected against corrosion with a suitable protective coating after installation and assembly.
Protection of the ID ring when repainting the valve is recommended.

Maintenance

Packing gland

When performing service and maintenance,replace the complete packing gland only,which is available as a spare part. As a general rule, the packing gland must not be removed if there is internal pressure in the valve. However, if the following precautionary measures are taken, the packing gland can be removed with the valve still under pressure:

Backseating (fig. 5)

To backseat the valve, turn the spindle counter-clockwise until the valve is fully open.

Pressure equalization (fig. 6)

In some cases, pressure forms behind the packing gland. Hence, a handwheel or a large washer (pos. A) should be fastened on top of the spindle while the pressure is equalized.
The pressure can be equalized by slowly screwing out the gland.

Removal of packing gland (fig. 7)

Packing gland can now be removed.

Dismantling the valve

Do not remove the bonnet while the valve is still under pressure.
- Check that the O-ring (fig. 9, pos. A) has not been damaged.
- If the gasket (pos. A) has been exposed to air or other refrigerants than listed in this installation guide for more than 6 months it must be replaced.
- Check that the spindle is free of scratches and impact marks.
- If the teflon cone ring has been damaged, the whole cone assembly must be replaced.
- DN 10-40: Unscrew the adapter (fig. 11, pos. A) to be able to change the cone.

Replacement of the cone (fig. 10)

Unscrew the cone screw (pos. B) with an Allen key. (An Allen key is included in the Danfoss Industrial Refrigeration gasket set).
REG 15-40..... 2.0 mm A/F
REG 50-65..... 2.5 mm A/F
Remove the balls (pos. C).
Number of balls in fig. 10, pos. C:
REG 15-20..... 10 pcs.
REG 25-65..... 14 pcs.

The cone can now be removed. Place the new cone on the spindle and remember to place the disk spring (pos. D) between the spindle and the cone. Compress the disk spring and replace the balls (pos. C).
Refit the cone screw in again using Loctite No. 648. to ensure that the screw is properly fastened. Do NOT remove or service the dark colored grease between the spindle thread and the bonnet. In case the grease has been contaminated with dirt, debris, particles or water the complete top part must be replaced.

Assembly

Remove any dirt from the body before the valve is assembled. Check that the cone has been screwed back towards the bonnet before it is replaced in the valve body (fig. 4).
Note:
For REG SA/SB sizes DN 10-40 it is important to ensure that the lower and upper part of the insert is tightly screwed together (fig. 12) and that this screw connection is kept tight during repositioning of the cone in the housing.

Tightening

Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 4). Tighten the packing gland with a torque wrench, to the values indicated in the table (fig. 8). Use only original Danfoss parts, including packing glands, O-rings and gaskets for replacement. Materials of new parts are certified for the relevant refrigerant. In cases of doubt, please contact your local Danfoss sales office.

DEUTSCH

Installation

Kältemittel
Anwendbar für HFCKW, HFKW, R717
(Ammoniak), R744 (CO2), Propan, Butan, Iso-Butan und Ethan.

Das Ventil wird nur für den Einsatz in geschlossenen Kreisläufen empfohlen.
Für weitere Informationen wenden Sie sich bitte an Danfoss.

Temperaturbereich
–60/+150°C)
Druckbereich
Die Ventile sind für einen max. Betriebsdruck von 52 bar g (754 psi g) ausgelegt.

Installation
Das Ventil ist mit der Spindel vertikal nach oben oder in waagerechter Position zu montieren (Abb. 1). Ventile sollten mit der Hand laut Hinweisen auf dem Datenblatt geöffnet werden. Das Ventil ist für sehr hohe Innendrücke dimensioniert. Jedoch ist bei der Auslegung des Rohrsystems darauf zu achten, dass Kältemitteleinschlüsse vermieden werden, und dass das Risiko von durch thermische Expansion verursachtem hydraulischem Druck reduziert wird. Es ist sicherzustellen, dass das Ventil gegen Druckschwingungen in der Anlage, wie "Flüssigkeitsschläge", geschützt ist.

Empfohlene Durchflussrichtung
Der Durchfluss ist zum Kegel hin in Richtung des Pfeils auf dem Ventilgehäuse (Abb. 2) zu leiten. Die zum Öffnen und Schließen des Ventils aufgewendete Kraft darf die Kraft eines gewöhnlichen Handrads nicht überschreiten.

Anschweißenden
Entfernen Sie das Oberteil vor dem Schweißen (Abb. 3), um eine Beschädigung der O-Ringe in der Stopfbuchse und zwischen dem Ventilkörper und dem Oberteil sowie der Teflondichtung im Ventilsitz zu vermeiden. Achten Sie darauf, den Teflon-Konusring nicht zu beschädigen, und stellen Sie sicher, dass das komplette demontierte Oberteil vor Schmutz und Wasser geschützt ist.
Auf das Entfernen des Oberteils kann unter folgenden Voraussetzungen verzichtet werden: Es muss sicher gestellt werden, dass die Temperatur im Bereich der Dichtungen während des Schweißens nicht auf mehr als 150 °C ansteigt. Diese Temperatur hängt von der Schweißmethode und von der Kühlung des Ventilkörpers während des Schweißvorgangs ab. (Die Kühlung kann beispielsweise sichergestellt werden, indem ein feuchtes Tuch um den Ventilkörper gewickelt wird.) Stellen Sie sicher, dass während des Schweißens kein Schmutz und keine Schweißrückstände usw. in das Ventil gelangen.
Es dürfen nur Materialien und Schweißmethoden verwendet werden, die mit dem Material des Ventilgehäuses kompatibel sind. Das Ventilgehäuse muss nach der Installation frei von externen Spannungen sein (keine äußeren Lasten).
Das Ventil sollte vor dem erneuten Zusammenbauen von innen gereinigt werden, um nach den Schweißarbeiten Schweißrückstände zu entfernen. Vermeiden Sie Schweißrückstände und Schmutz in den Gewindebohrungen des Gehäuses und des Oberteils.
Das dunkle Schmierfett zwischen dem Spindelgewinde und dem Ventiloberteil darf NICHT entfernt oder gewartet werden. Falls das Schmierfett durch Schmutz, Rückstände, Partikel oder Wasser verunreinigt wurde, muss das Oberteil vollständig ausgetauscht werden.
Montieren Sie keine REG-Ventile in Systemen, bei denen die Austrittsseite des Ventils nach außen hin offen ist. Die Austrittsseite des Ventils muss immer an die Anlage angeschlossen oder ordnungsgemäß abgedeckt sein, z. B. mit einer angeschweißten Endplatte.
Zusammenbau
Vor dem Zusammenbausind alle Schweißrückstände und eventueller Schmutz von Rohren und Ventilgehäuse zu entfernen. Der Kegel völlig muss völlig gegen den Ventildeckel geschraubt sein, bevor der Einbau in das Ventilgehäuse erfolgt (REG DN 50-65) (Abb. 4).
Festspannen
Den Ventildeckel mit einem Drehmomentschlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 4).

Farben und Kennzeichnung
Die REG-Ventile werden in der Fabrik mit einem roten Grundanstrich versehen. Eine genaue Kennzeichnung des Ventils erfolgt auf dem gelben ID-Ring oben am Ventildeckel und ist auch in das Ventilgehäuse eingeschlagen. Die Außenoberfläche des Ventilgehäuses ist mit einer passenden Schutzschicht nach Installation und Zusammenbau gegen Korrosion zu schützen.
Beim erneuten Anstreichen des Ventils ist der ID-Ring zum Schutz abzudecken.

Wartung

Stopfbuchse
Bei Service- und Wartungsarbeiten ist immer nur die komplette Stopfbuchse auszutauschen, die als Ersatzteil erhältlich ist. Prinzipiell darf die Stopfbuchse nur bei drucklosem Ventil entfernt werden. Unter Berücksichtigung folgender Vorsichtsmaßnahmen kann die Stopfbuchse jedoch aus von einem unter druckstehenden Ventil entfernt werden:

Rücksitzdichtung (Abb. 5)
Zur Aktivierung der Rücksitzdichtung des Ventils, ist die Spindel gegen den Uhrzeigersinn zu drehen, bis das Ventil völlig offen ist.

Druckausgleich (Abb. 6)
Unter Umständen bildet sich hinter der Stopfbuchse Druck. Deswegen sollte, während der Druck ausgeglichen wird, am Spindelkopf ein Handrad oder Ähnliches befestigt sein. Der Druck lässt sich dann durch langsames Herausdrehen der Stopfbuchse ausgleichen.

Ausbau der Stopfbuchse (Abb. 7)
Die Stopfbuchse kann jetzt entfernt werden.
Ausbau des Ventils
Den Ventildeckel nicht entfernen, solange das Ventil unter Druck steht.
- Kontrollieren, dass der O-Ring (Abb. 9, Pos. A) nicht beschädigt ist.
- Wenn die Dichtung (Pos. A) länger als sechs Monate der Luft oder Kältemitteln, die nicht in dieser Installationsanleitung aufgelistet sind, ausgesetzt war, muss sie ausgetauscht werden.
- Kontrollieren, dass die Spindel frei von Riefen und Schlagkerben ist.
- Ist der Teflonring am Kegel beschädigt, ist die gesamte Kegeleinheit auszutauschen.
- DN 10-40: Adapter (Abb. 11 Pos. A) lösen um die Stopfbuchse demontieren zu können.

Austausch des Kegels (Abb. 10)
Die Kegelschraube (Pos. B) mit einem Sechskantstiftschlüssel lösen.
REG 15-40 ..... 2,0 mm Schlüsselweite
REG 50-65 ..... 2,5 mm Schlüsselweite
(Ein Sechskantstiftschlüssel ist im Dichtungs-satz von Danfoss Industrial Refrigeration eingeschlossen).
Die Kugeln (Pos. C) entfernen.
Anzahl Kugeln in Abb. 10, Pos. C:
REG 15-20 ..... 10 Stck.
REG 25-65 ..... 14 Stck.
Anschließend lässt sich der Kegel ausbauen. Den neuen Kegel auf der Spindel platzieren, hierbei die Montage der Federscheibe (Pos. D) zwischen Spindel und Konus nicht vergessen. Die Kugeln unter Spannung der Federscheibe wieder anbringen (Pos. C). Die Kegelschraube wieder montieren und mit Loctite No. 648 fest angespannt sichern.
Das dunkle Schmierfett zwischen dem Spindelgewinde und dem Ventiloberteil darf NICHT entfernt oder gewartet werden. Falls das Schmierfett durch Schmutz, Rückstände, Partikel oder Wasser verunreinigt wurde, muss das Oberteil vollständig ausgetauscht werden.

Zusammenbau
Vor dem Zusammenbau ist jeglicher Schmutz aus dem Ventilkörper zu entfernen. Bevor der Konus in den Ventilkörper eingesetzt wird ist sicherzustellen, daß der Kegel völlig gegen den Ventildeckel geschraubt ist (Abb. 4).

Achtung:
Für REG SA/SB DN 10-40 ist es wichtig sicher zu stellen, daß das obere und untere Teil des Einsatzes fest zusammengeschraubt ist (Abb. 12) und das die Schraubverbindungen beim Einsetzen fest verbunden bleiben.

Festspannen
Den Ventildeckel mit einem Drehmoment-schlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 4).

Die Stopfbuchse mit einem Drehmoment-schlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 8).

Zum Austausch nur Originalteile von Danfoss, einschließlich Stopfbuchsen, O-Ringe und Dichtungen, verwenden. Die Werkstoffe von Neuteilen sind für das betreffende Kältemittel zertifiziert.
Im Zweifelsfall nehmen Sie bitte Kontakt mit Danfoss Kontakt auf.

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FRANÇAIS

Installation

Fluides frigorigènes
Applicable aux fluides frigorigènes HCFC, HFC, R717 (ammoniac), R744 (CO2), propane, butane, isobutane et éthane

L'utilisation du régleur est uniquement conseillée dans les circuits fermés. Pour plus d'informations, contactez Danfoss.

Plage de températures
-60/+150 °C

Pression de service max.
Les régleurs sont conçus pour une pression de service maximale de 52 bar g.

Installation
Installez le régleur de sorte que la tige se trouve en position verticale ou horizontale (fig. 1). Les régleurs doivent être ouverts manuellement. Le régleur est conçu pour résister à une pression interne élevée. Toutefois, il convient de concevoir le circuit de façon à éviter les pièges à liquide et réduire les risques de formation d'une pression hydraulique sous l'effet de la dilatation thermique. Veillez à ce que le régleur soit protégé des variations de pression au sein du circuit comme les « coups de bélier ».

Sens du débit
Dirigez le débit vers le cône tel qu'indiqué par la flèche sur le corps de la vanne (fig. 2). La force utilisée pour ouvrir ou fermer la vanne ne doit pas excéder celle exercée par le volant.

Soudure
La partie supérieure interne doit être retirée avant le soudage (fig. 3), afin d'éviter d'endommager les joints toriques du presse-étoupe, et entre le corps de la vanne et la partie interne, ainsi que le joint d'étanchéité en téflon du siège de la vanne. Veiller à ne pas endommager la bague en téflon du cône. Vérifier que la partie interne une fois retirée est à l'abri de la saleté et de l'eau.
Le capuchon peut seulement rester en place si, pendant le soudage, la température dans la zone comprise entre le corps de vanne et le capuchon n'excède pas +150 °C/+302 °F. Cette température est fonction de la méthode de soudage ainsi que du refroidissement du corps de vanne pendant le soudage. (Le refroidissement peut être effectué, par exemple, en enveloppant le corps de vanne dans un linge humide.) Veiller à ce qu'aucune salissure, aucun débris de soudage, etc. ne s'introduise dans la vanne pendant le soudage.
Seuls des matériaux et des méthodes de soudage compatibles avec le matériau du corps de la vanne, peuvent être soudés et appliqués au corps de la vanne. Aucune contrainte (charges externes) ne doit être exercée sur le corps de la vanne après l'installation.
L'intérieur de la vanne doit être nettoyé pour éliminer les débris de soudage une fois le soudage effectué et avant le montage de la vanne. Éviter que des débris de soudage et des salissures ne pénètrent dans les filetages du boîtier et le capuchon.
Ne PAS enlever ou nettoyer l'excédent de graisse foncée entre le filetage de la tige et la partie interne. En cas de contamination de la graisse par de la saleté, des débris, des particules ou de l'eau, la partie supérieure doit être entièrement remplacée. Les robinets REG ne doivent pas être montés dans des systèmes où la sortie de la vanne est exposée à l'air. Le côté sortie de la vanne doit toujours être raccordé au système ou correctement couvert, par exemple à l'aide d'un embout soudé.

Montage
Retirez les résidus de soudure et les impuretés des conduites et du corps du régleur avant de procéder au montage. Vérifiez que le cône a été entièrement revissé à l'arrière du capuchon avant de le replacer dans le corps de la vanne (REG DN 50-65) (fig. 4).

Serrage
Serrez le capuchon à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 4).

Couleurs et identification
Les robinets régleurs REG sont recouverts en usine d'une couche de peinture primaire rouge. Le robinet peut être précisément identifié à l'aide de la bague d'identification jaune, située au sommet du capuchon, ainsi que par un estampillage sur le corps du régleur. La surface extérieure du corps du régleur doit être protégée de la corrosion à l'aide d'un revêtement adéquat appliqué après l'installation et le montage.
Il est recommandé de protéger la plaque signalétique lors de l'application de la peinture sur la vanne.

Maintenance

Presse-étoupe
Lors des opérations de service et de maintenance, remplacez uniquement le presse-étoupe complet, disponible en pièce détachée. En règle générale, le presse-étoupe ne doit pas être retiré lorsque le régleur est sous pression. Toutefois, si les mesures de précaution suivantes sont prises, il est possible de remplacer le presse-étoupe pendant que le régleur est sous pression :

Contre-siège (fig. 5)
Pour ouvrir le régleur, effectuez une rotation de la tige dans le sens inverse des aiguilles d'une montre jusqu'à ouverture complète du régleur.
Égalisation de la pression (fig. 6)
Dans certains cas, une pression se forme derrière le presse-étoupe. C'est pourquoi un volant de manœuvre ou un dispositif similaire (pos. A) doit être fixé au sommet de la tige pendant l'égalisation de la pression. La pression peut être égalisée en dévissant progressivement le presse-étoupe.

Dépose du presse-étoupe (fig. 7)
Le presse-étoupe peut maintenant être retiré.

Démontage du régleur
Ne jamais retirer le capuchon si le régleur est encore sous pression.
- Vérifiez que le joint torique (fig. 9, pos. A) n'a pas été endommagé.
- Si le joint d'étanchéité (pos. A) est resté à l'air libre ou s'il a été exposé à d'autres fluides frigorigènes que ceux mentionnés dans ce guide d'installation pendant plus de 6 mois, il doit être remplacé.
- Vérifiez que la tige est exempte de rayures et de traces d'impacts.
- Si la bague du cône en téflon a été endommagée, remplacez le cône entier.
- DN 10-40 : Dévissez l'adaptateur (fig. 11, pos. A) afin de pouvoir changer le cône.

Remplacement du cône (fig. 10)
Dévissez la vis du cône (pos. B) à l'aide d'une clé Allen. Une clé Allen est incluse dans le jeu de joints fourni Danfoss.
REG 15-40 ..... 2,0 mm A/F
REG 50-65 ..... 2,5 mm A/F
Retirez les billes (pos. C).
Nombre de billes sur la fig. 10, pos. C :
REG 15-20 ..... 10 pcs.
REG 25-65 ..... 14 pcs.
Le cône peut maintenant être retiré. Positionnez le cône neuf sur la tige et veillez à placer le ressort circulaire (pos. D) entre la tige et le cône. Comprimez le ressort circulaire et replacez les billes (pos. C).
Remettez la vis du cône en utilisant le produit Loctite n°648 pour garantir une fixation appropriée de la vis.
Ne PAS enlever ou nettoyer l'excédent de graisse foncée entre le filetage de la tige et la partie interne. En cas de contamination de la graisse par de la saleté, des débris, des particules ou de l'eau, la partie supérieure doit être entièrement remplacée.

Montage
Avant le montage, retirez si besoin les impuretés du corps du régleur. Vérifiez que le cône a été vissé à l'arrière du capuchon avant de le replacer dans le corps du régleur (fig. 4).

Remarque :
dans le cas des vannes REG SA/SB, tailles DN 10-40, il est important de vous assurer que les parties inférieure et supérieure de l'insert sont correctement vissées ensemble (fig. 12) et que leur raccord est fermement maintenu lors du repositionnement du cône dans le corps.

Serrage
Serrez le capuchon à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 4). Serrez le presse-étoupe à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 8).
N'utilisez que des composants Danfoss d'origine, en particulier pour tout remplacement du presse-étoupe ou des joints toriques et des joints d'étanchéité. Les matériaux des nouveaux composants sont homologués pour le fluide frigorigène utilisé.
En cas de doute, veuillez prendre contact avec Danfoss.

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ESPAÑOL

Instalación

Refrigerantes
Aptas para HCFC, HFC, R-717 (amoníaco),
R-744 (CO_2), propano, butano, isobutano y etano.
Se recomienda limitar el uso de estas válvulas a circuitos cerrados. Si desea obtener más información, póngase en contacto con Danfoss.

Rango de temperatura
De –60 a +150 °C (de –76 a +302 °F).
Presión de trabajo máxima
Estas válvulas están diseñadas para soportar una presión de trabajo máxima de 52 bar (754 psig).

Instalación
La válvula debe instalarse de forma que el eje quede en posición vertical y orientado hacia arriba o en posición horizontal (consulte la fig. 1). Las válvulas deben abrirse manualmente. Son válvulas diseñadas para soportar una presión interna elevada. Sin embargo, el sistema de tuberías debe diseñarse de tal forma que se eviten las acumulaciones de líquido y se reduzca el riesgo asociado a la presión hidráulica generada por la expansión térmica. Asegúrese de que la válvula se encuentre protegida frente a los fenómenos transitorios asociados a la presión que puedan producirse en el sistema (por ejemplo, el fenómeno conocido como "golpe de ariete").

Sentido de flujo recomendado
El caudal debe dirigirse hacia el cono, de acuerdo con el sentido indicado por la flecha situada en la carcasa de la válvula (consulte la fig. 2). La fuerza aplicada para abrir y cerrar la válvula no debe ser mayor que la que pueda ejercerse utilizando un volante convencional.

Soldadura
La parte superior de la válvula debe desmontarse antes de realizar la soldadura (fig. 3) con el fin de evitar que se produzcan daños en las juntas tóricas del prensaestopas y en la junta situada entre el cuerpo y la parte superior de la válvula, así como en la junta de teflón del asiento de la válvula. Tenga cuidado de no dañar el anillo cónico de teflón y asegúrese de proteger toda la parte superior de la válvula de la suciedad y el agua al extraerla.
Únicamente puede dejarse montada la parte superior de la válvula si: durante el proceso de soldadura, la temperatura del área comprendida entre el cuerpo y la parte superior de la válvula no supera los +150 °C / +302 °F. Dicha temperatura depende del método de soldadura empleado, así como de la refrigeración que pueda aplicarse al cuerpo de la válvula durante la realización de la soldadura (la refrigeración puede asegurarse, por ejemplo, envolviendo el cuerpo de la válvula en un paño húmedo).
Durante las operaciones de soldadura, asegúrese de que no se introduzcan en la válvula suciedad ni restos de materiales de soldadura, etc.
Los materiales y métodos de soldadura aplicados al cuerpo de la válvula deberán ser compatibles con el material de este. El cuerpo de la válvula no debe someterse a tensiones (cargas externas) tras su instalación.
Al finalizar la soldadura y antes de volver a montar la válvula, esta deberá someterse a una limpieza interna para eliminar los restos de materiales de soldadura. No deben quedar restos de materiales de soldadura ni suciedad en las roscas del cuerpo y la parte superior de la válvula.
NO elimine ni sustituya la grasa de color oscuro que se encuentra entre el eje roscado y la parte superior de la válvula. Si la grasa se contamina con suciedad, residuos, partículas o agua, deberá sustituirse toda la parte superior.
No deberán montarse válvulas REG en sistemas en los que el lado de salida de la válvula quede abierto a la atmósfera. El lado de salida de la válvula siempre debe conectarse al sistema o cerrarse debidamente (por ejemplo, soldando una placa).
Montaje
Elimine los restos de materiales de soldadura y la suciedad de las tuberías y el cuerpo de la válvula antes de proceder a su montaje. Compruebe que el cono se encuentre completamente enroscado en el casquillo antes de volver a acoplarlo al cuerpo de la válvula (REG DN 50-65) (consulte la fig. 4).
Apriete
Apriete el casquillo empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 4).
Colores e identificación
Las válvulas REG reciben una imprimación de color rojo durante su fabricación. La identificación precisa de dichas válvulas se lleva a cabo por medio de un anillo característico de color amarillo situado en la parte superior del casquillo, así como de la estampación del cuerpo de las válvulas. La superficie externa de la carcasa de las válvulas debe protegerse frente a la corrosión aplicando un recubrimiento protector adecuado tras su instalación y montaje. Se recomienda proteger el anillo de identificación antes de pintar la válvula.

Mantenimiento

Prensaestopas
Sólo es preciso sustituir el conjunto del prensaestopas como parte de las operaciones de servicio y mantenimiento; este elemento se encuentra disponible como pieza de repuesto. Como norma general, el prensaestopas no debe desmontarse si el interior de la válvula se encuentra presurizado. No obstante, si se adoptan las precauciones siguientes, el prensaestopas puede desmontarse aunque la válvula se encuentre presurizada.
Sellado interno (consulte la fig. 5)
Para sellar internamente la válvula, gire el eje en sentido antihorario hasta que la válvula quede completamente abierta.
Igualación de presión (consulte la fig. 6)
En algunos casos, puede producirse una acumulación de presión tras el prensaestopas. Debido a ello, debe acoplarse un volante u otro elemento similar a la parte superior del eje mientras la presión se iguala. La presión puede igualarse desenroscando lentamente el prensaestopas.
Desmontaje del prensaestopas (consulte la fig. 7)
Una vez llevados a cabo los pasos anteriores, puede desmontarse el prensaestopas.
Desensamblaje de la válvula
No desmonte el casquillo mientras la válvula se encuentre presurizada.
- Compruebe que la junta tórica (consulte la fig. 9, pos. A) no presente daños.
- Si la junta (pos. A) ha estado expuesta al aire o a refrigerantes no indicados en esta guía de instalación durante más de seis meses, deberá sustituirla.
- Compruebe que el eje no presente arañazos ni marcas de golpes por impacto.
- Si el anillo de teflón del cono ha sufrido daños, deberá sustituir el conjunto del cono.
- DN 10-40: desatornille el adaptador (consulte la fig. 11, pos. A) para poder sustituir el cono.

Sustitución del cono (consulte la fig. 10)
Desenrosque el tornillo del cono (pos. B) utilizando una llave Allen.
Nota: el juego de juntas de la división de Refrigeración Industrial de Danfoss incluye una llave Allen.
REG 15-40 ..... 2,0 mm A/F
REG 50-65 ..... 2,5 mm A/F
Desmonte las bolas (pos. C).
Número de bolas (consulte la fig. 10, pos. C):
REG 15-20 ..... 10 uds.
REG 25-65 ..... 14 uds.
A continuación podrá desmontar el cono. Coloque el cono nuevo en el eje y sitúe el muelle del disco (pos. D) entre el eje y el cono. Comprima el muelle del disco y vuelva a colocar las bolas en su posición (pos. C).
Monte el tornillo del cono utilizando el producto Loctite 648 para garantizar que dicho tornillo quede correctamente sujeto.
NO elimine ni sustituya la grasa de color oscuro que se encuentra entre el eje roscado y la parte superior de la válvula. Si la grasa se contamina con suciedad, residuos, partículas o agua, deberá sustituirse toda la parte superior.
Montaje
Elimine la suciedad que pueda existir en el cuerpo de la válvula antes de volver a montar esta. Compruebe que el cono se encuentre enroscado en el casquillo antes de volver a acoplarlo al cuerpo de la válvula (consulte la fig. 4).

Nota:
Para válvulas REG SA/SB de tamaños DN 10-40, es importante garantizar que las partes inferior y superior del módulo queden bien sujetas al enroscarlas (consulte la fig. 12) y que la conexión roscada se mantenga apretada al volver a instalar el cono en la carcasa.

Apriete
Apriete el casquillo empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 4). Apriete el prensaestopas empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 8).
Use únicamente piezas de repuesto originales fabricadas por Danfoss (incluidos los prensaestopas, las juntas tóricas y las juntas). Los materiales con los que se fabrican las piezas de repuesto poseen las homologaciones pertinentes para el refrigerante correspondiente.
En caso de duda, póngase en contacto con su distribuidor local de Danfoss.

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ITALIANO

Installazione

Refrigeranti
Applicabile a HCFC, HFC, R717 (ammoniaca),
R744 (CO_2), propano, butano, isobutano ed etano.
La valvola è raccomandata solo per l'utilizzo in circuiti chiusi. Per ulteriori informazioni, contattare Danfoss.

Campo temperatura
–60/+150°C (–76/+302°F)
Pressione d'esercizio massima
Le valvole sono state progettate per una pressione di esercizio massima di 52 bar g (754 psi g).

Installazione
La valvola deve essere installata con lo stelo rivolto verticalmente verso l'alto o in posizione orizzontale (fig. 1). Le valvole devono essere aperte manualmente. La valvola è progettata per tollerare pressioni interne estremamente elevate. Tuttavia, il sistema di tubazioni deve essere progettato per prevenire trappole di liquido e ridurre il rischio di una pressione idraulica causata dall'espansione termica. È necessario assicurarsi che la valvola sia protetta da transitori di pressione come i "colpi d'ariete".

Direzione del flusso raccomandata
Dirigere il flusso verso il cono, come indicato dalla freccia sull'involucro della valvola (fig. 2). La forza usata per aprire e chiudere la valvola non deve superare la forza di un volantino ordinario.

Saldatura
Il coperchio deve essere rimosso prima della saldatura (fig. 3) per prevenire danni agli o-ring nel premistoppa, fra il corpo valvola e il coperchio e alla guarnizione in teflon nella sede della valvola. Fare attenzione a non danneggiare l'anello in teflon del cono e assicurarsi che il coperchio sia protetto per intero da sporcizia e acqua in fase di rimozione.
Il coperchio superiore non deve essere rimosso, se: la temperatura nell'area compresa tra il corpo valvola e il coperchio durante la saldatura non eccede +150 °C/+302 °F. Questa temperatura dipende dal metodo di saldatura e da un eventuale raffreddamento del corpo valvola durante la saldatura stessa (il raffreddamento può essere assicurato, ad esempio, avvolgendo un panno umido intorno al corpo valvola). Assicurarsi che sporco, detriti di saldatura, ecc., non penetrino nella valvola durante la procedura di saldatura.
Solo materiali e metodi di saldatura compatibili con il materiale dell'involucro della valvola devono essere applicati all'involucro della valvola. L'involucro della valvola deve essere esente da sollecitazioni (carichi esterni) dopo l'installazione.
La valvola deve essere pulita internamente per rimuovere i detriti della saldatura al completamento dell'operazione e prima che la valvola sia rimontata. Evitare che detriti di saldatura e sporcizia si depositino nelle filettature dell'involucro e del coperchio.
NON rimuovere né intervenire sul grasso scuro tra la filettatura dell'asta e il coperchio. Nel caso in cui il grasso sia stato contaminato da sporco, detriti, particelle o acqua, è necessario sostituire interamente la parte superiore.
Le valvole REG non devono essere montate in impianti in cui il lato uscita della valvola sia esposto all'atmosfera. Il lato uscita della valvola deve sempre essere collegato all'impianto o correttamente bloccato, ad esempio saldando una piastra terminale.

Montaggio
Rimuovere i residui di saldatura e lo sporco dai tubi e dal corpo valvola prima del montaggio. Verificare che il cono sia stato completamente avvitato in direzione del coperchio prima che venga riposizionato nel corpo valvola (REG DN 50-65) (fig. 4).

Serraggio
Serrare il coperchio con una chiave dinamometrica, ai valori indicati nella tabella (fig. 4).

Colori e identificazione
Le valvole REG sono pitturate con un primer rosso in fabbrica. Un'identificazione precisa della valvola è possibile tramite l'anello di identificazione giallo sulla parte superiore del coperchio e tramite la stampigliatura sul corpo valvola. La superficie esterna dell'involucro della valvola deve essere protetta contro la corrosione con un rivestimento protettivo idoneo dopo l'installazione e il montaggio.
Si raccomanda di proteggere l'anello di identificazione quando la valvola viene riverniciata.

Manutenzione

Premistoppa
Quando si effettua un intervento di riparazione o manutenzione, sostituire solo il premistoppa completo, disponibile come ricambio. Come regola generale, il premistoppa non deve essere rimosso se pressione interna è presente nella valvola. Tuttavia, se ci si attiene alle seguenti misure cautelative, il premistoppa può essere rimosso con la valvola ancora sotto pressione:

Controtenuta (fig. 5)
Per posizionare la valvola in controtenuta, ruotare lo stelo in senso antiorario fino a quando la valvola non è completamente aperta.

Equalizzazione della pressione (fig. 6)
In alcuni casi, la pressione si accumula dietro al premistoppa. Un volantino (o simile) deve essere quindi fissato sulla parte superiore dello stelo mentre la pressione è equalizzata. La pressione può essere equalizzata avvitando lentamente il premistoppa.

Rimozione del premistoppa (fig. 7)
Il premistoppa può essere ora rimosso.

Smontaggio della valvola
Non rimuovere il coperchio mentre la valvola è ancora sotto pressione.
- Controllare che l'o-ring (fig. 9, pos. A) non sia danneggiato.
- Se la guarnizione (pos. A) è stata esposta all'aria o ad altri refrigeranti non menzionati nella presente guida all'installazione per più di sei mesi, dovrà essere sostituita.
- Verificare che lo stelo sia privo di graffi e segni di impatto.
- Se l'anello in teflon del cono è danneggiato, l'intero gruppo cono deve essere sostituito.
- DN 10-40: Svitare l'adattatore (fig. 11, pos. A) per sostituire il cono.

Sostituzione del cono (fig. 10)
Svitare la vite del cono (pos. B) con una chiave allen. (Una chiave allen è inclusa nel set delle guarnizioni Danfoss Industrial Refrigeration).
REG 15-40 ..... 2,0 mm A/F
REG 50-65 ..... 2,5 mm A/F
Rimuovere le sfere (pos. C).
Numero di sfere in fig. 10, pos. C:
REG 15-20 ..... 10 pz.
REG 25-65 ..... 14 pz.
Il cono può essere ora rimosso. Posizionare il nuovo cono sullo stelo e ricordarsi di inserire la molla a disco (pos. D) tra lo stelo e il cono. Comprimere la molla a disco e sostituire le sfere (pos. C).
Rimontare nuovamente la vite del cono utilizzando Loctite n. 648 per assicurare che la vite sia ben fissata.
NON rimuovere né intervenire sul grasso scuro tra la filettatura dell'asta e il coperchio. Nel caso in cui il grasso sia stato contaminato da sporco, detriti, particelle o acqua, è necessario sostituire interamente la parte superiore.

Montaggio
Rimuovere eventuale sporcizia dal corpo prima del montaggio della valvola. Verificare che il cono sia stato completamente avvitato in direzione del coperchio prima che venga montato nel corpo valvola (fig. 4).

Nota:
Per le REG SA/SB DN 10-40, è importante assicurarsi che la parte inferiore e la parte superiore dell'inserto siano ben avvitate insieme (fig. 12) e che questa connessione a vite sia mantenuta ben serrata durante il riposizionamento del cono nell'alloggiamento.

Serraggio
Serrare il coperchio con una chiave dinamometrica, ai valori indicati nella tabella (fig. 4). Serrare il premistoppa con una chiave dinamometrica, ai valori indicati nella tabella (fig. 8).
Utilizzare solo parti originali Danfoss, incluso premistoppa, o-ring e guarnizioni, per la sostituzione. I materiali dei nuovi componenti sono certificati per il refrigerante pertinente.
In caso di dubbio, contattare l'ufficio vendite Danfoss di zona.

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中文

安装
制冷剂
适用于 HCFC, HFC, R717（氨），
R 744 (CO 2)、丙烷、丁烷、异丁烷和乙烷。

建议该阀门仅用于闭合线路。详情请与 Danfoss 联系。

温度范围
–60/ +150 °C (–76/ +302 °F)
最大工作压力
这些阀门的最大工作压力为 52 bar (754 psig)。

安装
安装该阀门时，顶部轴必须垂直向上或呈水平位置（图1）。阀门应手动打开。该阀门可以承受很高的内部压力。但是，管道系统的设计应避免液阱并减少热膨胀所造成的液压风险。请确保该阀门不受系统中液锤等压力动态的影响。

建议流向
流向应按照阀套上的箭头所示指向阀锥（图2）。打开或关闭阀门的力不得超过普通手轮的力。

焊接
在焊接之前应取下阀盖（图3），防止对填料中以及阀体和阀盖之间的 o 型环、阀座内的特氟龙垫圈造成损坏。 请小心，不要损坏特氟龙阀芯，并确保阀盖在取下时不会沾到土和水。

在下列情况中，无需拆卸阀盖： 焊接期间，阀体和阀盖之间区域的温度小于 +150 °C/+302 °F。 此温度取决于焊接工艺，以及阀体在焊接过程中的冷却情况。 （例如给阀体盖上一条湿布，这样可确保阀体的冷却。）焊接过程中，务必要防止灰尘、焊接碎屑等异物进入阀体内。

只有与阀体材料相兼容的材料和焊接方法才能用于阀体。 安装完毕后，阀体不得再承受任何压力（外部负载）。

应对阀门内部进行清理，以便在重新组装阀门之前去除焊接完成时的焊接碎片。 避免外壳和阀盖的螺纹上沉积焊接碎屑和灰尘。
切勿清除或维护主轴螺纹和阀盖之间的深色油脂。 因为油脂已被土、杂质、颗粒物或水污染，必须更换整个顶部零件。

REG 阀门不得安装在阀门出口端与大气联通。 阀门出口侧必须始终与系统连接或密封，例如与焊接端板。

组装
在组装之前清除管道和阀体中的焊接碎片和灰尘。检查阀锥在阀体内被重新放置之前，已经完全向阀帽方向拧回。(REG DN 50-65) （图4）。

拧紧
使用扭矩扳手拧紧螺帽，并达到表中规定的数值（图4）。

色彩和识别
REG 阀门在工厂使用红色底漆粉刷。通过阀帽顶部的黄色 ID 环和阀体上的冲压可以准确识别阀门。安装和组装后，阀套外表面必须使用适当的保护层防止腐蚀。
重新粉刷阀门时建议对 ID 环进行保护。

维护
填料
在进行维修和维护时候，仅更换作为备件的整套填料。一般来说，如果阀门内有内部压力，不得移除填料。但是，如果采取以下预防措施，可以在阀门处于压力下时移除填料。

后座（图5）
如需对阀门进行后座，应逆时针转动轴，直至阀门完全打开。

压力均衡（图6）
在某些情况下，压力在填料后形成。因此，压力均衡期间应拧紧轴顶部的手轮或类似装置。可以通过慢慢拧出填料使压力均衡。

移除填料（图7）
现在可以清除填料。

拆除阀门
请勿在阀门处于压力下时移除阀帽。
–检查 O 型环（图9，位置 A）是否受到损坏。
–如果垫片（位置 A）暴露在空气或安装
指导列表之外的制冷剂中超过 6 月，则必须更换。
–检查轴是否有刮伤或撞击痕迹。
–如果特氟龙阀锥环受损，必须更换整个阀锥总成。
–DN 10–40：拧松适配器（图11），以便能够更换阀锥。

更换阀锥（图10）
使用
艾伦内六角扳手拧松阀锥螺钉（位置B）。（Danfoss 行业制冷垫圈套装中包括艾伦内六角扳手）。
REG 15-40 ..... 2.0毫米 A/F
REG 50-65 ..... 2.5毫米 A/F
移除滚珠（位置C）。
图10位置 C 中的滚珠数量：
REG 15-20 ..... 10个
REG 25-65 ..... 14个
现在可以移除阀锥。将新的阀锥放在轴上，并将盘簧（位置D）放在轴和阀锥之间。按下盘簧并更换滚珠（位置C）。
使用648号 Loctite 重新安装阀锥螺钉，确保螺钉正常拧紧。
切勿清除或维护主轴螺纹和阀盖之间的深色油脂。 因为油脂已被土、杂质、颗粒物或水污染，必须更换整个顶部零件。

组装
在组装阀门之前应清除阀体上的所有灰尘。在阀体内被更换之前，检查阀锥是否已经向阀帽方向拧回（图4）。

注意：
对于 REG SA/SB 尺寸的 DN 10-40，必须确保插入体上下部分已紧紧旋在了一起（图 12），且在壳体内重新放置阀锥的过程中，螺丝接口必须一直保持紧密。

拧紧
使用扭矩扳手拧紧螺帽，并达到表中规定的数值（图4）。使用扭矩扳手拧紧填料，并达到表中规定的数值（图8）。

务必使用原装 Danfoss 零件进行更换，包括填料、O 型环和垫圈。新零件的材料应经证明适合相关制冷剂。

如有疑问，请联系当地 Danfoss 销售处。

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POLSKI

Montaż zaworu
Czynniki chłodnicze
Dotyczy czynników chłodniczych: HCFC, HFC, R717 (amoniak), R744 (CO2), propan, butan, izobutan i etan.

Zawory te zaleca się stosować wyłącznie w obiegach zamkniętych.
Zakres temperatur
-60/+150°C (-76/+302°F)

Maks. ciśnienie robocze
Maksymalne ciśnienie robocze zaworów wynosi 52 bar g (754 psi g).

Montaż zaworu
Zawórnależyzamontowaćzwrzecionemskierowanympionowodogórylub w pozycji poziomej (rys. 1). Zawory należy otwierać ręcznie. Zawór został tak zaprojektowany, aby wytrzymał wysokie ciśnienie. Jednak układ rurociągów powinień być zaprojektowany tak, aby uniknąć zamkniętych przestrzeni cieczowych i zmniejszyć ryzyko wzrostu ciśnienia spowodowanego rozszerzalnością cieplną. Należy zapewnić ochronę zaworu przed impulsami wysokiego ciśnienia wynikającymi z uderzeń cieczowych.

Zalecany kierunek przepływu
Przepływ powinien być skierowany pod grzybek, zgodnie ze strzałką umieszczoną na korpusie zaworu (rys. 2). Siła używana do otwierania i zamykania zaworu nie może przekraczać siły wynikającej z zastosowania standardowego pokrętła.

Spawanie
Przed spawaniem należy wymontować pokrywę zaworu (rys. 3), aby zapobiec uszkodzeniu pierścieni O-ring znajdujących się w dławnicy i pomiędzy korpusem a pokrywą zaworu oraz teflonowej uszczelki w gnieździe zaworu. Należy zachować ostrożność, aby nie uszkodzić teflonowego pierścienia stożkowego, oraz upewnić się, czy podczas demontażu pokrywa jest chroniona przed kurzem i wodą.
Można nie demontować pokrywy pod warunkiem, że: temperatura otoczenia między korpusem zaworu a pokrywą podczas spawania nie przekracza +150°C/+302°F. Temperatura zależy od metody spawania, jak również od sposobu chłodzenia korpusu zaworu podczas spawania. (Chłodzenie można zapewnić między innymi poprzez owinięcie korpusu zaworu mokrą szmatą). Należy się upewnić, czy podczas spawania do zaworu nie dostał się kurz, okruchy spawalnicze itd.
Do spawania obudowy zaworu można stosować tylko materiały i metody spawania zgodne z materiałem obudowy. Po montażu korpus zaworu nie może podlegać zewnętrznym naprężeniom mechanicznym.
Po zakończeniu spawania, przed złożeniem zaworu należy oczyścić wnętrze zaworu z zanieczyszczeń mechanicznych po spawaniu. Nie pozostawiać okruchów spawalniczych ani zanieczyszczeń w gwintach korpusu i pokrywy.
NIE należy usuwać ani poprawiać warstwy ciemnego smaru między gwintem wrzeciona a pokrywą. Jeśli smar został zanieczyszczony kurzem, okruchami spawalniczymi, innymi cząstkami lub wodą, należy wymienić całą górną część.
Zawory regulacyjne nie mogą być montowane w instalacjach, w których wylot zaworu jest otwarty do atmosfery. Wylot zaworu musi być zawsze podłączony do instalacji lub należycie zaślepiony np. przyspawaną dennicą.

Montaż elementów zaworu
Przed złożeniem zaworu należy usunąć z rur oraz z korpusu zaworu okruchy spawalnicze i wszelkie zanieczyszczenia. Przed zmianą pozycji grzybka w korpusie zaworu upewnić się, że grzybek jest całkowicie wykręcony w stronę pokrywy (REG DN 50-65) (rys. 4).

Dokręcenie
Dokręcić pokrywę kluczem dynamometrycznym momentem podanym w tabeli (rys. 4).

Kolory i identyfikacja
Zawory REG malowane są w fabryce czerwonym podkładem gruntującym. Zawór można precyzyjnie zidentyfikować za pomocą żółtego pierścienia identyfikacyjnego znajdującego się na górze pokrywy oraz cechy numeratora na korpusie zaworu. Po złożeniu i zamontowaniu zaworu należy zabezpieczyć jego zewnętrzną powierzchnię przed korozją, odpowiednią powłoką ochronną.
Przed przystąpieniem do malowania zaworu zaleca się zabezpieczenie pierścienia identyfikacyjnego.

Serwis
Dławnica
Podczas wykonywania prac serwisowych należy wymieniać wyłącznie kompletną dławnicę, która jest dostępna jako część zapasowa. Generalnie nie wolno wymontowywać dławnicy, gdy zawór jest pod ciśnieniem. Jednakże, jeżeli zostaną podjęte poniższe środki zapobiegawcze, będzie można wymontować dławnicę z zaworu, wewnątrz którego panuje ciśnienie.
Pełne wykręcenie wrzeciona (rys. 5)
Aby całkowicie wykręcić wrzeciono, należy obracać go w lewo, aż do pełnego otwarcia zaworu.
Wyrównywanie ciśnień (rys. 6)
W niektórych przypadkach pod dławnicą tworzy się ciśnienie. W związku z tym przed wyrównywaniem ciśnień należy przymocować pokrętło (kółko ręczne) zamontowane na górnym końcu trzpienia. Ciśnienia można wyrównać poprzez powolne wykręcanie dławnicy.
Demontaż dławnicy (rys. 7)
Można teraz zdemontować dławnicę.
Demontaż elementów zaworu
Nie demontować pokrywy, gdy wewnątrz zaworu nadal panuje ciśnienie.
-Sprawdzić, czy pierścień O-ring (rys. 9, poz. A) nie jest uszkodzony.
-Jeżeli uszczelka (poz. A) została wystawiona na działania powietrza lub czynników chłodniczych innych niż wymienione w tej instrukcji instalacji przez czas dłuższy niż 6 miesięcy, wówczas należy ją wymienić.
-Sprawdzić, czy na wrzecionie nie ma zarysowań i/lub śladów uderzeń.
-Jeśli uszkodzony jest teflonowy pierścień grzybka, należy wymienić cały zespół grzybka.
-DN 10–40: Wykręcić przedłużkę wrzeciona (rys. 11, poz. A), aby ymienić grzybek.

Wymiana grzybka (rys. 10)
Wykręcić wkręt grzybka (poz. B) kluczem imbusowym. (Klucz imbusowy znajduje się w zestawie uszczelek firmy Danfoss Industrial Refrigeration).
REG 15–40 ..... 2,0 mm A/F
REG 50–65 ..... 2,5 mm A/F
Wyjąć kulki (poz. C).
Liczba kulek pokazanych na rys. 10, poz. C:
REG 15–20 ..... 10 szt.
REG 25–65 ..... 14 szt.
Można teraz zdjąć grzybek. Założyć nowy grzybek na wrzeciono, pamiętając o umieszczeniu sprężyny talerzykowej (poz. D) pomiędzy wrzecionem a grzybkiem. Ścisnąć sprężynę talerzykową i wymienić kulki (poz. C).
Posmarować gwint wkrętu grzybka klejem Loctite 648, aby zapewnić właściwe unieruchomienie wkrętu, i wkręcić wkręt.
NIE należy usuwać ani poprawiać warstwy ciemnego smaru między gwintem wrzeciona a pokrywą. Jeśli smar został zanieczyszczony kurzem, okruchami spawalniczymi, innymi cząstkami lub wodą, należy wymienić całą górną część.

Montaż elementów zaworu
Przed zmontowaniem zaworu oczyścić dokładnie wnętrze korpusu.
Przed umieszczeniem grzybka w korpusie zaworu upewnić się, że grzybek jest wykręcony
w stronę pokrywy (rys. 4).

Uwaga:
W odniesieniu do zaworów REG SA/SB o średnicach DN 10–40 upewnić się, że dolna i górna część wkładki jest dokładnie dokręcona (rys. 12) oraz że połączenie to będzie stabilne również podczas zmiany pozycji grzybka w obudowie.

Dokręcenie
Dokręcić pokrywę kluczem dynamometrycznym momentem podanym w tabeli (rys. 4). Dokręcić dławnicę kluczem dynamometrycznym momentem podanym w tabeli (rys. 8).

Używać wyłącznie oryginalnych części zamiennych Danfoss, łącznie z dławnicami, pierścieniami O-ring i uszczelkami. Materiały, z których wykonano nowe części, mają atest dopuszczający je do użytku z określonym czynnikiem chłodniczym.
W razie wątpliwości należy skontaktować się z lokalnym biurem sprzedaży firmy Danfoss.

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РУССКИЙ

Монтаж

Хладагенты

Пригодны для систем на ГХФУ, ГФУ, R717 (аммиак), R744 (CO_2), пропане, бутане, изобутане и этане.

Рекомендуется использовать клапан только в закрытых контурах. Для получения более подробной информации обращайтесь в компанию Danfoss.

Диапазон температуры

–60/+150°C (–76/+302°F)

Макс. рабочее давление

Клапаны предназначены для работы с макс. рабочим давлением 52 бар изб. (754 фунта/кв. дюйм изб.)

Монтаж

При установке клапана шток должен
быть направлен вертикально вверх или горизонтально (рис. 1).
Клапаны необходимо открывать вручную. Клапаны выдерживают высокое внутреннее давление. Однако система трубопроводов должна быть спроектирована так, чтобы избежать появления участков,
в которых может задерживаться жидкий хладагент, и таким образом понизить риск возникновения гидроудара при его тепловом расширении. Необходимо обеспечить защиту клапана от изменений давления в системе, таких как «гидравлический удар».

Рекомендуемое направление потока

Поток должен быть направлен, как показано стрелкой на корпусе клапана (рис. 2). Сила, используемая для открытия и закрытия клапана, не должна превышать силу ручного маховика.

Сварка

Перед проведением сварочных работ необходимо разобрать клапан (рис. 3), чтобы избежать повреждения уплотнительных колец и тефлоновых уплотнений функционального модуля. Осторожно, не повредите тефлоновое уплотнение. Необходимо обеспечить защиту снятого функционального модуля от грязи и воды.
Разбор клапана не обязателен, если температура между корпусом клапана и функциональным модулем во время сварки не превысит +150°C. Эта температура зависит от метода сварки, а также от наличия охлаждения корпуса клапана во время проведения сварочных работ (охлаждение можно обеспечить, обернув корпус клапана влажной тканью). Следите за тем, чтобы в ходе сварочных работ в клапан не попало никакой грязи, сварочной окалины и т. п.
Использоваться должны только материалы и методы сварки, совместимые с материалом корпуса клапана. После монтажа корпус клапана не должен подвергаться внешним воздействиям или нагрузкам.
После завершения сварочных работ, перед сборкой клапана необходимо очистить внутреннюю поверхность клапана от грязи и окалины. Не допускайте попадания окалины и грязи в резьбовые соединения между корпусом и функциональным модулем (крышкой).
Не удаляйте и не наносите дополнительную смазку на резьбовое соединение шпинделя. Если смазка загрязнена мусором, частицами или водой, необходимо заменить функциональный модуль.
Запрещается устанавливать клапаны REG в системах, где выходной штуцер сообщен с атмосферой. Выходной штуцер должен быть всегда соединен с системой, либо должен быть заглушен при помощи приваренной пластины или специальной заглушки.

Сборка

Перед сборкой удалите с труб и корпуса клапана, окалину и грязь любого характера. Перед переустановкой конуса в корпусе клапана убедитесь в том, что он был полностью вывинчен в сторону крышки (REG DN 50-65) (рис. 4).

Затяжка

Затяните болты при помощи динамометрического ключа до значений, указанных в таблице (рис. 4).

Окраска и Маркировка

На заводе клапаны REG окрашиваются грунтовкой красного цвета. Точная идентификация клапана производится благодаря опознавательному кольцу желтого цвета в верхней части штока, а также благодаря оттиску на корпусе клапана. Необходимо обеспечить защиту наружной поверхности корпуса клапана от коррозии при помощи соответствующего защитного покрытия после монтажа и сборки.
При повторной окраске клапана рекомендуется обеспечить защиту опознавательного кольца.

Техническое обслуживание

Сальник

При выполнении технического обслуживания сальник меняется полностью.Строго запрещается удалять сальник, если клапан находится под давлением. Однако, если принимаются следующие меры предосторожности, сальник можно вынуть, даже если клапан все еще находится под давлением:

Посадка на верхнее седло (рис. 5)

Для посадки клапана на верхнее седло поверните шпиндель против часовой стрелки до полного открытия клапана.

Выравнивание давления (рис. 6)

В некоторых случаях за сальником образуется давление. Поэтому в процессе выравнивания давления наверху шпинделя закрепляется маховик или аналогичное устройство. Давление можно выровнять, медленно откручивая сальник.

Демонтаж сальника (рис. 7)

Теперь можно снять сальник.

Разборка клапана

Запрещается демонтировать шток, пока клапан находится под давлением.
-Убедитесь, что уплотнительное кольцо (рис. 9, поз. A) не повреждено.
-Прокладку (поз. A), которая подвергается воздействию воздуха или хладоносителей, не рекомендованных в этом руководстве по установке, в течение более 6 месяцев, необходимо заменить.
-Убедитесь, что на шпинделе отсутствуют царапины или следы ударов.
-Если тефлоновое конусное кольцо было повреждено, замене подлежит весь конус в сборе.

- DN 10-40: отвинтите адаптер (рис. 11, поз. A), чтобы получить возможность заменить конус.

Замена конуса (рис. 10)

Отвинтите винт конуса (поз. B) с помощью торцевого ключа. (Торцевой ключ включен в комплект сальников подразделения Danfoss Industrial Refrigeration).
REG 15-40 ..... 2,0 мм по зеву
REG 50-65 ..... 2,5 мм по зеву
Снимите шарики (поз. C).
Количество шариков на рис. 10, поз. C:
REG 15-20 ..... 10 шт.
REG 25-65 ..... 14 шт.
После этого конус можно снять. Установите новый конус на шпиндель. Не забудьте установить дисковую пружину (поз. D) между шпинделем и конусом. Сожмите дисковую пружину и замените шарики (поз. C).
Вставьте винт конуса обратно на место, используя фиксатор Loctite № 648 для надежного закрепления винта.
Не удаляйте и не наносите дополнительную смазку на резьбовое соединение шпинделя. Если смазка загрязнена мусором, частицами или водой, необходимо заменить функциональный модуль.

Сборка

Перед сборкой клапана удалите с корпуса грязь любого характера. Перед заменой конуса в корпусе клапана (рис. 4) убедитесь, что он полностью выкручен.

Примечание:

Для клапанов REG SA/SB с размерами DN 10-40 важно сделать так, чтобы нижняя и верхняя части вставки были плотно свинчены (рис. 12) и чтобы данное винтовое соединение оставалось плотным в ходе переустановки конуса в корпусе.

Затяжка

Затяните болты при помощи динамометрического ключа до значений, указанных в таблице (рис. 4). Затяните сальник при помощи динамометрического ключа до значений, указанных в таблице (рис. 8).
Для замены используйте только подлинные детали производства компании Danfoss, включая сальники, уплотнительные кольца и прокладки. Материалы новых деталей сертифицированы для соответствующего хладагента.
В случае сомнения, пожалуйста, обращайтесь в отдел продаж компании Danfoss.

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PORTUGUÊS

Instalação

Refrigerantes

Aplicável a HCFC, HFC, R717 (Amônia),
R744 (CO_2), Propano, Butano, Isobutano e Etano.

A válvula é recomendada apenas para uso em circuitos fechados. Para mais informações, entre em contato com a Danfoss.

Faixa de temperatura

–60/+150°C (–76/+302°F)

Pressão máx. de trabalho

As válvulas são projetadas para uma pressão máx. de trabalho de 52 bar (754 psi g).

Instalação

A válvula deve ser instalada com o eixo verticalmente para cima ou em posição horizontal (fig. 1). As válvulas devem ser abertas manualmente. A válvula é projetada para suportar uma alta pressão interna. Entretanto, o sistema de tubulação deve ser desenhado para evitar armadilhas de líquido e reduzir o risco de pressão hidráulica causada pela expansão térmica. Assegure-se de que a válvula esteja protegida contra transientes de pressão, como os "golpes de aríete" no sistema.

Direção de fluxo recomendada

Direcione o fluxo para o cone, conforme indicado pela seta na carcaça da válvula (fig. 2). A força usada para abrir e fechar a válvula não deve exceder a força de um volante comum.

Soldagem

A tampa deve ser removida antes da soldagem (fig. 3) para evitar danos nos o-rings e vedações nas gaxetas e entre o corpo da válvula e a tampa, bem como o anel de teflon no assento de válvula. Tenha cuidado para não danificar o anel do cone de teflon e certifique-se de que a tampa toda esteja protegida contra sujeira e água enquanto estiver removida.

A remoção da tampa pode ser ignorada contanto que: durante a soldagem, a temperatura na área entre o corpo e a tampa da válvula não exceda +150°C/+302°F. Essa temperatura depende do método de soldagem e de qualquer resfriamento do corpo da válvula durante a soldagem em si. (O resfriamento pode ser feito, por exemplo, enrolando um pano molhado ao redor do corpo da válvula.) Certifique-se de que poeiras, resíduos de soldagem, etc. não entrem da válvula durante o processo de soldagem. Somente materiais e métodos de soldagem compatíveis com o material do corpo da válvula podem ser aplicados a ela. O corpo da válvula deve estar livre de tensão (cargas externas) após a instalação.
Limpe a válvula internamente para remover resíduos da soldagem no final do processo e antes que a válvula seja montada novamente. Evite resíduos de solda e sujeira nas roscas do corpo e da tampa.
NÃO remova ou realize a manutenção do lubrificante/graxa de cor escura entre a rosca do eixo e a tampa. Caso o lubrificante/graxa tenha sido contaminado por sujeira, resíduos ou água, toda a tampa superior deve ser substituída.
Não monte válvulas REG em sistemas em que o lado de saída da válvula fique aberto à atmosfera. O lado de saída da válvula deve estar sempre conectado ao sistema ou tampado adequadamente, por exemplo, com um cap ou uma tampa soldados na extremidade.

Montagem

Remova os detritos da soldagem e qualquer sujeira nos tubos e no corpo da válvula antes da montagem. Verifique se o cone foi totalmente parafusado para trás em direção ao castelo antes que ele seja recolocado no corpo da válvula (REG DN 50-65) (fig. 4).

Aperto

Aperte a tampa com uma chave de torque conforme os valores indicados na tabela (fig. 4).

Cores e identificação

As válvulas REG são pintadas com uma base de zarcão na fábrica. A identificação precisa da válvula é feita pelo anel de identificação na parte superior da tampa, assim como através da estampagem no corpo da válvula. A superfície externa da carcaça da válvula deve ser protegida contra corrosão com uma camada protetora adequada após a instalação e a montagem.

Recomenda-se proteger o anel de identificação quando a válvula é pintada novamente.

Manutenção

Junta de vedação

Ao executar serviços e manutenção substitua somente o prensa gaxeta completo, que está disponível como peça de reposição. Como regra geral, o prensa gaxeta não deve ser removido se houver pressão interna na válvula. Entretanto, se as seguintes medidas de precaução forem tomadas, a junta de vedação pode ser removida com a válvula ainda sob pressão:

Inversão (fig. 5)

Para inverter a válvula, gire o eixo no sentido anti-horário até que a válvula fique completamente aberta.

Equalização da pressão (fig. 6)

Em alguns casos, forma-se pressão atrás da junta de vedação. Neste caso, um volante ou dispositivo similar deve ser fixado na parte superior do eixo enquanto a pressão é equalizada. Pode-se equalizar a pressão ajustando a parafusagem da junta lentamente.

Remoção da junta de vedação (fig. 7)

Agora a junta de vedação pode ser removida.

Desmontando a válvula

Não remova a tampa enquanto a válvula ainda estiver sob pressão.

- Verifique se o anel de vedação (fig. 9, pos. A) não foi danificado.
- Se a junta de vedação (posição A) tiver sido exposta ao ar ou a mais refrigerantes do que os listados neste guia de instalação por mais de ela deverá ser substituída em 6 meses.
- Verifique se o eixo não apresenta arranhões e marcas de impacto.
- Se o anel de teflon do cone foi danificado, todo o conjunto do cone deve ser substituído.
- DN 10-40: Solte o adaptador (fig. 11, pos. A) para poder trocar o cone.

Substituição do cone (fig. 10)

Solte o parafuso do cone (pos. B) com uma chave allen. (Uma chave allen está incluída no conjunto de gaxetas de Refrigeração Industrial Danfoss).
REG 15-40 ..... 2,0 mm A/F
REG 50-65 ..... 2,5 mm A/F
Remova as esferas (pos. C)
Número de esferas na figura 10, posição C:
REG 15-20 ..... 10 pçs.
REG 25-65 ..... 14 pçs.

Agora o cone pode ser removido. Coloque o novo cone no eixo e lembre-se de colocar a mola de disco (pos. D) entre o eixo e o cone. Comprima a mola de disco e substitua as esferas (pos. C).
Reencaixe o parafuso do cone usando Loctite No. 648, garantindo que o parafuso seja fixado adequadamente.

NÃO remova ou realize a manutenção do lubrificante/graxa de cor escura entre a rosca do eixo e a tampa. Caso o lubrificante/graxa tenha sido contaminado por sujeira, resíduos ou água, toda a tampa superior deve ser substituída.

Montagem

Remova qualquer sujeira do corpo antes
de montar a válvula. Verifique se o cone foi totalmente parafusado para trás em direção à tampa antes que ele seja recolocado no corpo da válvula (fig. 4).

Observação:

Para os tamanhos REG SA/SB da DN 10-40, é importante garantir que a parte inferior e superior da inserção estão bem aparafusadas juntas (fig. 12) e que a conexão a parafuso é mantida firme durante a recolocação do cone na carcaça.

Aperto

Aperte a tampa com uma chave de torque nos valores indicados na tabela (fig. 4). Aperte a junta de vedação com uma chave de torque nos valores indicados na tabela (fig. 8).
Utilize somente peças originais Danfoss, incluindo juntas de vedação, anéis de vedação e gaxetas para as substituições. Os materiais das peças novas são certificados para o refrigerante relevante.
Em caso de dúvidas, entre em contato com a Danfoss em sua região.

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MAYEKAWA Europe MYCOM

SUCTION GAS STRAINER ELEMENT

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info@mayekawa.eu

1. Technical data.

The MYCOM suction gas strainer is mounted on the suction side of the compressor to protect the compressor against possible damages caused by foreign particles coming otherwise with the suction gas stream in the compressor.
The screen material itself is stainless steel.
The strainer element exists of a 200 mesh screen, which is sandwiched between a 30 mesh screen at the inner side and a 24 mesh screen at the outerside.
Maximum particle size: 74 micron

2. Construction

Position	Description
1	Inlet flange / counter flange
2	O-ring
3	Strainer element
4	Cover
5	Oil charge connection 1/2''PT
6	Gas purge connection 3/8''PT
7	Outlet flange
8	Body
9	PS transducer connection 3/8''BSPT
10	TS transducer connection 1/2'' BSPT

3. How to replace the filter element

Stop the compressor, isolate the suction gas strainer and depressurise the unit. Take off the cover and remove the filter element.
Required spare parts:

- Suction strainer element, in case not cleanable or damaged.
- Gasket.
- O-ring: (compressor oil mounting)

4. Suction strainer element: part codes

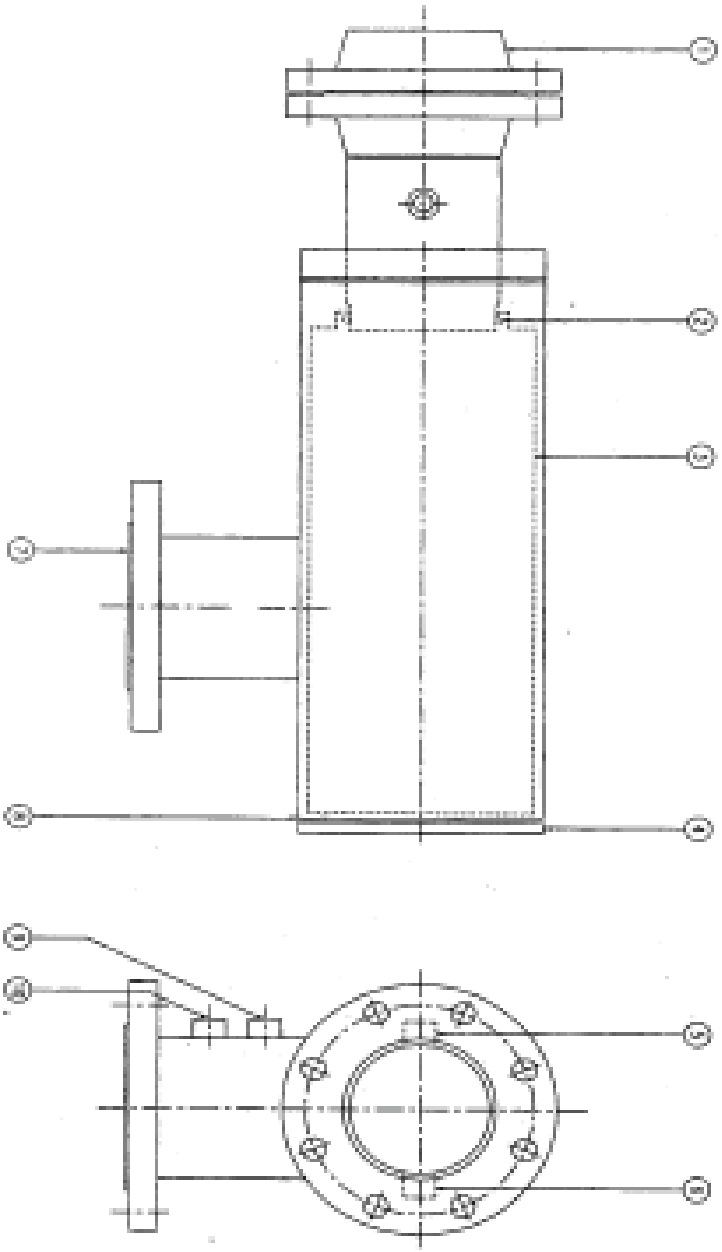
STRAINER TYPE	Element*	O-Ring	Cover Gasket
SSD-150	FG4230-150	PA2401-095	GAS-SSD150-COVER
SSD-200	FG4230-200	PA2401-130	GAS-SSD200-COVER
SSD-250	FG4230-250	PA2401-160	GAS-SSD250-COVER
SSD-350	FG4230-350	PA2401-210	GAS-SSD350-COVER
SSD-450	FG4230-450	PA2401-340	GAS-SSD450-COVER

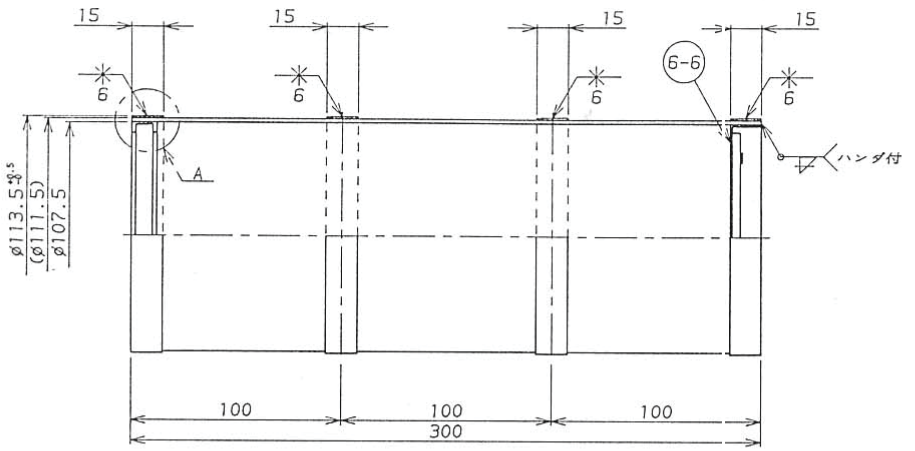
*Elements are supplied including the O-ring

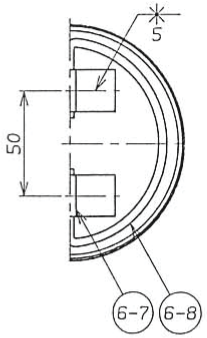
For start-up, cloth bags are recommanded to clean the system and protect the compressor.

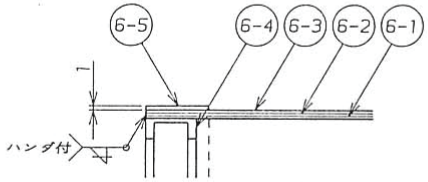
Type: FIL-SSD*-CLOTHBAG (O-ring to remove from element for bag installation)**

5). Standard strainer execution







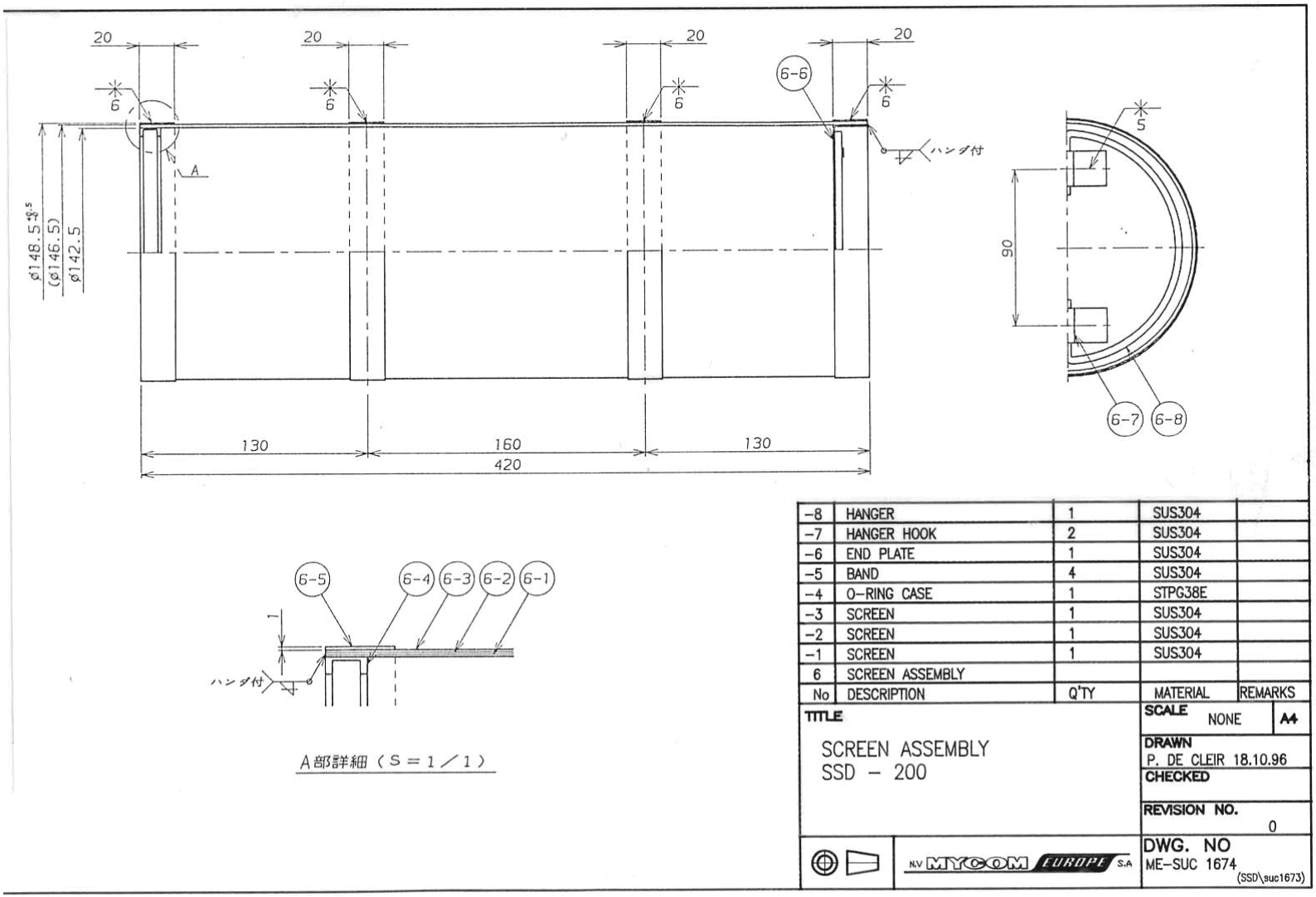


A部詳細（S＝1／1）

No	DESCRIPTION	Q'TY	MATERIAL	REMARKS
-10				
-9	HANGER	1	SUS304	
-8	HANGER HOOK	2	SUS304	
-7	END PLATE	1	SUS304	
-6	BAND	4	SUS304	
-5	O-RING CASE	1	STPG38E	
-4	O-RING	1	C r	
-3	SCREEN	1	SUS304	
-2	SCREEN	1	SUS304	
-1	SCREEN	1	SUS304	
6	SCREEN ASSEMBLY			

TITLE
SCREEN ASSEMBLY
SSD – 150

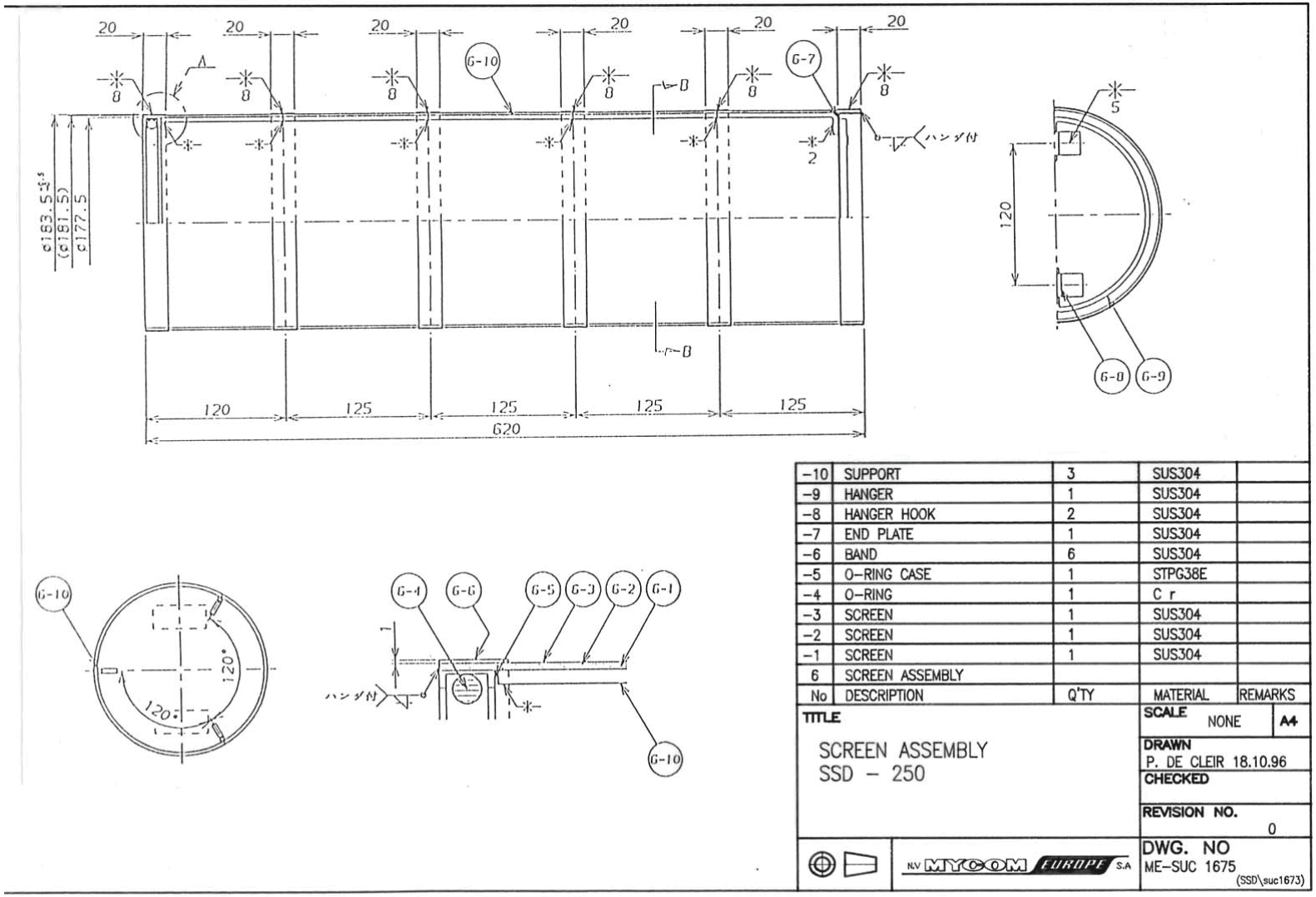
SCALE NONE A4
DRAWN P. DE CLEIR 18.10.96
CHECKED
REVISION NO. 0
N.V MYCOM EUROPE S.A
DWG. NO ME-SUC 1673 (SSD\suc1673)



No	DESCRIPTION	Q'TY	MATERIAL	REMARKS
-8	HANGER	1	SUS304	
-7	HANGER HOOK	2	SUS304	
-6	END PLATE	1	SUS304	
-5	BAND	4	SUS304	
-4	O-RING CASE	1	STPG38E	
-3	SCREEN	1	SUS304	
-2	SCREEN	1	SUS304	
-1	SCREEN	1	SUS304	
6	SCREEN ASSEMBLY			

TITLE
SCREEN ASSEMBLY
SSD - 200

SCALE NONE A4
DRAWN P. DE CLEIR 18.10.96
CHECKED
REVISION NO. 0
N.V MYCOM EUROPE S.A
DWG. NO ME-SUC 1674 (SSD\suc1673)

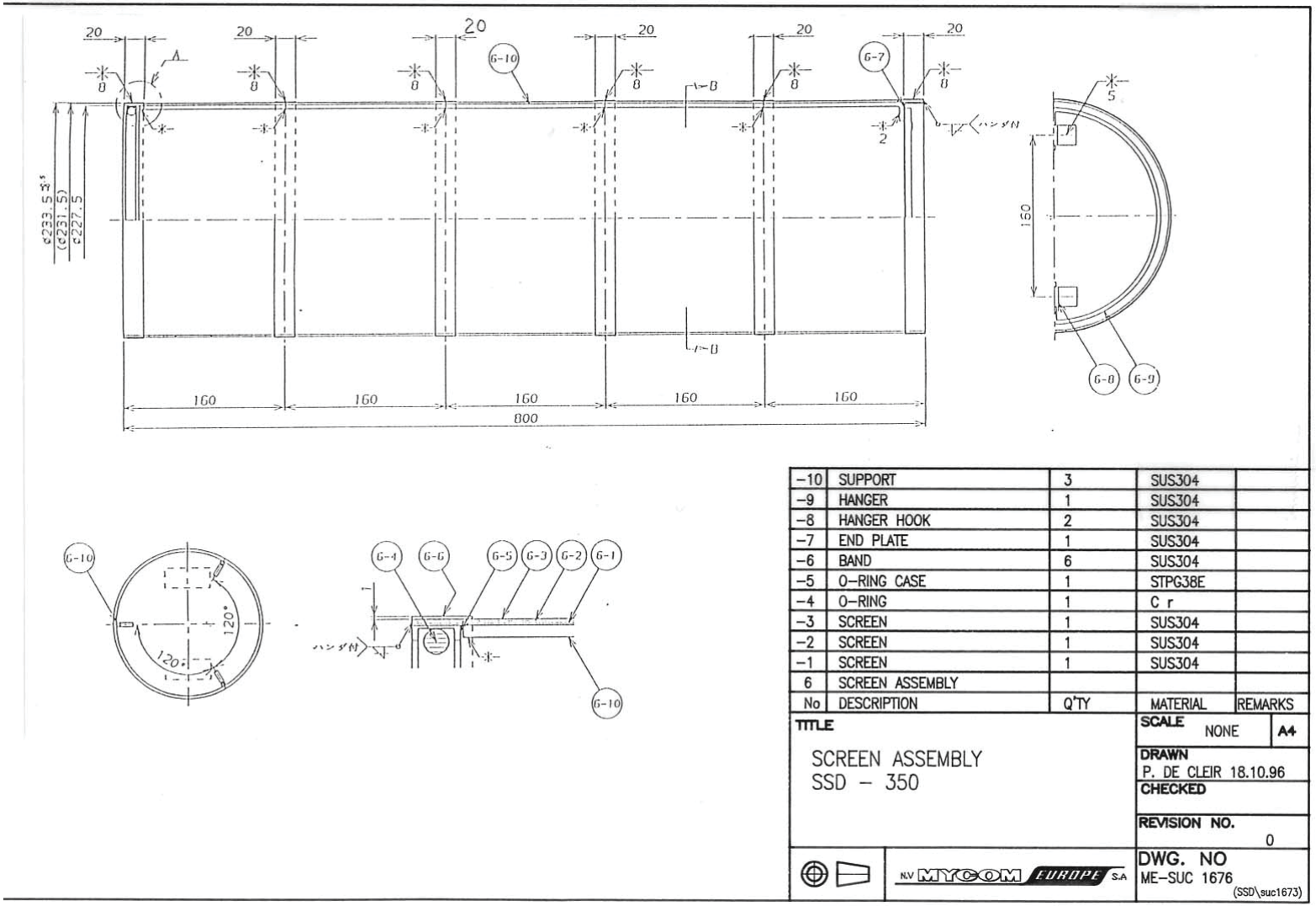


No	DESCRIPTION	Q'TY	MATERIAL	REMARKS
-10	SUPPORT	3	SUS304	
-9	HANGER	1	SUS304	
-8	HANGER HOOK	2	SUS304	
-7	END PLATE	1	SUS304	
-6	BAND	6	SUS304	
-5	O-RING CASE	1	STPG38E	
-4	O-RING	1	C r	
-3	SCREEN	1	SUS304	
-2	SCREEN	1	SUS304	
-1	SCREEN	1	SUS304	
6	SCREEN ASSEMBLY			

TITLE
SCREEN ASSEMBLY
SSD - 250

SCALE NONE A4
DRAWN P. DE CLEIR 18.10.96
CHECKED
REVISION NO. 0
DWG. NO ME-SUC 1675
(SSD\suc1673)

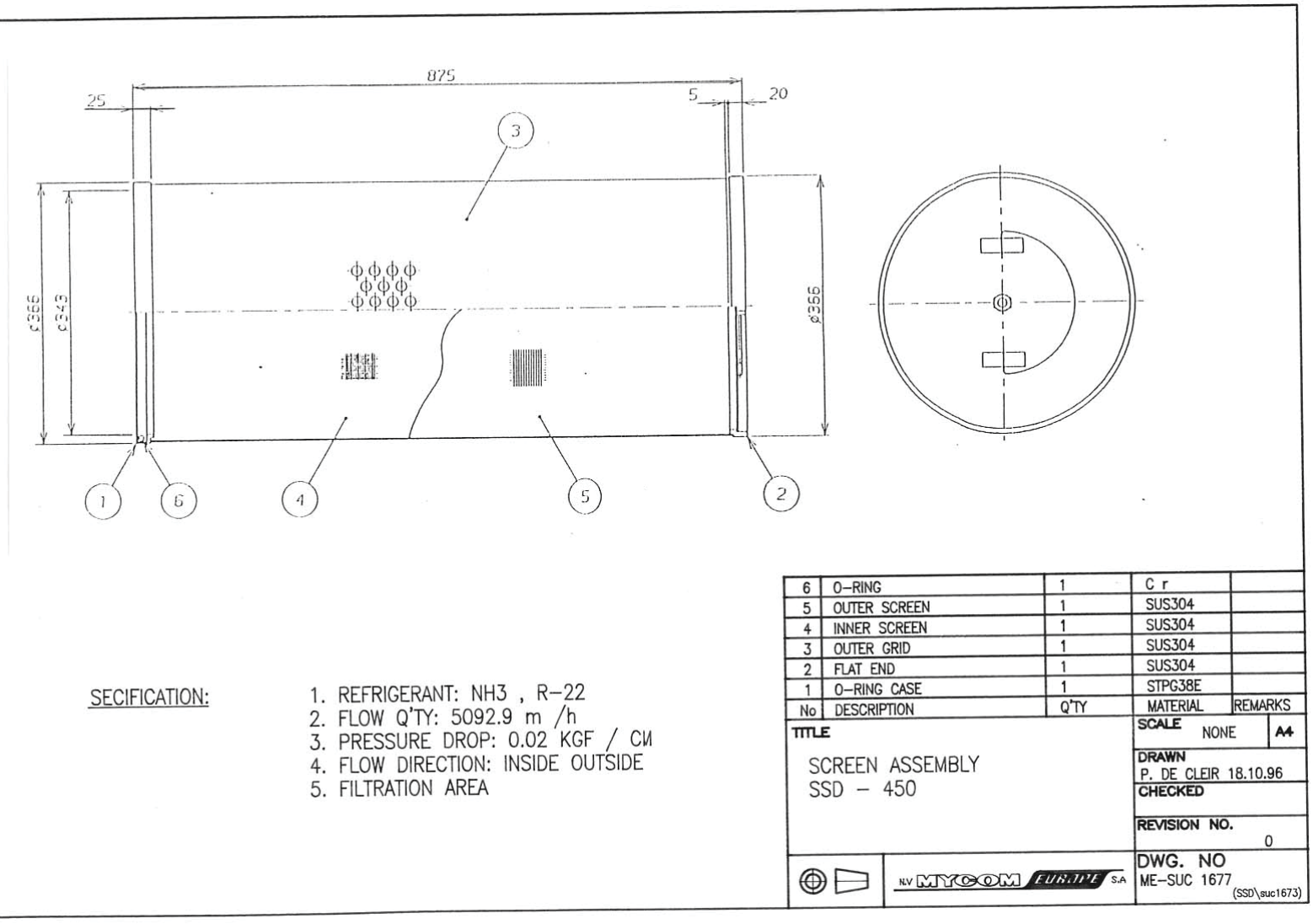
N.V MYCOM EUROPE S.A



No	DESCRIPTION	Q'TY	MATERIAL	REMARKS
6	SCREEN ASSEMBLY			
−1	SCREEN	1	SUS304	
−2	SCREEN	1	SUS304	
−3	SCREEN	1	SUS304	
−4	O−RING	1	C r	
−5	O−RING CASE	1	STPG38E	
−6	BAND	6	SUS304	
−7	END PLATE	1	SUS304	
−8	HANGER HOOK	2	SUS304	
−9	HANGER	1	SUS304	
−10	SUPPORT	3	SUS304	

TITLE
SCREEN ASSEMBLY
SSD − 350

SCALE NONE A4
DRAWN P. DE CLEIR 18.10.96
CHECKED
REVISION NO. 0
N.V MYCOM EUROPE S.A
DWG. NO ME−SUC 1676 (SSD\suc1673)



SECIFICATION:

1. REFRIGERANT: NH3 , R-22
2. FLOW Q'TY: 5092.9 m /h
3. PRESSURE DROP: 0.02 KGF / CM
4. FLOW DIRECTION: INSIDE OUTSIDE
5. FILTRATION AREA

No	DESCRIPTION	Q'TY	MATERIAL	REMARKS
6	O-RING	1	C r	
5	OUTER SCREEN	1	SUS304	
4	INNER SCREEN	1	SUS304	
3	OUTER GRID	1	SUS304	
2	FLAT END	1	SUS304	
1	O-RING CASE	1	STPG38E	

TITLE
SCREEN ASSEMBLY
SSD - 450

SCALE NONE A4
DRAWN P. DE CLEIR 18.10.96
CHECKED
REVISION NO. 0
DWG. NO ME-SUC 1677 (SSD\suc1673)

N.V MYCOM EUROPE S.A

6). Startup filter element (optionally available)

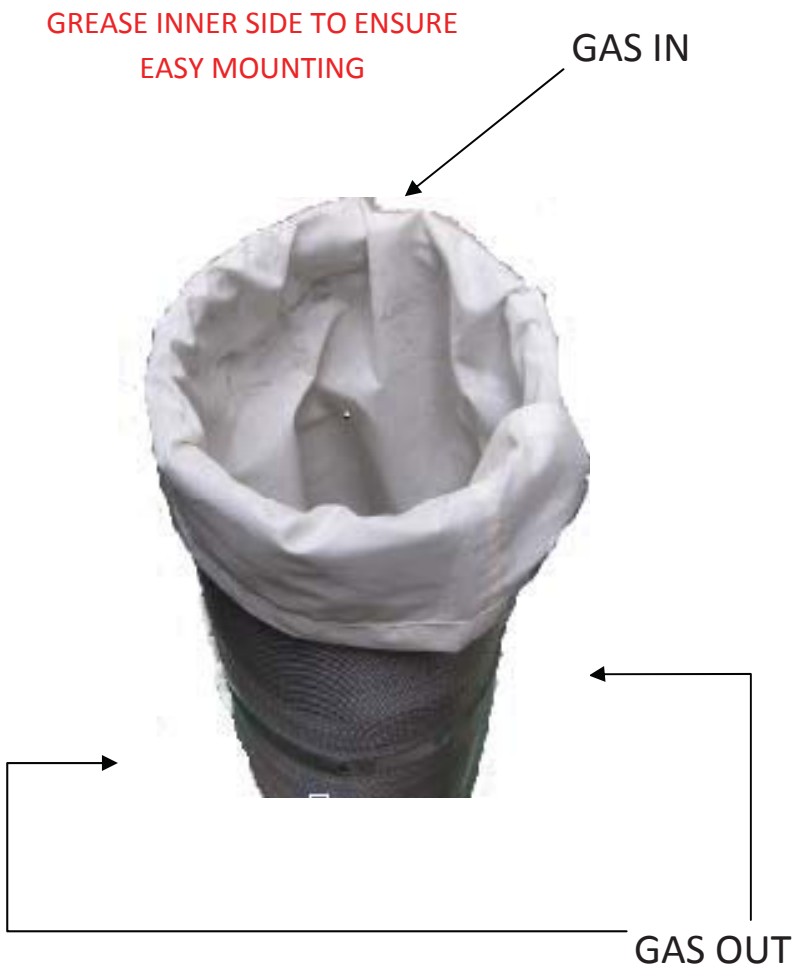
To prevent the suction strainer from clogging immediately after initial startup due to dirt, deposits, scale, etc originated from welding and cutting of piping, Mayekawa can offer a startup filter element. This start up filter element (cloth bag) is optionally available for all suction filter sizes.

Material of the cloth bag is cotton.

Mounting procedure:
Cloth bag is to be inserted into the suction filter element which is part of the standard supply and secured at the inlet by folding it over the edge of the filter element.
The inner part shall be greased as indicated on the below sketch to ensure easy mounting.

The startup filter may only be used over a limited period of 100-200 running hours, or when the differential pressure over the filter element becomes 0.7bar (what comes first).

Cloth bag shall be removed after operating the unit for 200 hours (max. 6 hours in case of ammonia refrigerant) and is disposed as chemical waste (contains oil and residue of refrigerant/process



MAYEKAWA Europe MYCOM

PRESSURE GAUGE

TYPE 232.50 -

233.50

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Fax. +32 (0)2 569 78 63
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info@mayekawa.eu

Operating instructions **EN**

Pressure gauges

Examples:

Model 213.40 | Model 23x.50 | Model 63x.50

Part of your business

Regulations for pressure equipment

- The pressure gauges are defined as “pressure accessories”
- The volume of the “pressure-bearing housings” of WIKA pressure gauges is < 0.1 L
- The pressure gauges carry conformity marking CE, UKCA for fluid group 1 per annex II, diagram 1 when their permissible working pressure is > 200 bar

Instruments that do not carry the mark are manufactured per article 4, paragraph 3 “sound engineering practice”.

Applicable standards (depending on model)

EN 837-1	Bourdon tube pressure gauges, dimensions, metrology, requirements and testing
EN 837-2	Selection and installation recommendations for pressure gauges
EN 837-3	Diaphragm and capsule pressure gauges, dimensions, metrology, requirements and testing

These operating instructions are only valid in conjunction with the data sheet of the respective instrument. The specifications given there must be observed.
See www.wika.com.

Subject to technical modifications.
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Fax +49 9372 132-406
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www.wika.de

2408976.08 10/2022

1. Safety

WARNING!
Before installation, commissioning and operation, ensure that the appropriate pressure gauge has been selected in terms of measuring range, design and suitable wetted material (corrosion) for the specific measuring conditions. In order to guarantee the measurement accuracy and long-term stability specified, the corresponding load limits must be observed.

The pressure measuring instruments may only be mounted by skilled personnel and after authorisation of the plant manager.

For hazardous media such as oxygen, acetylene, flammable or toxic gases or liquids, and refrigeration plants, compressors, etc., in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.

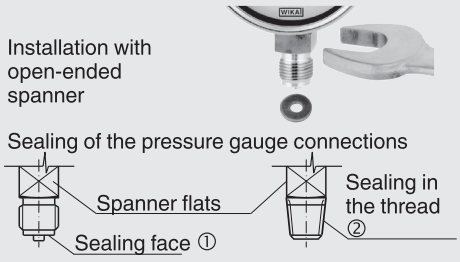
From pressure gauges which do not correspond to a safety version per EN 837 highly pressurised media might leak out through the possibly bursting window in case of a component failure. For gaseous media and working pressures > 25 bar a pressure gauge with safety version S3 is recommended per EN 837-2.

After an external fire, pressure media can leak out, particularly at soft solder joints. All instruments must be checked and, if necessary, replaced before recommissioning the plant.

The safety instructions within these operating instructions, as well as the safety, accident prevention and environmental protection regulations for the application area must be maintained.

2. Mechanical connection

In accordance with the general technical regulations for pressure gauges (e.g. EN 837-2). When screwing the instruments in, the force required to do this must not be applied through the case, but only through the spanner flats provided for this purpose, and using a suitable tool.
For parallel threads, use flat gaskets, lens-type



sealing rings or WIKA profile sealings at the sealing face ①. With tapered threads (e.g. NPT threads), sealing is made in the threads ② using additional sealing materials, e.g. PTFE tape.

The torque depends on the sealing used. In order to orientate the measuring instrument so that it can be read as well as possible, a connection with clamp socket or union nut should be used.

When a blow-out device is fitted to a pressure gauge, it must be protected against being blocked by debris and dirt. With safety pressure gauges (see Ⓢ) there must be a free space of > 20 mm behind the blow-out back.

After installation, open the vent valve (if present) or set from CLOSE to OPEN. The version of the vent valve depends on the model and can deviate from the above illustration!

Requirements for the installation point

If the line to the measuring instrument is not adequately stable, a measuring instrument holder should be used for fastening (and possibly via a flexible capillary). If vibrations cannot be avoided by means of suitable installation, instruments with liquid filling should be used. The instruments should be protected against coarse dirt and wide fluctuations in ambient temperature.

3. Permissible ambient and operating temperatures

When mounting the pressure gauge it must be ensured that, taking into consideration the influence of convection and heat radiation, no deviation above or below the permissible temperature limits can occur. Observe the influence of temperature on the indication accuracy!

4. Storage

To protect the pressure gauges from mechanical damage keep them in the original packaging until installation.
Protect the measuring instruments from humidity and dust.
Storage temperature range: -40 ... +70 °C
Storage temperature range model PG23LT: -70 ... +70 °C

5. Maintenance and repairs

The pressure gauges are maintenance-free. Regular checks should be carried out to ensure the measurement accuracy.
In the case of pressure measuring instruments with blow-out devices or safety pressure gauges, the safety elements (e.g. blow-out plug or blow-out back) must be replaced after 10 years. The replacement may only be carried out by skilled personnel using original parts and after authorisation of the plant manager.

When dismounting, close the vent valve (if present).

WARNING! Residual media in dismounted pressure gauges can result in a risk to persons, the environment and equipment. Take sufficient precautionary measures.

How to use the pressure gauge (Range <= 10 Bar)

The following instruction should be applied when the needle of the gauge is not on zero.

1. Apply some pressure to the gauge (Take care not to exceed the maximum range)
2. Release the pressure
3. Open the compensating valve on top of the gauge
4. The valve on top of the gauge should always be left open in order to have a correct measuring.

The needle should now be indicating zero. If this is not the case perform the procedure again.

* Contents is subject to change without notice.

MAYEKAWA Europe MYCOM

FLANGED SIGHT GLASS

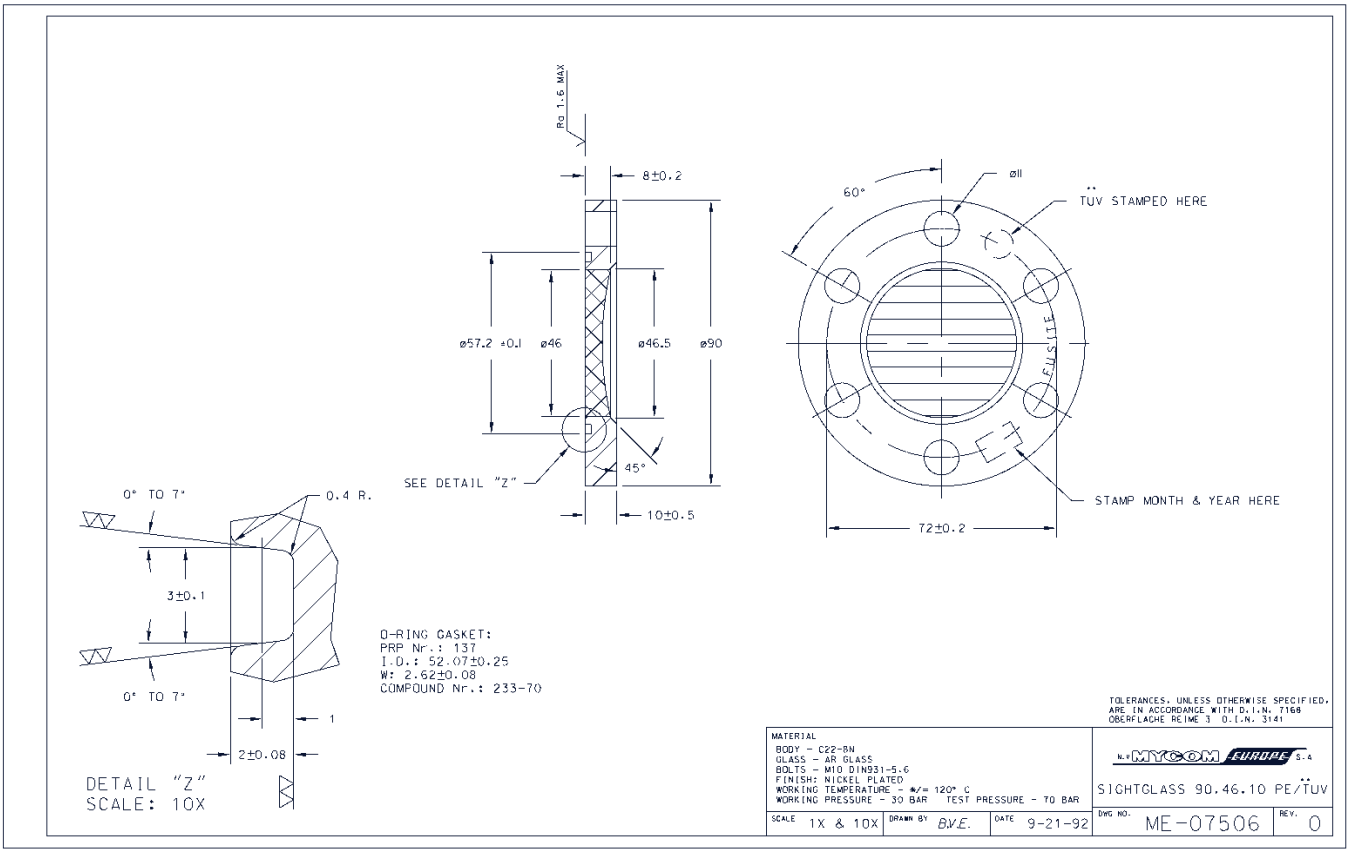
TYPE 90.46.10

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

Tel. +32 (0)2 757 90 75
www.mayekawa.eu
info@mayekawa.eu

- **FLANGED SIGHT GLASSES TYPE 90.46.10**

Body :	C22.8
Glass :	AR Glass (Soda Lime glass)
Bolts Holes:	For M10
Finish :	Nickel Plated
Working Pressure :	30 Bar
Test Pressure :	70 Bar



MAYEKAWA Europe MYCOM

HEAT EXCHANGER

TYPE KS-K-KK-KW
Standard Product Line/
EXOT Product Line
1000-3999 and 7700-8499

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

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HS Cooler
High-Performance Heat Exchanger

INSTALLATION AND OPERATING MANUAL

KS/K/KK/KW Standard Product Line/ EXOT Product Line 1000-3999 and 7700-8499

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HS-Cooler GmbH Wittenburg is not liable for any defect resulting from any improper use of the product. We reserve the right to adapt this operating manual at any time without prior notice to include the latest developments.

(1) General

- **Installation/Start-up**
  Prior to installing/starting up the heat exchanger, the operating manual (including drawings/part lists/data sheets) should be read thoroughly.
- **Service**
  For all service inquiries, please contact our factory, our sales force or your contracting party directly. In the case of spare part orders, please always indicate the designation of the device and/or the spare part. The necessary specifications can be taken from the enclosed drawings and from parts lists.
- **Warranty**
  Warranty claims are to be taken from our general delivery and payment terms, providing no other individual agreements were made. The goods should be inspected for damage at the time of delivery. Any damage must be clearly indicated on the delivery slip. In addition, HS Cooler and the forwarding agent should be notified immediately.
  Repairs of defective parts at a later stage may only be carried out with our approval. If circumstances should not permit that you obtain our approval, you may ignore it. In such a case, you must inform us as soon as possible.
  In principle, any changed service conditions must be approved by us in writing. By not adhering to the operating manual, or not using original spare parts, you forfeit the warranty.
- **Conservation**
  Under normal conditions, internal surfaces of the devices are protected for a duration of 6 months. The protection must be renewed after 6 months. The preserving liquid and the note on safety can be provided by us. The preservation agent used is compatible with all mineral lubricants. Should the removal of these substances be necessary, this can be done by using any regular solvent (check material compatibility!). The devices should only be stored in closed rooms. Condensation through strong temperature fluctuations must be avoided.
- **Transportation**
  Damage to the device must by all means be avoided. The transportation of the unpackaged device, when using lifting systems, has to be carried out with sufficient number of transportation straps set around the casing. In case of isolated heat exchangers, the welded lifting lugs must be used. Please note the dead weight of the device indicated on the current data sheet or the type plate.
- **Environmental Regulations**
  The mounting and operation of the heat exchangers must be carried out on site in accordance with environmental regulations and legislation. Disposal of the device must take place in accordance with regional and federal disposal regulations.

(2) Structural build-up

- **Tube bundle**
  The tube bundle consists of two facing identical tube plates with three grooves. The tubes are rolled or welded into the tube plate wholes. Between the tube plates at the outer side of the tubes, the surface is enlarged forming fins, which are connected to the tubes. The result is a compact finned bundle. At the outer side of the finned bundle, there are grooves across the whole length which are used to take up sealing straps. In the finned bundle, a different number of baffles can be installed. A groove is milled in the top of the baffle which contains one or two laminar rings (depending on groove width). The interior O-ring grooves in the tube plates seal against the casing in assembled state. The external grooves are used for sealing the bonnet. In this way, a intermixing

of the media is avoided if a seal becomes defective and a leakage localization is simplified. In the central groove, sheets are positioned, which fix the tube plate in assembled state, and allow for a thermal expansion for the opposite tube plate. With double-path devices, the fixation must be at the side of the connections. In any case, the side of fixation is marked by an imprinted 'F' at the flange of the casing in the area of the flanges M1 or M2. The fixation must be positioned at this side when the device is being operated.

- **Shell**
  The shell is used for taking up the tube bundle and forms the shell side casing. It consists of end pieces or flanges, which are circular-welded with the shell tube. The end pieces can be placed in such a way that the connections are positioned at one side or rotated by 180°. The shell tube is a precision tube with restricted allowances. Changes must not be carried out on the casing.
  At the starting area of the end pieces or flanges, the interior groove of the tube plates seals by means of an O-ring. This area must be treated carefully in order to guarantee a sealing effect.

- **Bonnets**
  The bonnets consist of different materials (see part list), depending on the version of the device. The bonnets, together with the tube bundle, forms the chamber of the cooling medium and is fixed to the casing by screws. At one side of the device, sheets are inserted between bonnet and casing which fix the tube plate. At the other side, washers form a spacer.
  The single-path versions have two identical bonnets positioned opposite each other. With the double-path version, one bonnet with two connections is mounted at one side of the device, at the other side there is a reversing cover. To separate the two chambers in the bonnet, a plastic or aluminium path is inserted into the tube plate at the connection side. In assembled state, the path partition seals bonnet and tube plate, i.e. it splits the flow of tube-side medium through the device.
  Seawater resistant versions may contain sacrificial anodes.

(3) Service

- **Installation**
  - ✓ Protective caps fitted to connections must be removed. If there is no protective cap on a connection, check whether it has been pushed into the connection or foreign bodies have penetrated the device.
  - ✓ Foreign bodies may not penetrate the openings of the connections.
  - ✓ The connection of the pipes must be tension-free to ensure that no inadmissibly high thermal or mechanical tensions affect the device in service.
  - ✓ Prior to connecting the heat exchanger to the system, it must be ensured that the surfaces of the seal faces and seals are free of debris, scratches, and damage.
  - ✓ Pipes that are connected through threads, may only be screwed into the maximally usable thread depth.
  - ✓ All circuits must be designed to avoid penetration of dirt and dust. We recommend the assembly of dirt traps and suitable filters.
  - ✓ Tubes must be correctly installed so that air locks cannot build up.
  - ✓ The assembly can be horizontal or vertical.
  - ✓ Sufficient space should be available to ensure easy accessibility to all screw connections. Take particular care to provide sufficient space to pull the tube bundle. You can find the required space dimensions for the removal of the tube bundle in the drawing.
  - ✓ The pipe connection and flow direction may be found on the enclosed drawing and data sheet.
  - ✓ Before start-up, the device must be completely bled.

- ✓ When mounting the heat exchanger, you must take linear expansion into account, which could occur as a result of the device being heated.
- ✓ Never weld or modify the device.
- ✓ For systems with specific requirements for the purity level, the heat exchangers, with the exception of the loads, must be cleaned professionally.
- ✓ Orifice plates must only be installed at the outlet side of the device.
- ✓ Heat exchangers are pressure vessels that are used and manufactured for specific dimensioning or operating conditions. The maximum/minimum pressures and temperatures indicated on the type plate must never be exceeded/fallen below. The total system is the responsible of the system manufacturer/operator, and must contain all required safety and control systems to ensure that the operating parameters are adhered to. This includes safety valves, expansion tanks, safety temperature limiters, ventilators, depot containers, etc. You should adhere particularly closely to the regulations governing the site.
- ✓ The heat exchanger, or the system that is electrically connected with it, is to be connected to ground manifold using a copper wire (16mm² diameter). In this connection, you should ensure that the connecting points of the ground strap are free of colour or other electrically isolating materials.
- ✓ When operating with steam, you must ensure that no steam impact occurs due to accumulation of condensate. Only suitable control valves should be used. The outflow of condensate must take place by means of a suitable steam trap.

- **Screw fasteners**

  To ensure a safe operation and a long service of fastening elements, the screw fastenings should only be torqued. In this connection, the torque should be increased step-by-step until it reaches the maximum value. The table below lists the torque figures for the screws applied. Through influence of various factors, the specified values may show a deviation which in individual cases require lower or higher values. The screw threads must be lubricated using a suitable lubricating agent.

Connection between housing/mat/cover			**Flange joint connection**		
Type	Bolt/ Strength	Tightening torque [Nm]	Bolt/ Strength	Thread material	Tightening torque [Nm]
K10	M8 / 8.8	12	M8 / 5.6	GG25 / Aluminium	10
KK12/KA12	M10 / 8.8	23	M10 / 5.6	GG25 / Aluminium	20
K12/KS12/KK12/KW12	M12 / 5.6	40	M10 / 5.6 / 8.8	Steel	23
	M12 / 8.8	86	M12 / 5.6 / 8.8	Steel	40
K20/KS20/KK20/KW20	M16 / 5.6	100	M12 / 5.6	GG25 / Aluminium	30
	M16 / 8.8	210		Bronze	30
K25/KS25/KW25	M20 / 5.6	190	M16 / 5.6	GG25 / Aluminium	75
	M20 / 8.8	410		Bronze	75
K35	M24 / 5.6	330		Steel	100
	M24 / 8.8	710	M24 / 5.6	Steel	300

- **Type plate**

  The type plate is at the side of the device and is permanently fixed. The type plate must not be removed.

- **Start-up**

At first, the device must be filled up with the intended medium, and then the entire system must be checked for leakage. The flow of the cold medium must first be established. Next, the flow of the hot medium is slowly added. Both heat exchange circuits must be ventilated. Once the operating parameters have been reached (pressure and temperature), the device must be ventilated again, and a leakage test should be carried out. The flow rate volumes indicated on the data sheet must be adhered to. If not, there is an increased risk that the heat exchanger corrodes/erodes. Operating the device without flow of cooling medium is not permissible. Abrupt temperature fluctuations and pressure surges should be avoided. Prior to adding an inhibitor to one of the media, the stability of the heat exchanger material should be checked (in accordance with the parts list).
Only for water-cooled units:
If the flow adjustment is carried out by a control, we recommend a oil-sided control, especially when operating with river or sea water.
Discuss the control of cooling water with our factory, because factors like material and quality of cooling water are very important to avoid later problems.
The use of additives in the cooling water has to be confirmed by HS-Cooler GmbH.

- **Operating instructions**
  During the operation, make sure, by suitable means, that pre-set parameters for which the devices are designed are adhered to. If reserve devices with switch-over valves are present, switch these devices on periodically (every 2-3 days) or load the reserve device daily for some time with the full water volume. The compensating line between both apparatuses must be kept open at all times during operation, in order to protect the decommissioned apparatus against overpressure. The compensation line should be closed only during the removal of a cooler, to ensure that no medium leaks into the environment.

- **Switching off/standstill of the unit**
  With a short-term standstill (<4 days) of the unit, the device can remain filled. If the heat exchanger is not used for a longer period of time (>4 days), it must be emptied completely and dried with hot pressurized air. If the device was used in connection with a corrosive medium, this measure (emptying and drying) must be carried out if the standstill time exceeds one (1) day. In addition, the device must be rinsed with fresh water after it has been emptied.
  In case of frost, suitable measures should be taken to prevent the media from freezing.

(4) Maintenance

- **Periodic inspections**
  Devices manufactured by HS-Cooler are normally reliable and easy to maintain. However, some periodic inspections of the device are necessary to provide a safe, continuous operation. Normally inspections on the tube-side predominate. The shell-side is less inclined to pollution, which means that an inspection can be carried out based on the experience of the operator.
  - ✓ When operating with sea water, sacrificial anodes are installed in the bonnets. These should be checked in the initial phase every 3 months. If the anodes are used up, they must be replaced by new ones. In the case of excessively fast consumption of the anodes, water quality and the electrical potential of the system must be checked. The shell-side of the heat exchanger must be inspected every 6 months.
  - ✓ The device should be cleaned at the tube side at least once a year. An excessive pollution of the tubes must by all means be avoided. The intervals are to be shortened during long ship operation in harbours or in other polluted waters and in accordance with the experience of the operator.

- ✓ At shorter intervals, the device must be subject to an external visual inspection, in order to identify leakage or other problems early. Through the double O-ring sealing, leakages can be precisely located and the effort needed to counter the problem can be estimated.

- **Dismounting**

  - ✓ **Note:**
    Appendix B: Supplement to chapter (4) Maintenance/Dismounting/Dismounting Without Pulling Out The Tube Bundle must be adhered to

Proceed as follows when dismounting the device:

- ✓ Lock-up any pipelines.
- ✓ Both media must have cooled down to ambient temperature.
- ✓ Empty the device at the tube side, and if it is necessary to remove the tube bundle, also empty the shell side.
- ✓ Remove the pipelines at the tube side.
- ✓ Remove the bonnets/covers. For this purpose, the screws at the bonnet/casing connection must be loosened. Between the bonnet/cover there are 4 fixing plates or washers. These must be replaced at the same side again during re-assembly. The marking on the casing flange must adhered to in this connection.
- ✓ If you want to dismount without removing the tube bundle, the bonnet/cover must be disassembled first without fixing plates in order to protect the tube bundle against displacement before you remove the fixing plates. This can be done with another set of fixing plates or with similar tools.

Dismounting without removing the tube bundle:

- ✓ Remove the O-rings from the external groove of the tube plates, and secure the tube bundle to the casing with four screws and the four fixing plates in the middle groove of the tube plates. The tube side can now be inspected and cleaned mechanically. The shell side can remain under pressure.

Dismounting with the tube bundle removed:

- ✓ Remove the O-rings from the external groove of the tube plates. At one tube plate, a marking of the fixed position in relation to the casing is attached. A half of an ‘X’ is stamped at the front of the tube plate and the adjacent casing flange. Check the position of the marking. Push the tube bundle (where appropriate with auxiliary tools) so far sideways until the O-ring of the interior groove becomes visible. Remove the O-ring from the interior groove. Pull out the tube bundle in the opposite direction. Remove the tube bundle carefully from the casing without damaging the fins. To the extent possible, suspend the tube bundle with the help of large-surface transportation straps. The grooves accommodating the O-rings must not be damaged.
- ✓ When dismounting vertically fixed devices, make sure at all times that the tube bundle does not slip down after removing the fixing plates. We recommend keeping an additional set of fixing plates at hand, and to start the removal at the side where no fixing plates are mounted. There the bundle must first be secured. After dismounting the second bonnet, the bundle can be removed carefully. While assembling, only one set of fixing plates is permitted at the side of the marking.

- **Assembly**

  The assembly is carried out in reverse order to the dismounting. The following must also be considered:

  - ✓ You should generally use new seals and clean the seal faces.
  - ✓ Note the marking for proper assembly of the tube bundle (mounting position) (Marked "X").
  - ✓ Note the marking for correct assembly of the fixing plates ("F").

- ✓ If sealing strips have been placed sideways in the tube bundle, they should only be replaced in case of damage. When pushing in the tube bundle, take care that the sealing straps are not displaced or twisted. Before assembling the tube bundle, the sealing straps should be greased. You can use the operating medium to this end. The sealing straps must be operant along the entire length of the tube bundle.
- ✓ Laminar rings in the baffle groove should be checked for damage. When mounting the baffle grooves, the laminar rings must be pressed onto the entire area, so that the bundle can be slid into the shell. To this purpose, you can use a metal strip (available from HS-Cooler) or a similar auxiliary tool. The mounting of the bundle in the shell is clarified further in Appendix A of this operating manual.
- ✓ Lubricate O-rings with suitable O-ring grease.
- ✓ During insertion of the tube plate into the seal faces, make sure that the O-rings do not shear. The bonnets/covers must be set up in parallel onto the tube plate and must be pushed evenly onto the O-ring; ensure also that the O-ring does not shear.
- ✓ With double-path devices, a path partition must be fitted at the side of the bonnet in the tube plate with the two connections. At this side, the fixing sheets must also be installed later.
- ✓ When assembling the double-path bonnet, make sure that the path partition is correctly placed.
- ✓ If the screws and nuts are reused, it must be checked that they are undamaged.
- ✓ Then continue as described under 'Operation'.

- **Cleaning**

  The tube side can be cleaned mechanically if the level of dirt/dust is low. Disassemble the device as described under 'dismounting without removing the tube bundle' and clean each tube on the inside with a suitable nylon brush (do not use metal brushes), and then clean with water. Never remove stuck deposits or coarse dirt by force. In the case of stuck deposits, the tube bundle must be cleaned chemically. This can be carried out by rinsing the tube in the assembled state or submerging it in disassembled state. Such a cleaning must only be carried out by trained specialists. Only suitable solvents must be used. To select a suitable agent, refer to the heat exchanger part list. Take the materials of the plastic separator strip and O-rings in the assembled state into consideration.

  Provided that the type designation gets a C at the 11th position (example: KS12-BCN-821**C** L1000), then it is a coated tube bundle. To prevent damage caused by corrosion, this bundle is weld-coated on the inside of the tubes and on the tube sheets. When dismounting the bundle, and during cleaning, make sure that the coating will not be damaged or destroyed. Use only nylon cleaning brushes and approved cleaning agents. If there are any doubts about the suitability of an agent, please contact our service department.

(5) Troubleshooting

- **Insufficient performance**
  - ✓ Check all temperatures and material flows in accordance with the design data (refer to the data sheet).
  - ✓ Are foreign bodies in pipe or in device causing obstruction?
  - ✓ Is the tube bundle correctly assembled? Check the marking "X".
  - ✓ Are the path partition and the fixing plates correctly assembled in the double-path bonnet?
  - ✓ Are all pressure rooms vented?
  - ✓ Are tube side or shell side too dirty (too thick deposits)?
  - ✓ Are more than 10% of the tubes plugged?

- **Leaky tubes**
  If a presumption exists that tubes have become leaky, proceed as with 'dismounting without removing the tube bundle'. The shell side can remain under pressure. After cleaning the tube plates, you can identify the defective tube by the state of the emerging medium. The leaking tube must be mended on both sides. HS-Cooler GmbH offers reparation kits for this purpose. You can lock 10% of the tubes at the most without a noticeable reduction in performance. Dismounting the defective tube is not possible.

- **Leaky rolling connection/welding points**
  If it is found during the check for leaky tubes that a rolling connection is leaky, it can be rolled again with a specific rolling tool. If a pipe welding joint is leaky, it can be welded. This work, however, is only to be carried out by specially trained personnel. Since defects of this type are uncommon, a check of the complete bundle in our factory is recommended.

- **Leaky O-ring**
  If a leakage is found between bonnet/cover and casing, an O-ring in the tube plate is defective. The emerging medium type defines at which groove of the tube plate the defect developed. In the case of a defect on the tube side, proceed as described under 'dismounting without removing the tube bundle'. In the case of a defect at the shell side, proceed as described under 'dismounting with removal of the tube bundle'. In this case, of course, the tube bundle does not need to be removed completely from the casing. Assemble the O-ring as described in 'Assembly'.

- **Repair/spare parts**
  Repairs must only be carried out by specially trained personnel. However, we recommend to carry out any and all repairs at our factory. You can purchase spare parts directly from us by indicating the drawing number. Please contact our head offices or our sales office.

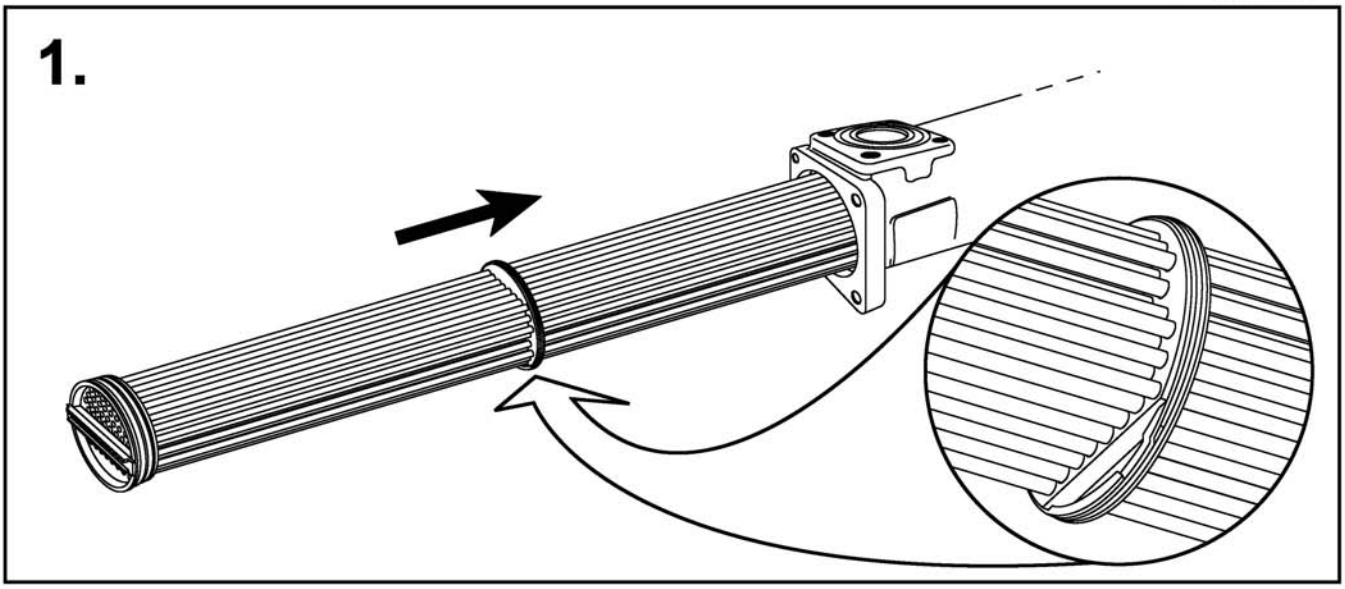
(6)Appendices

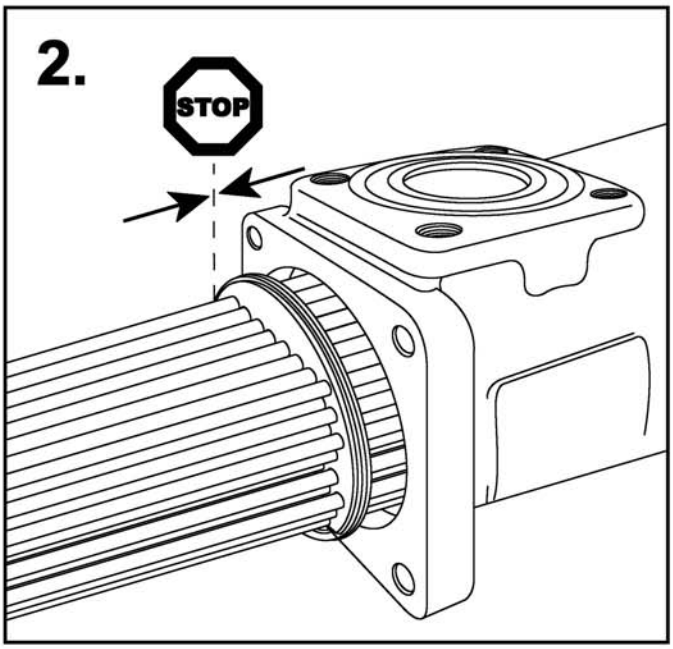
Recommended water quality for water cooled heat exchangers series K

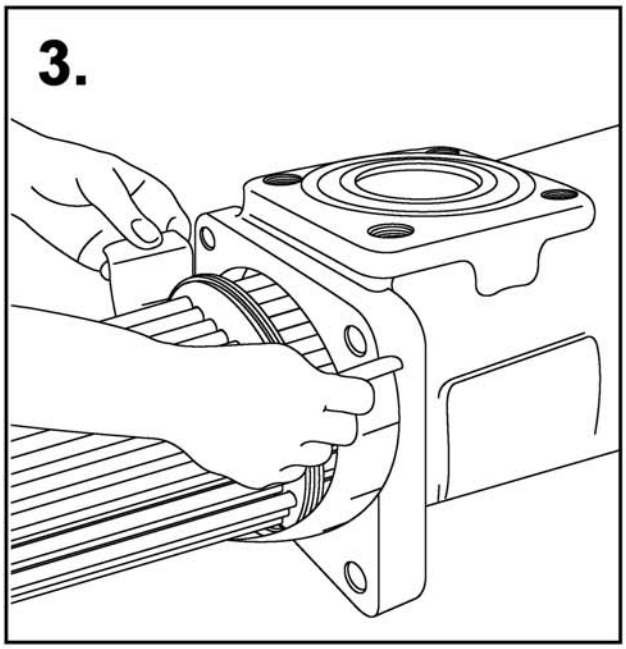
Values are valid for the following conditions:
-Clean surfaces without any deposits
-No contatmination with solid particles
-Sufficient water flow as per datasheet
-Absence of any other substances in inadmissible concentrations
-Absence of biofouling
-When using additives or cooling brines the suitability of the materials has to be checked in each case!
-Please pay attention to cycles of concentration of cooling tower circuits. Values only valid for final concentrations - not for supply water!

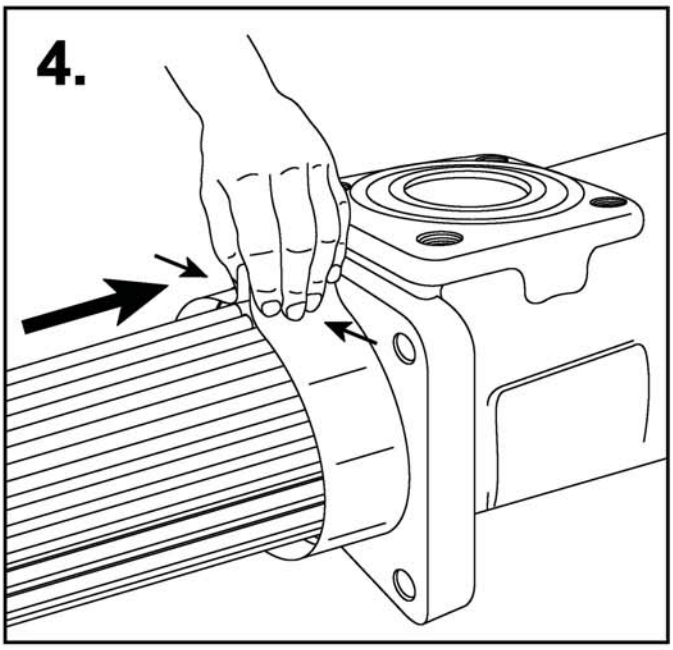
	Tube material 1.4404 (316L)	**Tube material CuNi10Fe1Mn**
Appearance	colorless,clear,without deposits	colorless,clear,without deposits
PH-value	6-11	6-9
Total salt content	<1.000 mg/l	<30.000 mg/l
Conductivity	<1500 µS	n.a.
Total hardness	<20°dH	<20°dH
Dry residue	<1.000 mg/l	< 30.000 mg/l
Acid capacity (Ks 4,3)	<6 mmol/l	<6 mmol/l
Cloride	<300 mg/l	<20.000mg/l
Sulphate	<400 mg/l	<2.500 mg/l
Nitrate	n.a.	<50 mg/l
Iron & Manganese	<0,2 mg/l	<0,2 mg/l
Sulfide	n.a.	<0,5 mg/l
Ammonium	n.a.	<10 mg/l
Temperature	<55 °C	<55 °C
Free chloride	<2 mg/l	<2 mg/l
Sulfite	<5 mg/l	<5 mg/l
Carbon dioxide, aggr.	n.a.	<50 mg/l
Oxigen	n.a.	>5 mg/l

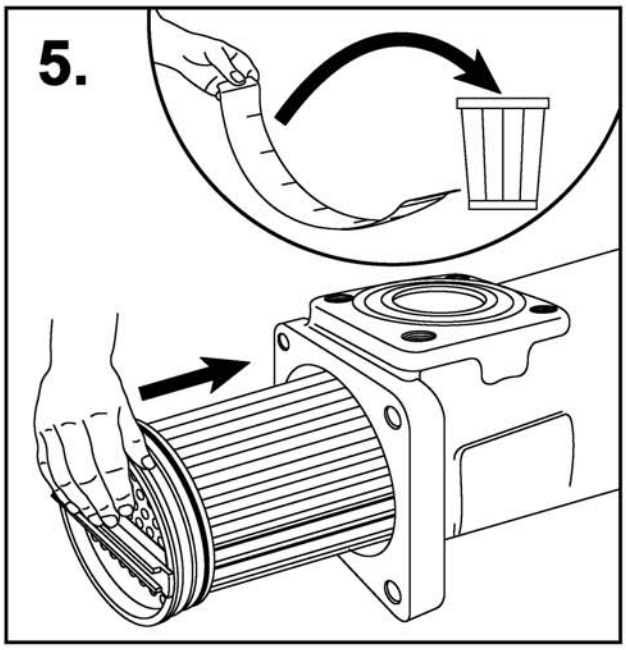
We reserve the right to adapt this data at any time without prior notice to include the latest researches.











Stand: 15.11.2010

- Ergänzung zu Kapitel ‚Wartung/Demontage/Demontage ohne Herausziehen des Rohrbündels'. Bei Zusammenbau müssen die Fixierplatten wieder an der richtigen Seite des Wärmetauschers eingebaut werden - siehe dazu die Bedieungsanleitung!

- Addition to chapter 'Maintenance/Dismounting/Dismounting without remove the test bundle'. During assembly the fixing plates have to be assembled to the correct side of the heat exchanger – see the instruction manual!

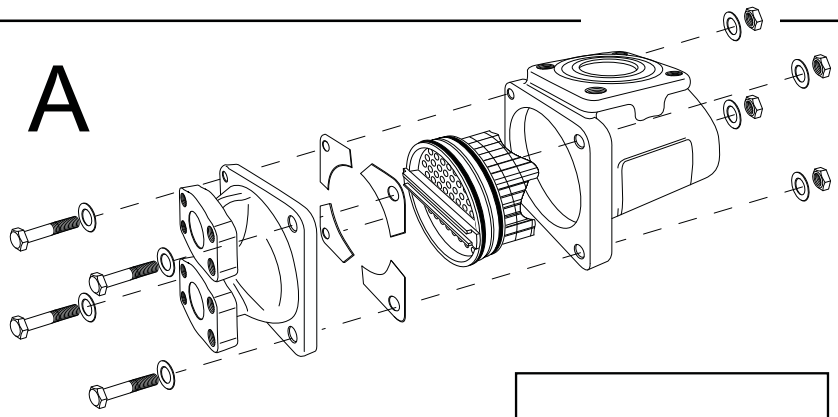
- En complément du chapitre « maintenance/démontage/démontage sans tirer vers l'extérieur le faisceau tubulaire ». Lors de l'assemblage les dalles de fixation doivent être encastrées dans le côté exact de l'échangeur de chaleur - voir à cet effet l'instruction d'exploitation.

- Complemento al capítulo "Mantenimiento/Desmontaje/Desmontaje sin extraer el haz de tubos". Al realizar el montaje, las placas fijadoras se han de volver a colocar en el lado correcto del intercambiador de calor - ver para ello las instrucciones de servicio.

- Completamento del capitolo 'Manutenzione/Smontaggio/Smontaggio senza estrazione del fascio tubolare'. Nella fase di assemblaggio, le piastre di fissaggio devono essere rimontate sul corretto lato dello scambiatore di calore – vedi a questo proposito le istruzioni per l'uso!

- Suplemento do capítulo "Manutenção/Desmontagem/Desmontagem sem extracção do feixe de tubos". No momento da montagem, as placas de fixação deverão ser outra vez aplicadas no lado correcto do permutador térmico -- consulte o manual de instruções!

A



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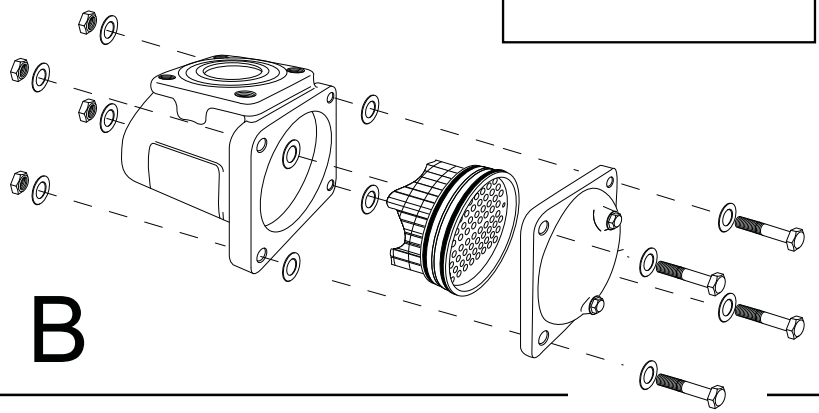


- Aanvulling bij het hoofdstuk 'Onderhoud/demontage/demontage zonder uittrekken van de buizenbundel'. Bij de montage moeten de fixeerplaten opnieuw aan de correcte zijde van de warmtewisselaar worden ingebouwd – zie ook de gebruiksaanwijzing!

- Komplettering av kapitel 'Skötsel/demontage/demontage utan att dra ut rörpaketet'. Vid sammansättningen måste fixerplattorna åter monteras på rätt sida av värmeväxlaren - se bruksanvisningen om detta!

- Supplement til kapittel Vedlikehold/demontering/demontering uten uttrekking av rørbunt. Ved sammensetting må posisjoneringsplatene monteres på korrekt side av varmeveksleren - se bruksveiledningen!

- Täydennys lukuun 'Huolto/Purkaminen/purkaminen ilman putkinipun ulosvetämistä'. Koottaessa on kiinnityslevyt asennettava taas oikein lämmönvaihtimen sivulle – katso käyttöohje!

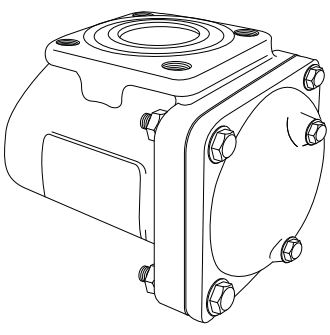
- Дополнение к главе ´Техобслуживание/демонтаж/демонтаж без выдергивания пучка труб´ - При сборке все фиксирующие пластины должны монтироваться в правильной стороне теплообменника – смотри касательно этого инструкцию по эксплуатации!

- Uzupełnienie do rozdziału 'Konserwacja/Demontaż/Demontaż bez wyciągania wiązki rurowej'. Przy montażu, płyty ustalające muszą zostać znowu wbudowane po właściwej stronie wymiennika ciepła – patrz: Instrukcja obsługi!

- Dodatek k poglavju - Vzdrževanje/Demontaža/demontaža brez izvleka snopa cevi. Pri sestavi je potrebno fiksirne ploščice spet vgraditi nazaj na pravilni strani toplotnega izmenjevalnika – glejte k temu navodila za upravljanje!

- Dodatok ku kapitole „Údržba/demontáž/demontáž bez vyťahovania zväzku trubiek". Pri montáži je potrebné fixačné dosky znovu namontovať na správnu stranu výmenníka tepla – pozri v tejto súvislosti návod na obsluhu!

1.



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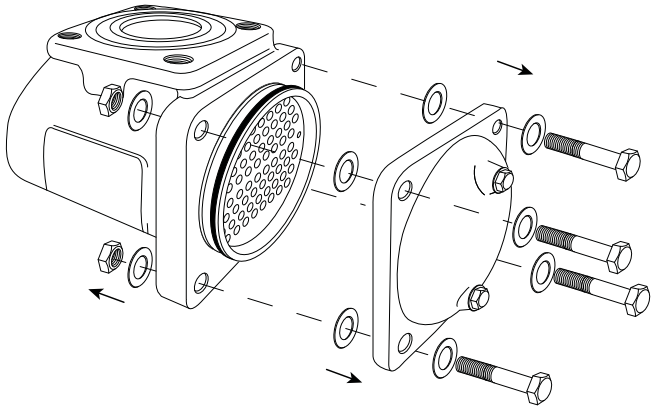

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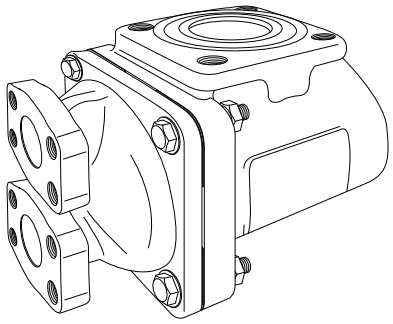

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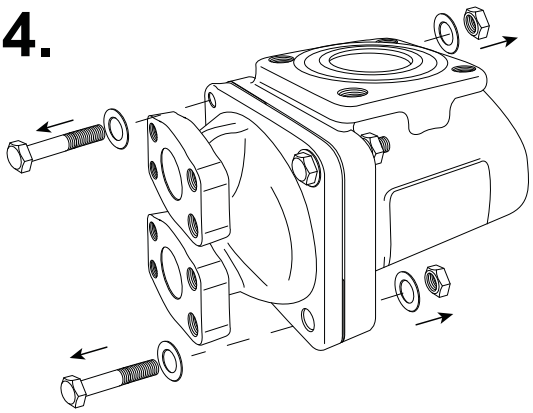

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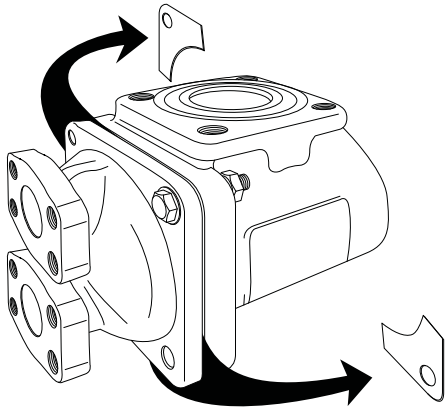

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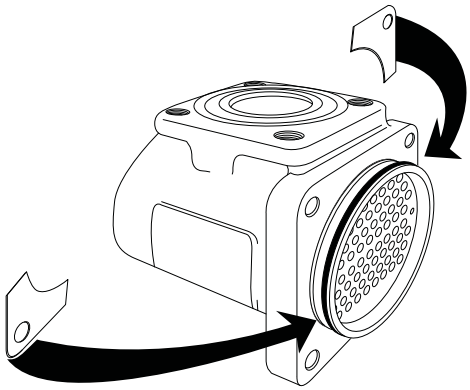

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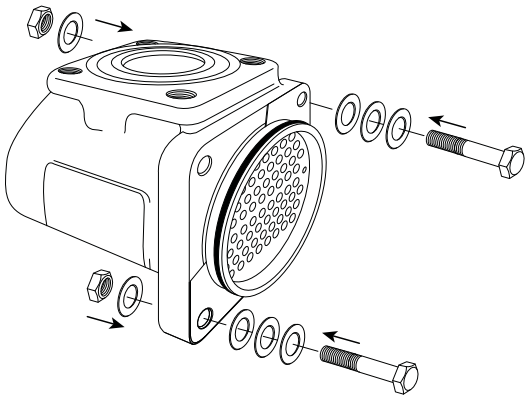

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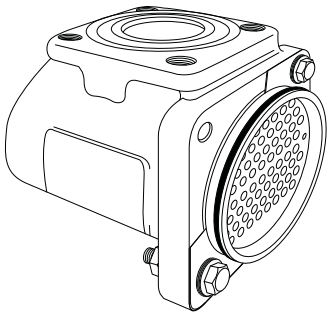

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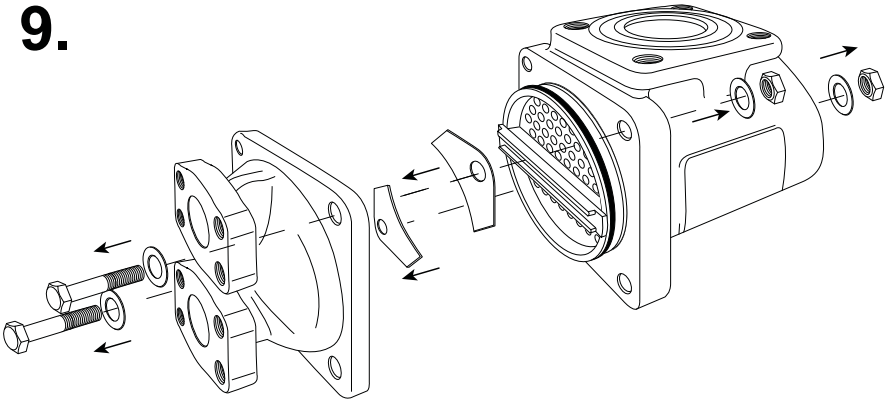

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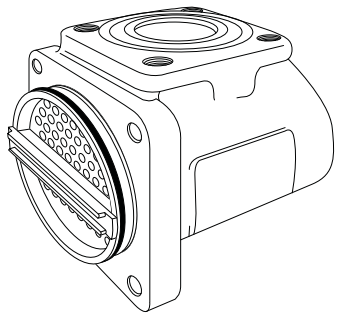

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(7) Drawing/Part List/Data Sheet

SO 119897
OIL COOLER DATASHEETS

Customer	MAYEKAWA Europe NV	Date	29.05.2024
Reference	MME 119897	Offer No.	B24-59262B-01
Type	KS 12 - F E H - 1 1 3 - L2200	Pressure range	Z

		Shellside	General	Tubeside
Medium		ISO VG 68 + R290		R290
Heat capacity	kW		24,7	
Inlet temperature	°C	70,2		56
Outlet temperature	°C	60		56
Mass flow rate	kg/s	-		0,09
Volume flow	l/min	84		-
Pressure drop	bar	0,06		0,01
Active surface	m²	28,66		3,48
Max. temperature	°C	100		100
Max. pressure	bar	30		30
Fouling	m²K/kW		0,17	
Extra capacity*	%		10,2	
Shell diameter	mm		139,7	
No. of baffles	-		3	
No. of tubes	-		72	
Tube diameter	mm		8,0 x 0,5	
Bundle length	mm		2200	
Paths tubeside	-		1	
Weight(e)	kg		81	
Contents	dm³	17		7,6
			Material	
Tubes	-		1.4404	
Tubesheets	-		1.4301	
Fins	-		Aluminium	
Baffles	-		Aluminium	
O-rings	-		HNBR	
Bonnets/cover	-		Steel	
Shell	-		Steel	
Connections	-	DN50		SAE2"
Remarks	*Extra capacity is based on reduced installation angle of 3°.			

Customer	MAYEKAWA Europe NV	Date	29.05.2024
Reference	MME 119897	Offer No.	B24-59262B-02
Type	KS 12 - F E H - 1 1 3 - L2200	Pressure range	Z

		Shellside	General	Tubeside
Medium		ISO VG 68 + R290		R290
Heat capacity	kW		37,5	
Inlet temperature	°C	74,7		56
Outlet temperature	°C	60		56
Mass flow rate	kg/s	-		0,14
Volume flow	l/min	88		-
Pressure drop	bar	0,06		0,01
Active surface	m²	28,66		3,48
Max. temperature	°C	100		100
Max. pressure	bar	30		30
Fouling	m²K/kW		0,17	
Extra capacity*	%		>10	
Shell diameter	mm		139,7	
No. of baffles	-		3	
No. of tubes	-		72	
Tube diameter	mm		8,0 x 0,5	
Bundle length	mm		2200	
Paths tubeside	-		1	
Weight(e)	kg		81	
Contents	dm³	17		7,6
			Material	
Tubes	-		1.4404	
Tubesheets	-		1.4301	
Fins	-		Aluminium	
Baffles	-		Aluminium	
O-rings	-		HNBR	
Bonnets/cover	-		Steel	
Shell	-		Steel	
Connections	-	DN50		SAE2"
Remarks	*Extra capacity is based on fixed temperatures and variable flow rates and a reduced installation angle of 3°!			

MAYEKAWA Europe MYCOM

CHECK VALVE

TYPE DUO

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

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www.mayekawa.eu
info@mayekawa.eu

DUO CHECK VALVE

INSTALLATION, OPERATION, MAINTENANCE and SAFETY MANUAL

TABLE OF CONTENTS

1. Introduction / Background

2. Safety information

3. Installation

4. Layout drawing with dimensions and material

5. Operation

6. Maintenance

7. Assembly and Disassembly Instructions

8. Troubleshooting

1. INTRODUCTION AND BACKGROUND

1.1 HIGH PERFORMANCE CHECK VALVE

The Duo-Check II check valve has exclusive design and patented features that result in exceptionally high performance and reliability for most liquid, vapour, gas and fluid applications. The newest Check valve incorporates the sound, imaginative design which has characterised Duo-Check valves for many years, plus added patented features that offer performance advantages not found in any other available check valve.

1.2 DUO-CHEK II FEATURES

The Duo-Check II family provides the following important features:-

- Lightweight, small size and strong construction compared with conventional swing check valves.
- Dual-plate, flat-seat design for efficient seating under most flow and pressure conditions.
- Long-leg spring action which allows the plates to open and close without seat scrubbing.
- New, patented, independent spring design which provides as much as 25% lower stress and 50% reduction of water hammer.
- New, patented, independent plate suspension which reduces friction by 66%, which minimises water hammer.
- Lower head loss than swing checks in larger sizes.

The advanced technology of the Duo-Check II valve provides the Process Engineer with unique opportunities to advance the science of fluid mechanics and system design.

2. SAFETY INFORMATION

General

2.1 The Duo-Check is a non-return check valve used to temporarily prevent or limit the amount of reverse flow and pressure in one direction, whilst permitting it in the other.

2.2 The relevant valve classification has been determined based on the valve body material, DN and maximum service pressure (PSmax) in accordance with the PED rules. Except where specifically agreed, valves other than those made from cast irons and aluminium have been classified for Group 1 gases (Cat. III). Cast Irons and aluminium valves are classified for Group 2 gases (SEP, Cat. I-III as appropriate). Unless agreement is reached before hand, the responsibility for approval of material selection rests with the user who must ensure their suitability from a corrosion and application standpoint.

2.3 Ensure the allowable operating pressure (see CWP or PSmax on nameplate) and the allowable temperature limits of the valve (see TSmin / TSmax on nameplate) are consistent with the system design limits.

2.4 If valves are to be stored for any significant length of time prior to installation, they should be kept out of direct sunlight and in a cool, dry environment in the original packaging. Corrosion inhibitor may be required at periodic intervals.

2.5 Duo-Check's are not generally recommended for reciprocating compressor applications.

2.6 Where there is a risk of compressor surge in gas applications or where there is rapid pressure pulses or flow reversal causing high impact opening or closure, extended body Style X Duo-Check valves are recommended.

2.7 If used for flow that contains particular or stringy, fibrous matter, internal modifications may be necessary. In severe cases, the valve may not be suitable.

3. INSTALLATION

3.1 Suction check valve is to be checked on the correct opening degree. There are only two possible mounting positions which allows the check valve to be fully open without hitting the compressor inlet reinforcement rib.

3.2 Installation for horizontal flow is preferred, however, the valve may be installed in vertical pipelines, as different spring strength may be needed. Higher minimum dynamic pressures are required for vertical up-flow orientation to ensure avoidance of chatter.

3.3 Remove all packaging ensuring removal of any loose materials and tags wired to the stop pin.

3.4 Care must be taken to ensure the sealing faces are not damaged prior to or during installation.

3.5 Using a petroleum solvent, clean off any rust inhibitor applied to machined surfaces and ensure the free opening and closing of the plates. Ensure the cleaning agent does not contact any soft seals.

3.6 Wafer, Wafer Lug and Flanged end valves

1) Making sure the check valve is orientated in the correct direction for forward flow (see flow direction arrow on the valve body) install the valve between the mating flanges using correctly selected gaskets for the fluid to be handled. The hinge pin must be vertical for horizontal flow.
2) After achieving good centralisation between the companion flanges, tighten the bolting to the predetermined torque as required by the gasket manufacturer in the same manner as any normal joint, consistent with the allowable stress limits of the bolting material. Note that over-tightening of bolts can result in damage to the valve and gaskets.

3.7 Weld end valves

Making sure the check valve is orientated in the correct direction for forward flow (see flow direction arrow on the valve body), using an approved welding procedure, weld the valve to the connecting pipes. The hinge pin must be vertical for horizontal flow. Care must be taken to ensure temperature build up does not exceed the maximum allowable for soft materials within the valve - refer to relevant certified drawing for temperature limits and location.

3.8 Mechanical hub end connections and proprietary flanged end connections

Refer to the detailed instructions from the connector supplier regarding correct preparation and installation. Make sure the check valve is orientated in the correct direction for forward flow (see flow direction arrow on the valve body) and that the hinge pin is vertical for horizontal flow.

3.9 Fitting between flanges

The Duo-Check II valve flange dimension has been sized so the valve centreline will be in alignment with the centre of the companion flanges when it rests inside the stud bolts.

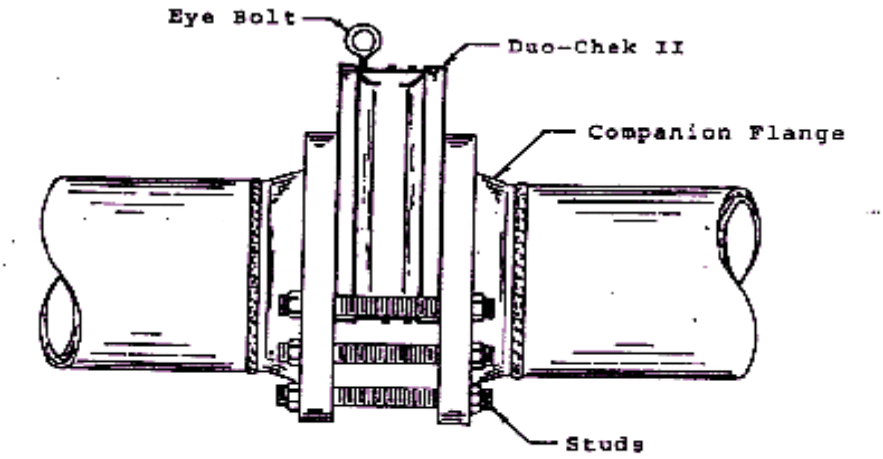


Figure 1

NB: There is an arrow cast or stamped on the side of the valve to indicate normal direction of fluid flow.

Figure 1 shows the ease with which the Duo-Check II valve is installed.
The valve is inserted between two companion flanges with gaskets on the contact faces. Stud bolts that will span the valve flanges are installed and the joint is made up in the same manner as any flanged joint.
The normal installation of the Duo-Check II is for horizontal flow with the pin vertical in order for plates to swing properly.

The Duo-Check may need to be fitted with special springs to permit installation in vertical pipelines.

3.10 Valve position

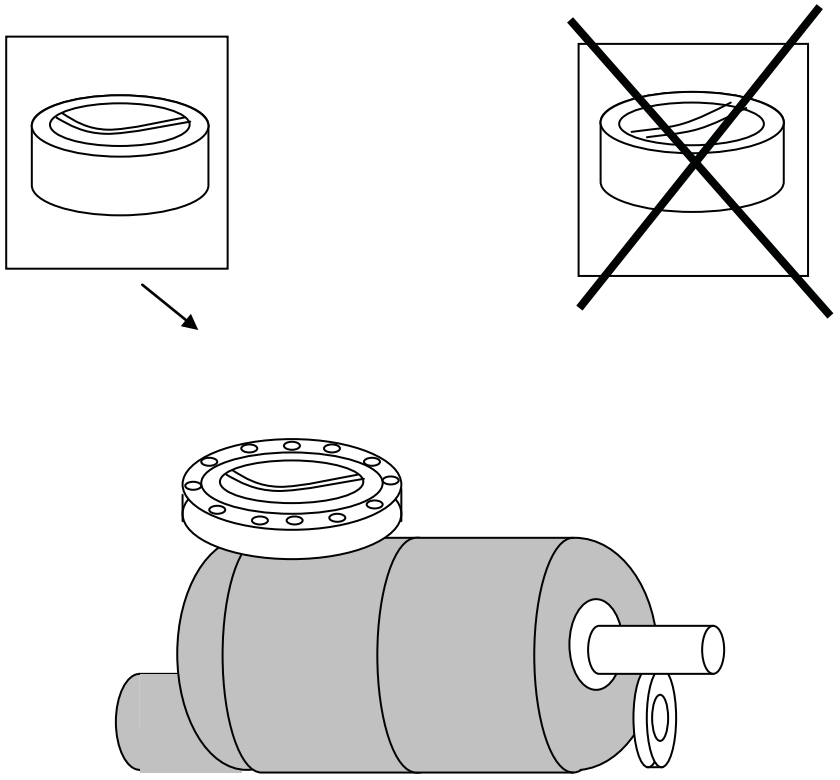
The Duo-Check II valve can be installed in three basic flow configurations. While the standard installation is in horizontal flow with the pins vertical, the valve can also be placed in upwards vertical flow and downwards vertical flow, which may necessitate special springs.

In each of the three positions, gravity has a different effect on the plates and subsequent performance on the valve. In the horizontal position, gravity effects the valve only by causing lug friction and is the most efficient installation of the valve.

For upwards vertical flow, gravity induces additional force on the plates. The total force in the plates is the sum of the spring force and the plate weight. The force has to be overcome by the pressure and flow in the system and results in an increase in pressure loss.

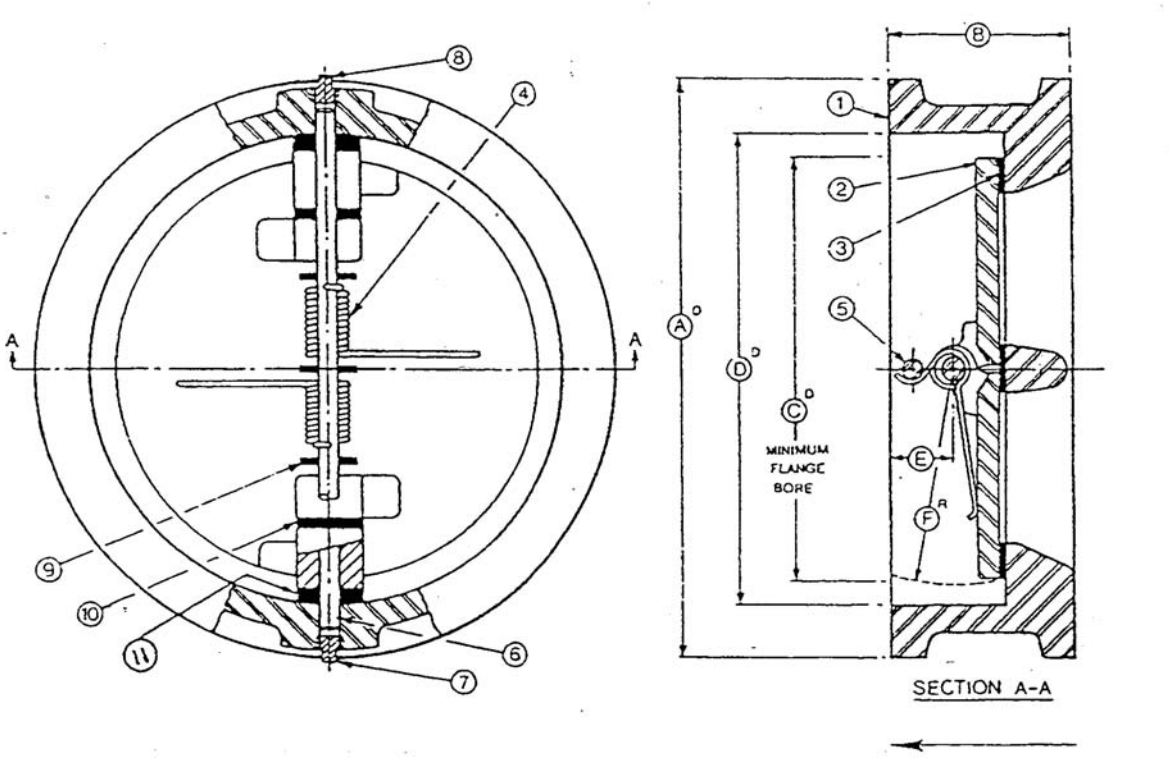
3.11 Suction check valve mounting.

When mounting the check valve on the compressor suction flange, the positioning of the check valve construction must be as shown below. Otherwise, the plates will hit the reinforcing ribs in the compressor gas intake port.



4. Layout drawing and dimensions

4.1 Layout drawing



Direction of flow

4.2 Dimensions

Valve size	A	B	C	D	E	F	Weight
	mm	mm	mm	mm	mm	mm	kgs.
M 50	109	60	49	61	33	27	3
M 65	129	67	60	73	33	33	3,8
M 80	144	73	74	89	35	41	4,4
M 100	170	73	97	115	36	54	
M 125	196	86	122	141	41	65	
M 150	226	98	146	169	45	79	
M 250	343	146	242	274	52	126	
M 350	486	222	318	356	94	175	
M 400	517	232	364				

4.3 Material of the components

Valve size	Items																	
	1 Body		2 Plates		3 Seal		4 Spring		5 Stop pin		6 Hinge pin		7 Hinge pin ret		8 Stop pin ret		9 Lug bearings	
	QTY	Material	QTY	Material	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material	
M 50	1	ASTM A216 GR WCB	2	ASTM A216 GRWCB	Metal to metal	1	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316SS	4	316SS	
M 65	1	ASTM A216 GR WCB	2	ASTM A216 GR WCB	Metal to metal	1	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	4	316 SS	
M 80	1	ASTM A216 GR WCB	2	ASTM A216 GR WCB	Metal to metal	1	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	4	316 SS	
M 100	1	ASTM A352 GR LCB	2	ASTM A351 GR CF 8M	Metal to metal	1	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	4	316 SS	
M125	1	ASTM A352 GRLCB	2	ASTM A532 GRLCB	Metal to Metal	1	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	4	316 SS	

Valve size	Items																	
	1 Body		2 Plates		3 Seal	4 Spring		5 Stop pin		6 Hinge pin		7 Hinge pin ret		8 Stop pin ret		9 Spring bearings		10 Lug bearings	
	QTY	Material	QTY	Material	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material	QTY	Material
M 150	1	ASTM A352 GR LCB	2	ASTM A351 GR CF 8 M	Metal to metal	2	Inconel	1	316 SS	1	316 SS	2	316 SS	2	316 SS	3	316 SS	4	316 SS
M 200	1	ASTM A217 GR CA 15	2	ASTM A217 GR CA 15	Metal to metal	2	Inconel 600	1	BS970 GR410 S21 PT1	1	BS970 GR410 S21 PT1	2	BS970 GR410 S21 PT1	2	BS970 GR410 S21 PT1	3	BS970 GR410 S21 PT1	4	BS970 GR410 S21 PT1
M 250	1	ASTM A352 GR LCB	2	ASTM A351 GR CF 8 M	Metal to metal	2	316 SS	1	316 SS	1	316 SS	2	316 SS	2	316 SS	3	316 SS	4	316 SS
M 300	1	ASTM A352 GR LCB	2	ASTM A351 GR CF 8M	Metal to metal	2	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	3	316 SS	4	316 SS
	1	ASTM A352 GRLCB	2	ASTM A351 GRCF 8M	Metal to metal	2	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	3	316 SS	4	316 SS
M 400	1	ASTM A352 GR LCB	2	ASTM A352 GRLCB	Metal to metal	2	Inconel 600	1	316 SS	1	316 SS	2	316 SS	2	316 SS	3	316 SS	4	316 SS

5. Operation

5.1 The Duo-Check II is designed to block flow in only one direction and operate as a result of differential pressure. The valve initially opens as a result of this differential pressure and is a function of the valve orientation and spring strength.
When the upstream pressure becomes higher than the spring force and downstream pressure, the plates unseat and the valve opens.
This initial pressure is sometimes called the cracking pressure. As flow increases the plates assume a position dependent on only the flow rate. Static pressure initially forces the plates open, however the dynamic pressure resulting from the flow determines the subsequent position. The plate position is developed by the velocity and density of the flowing media and the resulting impact force on the valve plates and is totally independent of line pressure.

5.2 The degree of opening will be dependent on the dynamic pressure of the flowing medium. Valve plates are fully open only at maximum flow depending on the media and operate partly open at low flow rates. As the flow rate decays, the plate angle decreases as the torsion spring actuates the plates. In most applications, the springs provide a positive closing force at all angles as the flow decays until the plate closes.
In some applications, when the flow decrease suddenly, plates closure lags behind the changing flow. The plates will still open at some angle when the flow stops.
The flow back will then speed up the final closing movement of the plates and flow is stopped, however the kinetic energy of the moving fluid must be dissipated as a shock force called waterhammer. The use of high torque and maximum torque springs provide the necessary spring force to control and minimise waterhammer effects in most applications.
As a general rule, for horizontal flow with standard torque spring(s), a dynamic pressure of 20Pa will ensure the plates rotate sufficiently away from the body seal face to avoid chatter. For best valve life it is recommended that the dynamic pressure is limited to 4.5kPa. If this is to be exceeded, then increased inspection and maintenance may be required.

5.3 High cycling applications may require special low fatigue springs and adaptations for maximum life.

5.4 In fast decelerating liquid applications, check valves can be subject to valve slam.
High strength springs and other adaptations can be employed to help control this phenomenon. In severe cases the Duo-Check may be unsuitable.
Typical applications where high strength springs may be required are those where a high energy source exists downstream under transient flow conditions (e.g. multi-pump discharge service or on pump discharge service upstream from an air vessel).

6. Maintenance

6.1 Unless otherwise agreed, the valve design life is usually expected to be in the range of 15-20 years under average conditions, provided materials are suitable for the service.

6.2 Depending on the severity of the application (e.g. flow velocity, cycling, location of valve, criticality) maintenance can be scheduled accordingly. A recommended duration is in the range of 3-5 years under average conditions.

6.3 The valve should never be tampered especially whilst in a pressurised pipeline.

6.4 Once de-pressurised, the valve can be removed from the pipeline and functionally tested (opening and closing the valve several times by hand and checking for freedom of movement). It should then be inspected for signs of wear between components in relative motion. Particular areas of interest would be:

a) The sealing faces of the body and plates
b) Where the pins locate into the valve body or insert
c) The spring and bearings
d) The plate hinges (lugs) that support the plates on the hinge pin.

6.5 Parts which are worn to such an extent that the functionality and performance of the valve are / will soon be impaired, should be replaced. All internal parts are replaceable
NB: The assembly / disassembly instructions should be followed. See section 7

6.6 It is recommended that quality original parts are replaced as required

6.7 Only properly skilled maintenance technicians should carry out this work.

6.8 After parts are replaced and valve is built, a pressure test should be performed to establish that there are no external leaks, and that the seat leakage is within acceptable limits. API 598 hydrostatic seat leakage rates are zero for resilient seated valves and 3 ml / min. per inch of nominal bore for metal-seated valves.

6.9 Safety is paramount and extreme care should be exercised during pressure testing.

7. ASSEMBLY AND DISASSEMBLY INSTRUCTIONS

7.1 ASSEMBLY

The assembly of the Duo-Check II valve can be accomplished with relative ease using only an open-end wrench, PTFE tape or other suitable pipe sealant and these instructions - see figure 2 below:

NOTE: EYE PROTECTION IS HIGHLY RECOMMENDED FOR ASSEMBLY AND DISASSEMBLY OF VALVES

1. Thoroughly wash the body (1) and plates (2) with a petroleum solvent, or other suitable detergent. Do not splash onto resilient seals if fitted, as degradation may result.

2. Lay the body down with the 'downstream' side facing upwards.

3. Lay the plates inside the body, sealing surfaces down, with the Plate hinge lugs together.

4. Insert the body lug bearings (9) between the body and the outer plate lug.

5. Insert the plate lug bearings (8) between the two plate lugs.

6. Standard Wafer Check Valves:
   Lay springs (5) in plate recess with stop pin leg (short hooked leg) ex ended upwards.
   Weld End Valves:
   Rotate spring legs to increase torque and hold in plate recess.

7. For valves with more than one spring, install spring bearings (10), one at each end and one between each spring.

8. Insert hinge pin (4).

9. Coat body pin retainer threads (1) with thread lubricant.

10. Wrap pin retainers (6) and (7) with 1½ rounds of PTFE tape.

11. Screw hinge pin retainers (7) into body and wrench tighten.

12. Move hinge pin to ensure that it is free from binding on pin retainers.

13. Pull stop pin leg of spring towards the plate leg, insert stop pin (3) and release spring.

14. Screw PTFE wrapped stop pin retainers into body and wrench tighten.

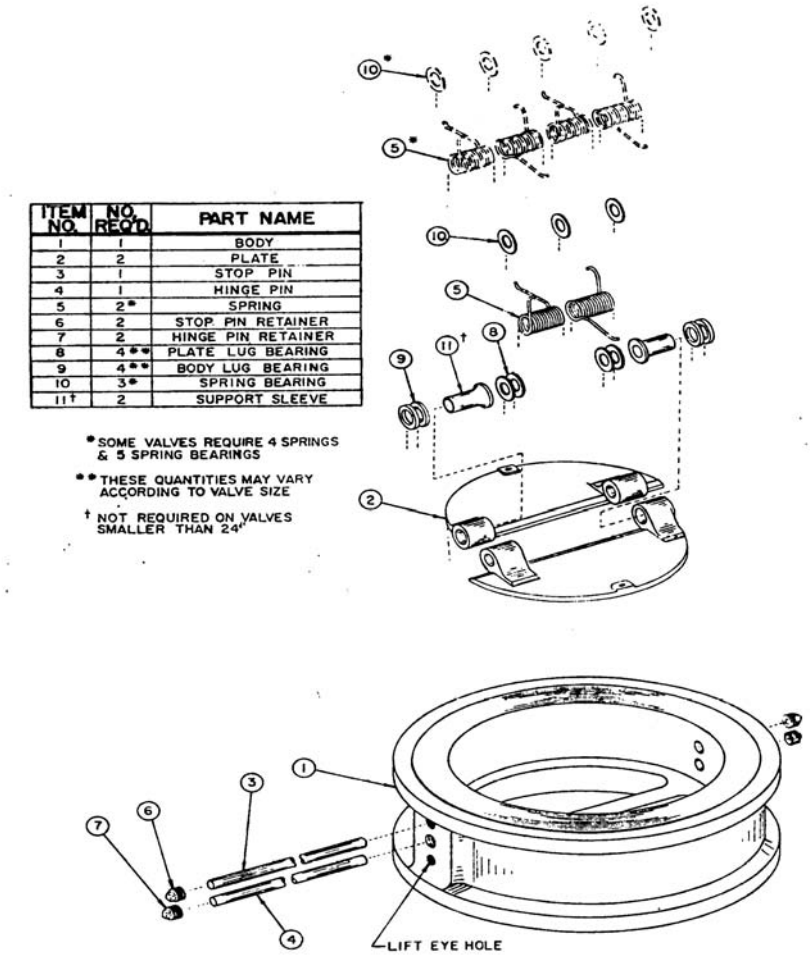
15. Check valve operation by moving plate several times by hand.

16. If valves are not for immediate use, coat with rust preventative.

7.2 DISASSEMBLY

The disassembly of the Duo-Check valve can be accomplished by simply reversing the assembly instructions. Exercise care when removing the stop / or hinge pin. Preset springs may cause serious injury when tension is released.

REMEMBER: PLEASE USE EYE PROTECTION



8. TROUBLESHOOTING

One should keep in mind the purpose of the Duo-Check when operating difficulties are encountered. The valve is supposed to check reverse flow. When the valve fails to perform this function, the following points should be checked:

8.1 The valve fails to check

- Washout of body around hinge pin may have occurred allowing hinge pin to be cocked preventing plates from seating properly. Valve may be completely void of plates due to washout of hinge pin.
- One or both plates may become loose from the hinge pin. This may be caused by extreme shock type opening of the valves. Corrosion may destroy all or part of the plates. This would indicate plate material is incorrect for media being handled.
- Spring may be broken and the valve is without a stop pin due to body washout, breakage or corrosion allowing plates to swing past centre line of the valve when in open position, This prevents back flow from catching plates properly to close them.
- The hinge pin is not vertical when valve is in horizontal flow position.

8.2 The valve slams violently when flow reverses

- The spring in the valve is broken and hence does not perform its function.
- The spring is too weak. Some flow conditions require the valve to close quicker than others. Unless the plates seat before backflow occurs, possible slamming will result. A stronger spring will help remedy this problem. Sometimes it is also necessary to limit the opening angle of the plates.

8.3 The valve leaks excessively across seal

- The seal is defective.
- Plates are not sealing properly.

8.4 The valve leaks between the flange faces

- The serrations on either the Duo-Check flange or the companion flange are damaged.
- A new gasket or seal ring is needed.
- Relaxation of bolt load.

8.5 There is no flow through the line

- The valve is installed backwards.
- The valve is new and the plates have not been broken loose from the valve set. Ferrous valves are coated internally with Shell Ensis fluid to prevent oxidation at assembly. When the Shell Ensis fluid dries, the plate becomes ‘glued’ to the valve seat and the operating pressure of the system is not sufficient to break the plates loose.

MAYEKAWA Europe MYCOM

STOP NEEDLE VALVE

TYPE SNV - ST

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

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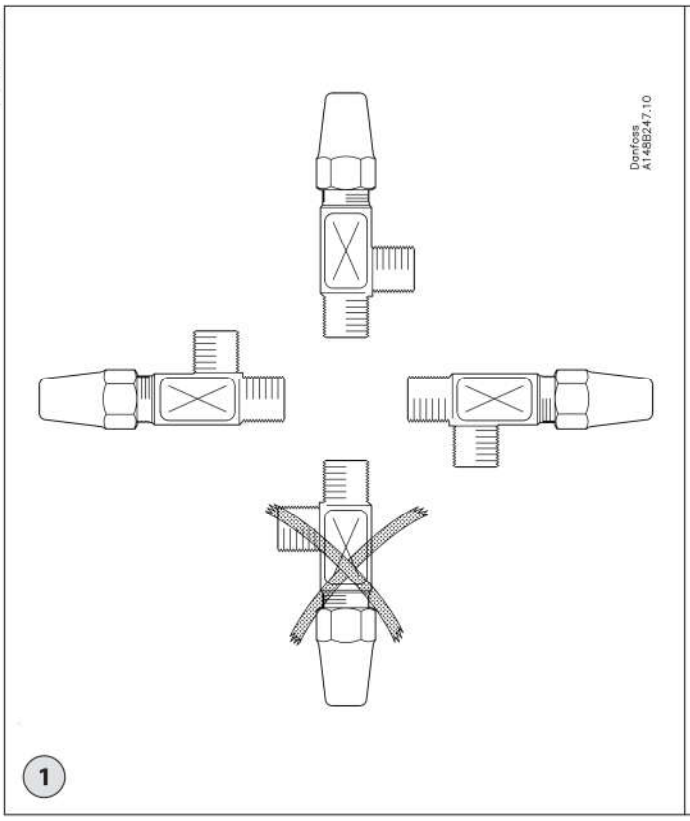
info@mayekawa.eu

Installation Guide

Gauge valve
Type SNV-ST, SNV-SS

148R9517



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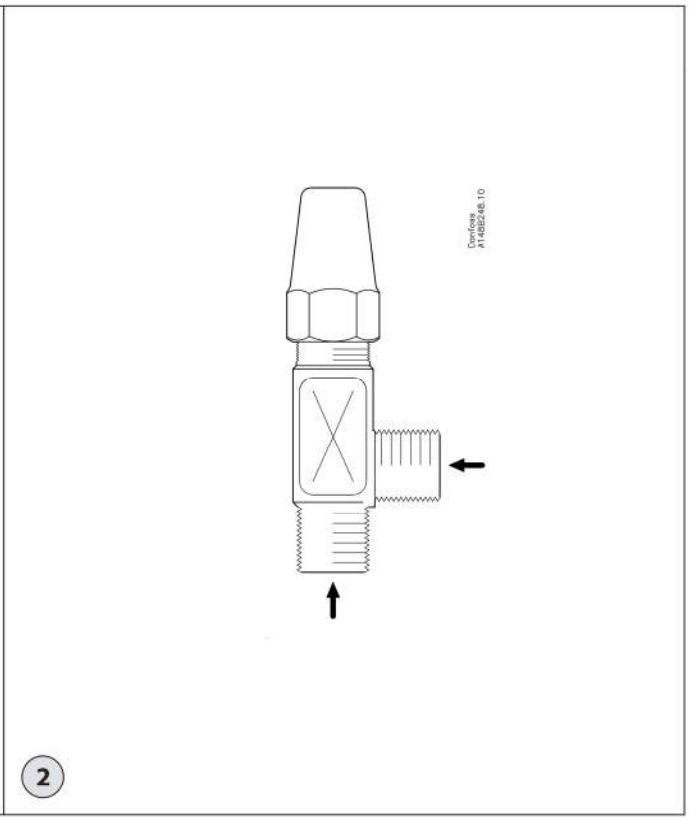
148R9517



2

DANSK

Installation

Kølemidler
Anvendelig til HCFC, ikke-brændbar HFC, R717 (ammoniak) og R744 (CO_2).
Ventilen bør kun bruges i lukkede kredsløb. Kontakt venligst Danfoss for yderligere information.

Temperaturområde
-60 – 150 °C / -76 – 302 °F

Trykområde
SNV ventilerne er designet til et maksimalt arbejdstryk på 52 bar g / 754 psig.

Installation
Ventilen skal installeres med spindlen i en vertikal oprejst eller horisontal position (fig. 1). Ventilerne bør åbnes med håndkraft ved brug af almindelig sund fornuft i overensstemmelse med mekanisk praksis, og kun ved brug af små skruenøgler. Ventilen er konstrueret til at kunne modstå et højt internt tryk. Uanset hvilket system, der er tale om, skal det være konstrueret til at forhindre væskefælder og reducere risikoen for hydraulisk tryk forårsaget af termisk ekspansion. Sørg for, at ventilen er beskyttet mod kortvarige tryk såsom væskeslag i systemet.

Anbefalet strømretning
Strømretning som vist med pilen (fig. 2). Den kraft, der bruges til at åbne og lukke ventilen, må ikke overskride den kraft, et almindeligt håndhjul anvender.

Ventilhuset skal være fri for spændinger (eksterne belastninger), efter installation.

SNV-ventilen må ikke monteres i systemer, hvor udgangssiden af ventilen er åben til omgivelserne. Ventilens udgangsside skal altid være forbundet til systemet eller korrekt lukket, f.eks. med et påsvejset endestykke.

Identifikation
Nøjagtig identifikation af ventilen sker ved at kontrollere stemplet på ventilhuset.

Overfladebehandling
SNV-ST er dækket udvendig med zinkkromat, og SNV-SS er fremstillet af rustfri stål. Ventilhusets udvendige overflade kan beskyttes yderligere mod korrosion med et egnet beskyttende lag.

Vedligeholdelse

SNV-ventilerne er samlet uden mulighed for at blive skilt ad igen. Spindlen kan, under igen omstændigheder, skrues af igen. Dette beskytter systemet mod, at man kan pille ved det.

Pakbøsning
Hvis pakbøsningen lækker, er der mulighed for at stramme den ved forsigtigt at bruge en skruenøgle. Undgå at bruge al for meget kraft (maks. 20 Nm). Det anbefales, at stramme pakbøsningen i etaper og indimellem kontrollere, om den lækker.

Forholdsregel!
For at undgå at beskadige SNV-ventilen med risiko for utæthed, når SNV-spindelbeskyttelseshætten løsnes, bør følgende sikkerhedsforanstaltninger følges:
- Stram ventilhætten med højst 50 Nm (udvid ikke standardmomentnøglen, når hætten strammes).
- Hvis hætten sidder fast, bruges eventuelt en ekstra momentnøgle til at tilføre moddrejemoment til ventilhuset.
- Forsøg ikke at samordne eller justere placeringen af ventilen på et tryksat anlæg.

Kontakt venligst Danfoss i tilfælde af tvivl.

ENGLISH

Installation

Refrigerants
Applicable to HCFC, non flammable HFC, R717 (Ammonia) and R744 (CO_2).
The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range
SNV: -60 – 150 °C / -76 – 302 °F

Pressure range
SNV: The valves are designed for a max. working pressure of 52 bar g / 754 psig.

Installation
The valve must be installed with the spindle vertically upwards or in horizontal position (fig. 1). Valves should be opened by hand according to sound engineering practice only by use of small spanners. The valve is designed to withstand a high internal pressure. However, the piping system should be designed to avoid liquid traps and reduce the risk of hydraulic pressure caused by thermal expansion. It must be ensured that the valve is protected from pressure transients like "liquid hammer" in the system.

Recommended flow direction
Flow direction as indicated by the arrow (fig. 2). The force used to open and close the valve must not exceed the force of an ordinary handwheel.

The valve housing must be free from stresses (external loads) after installation.

SNV valves must not be mounted in systems where the outlet side of the valve is open to atmosphere. The outlet side of the valve must always be connected to the system or properly capped off, for example with a welded-on end plate.

Identification
Precise identification of the valve is made via the stamping on the valve body.

Surface Treatment
SNV-ST is externally zinc-chromated and SNV-SS is made of stainless steel. The external surface of the valve housing can be further prevented against corrosion with a suitable protective coating.

Maintenance

SNV valves are assembled without the possibility to be disassembled. The spindle can in no way be unscrewed. This will protect the system from tampering.

Packing gland
If the packing gland is found to be leaking, there is a possibility to tighten it by carefully screwing with a wrench. Make sure not to apply very high force (max. 20 Nm)and we recommend turning the packing gland in steps and to check the leaking in between.

Precaution!
To avoid damaging the SNV valve with the risk of leakage when unscrewing the SNV spindle protection cap the following precautions should be followed:
- Tighten the valve cap with no more than 50 Nm (no extension to be applied to a standard wrench while tightening the cap)
- In case the cap is stuck; use counter torque on the valve house by means of e.g. additional wrench
- Do not try to align or adjust the position of the valve on a pressurized system

In cases of doubt, please contact Danfoss.

DEUTSCH

Installation

Kältemittel
Geeignet für H-FCKW, nicht brennbares HFKW, R717 (Ammoniak) und R744 (CO_2). Das Ventil ist nur für die Verwendung in geschlossenen Kreisläufen empfohlen. Für weitere Informationen wenden Sie sich bitte an Danfoss.

Temperaturbereich
-60 – 150 °C / -76 – 302 °F

Druckbereich
Die SNV Ventile sind für einen max. Betriebsdruck von 52 bar g / 754 psig ausgelegt.

Installation
Das Ventil muss mit der Spindel senkrecht nach oben oder waagerecht (Abb. 1) eingebaut werden. Die Ventile sollten per Hand gemäß vernünftiger technischer Praxis nur mit einem kleinen Schraubenschlüssel geöffnet werden. Das Ventil ist für einen hohen Innendruck ausgelegt. Das Verrohrungssystem sollte jedoch ausgelegt sein, um Flüssigkeitseinschlüsse zu verhindern und das Risiko von Hydraulikdruck, verursacht durch Wärmeausdehnung, zu senken. Es muss sichergestellt werden, dass das Ventil vor Druckstößen wie Wasserschlag im System geschützt ist.

Empfohlene Durchflussrichtung
Die Durchflussrichtung ist in Pfeilrichtung (Abb. 2). Die zum Öffnen und Schließen des Ventils aufgewendete Kraft darf die Kraft eines gewöhnlichen Handrads nicht überschreiten.

Das Ventilgehäuse muss nach dem Einbau frei von Beanspruchungen (externen Belastungen) sein.

SNV-Ventile dürfen nicht in Systemen eingebaut werden, in denen die Auslassseite des Ventils zur Atmosphäre offen ist. Die Auslassseite des Ventils muss immer an das System angeschlossen oder richtig verschlossen werden, wie zum Beispiel mit einem angeschweißten Endblech.

Kennzeichnung
Das Ventil lässt sich über die Prägung am Ventilgehäuse genau identifizieren.

Oberflächenbehandlung
SNV-ST wird außen zinkchromatisiert und SNV-SS besteht aus Edelstahl. Die Außenfläche des Ventilgehäuses kann mit einer geeigneten Schutzbeschichtung weiter gegen Korrosion geschützt werden.

Wartung

SNV-Ventile werden zusammengebaut, ohne anschließend wieder zerlegt werden zu können. Es gibt keine Möglichkeit, die Spindel abzuschrauben. Dies schützt das System vor unbefugten Eingriffen.

Stopfbuchse
Falls die Stopfbuchse leckt, gibt es eine Möglichkeit, sie festzuziehen, indem sie vorsichtig mit einem Schraubenschlüssel eingeschraubt wird. Dabei darf keine sehr hohe Kraft aufgewendet werden (Max. 20 Nm) und wir empfehlen, die Stopfbuchse schrittweise zu drehen und Leckage zwischen diesen zu überprüfen.

Achtung!
TUm das Risiko dass es beim Lösen der Schutzkappe der SNV-Ventilspindel zu einer Beschädigung/evtl. Leckage kommt, sollten Sie die folgenden Sicherheitsvorkehrungen treffen:
- Ziehen Sie die Ventilkappe mit maximal 50 Nm fest (zum Festziehen der Kappe darf keine Verlängerung an einen Standardschraubenschlüssel angebracht werden).
- Falls die Kappe klemmt: Erzeugen Sie z. B. mithilfe eines zusätzlichen Schraubenschlüssels ein Gegenmoment am Ventilgehäuse.
- Versuchen Sie keinesfalls, die Stellung des Ventils eines unter Druck stehenden Systems zu richten oder anzupassen.

Wenden Sie sich im Zweifelsfall bitte an Danfoss.

FRANÇAIS

Installation

Fluides frigorigènes
Applicable au HCFC, HFC non inflammable, R717(ammoniac) et R744 (CO_2).
Cette vanne est préconisée uniquement pour les circuits fermés. Contacter Danfoss pour de plus amples informations.

Plage de température
-60 – 150 °C / -76 – 302 °F

Plage de pression
Ces vannes SNV ont été conçues pour une pression de service maximale de 52 bars g / 754 psi g.

Installation
Installer la vanne de sorte que la tige soit orientée à la verticale vers le haut ou en position horizontale (fig. 1). Les vannes doivent être ouvertes manuellement conformément aux bonnes pratiques en utilisant uniquement de petites clés. Cette vanne est conçue pour supporter une pression interne élevée. Toutefois, il convient de concevoir le circuit de façon à éviter les pièges à liquide et réduire les risques de formation d'une pression hydraulique sous l'effet de la dilatation thermique. Veiller à ce que la vanne soit protégée des variations de pression au sein du circuit comme les « coups de bélier ».

Sens de débit recommandé
Le sens du débit doit être conforme à l'indication de la flèche (fig. 2). La force utilisée pour ouvrir et fermer la vanne ne doit pas dépasser la force d'un volant de manoeuvre normal.

Préserver le boîtier de vanne des contraintes (charges externes) après l'installation.

Les vannes SNV ne doivent en aucun cas être montées dans des circuits où la sortie de la vanne serait mise à l'atmosphère. La sortie de la vanne doit systématiquement être raccordée au circuit ou obturée comme il se doit, par exemple à l'aide d'un embout soudé.

Identification
La vanne peut être identifiée précisément à l'aide de l'estampage sur le corps de vanne.

Traitement de surface
La vanne SNV-ST a subi une phosphatation au zinc sur la surface extérieure et la vanne SNV-SS est en acier inoxydable. La protection de la surface extérieure du boîtier de la vanne peut être renforcée contre la corrosion avec un revêtement adéquat.

Maintenance

Les vannes SNV sont assemblées définitivement, sans possibilité de démontage. La tige ne peut en aucun cas être dévissée. Le système est ainsi protégé de toute altération.

Fouloir
Si une fuite est détectée au niveau du fouloir, il est possible de le serrer en le vissant avec précaution au moyen d'une clé. Veiller à ne pas exercer une force trop importante (au maximum 20 Nm). Nous conseillons de tourner le fouloir par pas et de contrôler la fuite entre chaque pas.

Attention!
TPour éviter d'endommager la vanne SNV, ce qui pourrait engendrer des fuites lors du dévissage du capuchon de protection de la tige SNV, les précautions suivantes doivent être respectées:

- Lors du serrage du capuchon de la vanne, veillez à ne pas dépasser 50 Nm de couple (utilisez une clé standard sans extension pour serrer le capuchon)
- Si le capuchon est bloqué, appliquez un couple inverse sur le corps de vanne, à l'aide d'une autre clé par exemple
- Ne tentez pas d'aligner ni d'ajuster la position de la vanne lorsque le système est sous pression

Contacter Danfoss en cas de doute.

ESPANOL

Instalación

Refrigerantes
Producto compatible con refrigerantes HCFC, HFC no inflamables, R-717 (amoníaco) y R-744 (CO_2).
El uso de estas válvulas sólo se recomienda en circuitos cerrados. Si desea obtener más información, póngase en contacto con Danfoss.

Rango de temperatura
SNV: -60 – 150 °C / -76 – 302 °F

Rango de presión
SNV: Las válvulas están diseñadas para una presión máxima de trabajo de 52 bar g / 754 psi g.

Instalación
La válvula debe instalarse con el eje en posición vertical (orientado hacia arriba) u horizontal (consulte la fig. 1). Estas válvulas deben abrirse manualmente, aplicando prácticas de ingeniería apropiadas y usando sólo llaves fijas de pequeño tamaño. La válvula está diseñada para soportar una elevada presión interna. Sin embargo, el sistema de tuberías debe diseñarse de tal forma que se eviten las acumulaciones de líquido y se reduzca el riesgo asociado a la presión hidráulica generada por la expansión térmica. Debe garantizarse que la válvula en cuestión cuente con protección frente a los fenómenos transitorios asociados a la presión que puedan producirse en el sistema (como el conocido "golpe de ariete").

Sentido de flujo recomendado
El sentido de flujo es el indicado por la flecha (consulte la fig. 2). La fuerza empleada para abrir y cerrar la válvula no debe ser superior a la que pueda ejercerse usando un volante convencional.

El cuerpo de la válvula no debe verse sometida a tensiones (cargas externas) tras su instalación.

Las válvulas SNV no deben montarse en sistemas en los que el lado de salida de la válvula esté abierto a la atmósfera. El lado de salida de la válvula debe permanecer conectado al sistema o condenarse, por ejemplo, soldando una placa.

Identificación
La válvula se puede identificar con precisión mediante los datos estampados en el cuerpo de la misma.

Tratamiento superficial
Las válvulas SNV-ST reciben un tratamiento externo con cromato de zinc; las válvulas SNV-SS se fabrican en acero inoxidable. La superficie externa de la carcasa de la válvula puede, además, protegerse contra la corrosión aplicando un revestimiento protector.

Mantenimiento

El montaje de las válvulas SNV no permite el desmontaje posterior. El eje no se puede desenroscar de ningún modo. Ello protege el sistema frente a la manipulación.

Prensaestopas
En caso de fugas en el prensaestopas, es posible apretarlo con cuidado usando una llave inglesa. Asegúrese de no ejercer demasiada fuerza (20 N·m, máx.); se recomienda apretar el prensaestopas por pasos y comprobar las posibles fugas.

¡Precaución!
Para no dañar la válvula SNV y evitar el riesgo de fuga que ello entrañaría, deben respetarse las siguientes precauciones al desenroscar la caperuza de protección del eje de la misma:

- Apriete la caperurza de la válvula aplicando un par no superior a 50 N·m (la llave estándar empleada para apretar el tapón no debe estar equipada con un extensor).
- Si la caperuza está atascada, compense el par de torsión sujetando la carcasa de la válvula, por ejemplo, con otra llave.
- No intente alinear ni ajustar la posición de la válvula en un sistema presurizado.

En caso de duda, póngase en contacto con Danfoss.

PORTUGUÊS

Instalação

Refrigerantes
Aplicável a todos os refrigerantes comuns, incluindo R717, H_2S e gases/líquidos não corrosivos, dependendo da compatibilidade com o material de vedação.
A válvula é apenas recomendada para utilização em circuitos fechados. Para obter mais informações, entre em contato com a Danfoss.

Faixa de temperatura
SNV: -60 – 150 °C / -76 – 302 °F

Faixa de pressão
SNV: As válvulas são projetadas para uma pressão máx. de funcionamento de 52 bar g / 754 psi g.

Instalação
A válvula deve ser instalada com o eixo em posição vertical ou horizontal ascendente (fig. 1). As válvulas devem ser abertas manualmente de acordo com as práticas corretas de engenharia, usando apenas chaves pequenas. A válvula está concebida para suportar uma elevada pressão interna. No entanto, o sistema da tubulação deve ser concebido para evitar retenções de líquido e reduzir o risco de pressão hidráulica provocada pela expansão térmica. Certifique-se de que a válvula está protegida de transientes de pressão como "golpe de líquido" no sistema.

Direção do fluxo recomendada
Direção do fluxo tal como indicado pela seta (fig. 2). A força usada para abrir e fechar a válvula não deverá exceder a força de um volante comum.

O corpo da válvula deve estar livre de tensão (cargas externas) após a instalação.

As válvulas SNV não podem ser montadas em sistemas onde o lado de saída da válvula está aberto à atmosfera. O lado de saída da válvula deve sempre estar conectado ao sistema ou fechado de forma apropriada, por exemplo soldando uma tampa.

Identificação
A identificação precisa da válvula é feita através da estampagem no corpo da válvula.

Tratamento da superfície
As válvulas SNV-ST são tratadas externamente com cromato de zinco e as SNV-SS são feitas em aço inoxidável. A superfície externa
do corpo da válvula pode ser protegida adicionalmente contra corrosão com um revestimento protetor adequado.

Manutenção

As válvulas SNV são montadas sem a possibilidade de serem desmontadas. O eixo nunca pode ser desparafusado. Deste modo o sistema está protegido contra adulterações.

Sobreposta de vedação
Caso a sobreposta de vedação tenha vazamentos, é possível apertar aparafusando cuidadosamente com uma chave. Certifique-se de não aplicar força excessiva (máx. 20 Nm); recomendamos que gire a sobreposta de vedação ao poucos e que verifique se há vazamentos durante o processo.

Atenção!

Para evitar danificar a válvula SNV com o risco de vazamento ao desaparafusar a tampa de proteção do eixo SNV, as seguintes precauções devem ser seguidas:

- Aperte a tampa da válvula com um máximo de 50 Nm (não devem ser aplicadas a uma chave padrão ao apertar a tampa)
- Caso a tampa esteja presa; use contra torque no corpo da válvula por meio de por ex, uma chave adicional
- Não tente alinhar ou ajustar a posição da válvula em um sistema pressurizado

Em casos de dúvida, entre em contato com a Danfoss.

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MAYEKAWA Europe MYCOM

COUPLING

INSTALLATION AND MAINTENANCE TYPE REXNORD WRAPFLEX

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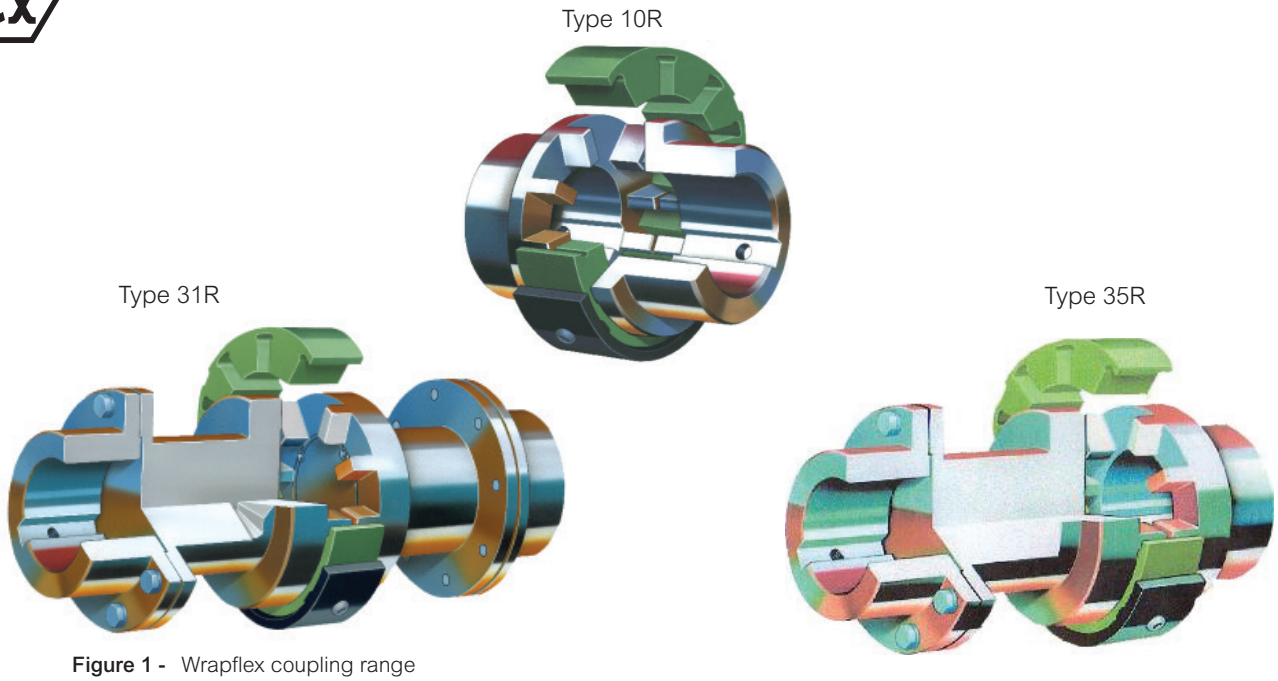

Figure 1 - Wrapflex coupling range

1. General Information

1.1. Falk Wrapflex Couplings are designed to provide a mechanical connection between the rotating shafts of mechanical equipment, using flexible disc elements to accommodate inherent misalignment while transmitting the power and torque between the connected shaft.

1.2. These instructions are intended to help you to install and maintain your Falk Wrapflex coupling. Please read these instructions prior to installing the coupling, and prior to maintenance of the coupling and connected equipment. Keep these instructions near the coupling installation and available for review by maintenance personnel. For special engineered couplings, Rexnord may provide an engineering drawing containing installation instructions that take precedence over this document.

1.3. Rexnord Industries, LLC owns the copyright of this material. These Installation and Maintenance instructions may not be reproduced in whole or in part for competitive purposes

1.4. Symbol descriptions:

STOP Danger of injury to persons.

Damages on the machine possible.

Pointing to important items.

Hints concerning explosion protection

2. Safety and Advice Hints

STOP **DANGER!**

2.1. Safety should be a primary concern in all aspects of coupling installation, operation, and maintenance.

2.2. Do not make contact with the coupling when it is rotating and/or in operation.

2.3. Because of the possible danger to person(s) or property from accidents which may result from improper use or installation of these products, it is extremely important to follow the proper selection, installation, maintenance and operational procedures.

2.4. All personnel involved in the installation, service, operation, maintenance, and repair of this coupling and the connected equipment must read, understand, and comply with these Installation and Maintenance instructions.

PRECAUTION!

For this coupling to meet the ATEX requirements, you must precisely follow these installation and maintenance instructions, and the supplement form 0005-08-49-01. This supplement outlines the ATEX requirements. If the operator does not follow these instructions, the coupling will immediately be considered non-conforming to ATEX.

2.5. All rotating power transmission products are potentially dangerous and can cause serious injury. They must be properly guarded in compliance with OSHA, ANSI, ATEX, European machine safety standards and other local standards. It is the responsibility of the user to provide proper guarding.

2.6. For ATEX requirements the guard must have a minimum of 12.7 mm (1/2 inch) radial clearance to the coupling outside diameter and allow for proper ventilation.

2.7. Make sure to disengage the electrical power and any other sources of potential energy before you perform work on the coupling.

2.8. Proper lockout-tag out procedures must be followed to safeguard against unintentional starting of the equipment.

2.9. All work on the coupling must be performed when the coupling is at rest with no load.

2.10. Do not start or jog the motor, engine, or drive system without securing the coupling components. If the equipment is started with only a hub attached, the hub must be properly mounted and ready for operation, with the key and set screw (if included) fastened. When the full coupling assembly is started, all fasteners and hardware must be completely and properly secured. Do not run the coupling with loose fasteners.

2.11. The coupling may only be used in accordance with the technical data provided in the Falk Wrapflex coupling catalog. Customer modifications and alterations to the coupling are not permissible.

2.12. All spare parts for service or replacement must originate from or be approved by Rexnord Industries, LLC

3. Components and Part Numbers

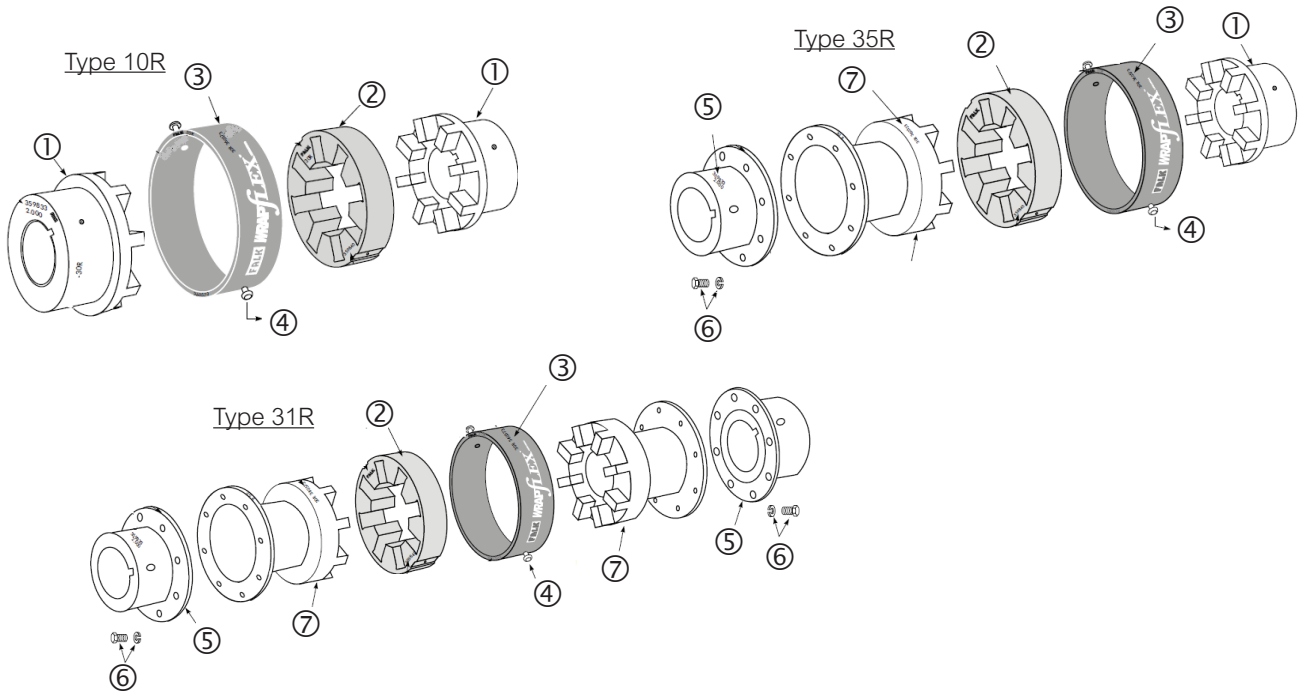

Figure 2 - Falk Wrapflex Coupling Components

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Table 1 - Falk Wrapflex Coupling Component part numbers

Size	Hub			Flex Element with fasteners	Cover			T-hub	Flange fasteners	Spacer hub
	Rough bore	Taper Lock	Rough bore stainlesssteel		Nylon	Steel	Coverfastener			
	1.1	1.2	1.3	2	3.1	3.2	4	5	6	7
2R	3302297	-	-	3701853	3701853	-	2927918	-	-	-
3R	3302298	-	-	3701854	3701854	-	2927918	-	-	-
4R	3302299	-	-	3701855	3701855	-	2927924	-	-	-
5R	0359831	3400346	3301249	0789006	0360571	0359845	2919837	0251670A	Part of T-hub delivery	For Spacer hub part numbers contact Rexnord
10R	0359832	3400347	3301250	0789007	0360572	0359846	2919838	0251671A		
20R	0359833	3400348	3301251	0789008	0360573	0359847	2919842	0251672A		
30R	0359834	3400349	3301252	0789009	0436990	0359848	2919842	0251673A		
40R	0359835	3400350	3301253	0789010	0436991	0359849	2921012	0258639A		
50R	0359836	3400351	3301254	0789011	0436992	0359850	2921014	0258640A		
60R	3301259			3700220		3301262	2921227	0258641A		
70R	3301260			3700221		3301263	2921227	0265854A		
80R	3301261			3700222		3301264	2921227	0266172A		

DANGER!

Be sure to disengage the electrical power and any other sources of potential energy before you perform work on the hub and coupling assembly.

4. Hub mounting

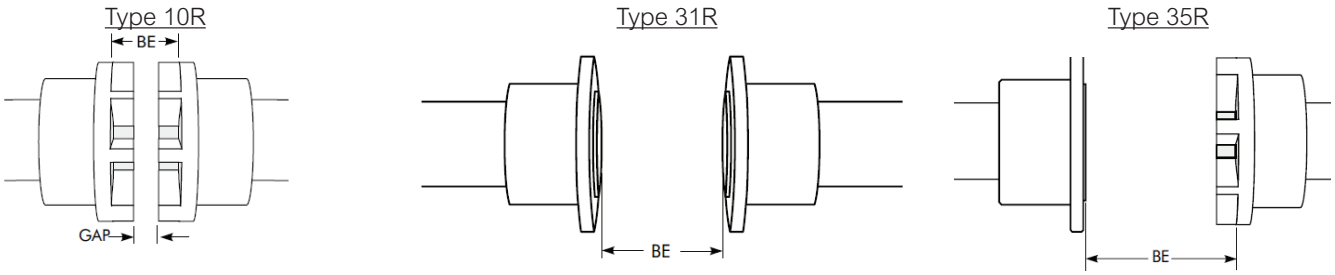

Figure 3 -

4.1. Examine the coupling assembly to insure there is no visible damage.

4.2. Clean the hub bores and shafts using lint free cloth. Remove any nicks or burrs.

4.3. When assembled, the key(s) should have a close side-to-side fit in the keyway in the hub and shaft, with a slight clearance over the top of the key.

4.4. Remove the cap screws that attach the hubs to the adapters, and remove both hubs.

CAUTION: When heating hubs is required, an oven is preferred and an open flame is not recommended. If flame heating is considered mandatory, it is important to provide uniform heating to avoid distortion and excessive temperature. A thermal stick applied to the hub surface will help determine the hub temperature.

DANGER!

Touching hot hubs causes burns. Wear safety gloves to avoid contact with hot surfaces.

5. Straight Bore with Clearance/Slip Fit

5.1. Install the key(s) in the shaft.

5.2. Check to be sure that the set screw(s) in the hub does not protrude into the keyway or the bore. Remove or back out the set screw to provide clearance during assembly.

5.3. Slide the hub up the shaft to the desired axial position.

5.4. Assemble and tighten the set screw(s) using a calibrated torque wrench to the values shown in Table 2

Table 2 - Set Screw Tightening Torque

Screw Size		M6	M8	M10	M12	M16	1/4"	3/8"
Hex Head Key Size		M3	M4	M5	M6	M8	1/8"	3/16"
Standard hubs	Tightening torque (Nm)	6	12	25	50	100	8	25
	Tightening torque (lb-in)	55	110	220	440	880	70	220
Stainless steel hubs	Tightening torque (Nm)	4	7	12	25	50	4	12
	Tightening torque (lb-in)	30	60	110	220	550	35	110

⚠ **CAUTION: Never use two set screws with one on top of the other in the same tapped hole.**

6. Straight Bore with Interference Fit

6.1. Accurately measure the bore and shaft diameters to assure proper fit.

6.2. Install the key(s) in the shaft.

6.3. Heat the hub in an oven until the bore is sufficiently larger than the shaft.

6.4. 350°F (177°C) is usually sufficient for carbon steel hubs. Do not exceed 500°F (260°C).

6.5. With the hub expanded, install it quickly on the shaft to the desired axial position. A pre-set axial stop device can be helpful.

7. Install Spacer hub(s) - types R31 and R35 only

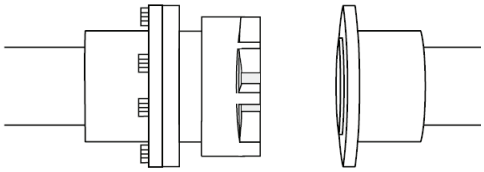

Figure 4 -

7.1. Carefully position spacer hub(s) on register of shaft hub and fasten parts together. Torque flange fasteners to specification in Table 3.

Table 3 - Flange fasteners tightening torque

R31/R35 Flange Fastener	M6	M8	M10	M12	M16
Wrench size	10	13	17	19	24
Tightening torque (Nm)	15	35	68	125	200
Tightening torque (lb-in)	130	310	600	1100	1800

8. Shaft alignment

8.1. Place element cover over the hub

8.2. Move the equipment into place

ATTENTION! Soft Foot – The equipment must rest flat on its base. If one or more feet of the machine are shorter, longer, or angled in some way to prevent uniform contact (a condition commonly known as “soft foot”) it must now be corrected.

ATTENTION! To improve the life of the coupling, the shafts must be aligned to minimize deflection of the flexing elements. Shaft alignment is required in the axial, parallel, and angular directions, with each of these values not to exceed the recommended installation limits shown in Table 4. Shaft alignment can be measured using various established methods, including Laser Alignment, Reverse Dial Indicator, and Rim and Face. Refer to Rexnord bulletin 538-214 “Coupling Alignment Fundamentals” for instructions regarding shaft alignment.

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8.3. Move the connected equipment to achieve acceptable alignment. When properly aligned, the hubs will be centered and approximately parallel.

8.4. Table 4 shows recommended installation limits for Parallel, Angular, and Axial alignment.

8.5. The "Parallel Misalignment" value (P) is the offset between the centers of the hubs, as shown in Figure 5.

8.6. When Parallel Offset is measured by rotating the hubs in unison with dial indicators the total indicated reading (TIR) should be divided by (2) to calculate "P".

8.7. It should be noted that parallel offset measured on the hub surfaces includes misalignment of the equipment shafting plus any variation (TIR) in the hubs. This may be helpful to consider during problem solving for alignment difficulties.

8.8. The "Angular Misalignment" value is the maximum difference between the measurements X and Y taken at opposite ends of the hub flanges, as shown in Figure 5.

8.9. These dimensions are suggested for initial installation. Additional capacity is available to compensate for thermal and structural equipment movement.

ATTENTION! Falk's Type R10, R31, and R35 Wrapflex couplings are not appropriate for limited end-float applications

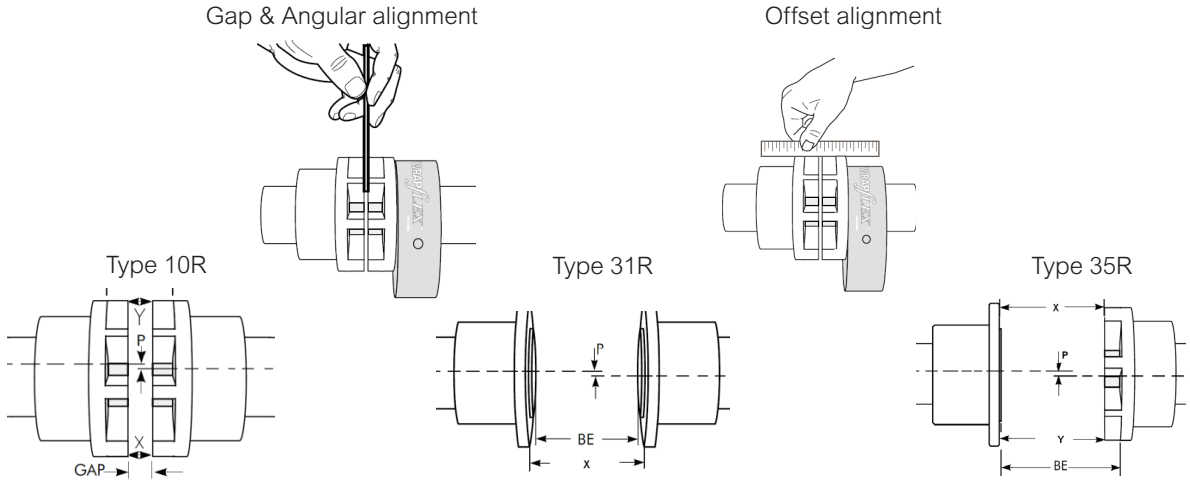

Figure 5 -

Table 4 - Alignment, Installation & Operating Limits

Size	BE *		Installation Limits							Operating Limits							Allowable speed
			Parallel offset - P		Angular (X-Y)			Gap* (±10%)		Parallel offset - P		Max Angular (X-Y)			Gap* (±10%)		
	mm	inch	mm	inch	degree	mm	inch	mm	inch	mm	inch	degree	mm	inch	mm	in	n-min
2R	16.5	0.65	0.25	0.01	0.25	0.17	0.007	1.50	0.062	0.50	0.062	1	0.68	0.027	1.50	0.062	4500
3R	18.5	0.73	0.25	0.01	0.25	0.22	0.009	1.50	0.062	0.50	0.062	1	0.89	0.035	1.50	0.062	4500
4R	19.5	0.77	0.25	0.01	0.25	0.25	0.01	1.50	0.062	0.50	0.062	1	1.01	0.04	1.50	0.062	4500
5R	20.0	0.77	0.5	0.02	0.25	0.28	0.011	2.0	0.062	1.0	0.04	1	1.12	0.044	2.0	0.062	4500
10R	24.0	0.93	1.0	0.04	0.25	0.33	0.013	2.0	0.062	2.0	0.08	1	1.33	0.052	2.0	0.062	4500
20R	32.0	1.24	1.0	0.04	0.25	0.45	0.018	2.0	0.062	2.0	0.08	1	1.78	0.07	2.0	0.062	4500
30R	36.0	1.4	1.0	0.04	0.25	0.51	0.02	2.0	0.062	2.0	0.08	1	2.06	0.081	2.0	0.062	4500
40R	47.0	1.84	1.5	0.06	0.25	0.65	0.026	5.0	0.188	3.0	0.12	1	2.62	0.103	5.0	0.188	3600
50R	61.0	2.39	1.5	0.06	0.25	0.83	0.033	5.0	0.188	3.0	0.12	1	3.32	0.131	5.0	0.188	3000
60R	75.4	2.96	1.5	0.06	0.25	0.99	0.039	5.0	0.188	3.0	0.12	1	3.98	0.157	5.0	0.188	2500
70R	84.4	3.31	1.5	0.06	0.25	1.18	0.046	5.0	0.188	3.0	0.12	1	4.71	0.186	5.0	0.188	2100
80R	96.8	3.82	1.5	0.06	0.25	1.43	0.056	6.0	0.25	3.0	0.12	1	5.73	0.225	6.0	0.25	1800

* "BE" dimension tolerance is ±10% of "Gap" listed. Hubs can be mounted for shorter than standard BE lengths as long as shaft ends do not extend into "Gap" and keys extend key on barrel of hub into tooth space. Stake key(s) in place for an interference fit without setscrew. Overhanging hubs is not recommended.

9. Final Assembly - Element and cover installation

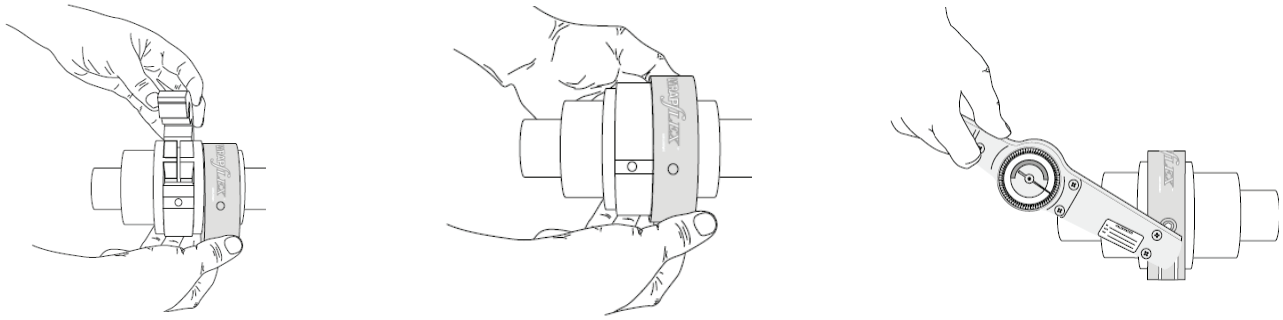

Figure 6 -

9.1. Rotate one hub so that the teeth of both hubs are aligned axially. Spread apart the element so that it will fit over the hub teeth and “wrap” the element between the two hubs. As shown on Figure 6.

9.2. Move the cover alongside the element with the fastener hole of the cover approximately aligned with the locating slot on the element as shown in figure 6. A soft mallet may be needed to install the cover on larger size couplings. If using a nylon cover, the cover’s locating key will engage the slot in the element when cover and element are properly aligned — this will aid in blind assembly.

9.3. Push or tap the cover onto the element until it is centered axially on the element. If using a steel cover, push or tap the cover onto the element and center the cover axially while making sure that the fastener holes on the cover and element are aligned. For the 5R-50R steel covers, use the flats on the O. D. of the steel cover as a visual aid to align the cover’s threaded hole with the slot and clearance hole of the element.

9.4. Install and tighten cover fasteners to the specified torque in Table 5, as shown in figure 6.

DO NOT over tighten

Table 5 - Cover fasteners tightening torque

Coupling size	2	3	4	5	10	20	30	40	50	60	70	80
Screw size	M3	M3	M4	M4	M4	M6	M6	M8	M8	M10	M10	M10
Hex Head Key size	M2	M2	M2.5	M2.5	M2.5	M4	M4	M5	M5	M6	M6	M6
Tightening torque (Nm)	0.2	0.2	0.5	0.5	0.5	2.5	2.5	5	5	15	15	15
Tightening torque (lb-in)	2	2	5	5	5	22	22	45	45	135	135	135

STOP DANGER!

Do not operate the coupling without the cover fasteners installed.

10. Blind Assembly

The term blind assembly refers to the ability to complete the assembly or connection of the coupling components without being able to actually see the coupling. Wrapflex couplings may be blind or axially assembled within motor adapters or bell housings.

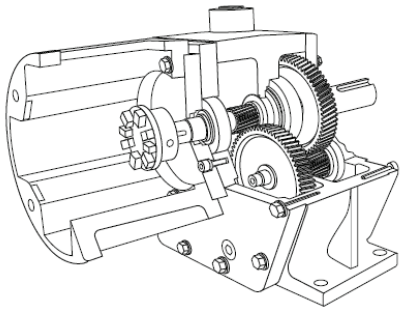

Figure 7 -

10.1. Mount both hubs on their respective shafts with the shaft ends flush with the end of the hub faces, unless instructed otherwise. Double-check the spacing of the assembly to be sure the required coupling hub face gap will be achieved when assembled.

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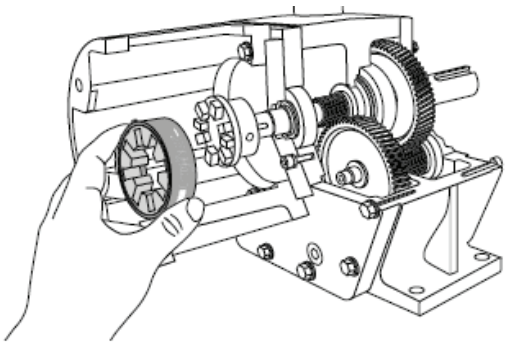

Figure 8 -

10.2. Mount the cover onto the flexible element, making certain to tighten both cover fasteners to the specified torque in Table 5. Make certain the element split is not overlapping, and position the assembled cover/element assembly onto the lower of the two hubs if a vertical assembly, or on the hub within the bell housing or motor adapter for horizontal arrangements.

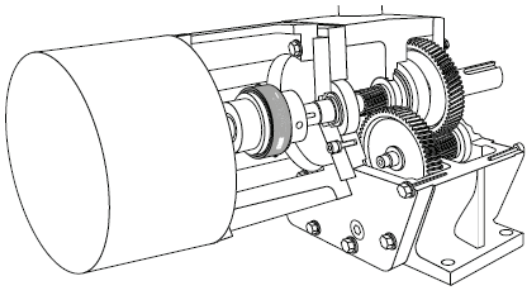

Figure 9 -

10.3. Bring the motor shaft hub axially into engagement with the element until the teeth seat within the element and the motor or bell housing adapter pilot is properly seated. Wrapflex hubs have a slightly tapered lead to facilitate this engagement. Complete the assembly by torquing the motor to the bell housing or motor adapter with the proper fasteners.

11. Preventive Maintenance & Element Replacement

STOP DANGER!

Be sure to disengage the electrical power and any other sources of potential energy before you perform work on the coupling assembly or individual components.

A periodic visual inspection of the element should be performed. Without removing the cover, check for element wear debris or cracks in the side of the element just underneath the cover. If wear debris or cracks are noted, the following maintenance procedure should be performed.

11.1. Remove the cover and element and inspect the element for wear. Replace the element if wear exceeds 10 % of the tooth thickness or cracks have appeared with one of the following characteristics:

- One or more cracks have broken through to the O.D. of the element, such that splitting or separation of the element web is imminent.
- One or more cracks extend the full thickness of a tooth.

11.2. Check the alignment before re-installing or replacing the element. Excessive or rapid element wear is generally an indication of coupling misalignment. If alignment is not within the limits specified in Table 4, re-align the coupling according to the alignment instructions.

MAYEKAWA Europe MYCOM

COUPLING REXNORD THOMAS

TYPE SERIES 52

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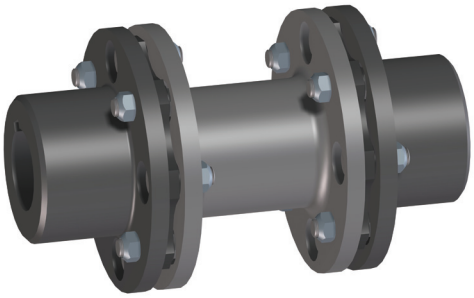

Figure 1 - Thomas Series 52 Tpack Coupling

1. General Information

1.1. Thomas Series 52 Tpack Couplings are designed to provide a mechanical connection between the rotating shafts of mechanical equipment, using flexible disc elements to accommodate inherent misalignment while transmitting the power and torque between the connected shafts.

1.2. These instructions are intended to help you install and maintain your THOMAS Series 52 Tpack coupling. Please read these instructions prior to installing the coupling, and prior to maintenance on the coupling and connected equipment. Keep these instructions near the coupling installation and available for review by maintenance personnel. For special engineered couplings, Rexnord may provide an engineering drawing containing installation instructions that take precedence over this document.

1.3. Rexnord Industries, LLC owns the copyright of this material. These Installation and Maintenance instructions may not be reproduced in whole or in part for competitive purposes.

1.4. Symbol descriptions:

STOP Danger of injury to persons.

Damages on the machine possible.

Pointing to important items.

Hints concerning explosion protection.

2. Safety and Advice Hints

STOP DANGER!

2.1. Safety should be a primary concern in all aspects of coupling installation, operation, and maintenance.

2.2. Proper lockout-tag out procedures must be followed to safeguard against unintentional starting of the equipment.

2.3. Because of the possible danger to person(s) and/or property, from accidents which may result from improper use or installation of these products, it is extremely important to follow the proper selection, installation, maintenance and operational procedures.

PRECAUTION! For this coupling to meet the ATEX requirements, you must precisely follow these installation and maintenance instructions, and the supplement form 0005-08-49-01. This supplement outlines the ATEX requirements. If the operator does not follow these instructions, the coupling will immediately be considered non-conforming to ATEX.

2.4. All personnel involved in the installation, service, operation, maintenance, and repair of this coupling and the connected equipment must read, understand, and comply with these Installation and Maintenance instructions.

2.5. All rotating power transmission products are potentially dangerous and can cause serious injury. They must be properly guarded in compliance with OSHA, ANSI, ATEX, European machine safety standards and other local standards. It is the responsibility of the user to provide proper guarding.

2.6. For ATEX requirements the guard must have a minimum of 12.7 mm (1/2 inch) radial clearance to the coupling outside diameter "A" (see Figure 3 and Table 3) and allow for proper ventilation.

2.7. Make sure to disengage the electrical power and any other sources of potential energy before performing work on the coupling.

2.8. Do not make contact with the coupling when it is rotating and/or in operation.

2.9. All work on the coupling must be performed when the coupling is at rest under no load.

2.10. Do not start or jog the motor, engine, or drive system without securing the coupling components. If the equipment is started with only a hub attached, the hub must be properly mounted and ready for operation, with the key and set screw (if included) fastened. When the full coupling assembly is started, all fasteners and hardware must be completely and properly secured. Do not run the coupling with loose fasteners.

2.11. The coupling may only be used in accordance with the technical data provided in the Thomas catalog for the Series 52 Tpack coupling. Customer modifications and alterations to the coupling are not permissible.

⚠ CAUTION: Air driven wrenches for assembly are not permitted to avoid the potential of excessive speed and heat build up that may lead to thread damage during assembly.

2.12. All spare parts for service or replacement must originate from or be approved by Rexnord Industries, LLC.

3. Components and Part Numbers

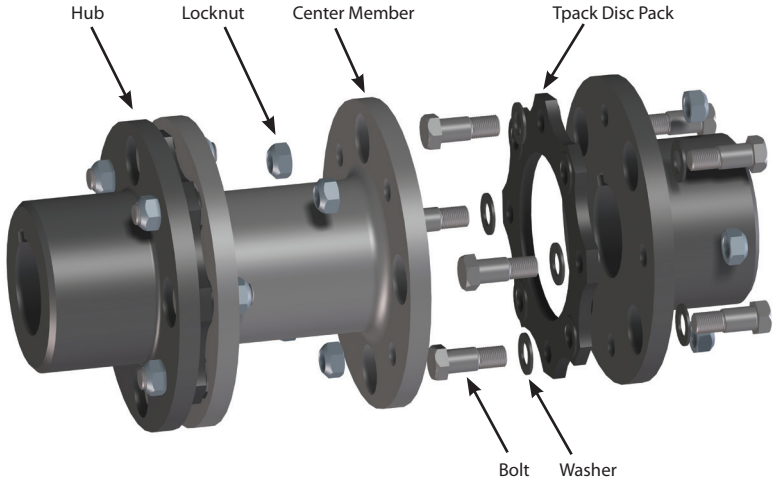

Figure 2 - Thomas Series 52 Tpack Coupling Components

Thomas Series 52 Tpack couplings may be delivered from the factory assembled or non-assembled. If assembled, the locknuts are not fully tightened. Examine the parts to assure there is no visible damage. If the coupling is assembled, remove the locknuts, bolts, and washers that attach the hubs to the disc packs. Remove both hubs. Leave the disc packs attached to the center member. (The disc pack locknuts will be tightened later to the specifications shown in Table 5 prior to operation.)

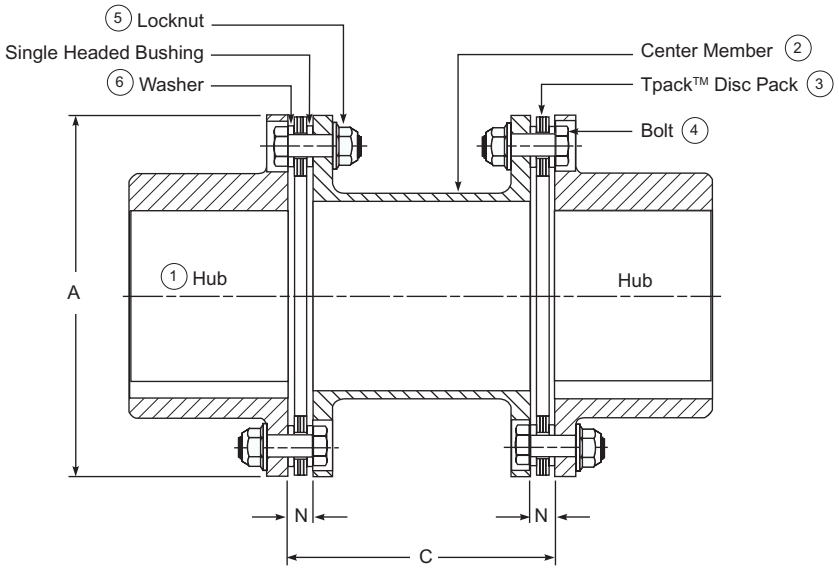

Figure 3 - Thomas Series 52 Tpack Cross Sectional View of Components

Table 1 - Part Numbers and Quantity Required

Size of Series 52 Coupling	Hub Rough Bored (Quantity 2) (1)	Center Member (2) (1 per Coupling)				Tpack™ Disc Pack (3) (2 per Coupling)		Parts Kit – Consists of Bolts, Locknuts and Washers for One Coupling			
		"C" Length		"C" Length		Tomaloy	Stainless	Parts Kit	Bolts (4)	Locknuts (5)	Washers (6)
	Part No.	Part No.	inch	Part No.	mm	Part No.	Part No.	Part No.	Quantity	Quantity	Quantity
225	434408	587513 587514	5.00 7.00	605493 603760 604789	100 140 180	586056	586070	591798	16	16	16
262	634409	587515 587516	5.00 7.00	581001 567658	140 180	586058	586071	591799	16	16*	16
312	834410	587517 587519	5.50 7.00	567659 567660	140 180	586913	586072	591800	16	16*	16
350	034411	587520 587521	6.00 7.00	585149 567662	180 250	586059	586076	591801	16	16	16
375	234412	587522	7.00	567663 582676	180 250	586060	586077	591802	16	16	16
425	434413	587535	7.00	605494 605495	180 250	586062	586078	591803	16	16	16
450	634414	587538 587541	7.00 8.00	605496 605497	180 250	586063	586080	591804	16	16*	16
500	834415	587544	9.00			586065	586081	591805	16	16*	16
550	034416	587548	10.00			586066	586082	591806	16	16*	16
600	234417	587551	10.00			586067	586083	591807	16	16*	16
700	434418	587554	11.00			586068	586084	591808	16	16*	16
750	663126	587557	11.00			586069	586085	591809	16	16*	16

* These locknuts are cadmium plated.

4. Hub Mounting

STOP DANGER!

Be sure to disengage the electrical power and any other sources of potential energy before you perform work on the hub and coupling assembly.

⚠ CAUTION: When disc type couplings are installed on "sleeve bearing" motor drives, some precautions are necessary. It is important that the coupling be installed as close to its free state (neutral) axial position as possible and that the motor shaft is on its "magnetic center" (normally defined by a scribed line on the shaft). Disc type couplings, with their flexing element(s) comprised of multiple laminated discs or sheets, will act as a spring in the axial direction (exhibiting non-linear restoring forces) and serve to hold the motor rotor on magnetic center during operation and away from the motor's internal thrust stops. The coupling span ordered for the equipment must consider the motor rotor as being positioned on its magnetic center.

4.1. Examine the coupling assembly to insure there is no visible damage.

4.2. Clean the hub bores and shafts using lint free cloth. Remove any nicks or burrs.

4.3. When assembled, the key(s) should have a close side-to-side fit in the keyway in both the hub and shaft, with a slight clearance over the top of the key.

⚠ CAUTION: When heating hubs is required, use of an oven is preferred and an open flame is not recommended. If flame heating is considered mandatory, it is important to provide uniform heating to avoid distortion and excessive temperature. A thermal stick (crayon marker) applied to the hub surface will help determine the hub temperature.

STOP DANGER!

Touching hot hubs causes burns. Wear safety gloves to avoid contact with hot surfaces.

5. Straight Bore with Clearance/Slip Fit –

5.1. Install the key(s) in the shaft.

5.2. Check to be sure that the set screw(s) in the hub does not protrude into the keyway and/or the bore. If needed, loosen the set screw to provide clearance during assembly.

5.3. Slide the hub up the shaft to the desired axial position.

5.4. Assemble and tighten the set screw(s), using a calibrated torque wrench, to the values shown in Table 2.

Table 2 - Set Screw Tightening Torque

Set Screw Thread Size				Internal Hex Size		Set Screw Thread Size				Internal Hex Size
inch	lb-in	lb-ft	Nm	inch		inch	lb-in	lb-ft	Nm	inch
1/4-20	66	6	7	1/8		3/8-16	240	20	27	3/16
1/4-28	76	6	9	1/8		3/8-24	276	23	31	3/16
5/16-18	132	11	15	5/32		1/2-13	600	50	68	1/4
5/16-24	144	12	16	5/32		1/2-20	660	55	75	1/4

ATTENTION! Never use two set screws with one on top of the other in the same tapped hole.

6. Straight Bore with Interference Fit –

6.1. Accurately measure the bore and shaft diameters to assure proper fit.

6.2. Install the key(s) in the shaft.

6.3. Heat the hub in an oven until the bore is sufficiently larger than the shaft.

6.4. 350°F (177°C) is usually sufficient for carbon steel hubs. Do not exceed 500°F (260°C).

6.5. Higher temperatures may be required for higher interference fit levels where alloy steel hubs may be encountered. A general rule to consider is that for every 160°F increase in temperature, steel will expand 0.001 inch for every inch of shaft diameter (or .029 mm/100°C). When calculating temperatures, also consider additional expansion to provide clearance and allow for a loss of heat and subsequent shrinkage during the handling process.

6.6. With the hub expanded, install it quickly on the shaft to the desired axial position. A pre-set axial stop device can be helpful.

7. Taper Bore –

7.1. Check for acceptable contact pattern between the hub and the shaft.

7.2. Put the hub on the shaft, keeping the keyways (if existing) aligned.

7.3. Lightly tap the face of the hub with a soft mallet. The resultant position will provide a starting point for the hub axial draw up.

7.4. Use a depth micrometer to measure the distance from the shaft end to the hub face, as shown in Figure 4. Record the dimension.

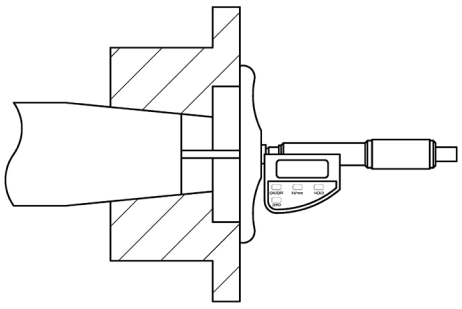

Figure 4 - Shaft end to hub face measurement example.

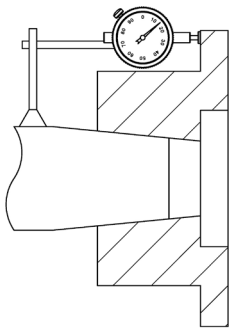

Figure 5 - Dial indicator placement for axial draw measurement example.

7.5. Mount a dial indicator to read axial hub advancement, as shown in Figure 5. Alternatively, the indicator can be positioned to contact the end of the hub. Set the indicator to "zero".

7.6. Remove the hub and install the key(s) in the shaft.

7.7. Heat the hub in an oven until the bore is sufficiently larger than the shaft.

7.8. 350°F (177°C) is usually sufficient for carbon steel hubs. Do not exceed 500°F (260°C).

7.9. Higher temperatures may be required for higher interference fit levels where alloy steel hubs may be encountered. A general rule to consider is that for every 160°F increase in temperature, steel will expand 0.001 inch for every inch of shaft diameter (or .029 mm/100°C). When calculating temperatures, also consider additional expansion to provide clearance and allow for a loss of heat and subsequent shrinkage during the handling process.

7.10. With the hub expanded, install it quickly on the shaft to the "zero" set point. Continue to advance the hub up the taper to the desired axial position, as defined by Rexnord's customer. Use the indicator as a guide only. A pre-set axial stop device can be helpful.

7.11. Inspect the assembly to verify that the hub is properly positioned. Consult Rexnord if necessary.

7.12. install any hub axial retention device (if any) in accordance with the equipment manufacturer's specifications.

8. Shaft Alignment –

8.1. Move the equipment into place.

ATTENTION! Soft Foot – The equipment must rest flat on its base. If one or more feet of the machine are shorter, longer, or angled in some way to prevent uniform contact (a condition commonly known as "soft foot") it must now be corrected.

ATTENTION! To improve the life of the coupling, the shafts must be aligned to minimize deflection of the flexing elements. Shaft alignment is required in the axial, parallel, and angular directions, with each of these values not to exceed the recommended installation limits shown in Table 3. Shaft alignment can be measured using various established methods, including Laser Alignment, Reverse Dial Indicator, and Rim and Face. Refer to Rexnord bulletin 538-214 "Coupling Alignment Fundamentals" for instructions regarding shaft alignment.

8.2. Move the connected equipment to achieve acceptable alignment. When properly aligned, the disc packs will be centered and approximately parallel to their mating flange faces and the flexing elements will have little visible waviness when viewed from the side.

8.3. Table 3 shows recommended installation limits for Parallel, Angular, and Axial alignment.

8.4. The "Parallel Misalignment" value (P) is the offset between the centers of the hubs, as shown in Figure 6.

8.5. When Parallel Offset is measured by rotating the hubs in unison with dial indicators as shown in Figure 7, the total indicated reading (TIR) should be divided by (2) to calculate "P".

8.6. It should be noted that parallel offset measured on the hub surfaces includes misalignment of the equipment shafting plus any variation (TIR) in the hubs. This may be helpful to consider during problem solving for alignment difficulties.

8.7. The "Angular Misalignment" value is the maximum difference between the measurements X and Y taken at opposite ends of the hub flanges, as shown in Figure 8.

8.8. These dimensions are suggested for initial installation. Additional capacity is available to compensate for thermal and structural equipment movement.

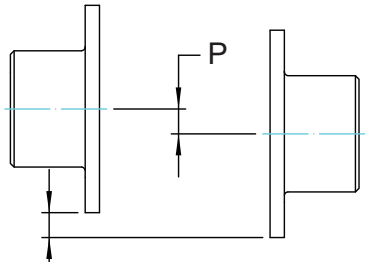

Figure 6 - Parallel Offset Misalignment.

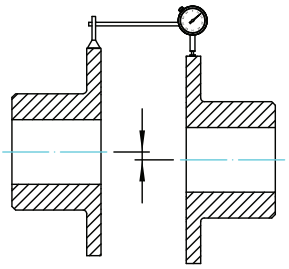
Figure 7 - Parallel Offset (TIR) Measurement.

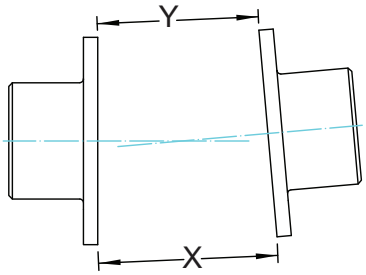

Figure 8 - Angular Misalignment.

Table 3 - Installation Alignment Values

Series 52 Coupling	"A" Dimension		"C" Dimension		Recommended Installation Limits ****							
					Maximum Coupling Parallel Misalignment Maximum Measurement Between Hubs Defined in one of two ways				Angular Misalignment Between Hubs Maximum (X-Y) ***		Axial Hub Gap Tolerance from "C" Dimension +/-	
					Parallel Alignment Total Indictor Reading (TIR)*		Parallel Offset "P" **					
Size	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
225	5.69	144.5	3.94	100.0	0.0039	0.10	0.0020	0.05	0.006	0.15	0.018	0.46
			5.00	127.0	0.0050	0.13	0.0025	0.06				
			5.51	140.0	0.0055	0.14	0.0028	0.07				
			7.00	177.8	0.0070	0.18	0.0035	0.09				
			7.09	180.0	0.0071	0.18	0.0035	0.09				
262	6.63	168.4	5.00	127.0	0.0050	0.13	0.0025	0.06	0.007	0.18	0.022	0.55
			5.51	140.0	0.0055	0.14	0.0028	0.07				
			7.00	177.8	0.0070	0.18	0.0035	0.09				
			7.09	180.0	0.0071	0.18	0.0035	0.09				
312	7.81	198.4	5.50	139.7	0.0055	0.14	0.0028	0.07	0.008	0.20	0.026	0.66
			5.51	140.0	0.0055	0.14	0.0028	0.07				
			7.00	177.8	0.0070	0.18	0.0035	0.09				
			7.09	180.0	0.0071	0.18	0.0035	0.09				
350	8.69	220.7	6.00	152.4	0.0060	0.15	0.0030	0.08	0.009	0.23	0.028	0.71
			7.00	177.8	0.0070	0.18	0.0035	0.09				
			7.09	180.0	0.0071	0.18	0.0035	0.09				
			9.84	250.0	0.0098	0.25	0.0049	0.13				
375	9.69	246.1	7.00	177.8	0.0070	0.18	0.0035	0.09	0.010	0.25	0.031	0.79
			7.09	180.0	0.0071	0.18	0.0035	0.09				
			9.84	250.0	0.0098	0.25	0.0049	0.13				
425	10.50	266.7	7.00	177.8	0.0070	0.18	0.0035	0.09	0.011	0.28	0.034	0.85
			7.09	180.0	0.0071	0.18	0.0035	0.09				
			9.84	250.0	0.0098	0.25	0.0049	0.13				
450	11.31	287.3	7.00	177.8	0.0070	0.18	0.0035	0.09	0.012	0.30	0.036	0.91
			7.09	180.0	0.0071	0.18	0.0035	0.09				
			8.00	203.2	0.0080	0.20	0.0040	0.10				
			9.84	250.0	0.0098	0.25	0.0049	0.13				
500	12.88	327.2	9.00	228.6	0.0090	0.23	0.0045	0.11	0.012	0.33	0.041	1.04
550	14.44	366.8	10.00	254.0	0.0100	0.25	0.0050	0.13	0.014	0.38	0.046	1.17
600	16.00	406.4	10.00	254.0	0.0100	0.25	0.0050	0.13	0.016	0.41	0.051	1.30
700	18.25	463.6	11.00	279.4	0.0110	0.28	0.0055	0.14	0.018	0.48	0.058	1.46
750	19.81	503.2	11.00	279.4	0.0110	0.28	0.0055	0.14	0.020	0.51	0.063	1.59

* Parallel misalignment measured by rotating the hubs with a dial indicator on the outside hub diameter will result in a maximum Total-Indicated-Reading of 0.001 inch per inch of "C" dimension (or 0.001 mm per mm of "C" dimension). For non-standard "C" dimensions, multiply "C" x 0.001 to calculate the TIR.

** Parallel offest "P" is equivalent to one-half of the TIR measurement using dial indicators.

*** Subtract Measurement Y from Measurement X to obtain Angular Misalignment dimension.

**** During installation and/or operation, do not exceed the maximum misalignment capacity of 1/3°per disc pack.

Refer to Rexnord Bulletin 538-214 "Coupling Alignment Fundamentals" for more details regarding alignment methods and procedures.

9. Final Assembly –

9.1. Verify that the hubs have been mounted to provide the correct "C" dimension shown in Figure 9 and defined in Table 1. The "C" dimension is the distance measured between the faces of the two mounted hub flanges.

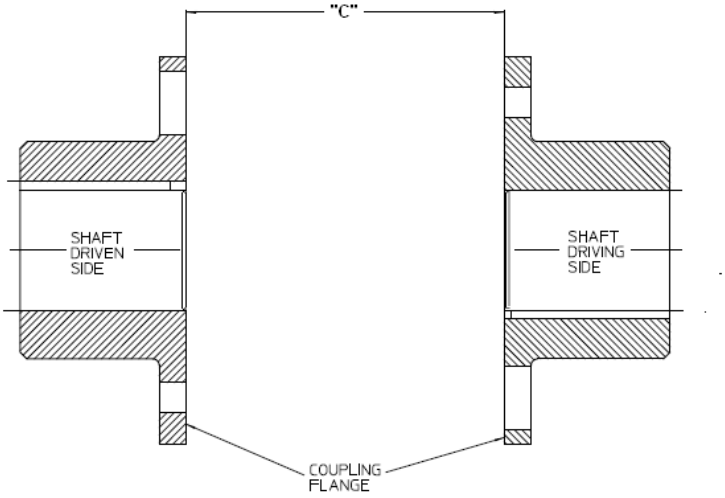

Figure 9 - Mounting hubs on shafts

9.2. If the coupling arrived assembled, the disc packs are still attached to the center member. Remove the locknuts, bolts, and washers that attach the disc packs to the center member.

9.3. For reference during assembly, measure and record the compressed thickness of the compressed disc pack "S" (as shown in Figure 10) by using a micrometer or caliper positioned midway between the OD and ID and between two adjacent holes.

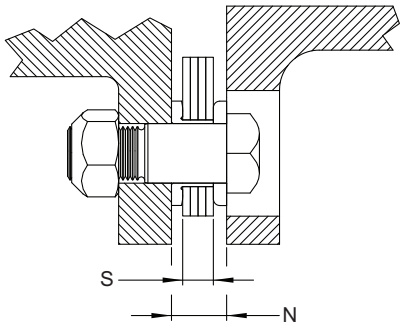

Figure 10 - Alignment confirmation values.

9.4. With the hubs mounted, put the center member into place between the two hubs.

⚠ CAUTION: Care should be taken when handling the center member as the tubular section can be damaged. Support the center member at both ends on wood blocks, with nylon straps from a hoist, or some convenient way. It may be helpful to support the end that is not being worked on with bolts through the center member flange bolt holes.

STOP DANGER!

When handling the coupling, components may sometimes slip and fall.
To prevent loss of fingers or injury do not insert fingers into any fastener holes.

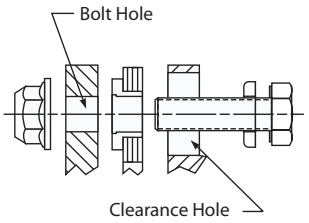

Figure 11 - Bolt, Washer and Tpack Disc pack assembly

9.5. Place a loose washer on a bolt, with the flat side of the washer facing the bolt hex head. This will properly position the side of the washer with the radius facing the disc pack, as shown in Figure 11.

⚠ CAUTION: It is important that the radius side of the washer must always be against the disc pack.

9.6. Hold the disc pack in one hand and slip it down between the two flanges so that the bushing heads in the disc pack line up with the bolt holes in the flanges as shown in Figure 1 and Figure 11.

9.7. Install the disc pack by rotating the hub or center member so that the hub bolt holes line up with the center member flange clearance holes. Align any match marks, if existing.

9.8. Insert a bolt and washer through the clearance hole in one flange, through the disc pack bushing, and through the bolt hole of the opposite flange. Make sure all parts are positioned on the body ground diameter of the bolt.

9.9. Lubricate the bolt threads with clean motor oil, and install a locknut onto the bolt, but do not tighten it at this time.

☞ ATTENTION! All bolt threads must be lubricated prior to assembly. A clean motor oil is recommended. Do not use lubricants containing molybdenum disulfide or greases, unless otherwise noted (see Table 5, Footnote 3 regarding stainless fasteners).

9.10. Pivot the disc pack around until the bushing heads are aligned with the rest of the bolt holes.

9.11. Place a loose washer on each remaining bolt and install the bolts through the clearance holes, through the disc pack bushings, and through the flange bolt holes.

9.12. The last bolt may offer slight resistance and require light tapping on the head of the bolt to insert it through the disc pack and flange bolt hole.

9.13. Slightly tighten all locknuts using an alternating progressive pattern making sure the disc pack is not distorted and all the bolts are fully seated.

9.14. Proceed to the other end of the coupling. Remove the support bolts, if used, and continue to support the center member. Repeat these installation steps to install the second disc pack.

9.15. The disc packs, when installed, should be centered and parallel with the mating flanges. The disc surface should never be in direct contact with the flange or the bolt head.

9.16. As an assembly and alignment check, measure the distance "N" between the flanges of the hub and the center spool at each end, as shown in Figure 3 and Figure 10. Dimension "N" should be measured at four (4) positions equally spaced around the circumference of the disc pack gap (at top, bottom, and side positions) at each end.

- Calculate the "$N_{average}$" value at each end by adding the measurements and dividing by 4.
- $N_{average} = (N1 + N2 + N3 + N4)/4$
- $N_{average}$ should be between the minimum and maximum values shown in Table 4.
- If the $N_{average}$ value is outside of these specifications, use a more precise measurement method to verify an acceptable gap, by first measuring the thickness of the disc pack "S" as shown in Figure 10. The discs should be tightly compressed during the measurement. Calculate "G" by subtracting "S" from $N_{average}$.
  - $G = N_{average} - S$
  - G should be between the minimum and maximum values shown in Table 4 for allowable G values.
- Calculate the Angular Misalignment at each end by subtracting the smallest (minimum) N value from the largest (maximum) N value. The Angular Misalignment should be less than the maximum value shown in Table 4.
  - Angular Misalignment = $(N_{maximum} - N_{minimum})$

Table 4 - Alignment Check Values

Series 52 Coupling Size	"A" Dimension		Dimension "N" Allowable Range for "N average" *				Maximum Allowable Coupling Angular Misalignment at Each End (N maximum) - (N minimum) **		Precision Alignment Check Allowable Range for G = (N average) - S***			
			Min.	Max.	Min.	Max.	Maximum Capacity		Min.	Max	Min.	Max.
	inch	mm	inch	inch	mm	mm	inch	mm	inch	inch	mm	mm
225	5.69	144.5	0.354	0.372	8.99	9.45	0.033	0.84	0.175	0.193	4.45	4.90
262	6.63	168.4	0.463	0.484	11.76	12.29	0.039	0.98	0.239	0.261	6.07	6.63
312	7.81	198.4	0.491	0.516	12.47	13.11	0.045	1.15	0.237	0.263	6.02	6.68
350	8.69	220.7	0.522	0.550	13.26	13.97	0.051	1.28	0.236	0.264	5.99	6.71
375	9.69	246.1	0.575	0.606	14.61	15.39	0.056	1.43	0.235	0.266	5.97	6.76
425	10.50	266.7	0.606	0.639	15.39	16.23	0.061	1.55	0.233	0.267	5.92	6.78
450	11.31	287.3	0.696	0.732	17.68	18.59	0.066	1.67	0.294	0.330	7.47	8.38
500	12.88	327.2	0.757	0.798	19.23	20.27	0.075	1.90	0.292	0.333	7.42	8.46
550	14.44	366.8	0.890	0.936	22.61	23.77	0.084	2.13	0.353	0.399	8.97	10.13
600	16.00	406.4	0.941	0.992	23.90	25.20	0.093	2.36	0.351	0.402	8.92	10.21
700	18.25	463.6	1.171	1.228	29.74	31.19	0.106	2.70	0.471	0.529	11.96	13.44
750	19.81	503.2	1.222	1.284	31.04	32.61	0.115	2.93	0.469	0.531	11.91	13.49

* "N average" is the average of four dimensions measuring the gap at four positions equally spaced around the circumference of the disc pack (at top, bottom, and side positions, or otherwise stated as 0°, 90°, 180°, and 270°).

** At each end, subtract the minimum N measurement from the maximum N measurement. The calculated value allows a maximum of 1/3° angular misalignment at each end.

*** G = (N average) - S, where S = measured thickness of stack of disc pack laminates (when tightly compressed).

Refer to Rexnord Bulletin 538-214 "Coupling Alignment Fundamentals" for more details and procedures regarding alignment methods and procedures.

9.17. If the "N average," and "G" values are outside of these specifications, or the angular misalignment exceeds the maximum capacity, it is suggested that the alignment is rechecked and improved. Dimensional measurements should also be made to verify the set up is accurate.

9.18. Now fully tighten each locknut using an incremental torque in a progressive alternating pattern to the appropriate torque value shown in Table 5.

9.19. When possible, it is recommended that all locknuts have their tightening torque checked after several hours of operation, per Table 5.

Table 5 - Locknut Tightening Torques

Series 52 Coupling Size	"A" Dimension		Tightening Torque for Steel Locknut (For Stainless Steel see Note 3)				Bolt Head
			Thread Size	Torque		Wrench Hex Size	Wrench Hex Size
	inch	mm	inch	lb-ft*	Nm	inch	inch
225	5.69	144.5	5/16-24 UNF	25	34	1/2	1/2
262	6.63	168.4	3/8-24 UNF	30*	41*	9/16	5/8
312	7.81	198.4	7/16-20 UNF	40*	54*	11/16	11/16
350	8.69	220.7	1/2-20 UNF	95	129	3/4	13/16
375	9.69	246.1	9/16-18 UNF	130	176	7/8	15/16
425	10.50	266.7	5/8-18UNF	175	237	15/16	1-1/16
450	11.31	287.3	11/16-16 UNF	150*	203*	1-1/8	1-1/8
500	12.88	327.2	3/4-16 UNF	190*	258*	1-1/4	1-1/4
550	14.44	366.8	7/8-14 UNF	255*	346*	1-7/16	1-7/16
600	16.00	406.4	1-14 UNS	335*	454*	1-5/8	1-5/8
700	18.25	463.6	1-1/8-12 UNF	425*	576*	1-13/16	1-13/16
750	19.81	503.2	1-1/4-12 UNF	560*	759*	2	2

* These locknuts are cadmium plated (for steel). Do not use any lubricant other than clean motor oil.

1. These torque values are for steel bolts with threads lubricated with clean motor oil. The locknuts are prevailing torque type and some resistance will be felt. If thread galling is suspected, immediately stop and contact Rexnord.
2. Bolts should be held stationary while the locknuts are tightened to the values shown. Do not tighten the fastener by rotating the bolt.
3. The use of Stainless Steel bolts and locknuts requires the tightening torque to be reduced to 60% of the values shown. Stainless steel bolt and locknut threads must also be liberally coated with molybdenum disulfide grade (do not use motor oil).
4. Air driven wrenches for fastener assembly are not permitted (heat build up may lead to thread damage during assembly).

10. Disc Pack Replacement –

⚠ CAUTION: Series 52 sizes 225 through 750 use the Tpack™ unitized disc pack. The Tpack disc pack will replace the original Thomas round disc pack (without Tpack bushings) without modification to the coupling. Be sure to use the washers that are supplied with the Tpack replacement kit. It is not permitted to use Tpacks with washers supplied with the original Thomas round disc pack. If it becomes necessary to replace the disc packs, it can be done as follows.

10.1. Support the coupling at one end, and remove all locknuts from this end.

10.2. Back out and remove the bolts and loose washers. It may be necessary to tap the ends of the bolts with a soft hammer to remove them.

10.3. Slide the disc pack out while supporting the center member at this end.

10.4. Support the other end of the coupling, and disassemble the locknuts and fasteners to remove the disc pack.

STOP DANGER!

When handling the coupling, components may sometimes slip and fall,
to prevent loss of fingers or injury do not insert fingers into any fastener holes.

10.5. Replace parts as necessary. If an original Thomas round disc pack (with no Tpack bushings) is being replaced, discard the washers (they cannot be used with the Tpack).

☞ ATTENTION! Match marks (if applied) must be in-line to maintain balance integrity.

10.6. Recheck alignment and reassemble the coupling per the instructions in Section 9.0, Final Assembly.

10.7. When possible, it is recommended that all locknuts have their tightening torque checked after several hours of operation, per Table 5.

10.8. For spare replacement part numbers, see Table 1.

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SVA 455/456

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Sicherheitsventile / Safety Relief Valves

Übersicht der Bauarten, Technische Kennwerte
Overview of Types, Technical Characteristics

1. Übersicht der Bauarten (DN 15 – DN 40)

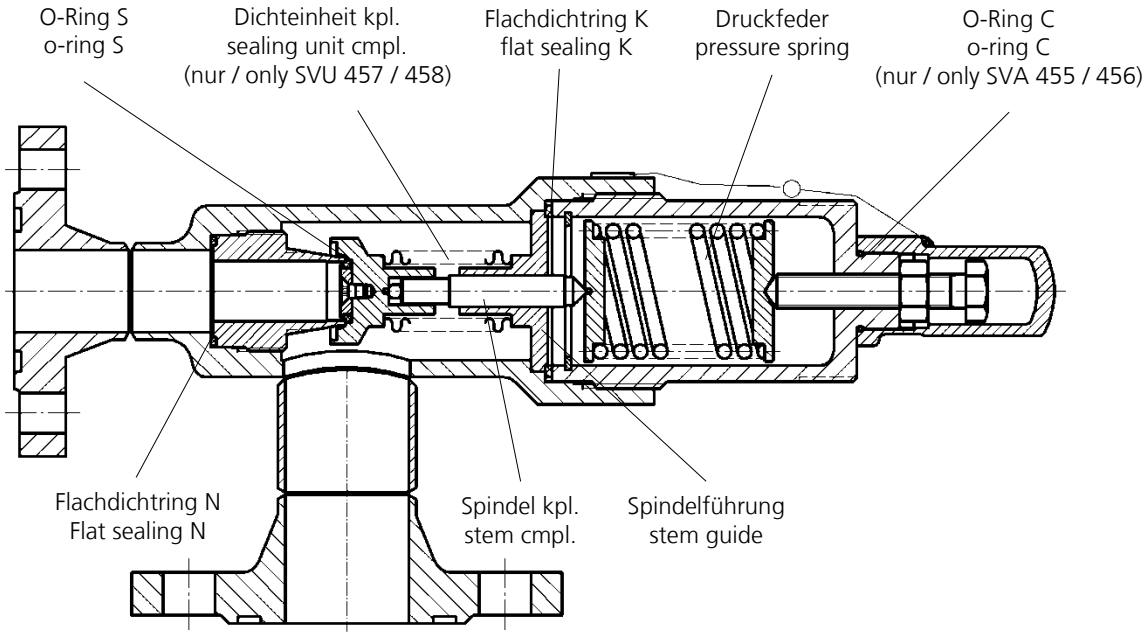
SVU 457 / 458 gegendruckunabhängig, federbelastet

SVA 455 / 456 gegendruckabhängig, federbelastet

1. Overview of Types (DN 15 – DN 40)

SVU 457 / 458 independent on back-pressure, spring-loaded

SVA 455 / 456 dependent on back-pressure, spring-loaded



2. Technische Kennwerte

Gehäusewerkstoff – Auswahl nach DIN EN12284, AD-2000 Reihe W
Stahl (St): P235GH, S235JR, S355J2
Tieftemperaturstahl (TT): P215NL, P255QL, P355NL1
Edelstahl (NIRO): X5CrNi18-10
oder gleichwertige

2. Technical Characteristics

Selection of body material as per German DIN EN12284, AD-2000 series W
Steel (St): P235GH, S235JR, S355J2
Low temperature steel (TT): P215NL, P255QL, P355NL1
Stainless steel (NIRO): X5CrNi18-10
or any equivalent

			SVU 458..., SVA 456...				SVU 457..., SVA 455...			
PN	DN	TB (MWT) [°C]	-60	-10	+50	+180	-50	-10	+50	+110
25	15-40	PS (MWP) [bar]	18,7	25	25	25	18,7	25	25	25
40	15-40		30	40	40	40	30	40	40	40
63	15-25		47,3	63	63	63	47,3	63	63	63

Zulässiger Umgebungstemperaturbereich (°C):
-35 bis +55

Permissible ambient temperature range (°C):
-35 to +55

Betriebsmedien

Kältemittel EN 378 Teil 1, z.B.NH3, R22, R134a, R290 (Propan), R507, Gemische mit Kältemaschinenöl, neutrale, gasförmige und flüssige Medien Kühlsole auf Glycol-Basis

Working Media

Refrigerant EN 378 part 1, e.g. NH3, R22, R134a, R290 (propane), R507, mixtures with refrigerator oil, neutral, gaseous and liquid media, cold brine basing on glycol

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Sicherheitsventile / Safety Relief Valves

Technische Kennwerte, Sicherheitshinweise
Technical Characteristics, Safety Advices

Kennwerte		Characteristics				
zuerkannte Ausflussziffer certified coefficient of discharge	**DN1/DN2**	**15/25**	**20/32**	**25/40**	**32/50**	**40/65**
für Dampf/Gas for steam/gas	K_{dr} (αw) [-]	0,72	0,64	0,70	0,60	0,69
für Flüssigkeit for liquid		-	-	-	-	-
engster Strömungsquerschnitt smallest cross section of flow	[mm²]	117	206	320	460	716
Einstelldruck set pressure	pe [bar]	5-63	5-63	5-63	5-40	5-40

Druckbereich der Federn siehe Ersatzteilliste.
Einbaulage: senkrecht nach AD2000-Merkblatt A2, waagerecht
Leckage nach außen: <15g Kältemittel im Jahr
Leckage am Sitz: <5g Kältemittel im Jahr

For the pressure range of springs see spare parts list.
Installation position: vertical as per AD2000 leaflet A2, and horizontal
Leakage outward: <15g refrigerant per year
Leakage on the seat: <5g refrigerant per year

3. Sicherheitshinweise

Ventile mit Transport- oder Lagerschäden dürfen nicht eingebaut werden.
Die Ventile müssen frei von Achskräften, Biege- und Torsionsmomenten sein und dürfen nicht als Fixpunkte von Rohrleitungen dienen.
Bei Autogenschweißung oder Hartlötung darf die Flamme das Ventil nicht berühren.
Verunreinigungen jeglicher Art müssen vom Innenraum der Ventile ferngehalten werden.
Schließen oder Öffnen der Ventile mit einer Handradgabel oder sonstiger hebelarmverlängernder Gegenstände ist unzulässig, da dies zur Beschädigung der Sitzdichtung führen kann. Demontage bzw. Ausbau der Ventile nur bei druckloser, abgesaugter und ausreichend belüfteter Rohrleitung.

Bedingungen für die sichere Verwendung / Verwendungshinweise

Die Sicherheitseinrichtungen müssen dauerhaft leitend mit der Gesamtanlage verbunden sein; die Gesamtanlage kann für sich geerdet werden oder in den Potentialausgleich des Gebäudes eingebunden werden. Der Potentialausgleich ist vom Betreiber in regelmäßigen Abständen zu überprüfen.
Abgänge zu Sicherheitseinrichtungen sollten nicht anderen Abzweigungen gegenüber liegen.
Sicherheitsventile sind gegen schädigende äußere Einflüsse (z. B. Witterungseinflüsse), die funktionshemmend sein können, zu schützen.
Sicherheitsventile aus unlegierten Gehäuseteilen sind dauerhaft gegen Korrosionsbildung zu schützen.
Übertragungen von Vibrationen auf das Sicherheitsventil sind zu vermeiden.
Abblaseleitungen müssen, unter Berücksichtigung der örtlichen Betriebsverhältnisse, so bemessen und

3. Safety Advices

Valves that have been damaged during transport or storage may not be installed.
No axial forces, bending or torsional moments should act upon the valves. They may not be used as fixing points for pipes.
In the case of autogenic welding or brazing, the flame may not reach the valve.
Any kind of soiling has to be kept away from the inside of the valve.
It is not allowed to open or close the valves by using a hand wheel wrench or any other devices for extending the lever arm, as this may damage the seat sealing.
The valves may not be disassembled or detached before the pipe has been depressurized, sucked off and adequately ventilated.

Requirements for Safe Usage / Advices for Application

The safety devices must be connected conductive to the entire plant; the entire plant can be grounded on its own or included into the potential equalization of the building. The operator has to check the potential equalization in regular intervals.
Outlets to safety devices should not front other branch points.
Safety valves must be protected against damaging influences from outside (e. g. climatic influences) which might impair their functionality.
Safety valves made of unalloyed body parts must be permanently protected against corrosion.
Transferring vibrations to the safety valve has to be avoided.
Discharge pipes must be dimensioned and installed in a way to securely absorb the static dynamic reaction forces as well as the thermic stresses. The local

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Sicherheitsventile / Safety Relief Valves

Sicherheitshinweise, Anwendung, Funktionsbeschreibung
Safety Advices, Application, Functional Description

verlegt sein, dass die statischen dynamischen Reaktionskräfte sowie die thermischen Beanspruchungen sicher aufgenommen werden können. An Sicherheitseinrichtungen, bei denen durch das Austreten eines zündfähigen Mediums direkt oder indirekt Gefahren für die Personen oder die in der Umgebung befindlichen Zündquellen entstehen, müssen geeignete Schutzmaßnahmen getroffen werden (z.B. Abblasen in eine sichere Umgebung).
Die empfohlenen Explosionsbegrenzungsmaßnahmen bzw. die Empfehlungen für das Tragen der persönlichen Schutzausrüstung im Sinne der Produkt-Sicherheitsdatenblätter sind zwingend beim Lösen von Verschraubungen oder Entspannen der Druckfeder zu beachten und einzuhalten.
Instandsetzungsmaßnahmen an den Sicherheitseinrichtungen dürfen ausschließlich nur durch den Gerätehersteller durchgeführt werden.
Ein Wechsel der Sicherheitseinrichtung darf nur im gesicherten drucklosen Zustand der Anlage und deren Leitungen durchgeführt werden. Bei brennbaren Gasen wie z.B. Propan, Butan, Methan, etc., ist funkenarmes Werkzeug hierzu zu verwenden.
Bei der Verwendung von Ammoniak als Kältemittel sind besondere Sicherheitsmaßnahmen zu beachten (siehe auch Sicherheitsdatenblatt).
Nach der Installation der Sicherheitsarmatur ist ein Dichtheitstest durch eine befähigte Person durchzuführen. Die Überprüfung des Ansprechdruckes ist in regelmäßigen Abständen anhand der Einstellbescheinigung vorzunehmen.

operating conditions have to be considered. Safety devices that are subject to discharging incendive media and therefore constitute a direct or indirect hazard to persons and ignition sources in their environment must be appropriately protected (e. g. discharging into a safe environment).
The recommended steps to limit potential explosions, resp. the recommendations for wearing personal protection equipment have to be attended and followed mandatorily when screw connections are being loosened or the pressure spring is being slackened.
Safety devices may be exclusively maintained by the manufacturer.
Safety devices may only be replaced when the plant and its pipes are secured and depressurized. When inflammable gases such as propane, butane, methane are being used this has to be done with tools that do not create sparks.
When ammonia is being used as refrigerant, special safety instructions have to be followed (see safety data sheet).
After the safety valve has been installed a leakage test has to be performed by an authorized person.
The response pressure has to be checked in regular intervals according to the setting certificate.

4. Anwendung

AWP Sicherheitsventile sind geeignet für den Einsatz in Kältemittelkreisläufen für Industrie-Kälteanlagen als Abblase- bzw. Überströmventil (! nur SVU 457 / 458). Sicherheitsventile sind Sicherheitseinrichtungen zum Schutz der Kälteanlage oder ihrer Bauteile vor unzulässiger Druckbeanspruchung (siehe auch EN 378 Teil 2). Sie entsprechen dem AD2000 - Regelwerk.

4. Application

AWP safety valves are suitable for being employed as relief or overflow valves in the refrigerant cycles of industrial refrigerating plants (! only SVU 457 / 458). Safety valves are safety devices for protecting the refrigerating plant or its components from excess pressure (see also EN 378 part 2). They correspond to the AD2000 set of rules.

5. Funktionsbeschreibung

AWP Sicherheitsventile öffnen nach dem Ansprechen innerhalb von 10 % Drucksteigerung bis zum konstruktiv begrenzten Hub. Sie schließen innerhalb einer Druckabsenkung von 10 % unter dem Ansprechpunkt. Die Typen SVU 457 / 458 sind mit einem Gegendruck-kompensierenden Metallbalg ausgestattet, d. h. das Ventil arbeitet unabhängig vom Gegendruck!
! Ansprechdruck = Einstelldruck !
Zur Gewährleistung des K_{dr} -Wertes darf der Gegendruck [abs.] max. 25 % des Einstelldruckes [abs.] betragen.
Die Typen SVA 455 / 456 arbeiten abhängig vom Gegendruck!
! Ansprechdruck = Einstelldruck + Fremdgegendruck!
Zur Gewährleistung des K_{dr} -Wertes darf der Gegendruck [abs.] max. 10 % des Ansprechdruckes [abs.] betragen.

5. Functional Description

Once an AWP safety valve has responded, it opens within a pressure increasing range of 10 % until it reaches the constructional limit. They close within a pressure dropping range of 10 % below the set response pressure.
The types SVU 457 / 458 are equipped with a metal bellows to compensate the back pressure, i.e. the valve is independent of back pressure!
! Response pressure = set pressure!
The back pressure [abs.] may not exceed 25 % of the set pressure [abs.] in order to ensure the K_{dr} -value.
The types SVA 455 / 456 work dependent on back pressure.
! Response pressure = set pressure + foreign back pressure!
The back pressure [abs.] may not exceed 10 % of the set pressure [abs.] in order to ensure the K_{dr} -value.

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Sicherheitsventile / Safety Relief Valves

Einbau, Wartung
Installation, Maintenance

6. Einbau

Vor Einbau der Ventile sind Rohrleitungen und Anlagenteile zu säubern.
Bitte beachten!
Die Abweichung von der Parallelität bzw. Rechtwinkligkeit der Anschweißenden bzw. Flanschdichtflächen darf 1° nicht überschreiten.
Anschlussflansche müssen achsengleich sein.
Ventile mit Transport- und Lagerschäden dürfen nicht eingebaut werden.

Nach dem Entfernen der Rohrstopfen können die Ventile eingeschweißt bzw. montiert werden.
Die Durchflussrichtung (siehe Pfeil auf Kennzeichenschild) ist einzuhalten.

Bei Anwendung moderner Schweißverfahren (z. B. WIG, CO_2) werden die Ventile zum Einschweißen nicht demontiert.
Die Befestigungsschrauben und Muttern der Flansche sind über Kreuz und gleichmäßig anzuziehen.

Beim Abblasen in die Atmosphäre sind die Abblasrohre möglichst kurz zu halten und dürfen keine scharfen Krümmer aufweisen. Der Biegeradius muss mindestens 3 x RAØ (Rohraußendurchmesser) betragen.
Beim Füllen der Öl- bzw. Wasservorlage ist darauf zu achten, dass kein Öl bzw. Wasser in die Sicherheitsventile gelangt.
Absperreinrichtungen vor und hinter dem Sicherheitsventil sind unzulässig, ausgenommen Wechselventile.
Zur Demontage der Haube ist genügend Platz auf der Haubenseite vorzusehen (siehe folgende Tabelle).

6. Installation

Before installing the valves, the pipelines and the components have to be cleaned.
Please note!
The welding or flanged ends on the pipes that the valves are connected to have to be parallel, resp. rectangular. If there is a deviation it may not exceed 1°. The connecting flanges have to be coaxial.
Valves that have been damaged during transport or storage may not be installed.

After the protective caps have been removed, the valves can be welded, resp. installed.
The flow direction (see arrow on name plate) has to be observed.

When modern welding processes are used (such as TIG, CO_2-shielded metal-arc) the valves do not have to be disassembled for welding.
The fastening bolts and nuts have to be tightened crosswise and evenly.

The pipes for blowing off the pressure into the atmosphere should be as short as possible and may not have any sharp bends. The bending radius must be at least 3 x RAØ (outside diameter of the pipe).
When filling oil or water into the recipient make sure that no water or oil gets into the safety valves.
Installing locking devices before or behind safety valves is not permitted, except 3-way valves.
To disassemble the valve bonnet enough space has to be provided on the side of the bonnet (see following table).

DN1	15	20	25	32	40
Benötigter Platz zur Demontage (mm) Required space for disassembly (mm)	90	100	100	100	120

7. Wartung

AWP Sicherheitsventile arbeiten wartungsfrei. Treten Mängel im Funktionsverhalten auf, ist eine Reparatur möglich. Während der Garantiezeit dürfen Reparaturen nur durch AWP bzw. mit dessen Einverständnis durch geschultes Instandhaltungspersonal des Betreibers der Anlage vorgenommen werden.
AWP empfiehlt, Sicherheitsventile alle 5 Jahre zu überprüfen.
Nach jedem Ansprechvorgang (Havariefall) ist der Einstelldruck [pe] und die Dichtheit am Sitz zu kontrollieren.
! Ventile nur im ausgebauten Zustand warten!
! Sicherheitshinweise beachten (siehe Kapitel 3)!

7. Maintenance

AWP safety valves are maintenance-free.
In case of any defects that occur in the functional performance of the valves, they can be repaired.
During the warranty period, repairs may only be carried out by AWP or with his consent - by specially-trained maintenance personnel working for the plant operator.
AWP recommends to check the safety valves every five years.
After every response action (case of average) the test pressure [pe] and the tightness at the valve seat must be verified.
! Maintenance work may only be done when the valve has been detached from the system!
! Safety instructions have to be followed (see chapter 3)!

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Sicherheitsventile / Safety Relief Valves

Wartung
Maintenance

Auswechseln von O-Ring S, Dichteinheit kpl. + Spindel bzw. Flachdichtring N

1. Plombe und Plombendraht entfernen
2. Haube aus Gehäuse herausschrauben. (Schlüsselweiten siehe folgende Tabelle)

DN1	15	20	25	32	40
Schlüsselweite Wrench width	46	60	60	80	80

3. Flachdichtring K, Spindel und Dichteinheit kpl. (SVU) bzw. Spindelführung und Ventilteller (SVA) aus dem Gehäuse nehmen.
4. Ventiltellerschraube (Senkschraube ISO 7046) herausdrehen und O-Ring S herausnehmen und ersetzen (siehe Ersatzeilliste). Senkschraube eindrehen und sichern z. B. mit Schrauben-Sicherungspaste.

DN1		15	20	25	32	40
Schrauben screws	ISO 7046	-	-	M5x8	M6x10	M6x10
	DIN 7500	M3x8	M3x8	-	-	-

5. Bei Schäden an der Dichteinheit kpl. bzw. der Spindelführung erfolgt deren Ersatz immer zusammen mit neuer Spindel (siehe Ersatzteilliste).
6. Das Auswechseln des Flachdichtringes N ist nur mit Spezialwerkzeug möglich. Der Sitzstutzen ist mit folgendem Drehmoment anzuziehen:

DN1	15	20	25	32	40
Schlüsselweite Wrench width	15,5	21	26	31	36,5
Anziehdrehmoment (Nm) Torque (Nm)	90	180	180	180	180

Vor der Montage Einzelteile reinigen, die Spindel leicht einölen. Vorhandensein und richtigen Sitz der Kugel in den Zentrierungen an Spindel und Ventilteller prüfen. Eventuell Kugel mit Kältefett in der Zentrierung der Spindel fixieren.
Anschließend neuen Flachdichtring K einlegen und Haube so aufsetzen, dass die Spitze der Spindel in die Zentrierung am Federteller greift. Eventuell Spindel etwas aus der Spindelführung herausziehen um ein sicheres Zentrieren zu ermöglichen.

How to Replace the O-Ring Sealing S, Sealing Unit cmpl. + Stem, resp. Flat Sealing N

1. Remove the seal and seal wire.
2. Unscrew the bonnet from housing. (see wrench widths in following table)

3. Remove the flat sealing-ring K, the stem and the sealing unit cmpl. (SVU), resp. the stem guide and valve plate (SVA) from the casing.
4. Unscrew the valve plate screw (countersunk screw ISO 7046), remove the o-ring seal S and replace it (see spare parts list). Screw the countersunk screw into place and secure it e.g. by using screw securing paste.

5. When the sealing unit cmpl. or the stem guide are damaged they must be replaced together with a new stem (see spare parts list).
6. To replace the flat sealing N a special tool is necessary. The nozzle must be tightened with the following torque:

Before assembly clean all parts and lubricate the stem. Check if the ball is present and if it is in the correct position within the centerings of the stem and valve plate. If necessary, secure the ball in the centering of the stem with low-temperature grease. Then insert a new flat sealing ring K and put the bonnet back into its place. The tip of the stem has to be placed into the centering of the spring plate. If necessary, draw out the stem slightly from the stem guide in order to enable correct centering.

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Wartung
Maintenance

Die Haube ist mit folgendem Drehmoment anzuziehen: Tighten the bonnet with the following torque:

DN1	15	20	25	32	40
Schlüsselweite Wrench width	46	60	60	80	80
Anziehdrehmoment (Nm) Torque (Nm)	300	350	350	520	650

! Nach jeder Demontage der Innenteile neuen O-Ring S einbauen!
! Nach jedem Teile-Ersatz Einstelldruck [pe] überprüfen!
Dabei ist eine Liegezeit von 48 Stunden, im montierten Zustand, vor Überprüfung zu gewährleisten.
Die Einstellung des Einstelldruckes [pe], die Plombierung der Einstellschraube und das Ausstellen einer Einstellbescheinigung hat durch einen Sachverständigen der Technischen Überwachungsvereine (TÜV) zu erfolgen.

! Insert a new o-ring every time the interior has been disassembled!
! Check the test pressure [pe] every time any spare parts have been replaced!
After the re-assembly of the valve, an idle time of 48 hours has to be observed before checking the test pressure. The setting of the test pressure [pe], the sealing of the adjusting screw and the issue of the certification for the adjustment has to be done by a surveyor of the Technical Control Board (TÜV).

Auswechseln der Druckfeder

1. Plombe und Plombendraht entfernen.
2. Haube aus Gehäuse herausschrauben (Schlüsselweiten siehe folgende Tabelle). Die Dichteinheit kpl. bzw. Spindelführung und Spindel bitte unberührt lassen!

How to Replace the Pressure Spring

1. Remove the seal and seal wire.
2. Unscrew the bonnet from housing (see wrench widths in following table). Please Do not touch the sealing unit cmpl. Resp. the stem guide and stem!

DN1	15	20	25	32	40
Schlüsselweite Wrench width	46	60	60	80	80

3. Flachdichtring K aus dem Gehäuse nehmen.
4. Kappe von der Haube schrauben, Kontermutter linksdrehend lösen und Einstellschraube herausschrauben (Schlüsselweiten siehe folgende Tabelle).

3. Remove the flat sealing ring K from the casing.
4. Unscrew the cap from the bonnet, unscrew the back nut counter-clockwise and remove the setting screw (see wrench widths in following table).

DN1	15	20	25	32	40
Schlüsselweite Kappe Wrench width cap	30	30	30	30	30
Mutter / nut EN 4032	M12	M12	M12	M12	M12
Schlüsselweite Mutter Wrench width nut	30	30	30	30	30
Schraube / screw ISO 4017	M12x50	M12x50	M12x50	M12x50	M12x50
Schlüsselweite Schraube Wrench width screw	30	30	30	30	30

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Sicherheitsventile / Safety Relief Valves

Wartung
Maintenance

5. Sicherungsring DIN 472 mit geeigneter Montage-Zange DIN 5256 ZGJ entfernen (Schlüsselweite siehe folgende Tabelle).

5. Remove the locking ring DIN 472 with suitable assembly pliers DIN 5256 ZGJ (see wrench width in following table).

DN1	15	20	25	32	40
Schlüsselweite Wrench width	42x2	52x2	52x2	70x2,5	70x2,5

6. Neue Druckfeder (siehe Ersatzteilliste) leicht geölt einlegen und Haube wieder montieren.

Vor der Montage Einzelteile der Haube reinigen, die Haube im Dichtring-Bereich leicht einölen. Anschließend neuen Flachdichtring K einlegen und Haube so aufsetzen, dass die Spitze der Spindel in die Zentrierung am Ventilteller greift. Eventuell Spindel etwas aus der Spindelführung herausziehen um ein sicheres Zentrieren zu ermöglichen.
Haube ist mit folgendem Drehmoment anzuziehen.

6. Insert a new pressure spring (see spare parts list), slightly greased, and re-assemble the bonnet.

Before assembly clean the components of the bonnet and slightly grease the area around the sealing ring. Afterwards insert a new flat sealing ring K and mount the bonnet in a way that the tip of the stem fits into the centering. If necessary, draw out the stem slightly from the stem guide to enable the centering.
Tighten the bonnet with the following torque.

DN1	15	20	25	32	40
Schlüsselweite Wrench width	46	60	60	80	80
Anziehdrehmoment (Nm) Torque (Nm)	300	350	350	520	650

! Nach jedem Druckfederwechsel Einstelldruck [pe] neu einstellen!
Dabei ist eine Liegezeit von 48 Stunden im montierten Zustand vor Überprüfung zu gewährleisten.
Die Einstellung des Einstelldruckes [pe], die Plombierung der Einstellschraube und das Ausstellen einer Einstellbescheinigung hat durch einen Sachverständigen der Technischen Überwachungsvereine (TÜV) zu erfolgen.

! After every change of the pressure spring, the test pressure [pe] must be readjusted!
After the assembly of the valve, an idle time of 48 hours has to be observed before checking the test pressure. The setting of the test pressure [pe], the sealing of the adjusting screw and the issue of the certification for the adjustment has to be done by a surveyor of the Technical Control Board (TÜV).

Korrektur und Überprüfung des Einstelldruckes

1. Plombe entfernen, Kappe von der Haube schrauben und Kontermutter linksdrehend lösen.

Correcting and checking the test pressure

1. Remove the sealing, unscrew the cap from the bonnet and unscrew the counter nut counter-clockwise.

DN1	15	20	25	32	40
Schlüsselweite Kappe Wrench width cap	30	30	30	30	30
Mutter / nut EN 4032	M12	M12	M12	M12	M12
Schlüsselweite Mutter Wrench width nut	19	19	19	19	19

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Sicherheitsventile / Safety Relief Valves

Wartung, Transport und Lagerung, Garantie
Maintenance, Transport and Storage, Warranty

2. Den Einstelldruck durch Drehen der Einstellschraube im Uhrzeigersinn erhöhen und durch Drehen entgegen dem Uhrzeigersinn absenken.
! Einstelldruck-Druckbereich der Druckfedern beachten (siehe Ersatzteilliste)**!**

2. Increase the test pressure by turning the adjusting screw clockwise and decrease it by turning the adjusting screw counter-clockwise.
! Mind the range of the test pressure of the pressure spring (see spare parts list)**!**

DN1	15	20	25	32	40
Schlüsselweite / Wrench width Schrauben / screws ISO 4017	19	19	19	19	19

3. Kontrolle des Einstelldruckes durch Belasten des Ventils von der Eingangsseite DN1 aus, mit Druckluft oder einem zulässigen Betriebsmedium in Höhe des Einstelldruckes, d.h. das Ventil beginnt zu öffnen. Das Ventil ist dreimal zum Ansprechen zu bringen.
! Einstelldruck-Toleranz [pe] = +3%, -1%!
4. Kontrolle des Schließdruckes durch anschließende Druckabsenkung von 10% unterhalb des Einstelldruckes, d.h. das Ventil muss geschlossen sein.

3. Verify the test pressure by loading the valve from the input side DN1 with compressed air or another approved working medium up to the adjusted test pressure. The valve starts to open. The valve has to respond three times.
! Tolerance of test pressure [pe] = +3%, -1%!
4. Check the closing pressure afterwards by decreasing the pressure to 10% below the test pressure. The valve has to be fully closed.

Die Einstellung des Einstelldruckes [pe], die Plombierung der Einstellschraube und das Ausstellen einer Einstellbescheinigung hat durch einen Sachverständigen der Technischen Überwachungsvereine (TÜV) zu erfolgen.

The setting of the test pressure [pe], the sealing of the adjusting screw and the issue of the certification for the adjustment has to be done by a surveyor of the Technical Control Board (TÜV).

8. Transport und Lagerung

AWP Sicherheitsventile werden stoßgeschützt, mit Folie abgedeckt transportiert. Die Lagerung hat in trockenen Räumen zu erfolgen.
Es ist auf den unversehrten Verschluss der Anschlussstutzen zu achten. Verschmutzungen jeglicher Art müssen vom Innenraum ferngehalten werden.
Die außenliegenden Flächen der Armaturen sind mit einem Korrosionsschutzanstrich für trockene Lagerung bei Raumtemperatur versehen, der mindestens ein Jahr wirksam ist.
Der Korrosionsschutzanstrich CELEROL-Reaktionsgrund 918 ist ein guter Haftvermittler für Deckanstrichstoffe auf 1- und 2-Komponenten-Basis.

8. Transport and Storage

During transport, AWP safety valves are protected against shocks and covered with plastic sheeting. They should be stored in dry rooms.
The connecting nozzles may not be damaged. Any kind of soiling has to be kept away from the inside of the valves.
The external surfaces of the valves are provided with a layer of anticorrosive paint for dry storing at room temperature, which remains effective for at least one year.
The “CELEROL-Reaktionsgrund 918” anticorrosive paint is a good bonding agent for one- or two-pot finishing coating paints.

9. Garantie

Die Garantieleistung für Erzeugnisse ist entsprechend den vertraglichen Bestimmungen im Liefervertrag festgelegt.

9. Warranty

The warranty services for our products have been defined in compliance with the regulations stipulated in the contract of delivery.

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Sicherheitsventile / Safety Relief Valves

Ersatzteilliste
Spare Parts List

10. Ersatzteilliste

10. Spare Parts List

DN1	Spindel Stem	Flachdichtring K (Aluminium) Flat Sealing Ring K (Aluminum)		Flachdichtring N (AL / AFM30) Flat Sealing Ring N (AL / AFM 30)	
	Artikelnummer Item Number	Artikelnummer Item Number	Abmessungen Dimensions	Artikelnummer Item number	Abmessungen Dimensions
15	457 00E10.8 061 002	54 55 90	⌀ 42 x 49 x 2,0	73 74 89	21 x 26 x1,5
20	443 31.11.8 061 002	73 97 87	⌀ 52 x 60 x 2,5	73 97 86	32 x 38 x 2
25	443 31.12.8 061 002	73 97 87	⌀ 52 x 60 x 2,5	73 97 86	32 x 38 x 2
32	443 31.13.8 061 002	73 97 88	⌀ 75 x 84 x 2,5	73 97 86	32 x 38 x 2
40	443 31.14.8 061 002	73 98 04	⌀ 90 x 100 x 2,5	73 97 86	32 x 38 x 2

DN1	O-Ring S (CR85 sb) – nur Typ 455 / 457 O Ring Sealing S (CR85 sb) – Types 455 / 457 only		O-Ring S (PTFE) – nur Typ 456 / 458 O Ring Sealing S (PTFE) – Types 456 / 458 only	
	Artikelnummer Item Number	Abmessungen Dimensions	Artikelnummer Item Number	Abmessungen Dimensions
15	73 75 74	⌀ 8 x 3	72 81 52	⌀ 8 x 3
20	73 75 75	⌀ 12 x 3	72 81 53	⌀ 12 x 3
25	73 75 76	⌀ 16 x 3	73 20 57	⌀ 16 x 3
32	73 75 77	⌀ 20 x 3	73 20 56	⌀ 20 x 3
40	73 75 78	⌀ 26 x 3	73 20 55	⌀ 26 x 3

DN1	Dichteinheit kpl. – nur Typ 458 Sealing Unit cmpl. – Type 458 only	Dichteinheit kpl. – nur Typ 457 Sealing Unit cmpl. – Type 457 only
15	458 00E10.8 059 001	457 00E10.8 059 001
20	458 00E11.8 059 001	457 00E11.8 059 001
25	458 00E12.8 059 001	457 00E12.8 059 001
32	458 00E13.8 059 001	457 00E13.8 059 001
40	458 00E14.8 059 001	457 00E14.8 059 001

DN1	Spindelführung – nur Typ 455 / 456 Stem Guide – Types 455 / 456 only	O-Ring C (CR 75) – nur Typ 455 / 456 O Ring Sealing C (CR 75) – Types 455 / 456 only	
	Artikelnummer Item Number	Artikelnummer Item Number	Abmessungen Dimensions
15	457 00E10.8 052 002	73 75 21	⌀ 25 x 2
20	457 00E11.8 052 002	73 75 21	⌀ 25 x 2
25	457 00E12.8 052 002	73 75 21	⌀ 25 x 2
32	457 00E13.8 052 002	73 75 21	⌀ 25 x 2
40	457 00E14.8 052 002	73 75 21	⌀ 25 x 2

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Sicherheitsventile / Safety Relief Valves

Ersatzteilliste
Spare Parts List

DN1	Druckfeder Pressure Spring	Druckbereich Pressure Range	
		SVU (Typ / Types 457 / 458)	SVA (Typ / Types 455 / 456)
15	443 31.10.5 003 06 3	5 - <9	5 - <7
	443 31.10.5 009 10 3	9 - <11	7 - <9
	443 31.10.5 010 12 3	11 - <14	9 - <11
	443 31.10.5 013 14 3	14 - <19	11 - <15
	443 31.10.5 015 17 3	19 - <22	15 - <20
	443 31.10.5 018 21 3	22 - <24	20 - <25
	443 31.10.5 021 24 3	24 - <32	25 - <32
	443 31.10.5 032 40 3	32 - <40	32 - <40
	443 31.10.5 040 50 3	40 - <50	40 - <50
	443 31.10.5 050 63 3	50 - 63	50 - 63
20	443 31.11.5 009 00 3	5 - <9	5 - <7
	443 31.11.5 010 00 3	9 - <11	7 - <9
	443 31.11.5 012 00 3	11 - <12	9 - <10
	443 31.11.5 013 00 3	12 - <16	10 - <13
	443 31.11.5 015 00 3	16 - <20	13 - <18
	443 31.11.5 018 00 3	20 - <24	18 - <20
	443 31.11.5 020 00 3	24 - <28	20 - <26
	443 31.11.5 021 00 3	---	26 - <28
	443 31.11.5 028 33 3	28 - <33	28 - <33
	443 31.11.5 033 40 3	33 - <40	33 - <40
	443 31.12.5 042 50 3	40 - <44	40 - <44
	443 31.14.5 016 18 3	44 - <55	44 - <55
	443 31.14.5 018 19 3	55 - 63	55 - 63
25	443 31.12.5 009 11 3	5 - <9	5
	443 31.12.5 011 13 3	9 - <11	6 - 8
	443 31.12.5 013 14 3	11 - <14	9 - <11
	443 31.12.5 014 16 3	14 - <15	11 - <14
	443 31.12.5 016 19 3	15 - <18	14 - <18
	443 31.12.5 019 20 3	18 - <19	18 - <20
	443 31.12.5 020 22 3	19 - <22	20 - <22
	443 31.12.5 022 25 3	22 - <24	22 - <25
	443 31.12.5 025 28 3	24 - <34	25 - <34
	443 31.12.5 034 42 3	34 - <42	34 - <40
	443 31.12.5 042 50 3	42 - <50	40 - <48
	443 31.14.5 018 19 3	50 - 63	48 - 63

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Sicherheitsventile / Safety Relief Valves

Ersatzteilliste
Spare Parts List

DN1	Druckfeder Pressure Spring	Druckbereich Pressure Range	
		SVU (Typ / Types 457 / 458)	SVA (Typ / Types 455 / 456)
32	443 31.13.5 008 09 3	5-6	5
	443 31.13.5 009 10 3	7	6
	443 31.13.5 010 11 3	8 - <9	7
	443 31.13.5 011 13 3	9 - <11	8 - <9
	443 31.13.5 013 14 3	11 - <12	9 - <10
	443 31.13.5 014 16 3	13 - <15	11 - <12
	443 31.13.5 016 18 3	15 - <16	12 - <14
	443 31.13.5 018 19 3	16 - <19	14 - <16
	443 31.13.5 019 22 3	19 - <23	16 - <19
	443 31.13.5 022 26 3	23 - <27	19 - <23
	443 31.13.5 027 32 3	27 - <32	23 - <28
	443 31.13.5 028 30 3	---	28 - <30
	443 31.14.5 023 25 3	32 - <36	30 - <34
	443 31.14.5 025 28 3	36 - 40	34 - 40
40	443 31.14.5 007 08 3	5 - 8	5 - 6
	443 31.14.5 008 09 3	9 - <10	7
	443 31.14.5 010 11 3	10 - <11	8 - <9
	443 31.14.5 011 12 3	11 - <12	9 - <10
	443 31.14.5 012 13 3	12 - <13	10 - <12
	443 31.14.5 013 15 3	13 - <15	-
	443 31.14.5 015 16 3	15 - <17	12 - <14
	443 31.14.5 016 18 3	17 - <19	14 - <16
	443 31.14.5 018 19 3	19 - <21	16 - <19
	443 31.14.5 021 23 3	21 - <25	19 - <21
	443 31.14.5 023 25 3	25 - <28	21 - <25
	443 31.14.5 025 28 3	28 - <31	25 - <30
	443 31.14.5 031 40 3	31 - <40	30 - <36
	443 31.14.5 036 40 3	---	36 - <40

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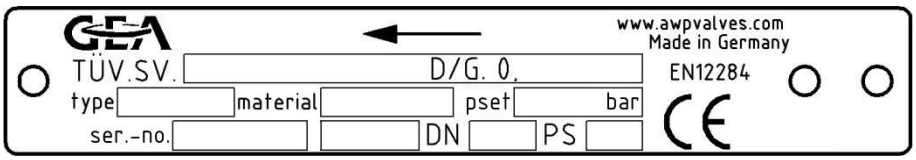
Sicherheitsventile / Safety Relief Valves

Kennzeichnung, Hinweise auf Restgefahren
Labelling, Advices on Residual Hazards

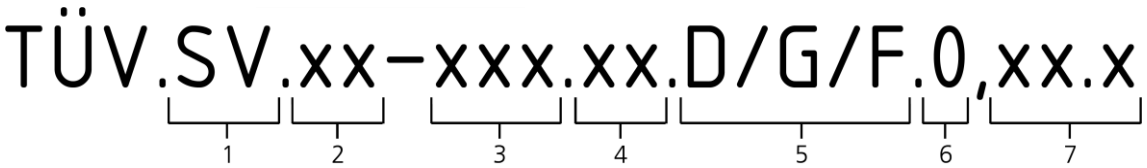
11. Kennzeichnung

Die Kennzeichnung der AWP Sicherheitsventile erfolgt entsprechend EN12284.



PS	maximal zulässiger Betriebsdruck (bar)
DN	Nennweite (mm)
EN12284	Kältemittelarmaturen, Sicherheits-technische Festlegungen, Prüfung, Kennzeichnung

Bauteilkennzeichen



1 SV = Sicherheitsventil
2 Jahr der Bauteilprüfung / Wiederholungsprüfung
3 Bauteilprüfnummer
4 Engster Strömungsdurchmesser vor dem Ventilsitz (mm)
5 D = einsetzbar für Dampf
G = einsetzbar für Gase
F = einsetzbar für Flüssigkeiten
6 zuerkannte Ausflussziffer aw
7 Einstelldruck pset (bar)

12. Hinweise auf Restgefahren entsprechend der Druckgeräterichtlinie

Vom Hersteller nicht zu vermeidende Restgefahren bestehen durch:

- Unbefugtes Lösen der Haube während des Betriebes
- Unsachgemäße Montage von Flanschverbindungen (Eingangs- und Ausgangsflansch, Deckel)
- Verschmutzungen im Betriebsmedium bzw. unsachgemäßer Umgang mit Einbauteilen können zu Beschädigungen an der Sitzdichtung führen
- Nichtbeachtung der Einsatzgrenzen und Herstellervorschriften entsprechend dieser Betriebsvorschrift

11. Labelling

The labelling of AWP safety valves complies with European Standard EN12284

PS	max. permissible working pressure (bar)
DN	nominal diameter (mm)
EN12284	European standard for refrigeration valves, safety requirements, testing, labelling

Mark of Conformity

1 SV = safety valve
2 Year of type approval / re-approval
3 number of type approval
4 smallest cross section of flow before valve seat [mm]
5 D = applicable for steam
G = applicable for gases
F = applicable for fluids
6 certified coefficient of discharge aw
7 set pressure pset (bar)

12. Advices on Residual Hazards According to Pressure Appliance Directive

Residual hazards which cannot be avoided by the manufacturer arise because of:

- Unauthorized loosening of the bonnet during operation
- Incorrect assembly of the flange connections (inlet and outlet flange, cover)
- Dirt in the operating medium or inappropriate handling of the internal fittings may cause damage to the seat seal
- Not following the operating range and manufacturer rules acc. to these operating instructions

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MAYEKAWA Europe MYCOM

PRESSURE CONTROLS

TYPE RT1AE-RT6AE-RT11-RT260

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

Tel. +32 (0)2 757 90 75
www.mayekawa.eu
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ENGINEERING
TOMORROW

Installation guide

Pressure switch

RT 1AE, RT 6AEW, RT 6AEB, RT 6AES, RT 116E, RT 5E, RT 117E,
RT 112E, RT 113E, RT 121E, RT 260AE, RT 262AE

089 UK CA

017R9519

Approvals and standards:
ATEX: EN 60079-0:2012+A11:2013; EN 60079-11:2012
IECEx: IEC 60079-0:2011; IEC 60079-11:2011
China Compulsory Certificate, CCC

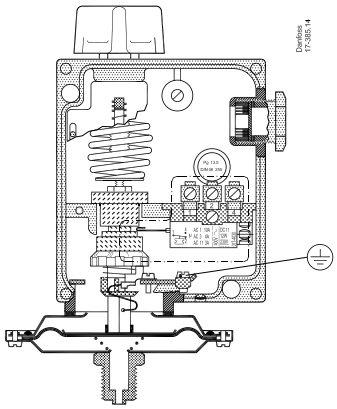


Fig. 1

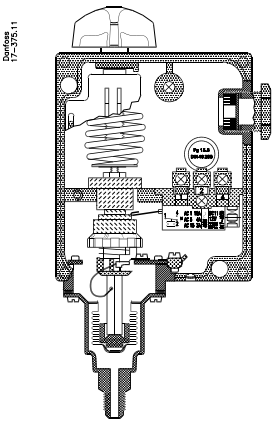


Fig. 2

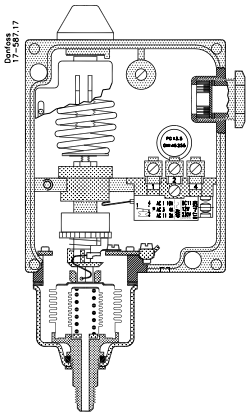


Fig. 3

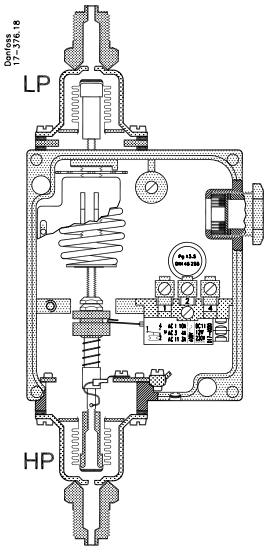


Fig. 4

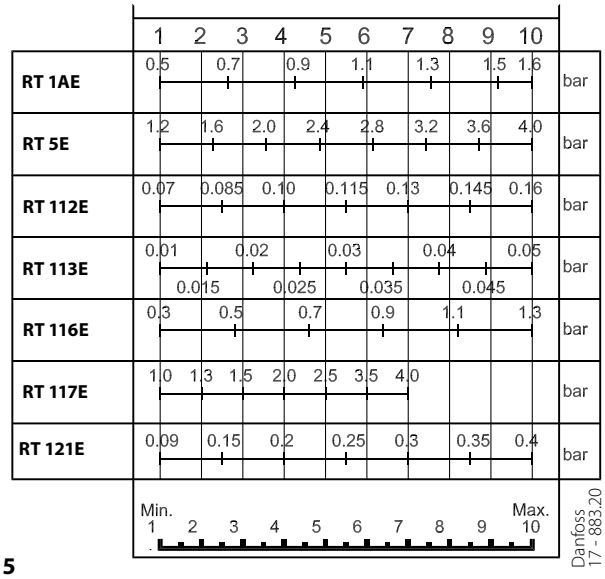


Fig. 5

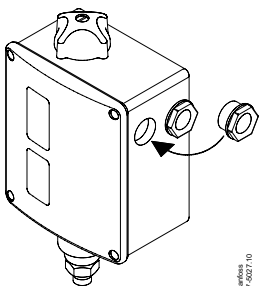
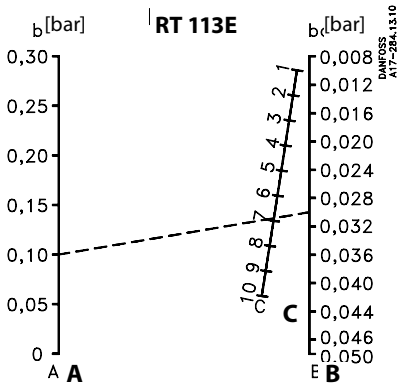


Fig. 6



A: Range setting
B: Differential obtained
C: Differential setting

Fig. 7

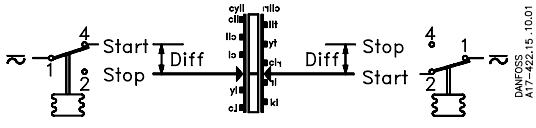


Fig. 8

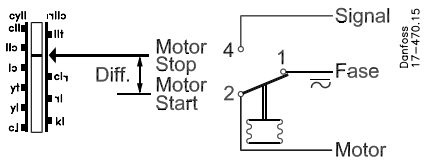


Fig. 9

Импортер:ТОВ з ii "Данфосс ТОВ" 04080, Київ 80, п/с 168, Україна

Info for UK customers only: Danfoss Ltd., 22 Wycombe End, HP9 1NB, GB

Product marking: RT112E, RT113E, RT1AE, RT116E, RT5E, RT117E, RT260AE, RT262AE, RT9E, RT14E, RT101E, RT107E, RT121E, RT123E

0539 II2G

Ex ia IIC T6...T1 Gb -20 °C ≤ Ta ≤ 65 °C
DEMKO 14 ATEX 1406X, Rev. 3
IECEx ULD 14.0013X
U_i = 29 V I_i = 0.5 A P_i = 1 W
C_i = 0.5 nF L_i = 0.2 µH

Product marking: RT 6AEW, RT 6AEB, RT 6AES

0035 0539 II2G

Ex ia IIC T6...T1 Gb -20 °C ≤ Ta ≤ 65 °C
DEMKO 14 ATEX 1406X, Rev. 3
IECEx ULD 14.0013X
U_i = 29 V I_i = 0.5 A P_i = 1 W
C_i = 0.5 nF L_i = 0.2 µH

Temperature class	Process temperature limit [°C]
T4 – T1	100
T5	94
T6	79

Technical data

Maximum Working Pressure:

Type	RT 113E	RT 112E	RT 1AE	RT 116E	RT 5E	RT 6AEW RT 6AEB RT 6AES	RT 117E	RT 121E	RT 260AE	RT 262AE
MWP [bar]	0.4	7	22	22	22	34 [1)]	42	7	22	11

[1)] 28 bar P_e when used as safety equipment acc. to EN12263

Permissible ambient temperature:	-20 – 65 °C
Intrinsically safe specification:	Ui = 29 V Ci = 0.5 nF Ii = 0.5 A Li = 0.2 µH Pi = 1 W
Contact load:	max. 100 mA, 30 V AC / DC
	min. 1 mA, 5 V AC / DC
	Must be used with a certified Ex ia barrier satisfying the input parameters.

Specific conditions of use:

The enclosure fascia has been coated with a layer of stainless steel to prevent the accumulation of electrostatic charge. In order to ensure that there is no accumulation of electrostatic charge on the enclosure, the end user shall ensure that the external metal work of the enclosure is locally bonded to earth. Information on the durability of the coating with regards to use of the equipment is contained within the instruction manual.

Installation

A set of Pg13.5 cable gland is attached to the RT in a separate bag. To ensure IP66 (units with automatic reset) or IP54 (units with external reset) grade of RT enclosure it is necessary to assemble this gland as shown in the fig. 6. If this gland is not used with a cable, a metal blinding should be also assembled.
The RT pressure switch is designed for fitting on the valve panel or the compressor. Use the mounting holes (25). If the unit can be exposend to vibration, it should be mounted on a resilient pad. If pressure pulsations occur in the system at the point where the pressure switch is connected, these should be effectively damped, as for example, by connecting the RT unit to the system via damping coil.

Electrical connection (see fig. 8 and fig. 9)

START = make. STOP = break. DIFF = differential.
Cable diameter: 6 – 14 mm
The earth terminal (38) should be connected to earth.
Wire dimension: min. 0,75 mm^2

Adjustment

RT 1AE, RT 116E, RT 5E, RT 117E, RT 112E, RT 113E, RT 121E (see fig. 1, fig. 2 and fig. 8)

Set the pressure switch for minimum actuating pressure (range setting). Setting is done by rotating the knob (5), at the same time reading the main scale (9).
The differential is set by rotating the differential adjusting nut (19) according to the nomogram concerned (fig. 5 or fig 7).
Maximum actuating pressure is the sum of the pressure setting and the differential.

RT 260AE, RT 262AE
See fig. 4 and fig. 8

Set the required differential pressure with the setting disc (5) while at the same time reading the scale (9).

RT 6AEW, RT 6AEB, RT 6AES (see fig. 3 and fig. 9)

After removing the seal cap (7), set the cut out pressure with the uncovered range spindle while reading the scale (9).

Safety requirements

1. The refrigeration system must always comply with European Ex installation standard, EN 60079-14, any local directive and legislation as well as any other regulation applying in the area of installation.
2. RT-E switch must be used only with reliable means of limiting the voltage and current to prevent sparks between the contact surfaces. The equipment to be used for electrical load limiting must always be approved for use in the zone concerned.
3. Cable and cable entries approved for the application must be used. Cables must not be in contact with sharp edges. The cable must be connected with adequate stress relief in order to prevent that pulling forces can be carried through the cable to the terminal.
4. In the event of pressure pulsations in the system, where the switch is connected, these must be effectively damped to prevent fatigue failure on the bellows. The cycle frequency of the RT-E switch must be kept as low as possible. The vibration level must be kept as low as possible.
5. It is recommended to regularly check the function of the RT-E switch.
6. Only apparatus designed, constructed and released by Danfoss must be used for application concerned. Danfoss can accept no responsibility in case of alterations made on the pressure switches or the use of them against the instructions of Danfoss.
7. Any overload of the RT switch must be prevented. Overloaded or damaged apparatus must be exchanged.
8. Only authorised persons, who are certified in installing and maintaining refrigration system may do the installation, maintenance and exchange of the switch.
9. Use only appropriate tools.
10. Dispose of the switch in an environmentally-friendly way.
11. RTE switches must be installed in area where is low risk of mechanical damage.
12. Components within the equipment can exceed the enclosure temperature by 1K (1°C). When the media temperature exceeds 80°C, it is the responsibility of the user to ensure that the media temperature does not cause a thermal ignition risk on parts between the media and the switch enclosure. Maximum media temperature on pressure switch is 100°C.
13. Isolation of the intrinsically safe circuit to ground and to the contact mounting screw has been verified through 500VACrms dielectric strength testing, carried out in accordance with IEC 60079-11:2011 section 10.3.
14. Surface of the front cover is sputtered with stainless steel - avoid abrasion.
15. Power must be switched off before maintenance and opening the RT-E.

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ENGINEERING TOMORROW

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Denmark
CVR nr.: 20 16 57 15

Telephone: +45 7488 2222
Fax: +45 7449 0949

EU DECLARATION OF CONFORMITY

Danfoss A/S

Refrigeration & Air Conditioning Controls

declares under our sole responsibility that the

Product category: Pressure switches

Type designation(s): RT6AEW, RT6AEB, RT6AES

Covered by this declaration is in conformity with the following directive(s), standard(s) or other normative document(s), provided that the product is used in accordance with our instructions.

Explosive or Protective Systems Intended for use in Potentially Explosive Atmospheres, Directive 2014/34/EU

Marking:

CE 0539 Ex II 2G

Ex ia IIC T6…T1 Gb

Tamb. -20C to +65C

EC-Type Examination Certificate: DEMKO 14 ATEX 1406X , Rev. 4

Notifying Body: UL Demko, No.: 0539

Test basis:

EN IEC 60079-0:2018 Explosive atmospheres, Part 0, Equipment-General requirements

EN 60079-11:2012 Explosive atmospheres, Part 11, Equipment Protection by Intrinsic safety "i".

Pressure Equipment Directive 2014/68/EU

Equipment Category IV

Notifying Body: TÜV Rheinland, Notified Body No.: 0035.

Test basis: EN 12263:1998 Refrigerating systems and heat pumps – Safety switching devices for limiting the pressure, Requirements and tests.

Conformity assessment: module B (production type) + module D (TÜV certificates: 01 202 931-B-11-0010 + 01 02 PL/Q-11-0004)

RoHS Directive 2011/65/EU including amendment 2015/863

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronics products with respect to the restriction of hazardous substances

Date: 2021.08.12 **Place of issue:** Grodzisk Maz.	**Issued by** Piotr Chylaszek **Signature:** **Name: Piotr Chylaszek** **Title: Atex Authorized Person**	Date: 2021.08.12 **Place of issue:** Grodzisk Maz.	**Approved by** **Signature:** **Name: Lukasz Stasiowski** **Title: RD&E Manager**

Danfoss only vouches for the correctness of the English version of this declaration. In the event of the declaration being translated into any other language, the translator concerned shall be liable for the correctness of the translation

ID No: 060-9655 **Revision No:** AF

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Classified as Business

ENGINEERING TOMORROW

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Denmark
CVR nr.: 20 16 57 15

Telephone: +45 7488 2222
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EU DECLARATION OF CONFORMITY

Danfoss A/S

Refrigeration & Air Conditioning Controls

declares under our sole responsibility that the

Product category: Pressure and temperature switches

Type designation(s): RT112E, RT113E, RT1AE, RT116E, RT5E, RT9E, RT117E, RT260AE, RT262AE, RT14E, RT101E, RT107E, RT121E, RT123E

Covered by this declaration is in conformity with the following directive(s), standard(s) or other normative document(s), provided that the product is used in accordance with our instructions.

Explosive or Protective Systems Intended for use in Potentially Explosive Atmospheres, Directive 2014/34/EU

Marking:

CE 0539 Ex II 2G

Ex ia IIC T6...T1 Gb

Tamb. -20C to +65C

EC-Type Examination Certificate: DEMKO 14 ATEX 1406X, Rev. 4

Notifying Body: UL Demko, No.: 0539

Test basis:

EN 60079-0:2018 Explosive atmospheres, Part 0, Equipment-General requirements

EN 60079-11:2012 Explosive atmospheres, Part 11, Equipment Protection by Intrinsic safety "i".

RoHS Directive 2011/65/EU including amendment 2015/863

EN IEC 63000:2018 Technical documentation for the assessment of electrical and electronics products with respect to the restriction of hazardous substances

Date: 2021.08.12 **Place of issue:** Grodzisk Maz.	**Issued by** Piotr Chylaszek **Signature:** **Name: Piotr Chylaszek** **Title: Atex Authorized Person**	Date: 2021.08.12 **Place of issue:** Grodzisk Maz.	**Approved by** **Signature:** **Name: Lukasz Stasiowski** **Title: RD&E Manager**

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ID No: 060-9657 **Revision No:** AG Page 1 of 1
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MAYEKAWA Europe MYCOM

CAPACITY SOLENOID VALVE BLOCK

TYPE SLV-ME-…-IP65 25B

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

Tel. +32 (0)2 757 90 75
Fax. +32 (0)2 569 78 63
www.mayekawa.eu
info@mayekawa.eu

MYCOM
Chemical Process Corporation

VALVE SPECIFICATION SHEET

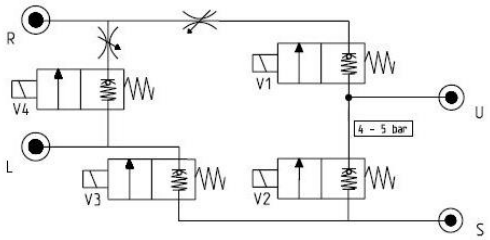
MYCOM code	Description
SLV-ME-. . . V-. . Hz-BLOCK	2/2 solenoid valve block, Normally closed, A.C.
SLV-ME-. . VDC-BLOCK	2/2 solenoid valve block, Normally closed, D.C.

GENERAL:

Construction : 4 valves 2/2 normally closed + 2 needle valves
Maximum allowable pressure : 40 bar
Response time : 5 - 25 msec
Lifetime coil : 30.000 hrs
Lifetime valve, expected : 500.000 cycles, dependent upon service

CONSTRUCTION:

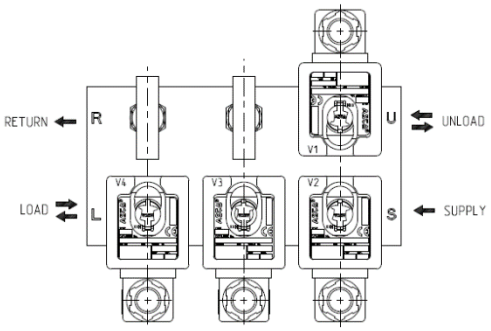
Body : Aluminum, Anodized
Core tube : Stainless steel, AISI type 304
Core and plugnut : Stainless steel, AISI type 430F
Springs : Stainless steel, AISI type 302
Seat : Stainless steel, AISI type 303
Sealing : PTFE
Disc : PTFE
Shading coil : Aluminum (AC Only)
Coil insulation class : AC= F (155°C), DC= H (180°C)
Power consumption : AC= 10.5W, DC= 29.5W
Enclosure : Fully encapsulated solenoid, IP-65
Electrical connection : Spade plug connector with led.
Pipe connections : 1/2" Rc (BSPT)
P.E.D. (97/23/EC) category. : S.E.P., Article 3.3

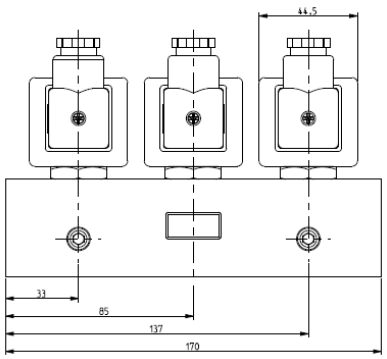


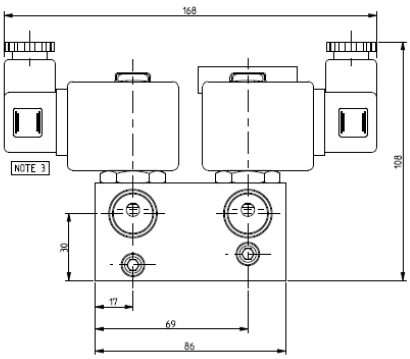
Schematic

Fluids	Temperature ranges
Light oil / NH3 / Freon	-25 to +85°C

Ambient temperature ranges
-25 to +75°C







PRODUCTS:

Pipe size	Orifice size	Flow coefficient Kv		Operating pressure differential (bar)		Coil type	Catalogue number
				min.	max.		
Rc	(mm)	(m^3/h)	(l/min)			=	PTFE sealing
1/2"	3	(V2+3) 0,20 (V1+4) 0,28	3,3 4,7	0	25	MXX	SLV-ME-…V-..Hz-BLOCK SLV-ME-..VDC-BLOCK

MAYEKAWA Europe MYCOM

STOP CHECK VALVES / CHECK VALVES TYPE SCA-X / CHV-X

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
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BELGIUM

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ENGINEERING TOMORROW

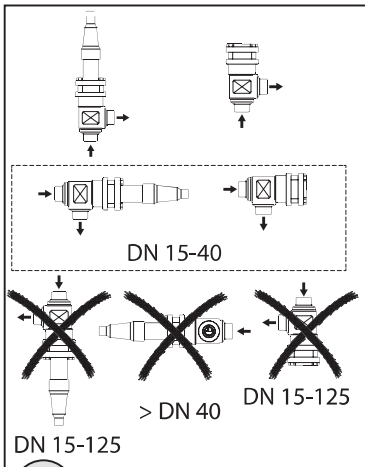
Installation guide

Check & stop valve / Check valves

SCA-X / CHV-X 15-125

UK CA 089 0879

148R9550



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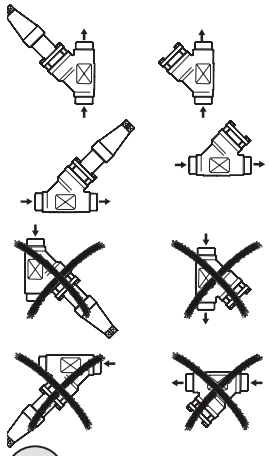

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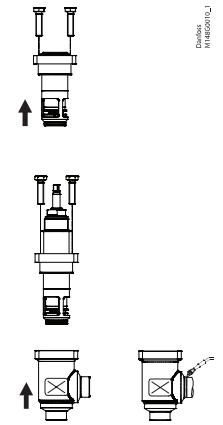

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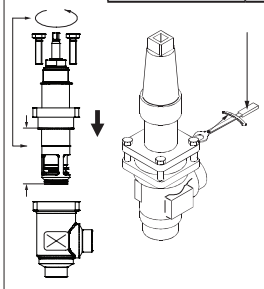
Valve size	Nm	LB-feet
DN 15, 20	21	15
DN 25, 32, 40, 50	44	32



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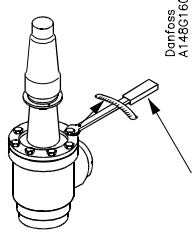
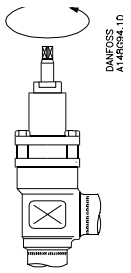


Valve size	Nm	Lb-feet
DN 65	74	54
DN 80	44	32
DN 100	75	53
DN 125	183	135

3a



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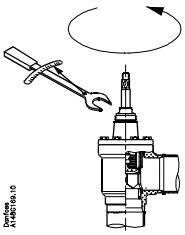

Valve size	Nm	LB-feet
DN 15-20	50	37
DN 25-40	75	55
DN 50-65	95	70
DN 80-100	150	111
DN 125	250	184

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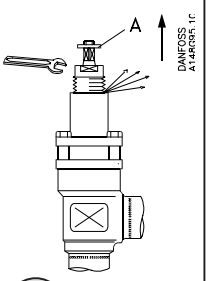

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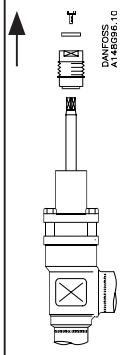

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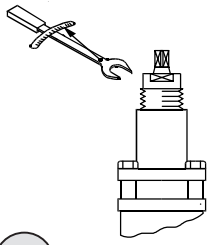
Valve size	Nm	LB-feet
DN 15, 20	50	37
DN 25, 32, 40	75	55



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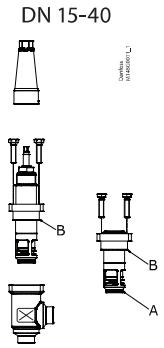

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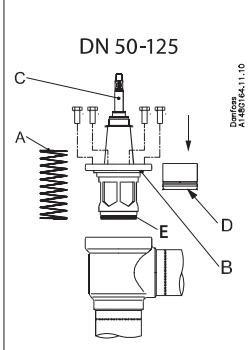

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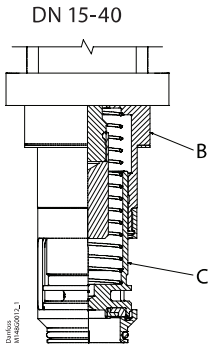

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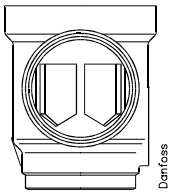

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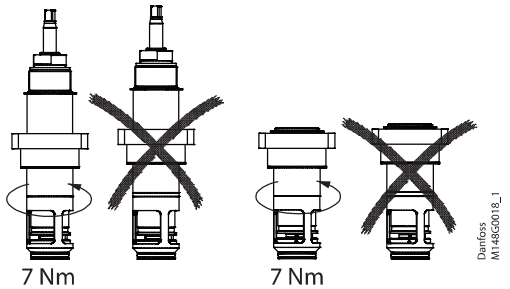
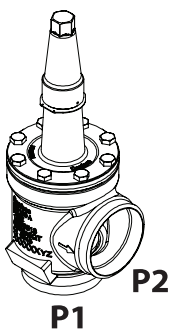


11

Valve size	Flow direction		
	P1 → P2	P2 → P1	P2 → P1
[DN]	Closing and opening pressure ΔP max. (P1-P2)	Closing pressure ΔP max. (P2-P1)	Opening pressure ΔP max. (P2-P1)
100	44 bar / 638 psi	52 bar / 754 psi	44 bar / 638 psi
125	33 bar / 478 psi	52 bar / 754 psi	33 bar / 478 psi



12

Імпортер:ТОВ зі ії "Данфосс ТОВ" 04080, Київ 80, п/с 168, Україна

Info for UK customers only: Danfoss Ltd., 22 Wycombe End, HP9 1NB, GB

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ENGLISH

Installation

Refrigerants

Applicable to HCFC, HFC, R717 (Ammonia), R744 (CO2), Propane, Butane, Iso-Butane and Ethane.
The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Temperature range

–60/+150°C (–76/+302°F)

Pressure range

52 bar (754 psi)
The valve must be installed with the spindle on top vertically upwards or in horizontal position (fig. 1). SCA-X valves should be opened by hand without the use of tools or other devices. The valve is designed to withstand a high internal pressure. However, the piping system should be designed to avoid liquid traps and reduce the risk of hydraulic pressure caused by thermal expansion. It must be ensured that the valve is protected from pressure transients like "liquid hammer" in the system.

Flow direction

Direct the flow towards the cone as indicated by an arrow on the valve housing (fig. 1).

Welding

The bonnet should be removed before welding (fig. 2) to prevent damage to the O-rings in the packing gland and the gasket
between the valve body and bonnet, as well as the teflon gasket in the valve seat. Be careful not to damage the teflon cone ring and make sure the complete bonnet is protected from dirt and water while removed.
Only materials and welding methods, compatible with the valve housing material, must be applied to the valve housing. The valve housing must be free from stresses(external loads) after installation.
The valve should be cleaned internally to remove welding debris on completion of welding and before the valve is reassembled. Avoid welding debris and dirt in the threads of the housing and the bonnet.
Do NOT remove or service the dark colored grease between the spindle thread and the bonnet. In case the grease has been contaminated with dirt, debris, particles or water the complete top part must be replaced.
Stop check valves must not be mounted in systems where the outlet side of the valve is open to atmosphere. The outlet side of the valve must always be connected to the system or properly capped off, for example with a welded-on end plate.

Assembly

Remove welding debris and any dirt from pipes and valve body before assembly. Check that the cone has been fully screwed back towards the bonnet before it is repositioned in the valve body (SCA DN 50-125) (fig. 3).

Important for the SCA-X valves:

Full capacity is only obtained when the spindle is screwed outward, "into bonnet", i.e. counterclockwise (fig. 3).

Tightening

Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 3).
Please note that the table (fig. 3) containing maximum torque must be adhered to and **never exceeded.**
Important for SCA-X/CHV-X 50 - 125 valves:
For optimal flow the insert must be installed as indicated in (fig. 10). Otherwise kv value will be below indicated in the technical brochure.

Colours and identification

The SCA-X and CHV-X valves are painted with a red primer in the factory. Precise identification of the valve is made via the
green coloured ID ring at the top of the bonnet, as well as by the stamping on the valve body. The external surface of the valve
housing must be protected against corrosion with a suitable protective coating after installation and assembly.
Protection of the name plate when repainting the valve is recommended.

Maintenance

Packing gland (only SCA-X types)

When performing service and maintenance,replace the complete packing gland only,which is available as a spare part. As a general rule, the packing gland must not be removed if there is internal pressure in the valve. However, if the following precautionary measures are taken, the packing gland can be removed with the valve still under pressure:

Backseating (fig. 4)

To backseat the valve, turn the spindle counterclockwise until the valve is fully open.

Pressure equalization (fig. 5)

In some cases, pressure forms behind the packing gland. Hence, a handwheel or a large washer (pos. A) should be fastened on top of the spindle while the pressure is equalized.
The pressure can be equalized by slowly screwing out the gland.

Removal of packing gland (fig. 6)

Packing gland can now be removed.

Dismantling the valve (fig. 8)

Do not remove the bonnet while the valve is still under pressure.

DN 15-40 (fig. 8a):

- Check that the gasket (pos. A+B) has not been damaged.
- If the gasket (pos. A) has been exposed to air or other refrigerants than listed in this installation guide for more than 6 months it must be replaced.
- Check that the spindle is free of scratches and impact marks.
- If the teflon cone ring has been damaged, the whole cone assembly must be replaced.

DN 50-125 (fig. 8b):

- Check that the spring (pos. A) is intact.
- Check that the gasket (pos. B+E) has not been damaged.
- If the gasket (pos. A) has been exposed to air or other refrigerants than listed in this installation guide for more than 6 months it must be replaced.
- Check that the spindle (pos. C) is free of scratches and impact marks.
- If the teflon cone ring (pos. D) has been damaged, the whole cone assembly must be replaced.

Replacement of the cone (fig. 9)

DN 15-40:
O-ring (pos. C) prevents the cone from falling out. Pull the cone clear of the bonnet. Ensure that the spring is not lost in the process.
Remove dirt, if any. Mount O-ring (pos. C) on cone. Mount spring and cone in bonnet.
Do NOT remove or service the dark colored grease between the spindle thread and the bonnet. In case the grease has been
contaminated with dirt, debris, particles or water the complete top part must be replaced.

Assembly

Remove dirt, if any, from pipes and housing before assembly. Important for the SCA-X valves: Full capacity is only obtained when
the spindle is screwed outward, "into the bonnet", i.e. counterclockwise (fig. 3).

Note:

For SCA-X and CHV-X sizes DN 15-40 it is important to ensure that the lower and upper part of the insert is tightly screwed together (fig. 11) and that this screw connection is kept tight during repositioning of the cone in the housing.
Use a torque wrench to tighten the bonnet (fig. 3).

Tightening

Tighten the bonnet with a torque wrench,to the values indicated in the table (fig. 3).
Tighten the packing gland with a torque wrench, to the values indicated in the table(fig. 7).
Use only original Danfoss parts, (including packing glands and gaskets) for replacement. Materials of new parts are certified for the relevant refrigerant.
In cases of doubt, please contact your local Danfoss sales office.

DEUTSCH

Installation

Refrigerants
Anwendbar für HFCKW, HFKW, R717
(Ammoniak), R744 (CO2), Propan, Butan, Iso-Butan und Ethan.
Das Ventil ist nur für die Verwendung in geschlossenen Kreisläufen empfohlen. Für weitere Informationen wenden Sie sich bitte an Danfoss.

Temperaturbereich
–60/+150 °C (–76/+302 °F)

Druckbereich
Die Ventile sind für einen max. Betriebsdruck von 52 bar (754 psi) ausgelegt.
Das Ventil muss mit der Spindel senkrecht nach oben (Abb. 1) eingebaut werden. SCA-X sollten per Hand ohne Werkzeug oder andere Vorrichtungen geöffnet werden. Das Ventil ist für einen hohen Innendruck ausgelegt. Das Verrohrungssystem sollte jedoch ausgelegt sein, um Flüssigkeitseinschlüsse zu verhindern und das Risiko von Hydraulikdruck, verursacht durch Wärmeausdehnung, zu senken. Es muss sichergestellt werden, dass das Ventil vor Druckstößen wie Flüssigkeitsschlag im System geschützt ist.

Durchflussrichtung
Die Ventile müssen mit dem Durchfluss zum Kegel in Pfeilrichtung auf dem Ventilgehäuse eingebaut werden (Abb. 1).

Schweißen
Das Oberteil sollte vor dem Schweißen entfernt werden (Abb. 2), um eine Beschädigung der O-Ringe in der Stopfbuchse und der Dichtung zwischen dem Ventilkörper und dem Oberteil sowie der Teflondichtung im Ventilsitz zu vermeiden. Achten Sie darauf, den Teflon-Konusring nicht zu beschädigen, und stellen Sie sicher, dass das komplette demontierte Oberteil vor Schmutz und Wasser geschützt ist.
Es dürfen nur Materialien und Schweißmethoden verwendet werden, die mit dem Material des Ventilgehäuses kompatibel sind. Das Ventilgehäuse muss nach der Installation frei von externen Spannungen sein (keine äußeren Lasten).
Reinigen Sie das Ventil vor dem erneuten Zusammenbauen von innen, um evtl. Schweißrückstände zu entfernen. Vermeiden Sie Schweißrückstände und Schmutz in den Gewindebohrungen des Gehäuses und des Oberteils.
Das dunkle Schmierfett zwischen dem Spindelgewinde und dem Ventiloberteil darf NICHT entfernt oder gewartet werden. Falls das Schmierfett durch Schmutz, Rückstände, Partikel oder Wasser verunreinigt wurde, muss das Oberteil vollständig ausgetauscht werden.
Absperrrückschlagventile dürfen nicht in Systemen verwendet werden, bei denen die Austrittsseite des Ventils nach außen hin offen ist. Die Austrittsseite des Ventils muss immer an die Anlage angeschlossen oder ordnungsgemäß abgedeckt sein, z. B. mit einer angeschweißten Endplatte.

Zusammenbau
Vor dem Zusammenbau Schweißüberreste und Schmutz von Rohrleitungen und
Ventilgehäuse entfernen. Sicherstellen, dass der Kegel vollständig zum Ventildeckel hin zurückgeschraubt wurde, bevor er im Ventilgehäuse eingesetzt wird (Abb. 3).

Wichtiger Hinweis für die SCA-X Ventile:
Volle Kapazität wird nur erreicht, wenn die Spindel nach außen „in den Deckel", d.h. gegen den Uhrzeigersinn geschraubt ist (Abb. 3).

Anziehen
Den Ventildeckel mit einem Drehmomentschlüssel anziehen (Werte bitter in der Tabelle 3 entnehmen.
Bitte beachten, dass es sich hierbei um Maximalwerte handelt, die niemals überschritten werden dürfen.
Farben und Kennzeichnungen
Die SCA-X und CHV-X Ventile werden ab Werk mit Rotoxid grundiert. Eindeutige Kennzeichnung des Ventils erfolgt über den Kennring oben am Ventildeckel sowie die Prägung am Ventilgehäuse. Die Außenfläche des Ventilgehäuses muss nach dem Einbau und dem Zusammenbau mit einer geeigneten Schutzbeschichtung gegen Korrosion geschützt werden.
Beim Neulackieren des Ventils wird der Schutz des Kennschilds empfohlen

Wartung

Stopfbuchse (nur SCA-X)
Bei Service- und Wartungsarbeiten ist immer nur die komplette Stopfbuchse auszutauschen, die als Ersatzteil erhältlich ist. Grundsätzlich darf die Stopfbuchse nur bei drucklosem Ventil entfernt werden. Unter Berücksichtigung folgender Vorsichtsmaßnahmen kann die Stopfbuchse jedoch auch von einem unter Druck stehenden Ventil entfernt werden:

Rücksitzdichtung (Abb. 4)
Zur Aktivierung der Rücksitzdichtung des Ventils, die Spindel gegen den Uhrzeigersinn drehen bis das Ventil völlig offen ist.

Druckausgleich (Abb. 5)
Unter Umständen entsteht Druck hinter der Stopfbuchse. Daher sollte, während der Druck ausgeglichen wird, am Spindelkopf ein Handrad oder Ähnliches befestigt sein.
Der Druck lässt sich dann durch langsames Herausdrehen der Stopfbuchse ausgleichen.

Ausbau der Stopfbuchse (Abb. 6)
Die Kappe und Stopfbuchse können jetzt entfernt werden.

Zerlegen des Ventils (Abb. 8)
Den Ventildeckel nicht entfernen, während das Ventil noch unter Druck steht.

DN 15 – 40 (Abb. 8a)
- Sicherstellen, dass der O-Ring (Pos. A+B) nicht beschädigt wurde.
-Wenn die Dichtung (Pos. A) länger als sechs Monate der Luft oder Kältemitteln, die nicht in dieser Installationsanleitung aufgelistet sind, ausgesetzt war, muss sie ausgetauscht werden.
- Sicherstellen, dass die Spindel (Pos. C) frei von Kratzern und Stoßspuren ist.
- Ist der Teflonring am Kegel beschädigt, ist die gesamte Kegeleinheit auszutauschen.

DN 50 – 125 (Abb. 8b)
- Sicherstellen, dass die Feder (Pos. A) intakt ist.
- Sicherstellen, dass der O-Ring (Pos. B+E) nicht beschädigt wurde.
-Wenn die Dichtung (Pos. A) länger als sechs Monate der Luft oder Kältemitteln, die nicht in dieser Installationsanleitung aufgelistet sind, ausgesetzt war, muss sie ausgetauscht werden.
- Sicherstellen, dass die Spindel (Pos. C) frei von Kratzern und Stoßspuren ist.
- Ist der Teflonring am Kegel (Pos. D) beschädigt, ist die gesamte Kegeleinheit auszutauschen.

Ersatz des Kegel (Abb. 9)
DN 15-40:
O-Ring (Pos. C) verhindert das Herausfallen des Kegels. Ziehen Sie den Kegel von der Ventiloberteil ab. Stellen Sie sicher, dass die Feder dabei nicht verloren geht. Entfernen Sie eventuell vorhandenen Schmutz. O-Ring (Pos. C) auf Kegel montieren. Feder und Kegel in Ventiloberteil montieren.
Das dunkle Schmierfett zwischen dem Spindelgewinde und dem Ventiloberteil darf NICHT entfernt oder gewartet werden. Falls das Schmierfett durch Schmutz, Rückstände, Partikel oder Wasser verunreinigt wurde, muss das Oberteil vollständig ausgetauscht werden.

Zusammenbau
Schmutz, falls vorhanden, vor dem Zusammenbau von Rohrleitungen und Gehäuse entfernen. Wichtiger Hinweis für die SCA-X Ventile: Volle Kapazität wird nur erreicht, wenn die Spindel nach außen„in den Deckel", d. h. gegen den Uhrzeigersinn geschraubt ist (Abb. 3).

Hinweis
Für SCA-X und CVH-X 15-40 ist es wichtig sicherzustellen, dass das Oberteil fest mit dem Unterteil verschraubt ist (Abb. 11) und das diese Schraubverbindung beim Wiedereinsetzen des Konus in das Gehäuse fest verschraubt bleiben.
Den Ventildeckel mit einem Drehmomentschlüssel anziehen (Abb. 3).

Festspannen
Den Ventildeckel mit einem Drehmomentschlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 3). Die Stopfbuchse mit einem Drehmomentschlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 7).
Zum Austausch nur Originalteile von Danfoss, einschließlich Stopfbuchsen, O-Ringe und Dichtungen, benutzen. Die Werkstoffe von Neuteilen sind für das betreffende Kältemittel zertifiziert.
Im Zweifelsfall bitte mit Danfoss Kontakt aufnehmen.

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FRANÇAIS

Installation

Fluides frigorigènes
Applicable aux fluides frigorigènes HCFC, HFC, R717 (ammoniac), R744 (CO2), propane, butane, isobutane et éthane.
Cette vanne est préconisée uniquement pour les circuits fermés. Pour plus d'informations, contactez Danfoss.

Plage de températures
-60/+150 °C
Plage de pressions
*52 bar
Installez la vanne de sorte que la tige se trouve en position verticale ou horizontale (fig. 1). Les vannes SCA-X doivent être ouvertes manuellement sans recourir à des outils ou d'autres matériels. Ces vannes sont conçues pour résister à une pression interne élevée. Toutefois, il convient de concevoir le circuit de façon à éviter les pièges à liquide et réduire les risques de formation d'une pression hydraulique sous l'effet de la dilatation thermique. Veillez à ce que la vanne soit protégée des variations de pression au sein du circuit comme les « coups de bélier ».

Sens du débit
Dirigez le débit en direction du cône comme indiqué par la flèche sur le corps de la vanne (fig. 1).

Soudure
La partie interne doit être retirée avant le soudage (fig. 2) afin de ne pas endommager les joints toriques du presse étoupe, et le joint entre le corps de vanne et la partie supérieure, ainsi que le joint en téflon du siège de la vanne. Veiller à ne pas endommager la bague en téflon du cône. Vérifier que la partie interne une fois retirée est à l'abri de la saleté et de l'eau.
Seuls des matériaux et des méthodes de soudage compatibles avec le matériau du corps de la vanne, peuvent être soudés et appliqués au corps de la vanne. Aucune contrainte (charges externes) ne doit être exercée sur le boîtier de la vanne après l'installation.
L'intérieur de la vanne doit être nettoyé pour éliminer les débris de soudage une fois le soudage effectué et avant le montage de la vanne. Éviter que des débris de soudage et des salissures ne pénètrent dans les filetages du boîtier et le capuchon.
Ne PAS enlever ou nettoyer l'excédent de graisse foncée entre le filetage de la tige et la partie interne. En cas de contamination de la graisse par de la saleté, des débris, des particules ou de l'eau, la partie supérieure doit être entièrement remplacée.
Les clapets anti-retour ne doivent en aucun cas être montés dans des systèmes où la sortie de la vanne est exposée à l'air. Le côté sortie de la vanne doit toujours être raccordé au système ou correctement couvert, par exemple à l'aide d'un embout soudé.

Montage
Retirez les résidus de soudure et les impuretés des conduites et du corps de vanne avant de procéder au montage. Vérifiez que le cône a été entièrement revissé à l'arrière ducapuchon avant de le replacer dans le corps de la vanne (SCA DN 50-125) (fig. 3).

Informations importantes concernant les vannes SCA-X :
La pleine capacité est obtenue uniquement lorsque la tige est vissée vers l'extérieur « dans le capuchon », c'est-à-dire dans le sens inverse des aiguilles d'une montre (fig. 3).

Serrage
Serrez le capuchon à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 3).
Veuillez noter que la valeur de couple maximale contenue dans le tableau (fig. 3) doit être respectée et ne doit en aucun cas être dépassée.
Informations importantes concernant les vannes SCA-X/CHV-X 50 - 125 :
Pour un débit optimal, l'insert doit être installé comme indiqué sur la fig. 10. Dans le cas contraire, la valeur kv sera indiquée plus bas dans la brochure technique.

Couleurs et identification
Les vannes SCA-X et CHV-X sont recouvertes en usine d'une couche de couleur primaire rouge. La vanne peut être précisément identifiée à l'aide de la bague d'identification de couleur verte, située au sommet du capuchon, ainsi que par un estampillage sur le corps de la vanne.
La surface extérieure du corps de la vanne doit être protégée de la corrosion à l'aide d'un revêtement adéquat appliqué après l'installation et le montage.
Il est recommandé de protéger la plaque signalétique lors de l'application de la peinture sur la vanne.

Maintenance

Presse-étoupe (uniquement pour les types SCA-X)
Lors des opérations de service et de maintenance, remplacez uniquement le presse-étoupe complet, disponible en pièce détachée. En règle générale, le presse-étoupe ne doit pas être retiré lorsque la vanne est sous pression. Toutefois, si les mesures de précaution suivantes sont prises, il est possible de remplacer le presse-étoupe pendant que la vanne est sous pression :

Contre-siège (fig. 4)
Pour ouvrir la vanne, effectuez une rotation de la tige dans le sens inverse des aiguilles d'une montre jusqu'à ouverture complète de la vanne.

Égalisation de la pression (fig. 5)
Dans certains cas, une pression se forme derrière le presse-étoupe. C'est pourquoi un volant de manœuvre ou un dispositif similaire (pos. A) doit être fixé au sommet de la tige pendant l'égalisation de la pression. La pression peut être égalisée en dévissant progressivement le presse-étoupe.

Dépose du presse-étoupe (fig. 6)
Le presse-étoupe peut maintenant être retiré.

Démontage de la vanne (fig. 8)
Ne jamais retirer le capuchon si la vanne est encore sous pression.

DN 15-40 (fig. 8a) :
-Vérifiez que le joint d'étanchéité (pos. A+B) n'a pas été endommagé.
-Si le joint d'étanchéité (pos. A) est resté à l'air libre ou s'il a été exposé à d'autres fluides frigorigènes que ceux mentionnés dans ce guide d'installation pendant plus de 6 mois, il doit être remplacé.
-Vérifiez que la tige est exempte de rayures et de traces d'impacts.
-Si la bague du cône en téflon a été endommagée, remplacez le cône entier.
DN 50-125 (fig. 8b) :
-Vérifiez que le ressort (pos. A) est intact.
-Vérifiez que le joint d'étanchéité (pos. B+E) n'a pas été endommagé.
-Si le joint d'étanchéité (pos. A) est resté à l'air libre ou s'il a été exposé à d'autres fluides frigorigènes que ceux mentionnés dans ce guide d'installation pendant plus de 6 mois, il doit être remplacé.
-Vérifiez que la tige (pos. C) est exempte de rayures et de marques d'impacts.
-Si la bague du cône en téflon (pos. D) a été endommagée, le cône entier doit être remplacé.

Remplacement du cône (fig. 9)
DN 15-40
Le joint torique (pos. C) évite au cône de tomber. Dégagez le cône du capuchon. Veillez à ne pas perdre le ressort au cours du processus. Éliminez les impuretés si besoin. Montez le joint torique (pos. C) sur le cône. Montez le ressort et le cône dans le capot.
Ne PAS enlever ou nettoyer l'excédent de graisse foncée entre le filetage de la tige et la partie interne. En cas de contamination de la graisse par de la saleté, des débris, des particules ou de l'eau, la partie supérieure doit être entièrement remplacée.

Montage
Avant le montage, retirez si besoin les impuretés des tuyauteries et du corps. Information importante concernant les vannes SCA-X : la pleine capacité est uniquement obtenue lorsque la tige est vissée vers l'extérieur « dans le capuchon », c'est-à-dire dans le sens inverse des aiguilles d'une montre (fig. 3).

Remarque :
dans le cas des vannes SCA-X et CHV-X, tailles DN 15-40, il est important de vous assurer que les parties inférieure et supérieure de l'insert sont correctement vissées ensemble (fig. 11) et que leur raccord est fermement maintenu lors du repositionnement du cône dans le corps.
Utilisez une clé dynamométrique pour serrer le capuchon (fig. 3).

Serrage
Serrez le capuchon à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 3). Serrez le presse-étoupe à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 7).
N'utilisez que des composants Danfoss d'origine, en particulier pour tout remplacement du presse-étoupe ou des joints d'étanchéité. Les matériaux des nouveaux composants sont homologués pour le fluide frigorigène utilisé.
En cas de doute, veuillez prendre contact avec Danfoss.

ESPAÑOL

Instalación

Refrigerantes
Aptas para HCFC, HFC, R-717 (amoníaco),
R-744 (CO_2), propano, butano, isobutano y etano.
Se recomienda limitar el uso de estas válvulas a circuitos cerrados. Si desea obten er más información, póngase en contacto con Danfoss.

Rango de temperatura
De –60 a +150 °C (de –76 a +302 °F).
Rango de presión
52 bar (754 psi).
La válvula debe instalarse de forma que el eje quede en posición vertical y orientado hacia arriba o en posición horizontal (consulte la fig. 1). Las válvulas SCA-X deben abrirse manualmente, sin hacer uso de herramientas u otros dispositivos. Son válvulas diseñadas para soportar una presión interna elevada. Sin embargo, el sistema de tuberías debe diseñarse de tal forma que se eviten las acumulaciones de líquido y se reduzca el riesgo asociado a la presión hidráulica generada por la expansión térmica. Debe garantizarse que la válvula se encuentre protegida frente a los fenómenos transitorios asociados a la presión que puedan producirse en el sistema (por ejemplo, el fenómeno conocido como "golpe de ariete").

Dirección del caudal
El caudal debe dirigirse hacia el cono, de acuerdo con lo indicado por la flecha de la carcasa de la válvula (consulte la fig. 1).

Soldadura
La parte superior de la válvula debe desmontarse antes de realizar la soldadura (fig. 2) con el fin de evitar que se produzcan daños en las juntas tóricas del prensaestopas y en la junta situada entre el cuerpo y la parte superior de la válvula, así como en la junta de teflón del asiento de la válvula. Tenga cuidado de no dañar el anillo cónico de teflón y asegúrese de proteger toda la parte superior de la válvula de la suciedad y el agua al extraerla.
Los materiales y métodos de soldadura aplicados al cuerpo de la válvula deberán ser compatibles con el material de este. El cuerpo de la válvula no debe someterse a tensiones (cargas externas) tras su instalación.
Al finalizar la soldadura y antes de volver a montar la válvula, deberá limpiarse el interior de esta para eliminar los restos de soldadura. No deben quedar restos de materiales de soldadura ni suciedad en las roscas del cuerpo y la parte superior de la válvula.
NO elimine ni sustituya la grasa de color oscuro que se encuentra entre el eje roscado y la parte superior de la válvula. Si la grasa se contamina con suciedad, residuos, partículas o agua, deberá sustituirse toda la parte superior.
No deberán montarse válvulas de cierre y retención en sistemas en los que el lado de salida de la válvula quede abierto a la atmósfera. El lado de salida de la válvula siempre debe conectarse al sistema o cerrarse debidamente (por ejemplo, soldando una placa).

Montaje
Elimine los restos de materiales de soldadura y la suciedad de las tuberías y el cuerpo de la válvula antes de proceder a su montaje. Compruebe que el cono se encuentre completamente enroscado en el casquillo antes de volver a acoplarlo al cuerpo de la válvula (SCA DN 50-125) (consulte la fig. 3).

Nota importante en relación con las válvulas SCA-X:
Únicamente puede alcanzarse la capacidad máxima si el eje se enrosca hacia fuera (esto es, hacia el casquillo), es decir, en sentido antihorario (consulte la fig. 3).
Apriete
Apriete el casquillo empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 3). Tenga en cuenta que deben respetarse los valores de par de apriete máximos indicados en la tabla (consulte la fig. 3), sin superarlos en ningún caso.
Nota importante en relación con las válvulas SCA-X y CHV-X de tamaños DN 50-125:
Para conseguir un caudal óptimo, la pieza debe instalarse según se indica en la fig. 10. De lo contrario, el valor kv será inferior al indicado en el folleto técnico.
Colores e identificación
Las válvulas SCA-X y CHV-X reciben una imprimación de color rojo durante su fabricación. La identificación precisa de dichas válvulas se lleva a cabo por medio de un anillo característico de color verde situado en la parte superior del casquillo, así como de la estampación del cuerpo de las válvulas.
La superficie externa de la carcasa de las válvulas debe protegerse frente a la corrosión aplicando un recubrimiento protector adecuado tras su instalación y montaje. Se recomienda proteger la placa de características antes de pintar la válvula.

Mantenimiento

Prensaestopas (sólo para válvulas SCA-X)
Sólo es preciso sustituir el conjunto del prensaestopas como parte de las operaciones de servicio y mantenimiento; este elemento se encuentra disponible como pieza de repuesto. Como norma general, el prensaestopas no debe desmontarse si el interior de la válvula se encuentra presurizado. No obstante, si se adoptan las precauciones siguientes, el prensaestopas puede desmontarse aunque la válvula se encuentre presurizada:
Sellado interno (consulte la fig. 4)
Para sellar internamente la válvula, gire el eje en sentido antihorario hasta que la válvula quede completamente abierta.
Igualación de presión (consulte la fig. 5)
En algunos casos, puede producirse una acumulación de presión tras el prensaestopas. Debido a ello, debe acoplarse un volante o una arandela grande a la parte superior del eje (pos. A) mientras la presión se iguala. La presión puede igualarse desenroscando lentamente el prensaestopas.
Desmontaje del prensaestopas (consulte la fig. 6)
Una vez llevados a cabo los pasos anteriores, puede desmontarse el prensaestopas.
Desensamblaje de la válvula (consulte la fig. 8)
No desmonte el casquillo mientras la válvula se encuentre presurizada.

DN 15-40 (consulte la fig. 8a):
-Compruebe que la junta (pos. A+B) no presente daños.
-Si la junta (pos. A) ha estado expuesta al aire o a refrigerantes no indicados en esta guía de instalación durante más de seis meses, deberá sustituirla.
-Compruebe que el eje no presente arañazos ni marcas de golpes por impacto.
-Si el anillo de teflón del cono ha sufrido daños, deberá sustituir el conjunto del cono.
DN 50-125 (consulte la fig. 8b):
-Compruebe que el muelle (pos. A) esté intacto.
-Compruebe que la junta (pos. B+E) no presente daños.
-Si la junta (pos. A) ha estado expuesta al aire o a refrigerantes no indicados en esta guía de instalación durante más de seis meses, deberá sustituirla.
-Compruebe que el eje (pos. C) no presente arañazos ni marcas de golpes por impacto.
-Si el anillo de teflón del cono (pos. D) ha sufrido daños, deberá sustituir el conjunto del cono.

Sustitución del cono (consulte la fig. 9)
DN 15-40:
La junta tórica (pos. C) impide que el cono pueda desprenderse. Tire del cono hasta separarlo del casquillo. Compruebe que el muelle no se ha separado durante el proceso. Limpie la suciedad que pueda existir. Monte la junta tórica (pos. C) en el cono. Monte el muelle y el cono en el casquillo.
NO elimine ni sustituya la grasa de color oscuro que se encuentra entre el eje roscado y la parte superior de la válvula. Si la grasa se contamina con suciedad, residuos, partículas o agua, deberá sustituirse toda la parte superior.

Montaje
Antes de proceder a realizar el montaje, limpie la suciedad que pueda existir en las tuberías y la carcasa. Nota importante en relación con las válvulas SCA-X: Únicamente puede alcanzarse la capacidad máxima si el eje se enrosca hacia fuera (esto es, hacia el casquillo), es decir, en sentido antihorario (consulte la fig. 3).

Nota:
Para válvulas SCA-X y CHV-X de tamaños DN 15-40, es importante garantizar que las partes inferior y superior del módulo queden bien sujetas al enroscarlas (consulte la fig. 11) y que la conexión roscada se mantenga apretada al volver a instalar el cono en la carcasa. Emplee una llave dinamométrica para apretar el casquillo (consulte la fig. 3).

Apriete
Apriete el casquillo empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 3).
Apriete el prensaestopas empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 7).
Use únicamente piezas de repuesto originales fabricadas por Danfoss (incluidos los prensaestopas y las juntas). Los materiales con los que se fabrican las piezas de repuesto poseen las homologaciones pertinentes para el refrigerante correspondiente. En caso de duda, póngase en contacto con su distribuidor local de Danfoss.

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ITALIANO

Installazione

Refrigeranti
Applicabile a HCFC, HFC, R717 (ammoniaca),
R744 (CO_2), propano, butano, isobutano ed etano.
La valvola è raccomandata solo per l'utilizzo in circuiti chiusi. Per ulteriori informazioni, contattare Danfoss.

Campo temperatura
–60/+150°C (–76/+302°F)
Campo di pressione
52 bar (754 psi)
La valvola deve essere installata con lo stelo sulla parte superiore, rivolto verticalmente verso l'alto o in posizione orizzontale (fig. 1). Le valvole SCA-X devono essere aperte manualmente senza l'ausilio di attrezzi o altri dispositivi. La valvola è progettata per tollerare pressioni interne estremamente elevate. Tuttavia, il sistema di tubazioni deve essere progettato per prevenire trappole di liquido e ridurre il rischio di una pressione idraulica causata dall'espansione termica. È necessario assicurarsi che la valvola sia protetta da transitori di pressione come i "colpi d'ariete".

Direzione del flusso
Dirigere il flusso verso il cono, come indicato dalla freccia sull'involucro della valvola (fig. 1).

Saldatura
Il coperchio deve essere rimosso prima della saldatura (fig. 2) per prevenire danni agli o-ring nel premistoppa, alla guarnizione fra il corpo valvola e il coperchio e alla guarnizione in teflon nella sede della valvola. Fare attenzione a non danneggiare l'anello in teflon del cono e assicurarsi che il coperchio sia protetto per intero da sporcizia e acqua in fase di rimozione. Solo materiali e metodi di saldatura compatibili con il materiale dell'involucro della valvola devono essere applicati all'involucro della valvola. L'involucro della valvola deve essere esente da sollecitazioni (carichi esterni) dopo l'installazione.
La valvola deve essere pulita internamente per rimuovere i detriti della saldatura al completamento dell'operazione e prima che la valvola sia rimontata. Evitare che detriti di saldatura e sporcizia si depositino nelle filettature dell'involucro e del coperchio.
NON rimuovere né intervenire sul grasso scuro tra la filettatura dell'asta e il coperchio. Nel caso in cui il grasso sia stato contaminato da sporco, detriti, particelle o acqua, è necessario sostituire interamente la parte superiore. Valvole di intercettazione/ritegno non devono essere montate in impianti in cui il lato uscita della valvola sia esposto all'atmosfera. Il lato uscita della valvola deve sempre essere collegato all'impianto o correttamente bloccato, ad esempio saldando una piastra terminale.

Montaggio
Rimuovere i residui di saldatura e lo sporco dai tubi e dal corpo valvola prima del montaggio. Verificare che il cono sia stato completamente avvitato in direzione del coperchio prima chevenga riposizionato nel corpo valvola (SCA DN 50-125) (fig. 3).

Importante per le valvole SCA-X:
È possibile ottenere una capacità piena solo quando lo stelo è avvitato verso l'esterno, "nel coperchio", vale a dire in senso antiorario (fig. 3).
Serraggio
Serrare il coperchio con una chiave dinamometrica, ai valori indicati nella tabella (fig. 3).
Notare che è sempre necessario rispettare le coppie massime riportate nella tabella (fig. 3); le coppie massime non devono essere mai superate.
Importante per le valvole SCA-X/CHV-X 50 - 125:
Per una portata ottimale, l'inserto deve essere installato come indicato nella (fig. 10). In caso contrario, il valore kv sarà inferiore a quello indicato nella brochure tecnica.

Colori e identificazione
Le valvole SCA-X e CHV-X sono pitturate con un primer rosso in fabbrica. Un'identificazione precisa della valvola è possibile tramite l'anello di identificazione verde sulla parte superiore del coperchio e tramite la stampigliatura sul corpo valvola. La superficie esterna dell'involucro della valvola deve essere protetta contro la corrosione con un rivestimento protettivo idoneo dopo l'installazione e il montaggio.
Si raccomanda di proteggere la targhetta quando la valvola viene riverniciata.

Manutenzione

Guarnizione premistoppa (solo tipi SCA-X)
Quando si effettua un intervento di riparazione o manutenzione, sostituire solo il premistoppa completo, disponibile come ricambio. Come regola generale, il premistoppa non deve essere rimosso se pressione interna è presente nella valvola. Tuttavia, se ci si attiene alle seguenti misure cautelative, il premistoppa può essere rimosso con la valvola ancora sotto pressione:

Controtenuta (fig. 4)
Per posizionare la valvola in controtenuta, ruotare lo stelo in senso antiorario fino a quando la valvola non è completamente aperta.

Equalizzazione della pressione (fig. 5)
In alcuni casi, la pressione si accumula dietro al premistoppa. Un volantino o una rondella grande (pos. A) devono essere quindi fissati sulla parte superiore dello stelo mentre la pressione è equalizzata. La pressione può essere equalizzata avvitando lentamente il premistoppa.

Rimozione del premistoppa (fig. 6)
Il premistoppa può essere ora rimosso.

Smontaggio della valvola (fig. 8)
Non rimuovere il coperchio mentre la valvola è ancora sotto pressione.

DN 15-40 (fig. 8a):
-Controllare che la guarnizione (pos. A+B) non abbia subito danni.
-Se la guarnizione (pos. A) è stata esposta all'aria o ad altri refrigeranti non menzionati nella presente guida all'installazione per più di sei mesi, dovrà essere sostituita.
- Verificare che lo stelo sia privo di graffi e segni di impatto.
- Se l'anello in teflon del cono è danneggiato, l'intero gruppo cono deve essere sostituito.

DN 50-125 (fig. 8b):
-Controllare che la molla (pos. A) sia intatta.
-Controllare che la guarnizione (pos. B+E) non abbia subito danni.
-Se la guarnizione (pos. A) è stata esposta all'aria o ad altri refrigeranti non menzionati nella presente guida all'installazione per più di sei mesi, dovrà essere sostituita.
-Verificare che lo stelo (pos. C) sia privo di graffi e segni di impatto.
-Se l'anello in teflon del cono (pos. D) è danneggiato, l'intero gruppo cono deve essere sostituito.

Sostituzione del cono (fig. 9)
DN 15-40:
L'o-ring (pos. C) previene la fuoriuscita del cono. Rimuovere il cono dal coperchio. Assicurarsi di non perdere la molla nel processo. Rimuovere eventuale sporco. Montare l'o-ring (pos. C) sul cono. Montare la molla e il cono nel coperchio.
NON rimuovere né intervenire sul grasso scuro tra la filettatura dell'asta e il coperchio. Nel caso in cui il grasso sia stato contaminato da sporco, detriti, particelle o acqua, è necessario sostituire interamente la parte superiore.

Montaggio
Rimuovere eventuale sporco dai tubi e l'involucro prima dell'assemblaggio. Importante per le valvole SCA-X: è possibile ottenere una capacità piena solo quando lo stelo è avvitato verso l'esterno, "nel coperchio", vale a dire in senso antiorario (fig. 3).

Nota:
Per le SCA-X e CHV-X DN 15-40, è importante assicurarsi che la parte inferiore e la parte superiore dell'inserto siano ben avvitate insieme (fig. 11) e che questa connessione a vite sia mantenuta ben serrata durante il riposizionamento del cono nell'alloggiamento.
Utilizzare una chiave dinamometrica per serrare il coperchio (fig. 3).

Serraggio
Serrare il coperchio con una chiave dinamometrica, ai valori indicati nella tabella (fig. 3). Serrare il premistoppa con una chiave dinamometrica, ai valori indicati nella tabella (fig. 7).
Utilizzare solo parti originali Danfoss (compresi i premistoppa e le guarnizioni) per la sostituzione. I materiali dei nuovi componenti sono certificati per il refrigerante pertinente.
In caso di dubbio, contattare l'ufficio vendite Danfoss di zona.

中文

安装

制冷剂
适用于 HCFC, HFC, R717（氨），
R 744 (CO_2)、丙烷、丁烷、异丁烷和乙烷。
阀门应使用在密封的制冷系统内部。如需了解更多详细信息请联系丹佛斯。

温度范围
–60/ +150 °C (–76/ +302 °F)
压力范围
52 bar (754 psi)
安装该阀门时，需保证阀杆垂直向上。(图1)。SCA-X截止止回阀应手动打开，不能使用工具或其他装置。该阀门的设计可以承受很高的内部压力。尽管如此，管路系统的设计也必须避免有存液弯，防止系统出现因热膨胀导致的过高压力而损坏管路。管路的设计应考虑对系统中出现瞬时“液击”现象的有效防护。

流向
流向应按照阀体上箭头所示的阀芯指向(图1)。

焊接
在焊接之前应取下阀盖（图2），防止对填料中的O型环、阀体和阀盖之间的垫圈、阀座内的特氟龙垫圈造成损坏。 请小心，不要损坏特氟龙阀芯，并确保阀盖在取下时不会沾到土和水。

只有与阀体材料相兼容的材料和焊接方法才能用于阀体。 安装完毕后，阀体不得再承受任何压力（外部负载）。

焊接结束后且在重新装配阀门之前，应当清洗阀门内部，以清除焊接碎屑。 避免外壳和阀盖的螺纹上沉积焊接碎屑和灰尘。

切勿清除或维护主轴螺纹和阀盖之间的深色油脂。因为油脂已被土、杂质、颗粒物或水污染，必须更换整个顶部零件。

截止止回阀不得安装在阀门出口侧与大气联通。 阀门出口侧必须始终与系统连接或密封，例如与焊接端板。

装配
装配前请清理管道和阀体内的焊渣及污垢。检查阀锥在阀体内被重新放置之前，已经完全向阀帽方向拧回（SCA DN 50-125）（图3）。

SCA-X截止止回阀注意事项
只有当轴向外拧“入阀帽”，即逆时针方向时才能获得完全容量(图3)。
紧固
使用扭矩扳手拧紧螺帽，并达到表中规定的数值(图3)。
请务必遵守包含最大扭矩的该表（图3），切勿超过。
SCA-X/CHV-X 50 - 125 阀门注意事项：
如需获得最佳流量，插入物必须按照图10中的指示安装。否则，kv值将低于技术手册中的规定。

彩色和标识
SCA-X和CHV-X值在工厂中使用红色底漆粉刷。通过阀帽顶部的绿色ID环和阀体上的冲压可以准确识别阀门。安装和组装后，阀套外表面必须使用适当的保护层防止腐蚀。重新粉刷阀门时建议对铭牌进行保护。

维护

填料 (仅用于SCA-X型)
在进行维修和维护时，仅更换作为备件的整套填料。一般来说，如果阀门内有内部压力，不得移除填料。但是，如果采取以下预防措施，可以在阀门处于压力下时移除填料。
后座 (图4)
如需将阀门置于后座，应逆时针转动轴，直至阀门完全打开。

压力均衡 (图5)
在某些情况下，压力在填料后形成。因此，应在压力处于平衡时拧紧轴顶部的手轮或大垫圈（位置A）。可以通过慢慢拧出填料使压力均衡。
移除填料(图6)
现在可以清除填料。

拆卸阀门 (图8)
请勿在阀门处于压力下时移除阀帽。
DN 15-40 (图8a) :
- 检查垫圈（位置A+B）是否受到损坏。
- 如果垫片（位置 A）暴露在空气或安装指导列表之外的制冷剂中超过 6 个月，则必须更换。
- 检查轴是否有刮伤或撞击痕迹。
- 如果特氟龙阀板受损，必须更换整个阀芯。

DN 50-125 (图8b) :
- 检查弹簧（位置A）是否完好无损。
- 检查垫圈（位置B+E）是否受到损坏。
- 如果垫片（位置 A）暴露在空气或安装指导列表之外的制冷剂中超过 6 个月，则必须更换。
- 检查轴（位置C）是否有刮伤或撞击痕迹。
- 如果特氟龙阀板(位置D)受损，必须更换整个阀芯。

更换芯 (图9)
DN 15-40:
O形圈（位置C）可以防止阀锥脱落。将阀锥拉离阀帽。确保弹簧在此过程中没有丢失。清除所有灰尘。在阀芯上安装O形圈(位置C)。在阀帽内安装弹簧和阀芯。

切勿清除或维护主轴螺纹和阀盖之间的深色油脂。 因为油脂已被土、杂质、颗粒物或水污染，必须更换整个顶部零件。

装配
在组装之前应清除管道和阀套上的所有异物。SCA-X阀门注意事项：只有当轴向外拧“入阀帽”，即逆时针方向时才能获得完全容量(图3)。

注意:

对于 SCA-X 和 CHV-X 尺寸的 DN 15-40，必须确保插入体上下部分已紧紧旋在了一起（图 11），且在壳体内重新放置阀锥的过程中，螺丝接口必须一直保持紧密。
使用扭矩扳手拧紧阀帽（图3）。
紧固
使用矩扳手拧紧螺帽，并达到表中规定的数值(图3)。
使用扭矩扳手拧紧填料，并达到表中规定的数值（图7）。

请使用丹佛斯原厂的配件，(包括填料和垫圈）进行更换。更换备件请提前确认新备件的材质是否适用于相关制冷剂。
如有任何疑问，请联系当地丹佛斯当地办事处。

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POLSKI

Montaż

Czynniki chłodnicze
Dotyczy czynników chłodniczych: HCFC, HFC, R717 (amoniak), R744 (CO2), propan, butan, izobutan i etan.
Zawory te zaleca się stosować wyłącznie w obiegach zamkniętych. Aby uzyskać więcej informacji, skontaktuj się z firmą Danfoss.

Zakres temperatur
-60/+150°C (-76/+302°F)
Zakres ciśnień
Maksymalne ciśnienie robocze zaworów wynosi 52 bary (754 psi)

Zawór należy zamontować z wrzecionem skierowanym pionowo do góry lub w pozycji poziomej (rys. 1). Zawory należy otwierać ręcznie. Zawór został tak zaprojektowany, aby wytrzymał wysokie ciśnienie. Jednak układ rurociągów powinien być zaprojektowany tak, aby uniknąć zamkniętych przestrzeni cieczowych i zmniejszyć ryzyko wzrostu ciśnienia spowodowanego rozszerzalnością cieplną. Należy zapewnić ochronę zaworu przed impulsami wysokiego ciśnienia wynikającymi z uderzeń hydraulicznych.

Kierunek przepływu
Przepływ powinien być skierowany pod grzybek, zgodnie ze strzałką umieszczoną na korpusie zaworu (rys. 1).

Spawanie
Przed spawaniem należy zdjąć pokrywę zaworu (rys. 2), aby zapobiec uszkodzeniu pierścieni O-ring w dławnicy oraz uszczelki pomiędzy korpusem a pokrywą zaworu, a także teflonowej uszczelki w gnieździe zaworu. Należy zachować ostrożność, aby nie uszkodzić teflonowego pierścienia stożkowego, oraz upewnić się, czy podczas demontażu pokrywa jest chroniona przed kurzem i wodą.
Do spawania obudowy zaworu można stosować tylko materiały i metody spawania zgodne z materiałem obudowy. Po montażu korpus zaworu nie może podlegać zewnętrznym naprężeniom mechanicznym.
Po zakończeniu spawania, przed złożeniem zaworu należy oczyścić wnętrze zaworu z zanieczyszczeń mechanicznych po spawaniu. Nie pozostawiać okruchów spawalniczych ani zanieczyszczeń w gwintach korpusu i pokrywy.
NIE należy usuwać ani poprawiać warstwy ciemnego smaru między gwintem wrzeciona a pokrywą. Jeśli smar został zanieczyszczony kurzem, okruchami spawalniczymi, innymi cząstkami lub wodą, należy wymienić całą górną część.
Zawory zwrotne nie mogą być montowane w instalacjach, w których wylotowa część zaworu jest otwarta do atmosfery. Wylot zaworu musi być zawsze podłączony do instalacji lub należycie zaślepiony np. przyspawaną dennicą.

Montaż elementów zaworu
Przed złożeniem zaworu należy usunąć z rur oraz z korpusu zaworu okruchy spawalnicze i wszelkie zanieczyszczenia. Przed zmianą pozycji grzybka w korpusie zaworu upewnić się, że grzybek jest całkowicie wykręcony w stronę pokrywy (SCA DN 50-125) (rys. 3).

Ważne dla zaworów SCA-X:
Pełną wydajność zaworu można uzyskać wyłącznie wtedy, gdy wrzeciono jest wykręcony do oporu w lewo (rys. 3).

Dokręcenie
Dokręcić pokrywę kluczem dynamometrycznym momentem podanym w tabeli (rys. 3).
Należy pamiętać, aby zawsze przestrzegać i nigdy nie przekraczać maksymalnego momentu podanego w tabeli (rys. 3).

Ważne dla zaworów SCA-X/CHV-X 50 - 125:
Dla zapewnienia optymalnego przepływu wkładka musi zostać zamontowana tak, jak pokazano na rysunku (rys. 10). W przeciwnym razie wartość kv będzie poniżej wartości podanej w dokumentacji technicznej.

Kolory i identyfikacja
Zawory SCA-X i CHV-X malowane są w fabryce czerwonym podkładem gruntującym. Zawór można precyzyjnie zidentyfikować za pomocą zielonego pierścienia identyfikacyjnego znajdującego się na górze pokrywy oraz cechy numeratora na korpusie zaworu. Po złożeniu i zamontowaniu zaworu, należy go zabezpieczyć przed korozją pokrywając odpowiednią powłoką ochronną.
Przed przystąpieniem do malowania zaworu zaleca się zabezpieczenie pierścienia identyfikacyjnego.

Serwis

Dławnica (wyłącznie typ SCA-X)
Podczas wykonywania prac serwisowych należy wymieniać wyłącznie kompletną dławnicę, która jest dostępna jako część zapasowa. Generalnie nie wolno wymontowywać dławnicy, gdy wewnątrz zaworu panuje ciśnienie. Jeśli jednak zostaną podjęte poniższe środki zapobiegawcze, będzie można wymontować dławnicę z zaworu, wewnątrz którego panuje ciśnienie.

Pełne wykręcenie wrzeciona (rys. 4)
Aby całkowicie wykręcic wrzeciono należy obracać go w lewo, do oporu.
Wyrównywanie ciśnień (rys. 5)
W niektórych przypadkach pod dławnicą tworzy się ciśnienie. W związku z tym przed wyrównywaniem ciśnień należy przymocować pokrętło lub dużą podkładkę (poz. A) na górnym końcu wrzeciona. Ciśnienia można wyrównać poprzez powolne wykręcanie dławnicy.
Demontaż dławnicy (rys. 6)
Można teraz zdemontować dławnicę.
Demontaż elementów zaworu (rys. 8)
Nie demontowywać pokrywy, gdy wewnątrz zaworu nadal panuje ciśnienie.
DN 15-40 (rys. 8a):
-Sprawdzić, czy uszczelka (poz. A+B) nie jest uszkodzona.
-Jeżeli uszczelka (poz. A) została wystawiona na działania powietrza lub czynników chłodniczych innych niż wymienione w tej instrukcji instalacji przez czas dłuższy niż 6 miesięcy, wówczas należy ją wymienić.
-Sprawdzić, czy na wrzecionie nie ma zarysowań i/lub śladów uderzeń.
-Jeśli uszkodzony jest teflonowy pierścień grzybka, należy wymienić cały zespół grzybka.

DN 50-125 (rys. 8b):
-Sprawdzić, czy sprężyna (poz. A) jest nienaruszona.
-Sprawdzić, czy uszczelka (poz. B+E) nie jest uszkodzona.
-Jeżeli uszczelka (poz. A) została wystawiona na działania powietrza lub czynników chłodniczych innych niż wymienione w tej instrukcji instalacji przez czas dłuższy niż 6 miesięcy, wówczas należy ją wymienić.
-Sprawdzić, czy na trzpieniu (poz. C) nie ma zarysowań i/lub śladów uderzeń.
-Jeśli uszkodzony jest teflonowy pierścień grzybka (poz. D), należy wymienić cały zespół grzybka.

Wymiana grzybka (rys. 9)
DN 15-40:
Pierścień O-ring (poz. C) zapobiega wypadnięciu grzybka. Wyjąć grzybek z pokrywy zaworu. Należy upewnić się, że podczas tego procesu nie zagubiono sprężyny. Usunąć zabrudzenia, jeżeli występują. Zamontować pierścień O-ring (poz. C) na grzybku. Zamontować w pokrywie zaworu sprężynę i grzybek.

NIE należy usuwać ani poprawiać warstwy ciemnego smaru między gwintem wrzeciona a pokrywą. Jeśli smar został zanieczyszczony kurzem, okruchami spawalniczymi, innymi cząstkami lub wodą, należy wymienić całą górną część.

Montaż elementów zaworu
Usunąć z rur i korpusu zabrudzenia, jeżeli występują. Ważne dla zaworów SCA-X: Pełną wydajność można uzyskać wyłącznie wtedy, gdy wrzeciono jest wykręcone do oporu, w lewo (rys. 3).

Uwaga:
W odniesieniu do zaworów SCA-X i CHV-X o średnicach DN 15–40 upewnić się, że dolna i górna część wkładki jest dokładnie dokręcona (rys. 11) oraz że połączenie to będzie stabilne również podczas zmiany pozycji grzybka w obudowie.
Dokręcić kluczem dynamometrycznym pokrywę zaworu (rys. 3).

Dokręcenie
Dokręcić pokrywę kluczem dynamometrycznym momentem podanym w tabeli (rys. 3). Dokręcić dławnicę kluczem dynamometrycznym momentem podanym w tabelce (rys. 7).
Używać wyłącznie oryginalnych części zamiennych Danfoss, łącznie z dławnicami i uszczelkami. Materiały, z których wykonano nowe części, mają atest dopuszczający je do użytku z określonym czynnikiem chłodniczym.
W razie wątpliwości należy skontaktować się z lokalnym biurem sprzedaży firmy Danfoss.

РУССКИЙ

Монтаж

Хладагенты

Пригодны для систем на ГХФУ, ГФУ, R717 (аммиак), R744 (CO2), пропане, бутане, изобутане и этане.
Рекомендуется использовать клапан только в закрытых контурах. Для получения более подробной информации обращайтесь в компанию Danfoss.

Диапазон температуры

–60/+150°C (–76/+302°F)

Диапазон давления

52 бар (754 фунта/кв. дюйм)

При установке клапана шток должен быть направлен вертикально вверх или горизонтально (рис. 1). Клапаны SCA-X должны открываться вручную без использования инструментов или иных устройств. Клапаны выдерживают высокое внутреннее давление. Однако система трубопроводов должна быть спроектирована так, чтобы избежать появления участков, в которых может задерживаться жидкий хладагент, и таким образом понизить риск возникновения гидроудара при его тепловом расширении. Необходимо обеспечить защиту клапана от изменений давления в системе, таких как «гидравлический удар».

Направление потока

Направление потока указано стрелкой на корпусе клапана (рис. 1).

Сварка

Перед проведением сварочных работ необходимо разобрать клапан (рис. 2), чтобы избежать повреждения уплотнительных колец и тефлоновых уплотнений функционального модуля. Осторожно, не повредите тефлоновое уплотнение. Необходимо обеспечить защиту снятого функционального модуля от грязи и воды.
Использоваться должны только материалы и методы сварки, совместимые с материалом корпуса клапана. После монтажа корпус клапана не должен подвергаться внешним воздействиям или нагрузкам.
После завершения сварочных работ, перед сборкой клапана необходимо очистить внутреннюю поверхность клапана от грязи и окалины. Не допускайте попадания окалины и грязи в резьбовые соединения между корпусом и функциональным модулем (крышкой).
Не удаляйте и не наносите дополнительную смазку на резьбовое соединение шпинделя. Если смазка загрязнена мусором, частицами или водой, необходимо заменить функциональный модуль.
Запрещается устанавливать обратно-запорные клапаны в системах, где выходной штуцер сообщен с атмосферой. Выходной штуцер должен быть всегда соединен с системой, либо должен быть заглушен при помощи приваренной пластины или специальной заглушки.

Сборка

Перед сборкой удалите с труб и корпуса клапана окалину и грязь любого типа. Перед переустановкой конуса в корпусе клапана убедитесь в том, что он был полностью вывинчен в сторону крышки (SCA DN 50-125) (fig. 3)..

Важная информация по клапанам SCA-X:

Полная пропускная способность достигается только, когда шпиндель полностью выкручен и находится в положении обратной посадки (рис. 3).

Затяжка

Затяните болты штока при помощи динамометрического ключа до значений, указанных в таблице (рис. 3).
Примите к сведению, что необходимо соблюдать значения максимального момента затяжки, указанные в таблице (рис. 3), и строжайше запрещено превышать данные значения.

Важная информация по клапанам SCA-X/CHV-X 50 - 125:

Для оптимального потока вкладыш должен устанавливаться, как показано на рисунке (рис. 10). В противном случае значение KV будет ниже указанного в техническом описании.

Покраска и маркировка

На заводе клапаны SCA-X и CHV-X окрашиваются грунтовкой красного цвета. Точная идентификация клапана производится благодаря опознавательному кольцу зеленого цвета в верхней части штока, а также благодаря оттиску на корпусе клапана. Необходимо обеспечить защиту наружной поверхности корпуса клапана от коррозии при помощи соответствующего защитного покрытия после монтажа и сборки.
При повторной окраске клапана рекомендуется обеспечить защиту заводской таблички.

Техническое обслуживание

Сальник (только модели SCA-X)

При выполнении технического обслуживания заменяйте только комплектный сальник. Запасные сальники имеются в наличии. Как правило, запрещается удалять сальник, если в клапане имеется внутреннее давление. Однако, если принимаются следующие меры предосторожности, сальник можно удалять из клапана, все еще находится под давлением:

Посадка на верхнее седло (рис. 4)

Для посадки клапана на верхнее седло поверните шпиндель против часовой стрелки до полного открытия клапана.

Выравнивание давления (рис. 5)

В некоторых случаях за сальником образуется давление. Поэтому в процессе выравнивания давления наверху шпинделя закрепляется маховик или большая шайба (поз. A). Давление можно выровнять, медленно откручивая сальник.

Демонтаж сальника (рис. 6)

Теперь можно снять сальник.

Разборка клапана (рис. 8)

Запрещается демонтировать шток, пока клапан находится под давлением.

DN 15-40 (рис. 8a):

-Убедитесь, что прокладка (поз. A+B) не повреждена.
-Прокладку (поз. A), которая подвергается воздействию воздуха или хладоносителей, не рекомендованных в этом руководстве по установке, в течение более 6 месяцев, необходимо заменить.
-Убедитесь, что на шпинделе отсутствуют царапины или следы ударов.
-Если тефлоновое конусное кольцо было повреждено, замене подлежит весь конус в сборе.

DN 50-125 (рис. 8b):

-Убедитесь, что пружина (поз. A) не повреждена.
-Убедитесь, что прокладка (поз. B+E) не повреждена.
-Прокладку (поз. A), которая подвергается воздействию воздуха или хладоносителей, не рекомендованных в этом руководстве по установке, в течение более 6 месяцев, необходимо заменить.
-Убедитесь, что шпиндель (поз. C) не имеет царапин и следов удара.
-Если тефлоновое конусное кольцо (поз. D) было повреждено, замене подлежит весь конус в сборе.

Замена конуса (рис. 9)

DN 15-40:
Уплотнительное кольцо (поз. C) предотвращает выпадение конуса. Вытащите конус из штока. Убедитесь, что не потеряли пружину в процессе. Удалите грязь, если таковая имеется. Установите на конус уплотнительное кольцо (поз. C). Установите в шток пружину и конус.
Не удаляйте и не наносите дополнительную смазку на резьбовое соединение шпинделя. Если смазка загрязнена мусором, частицами или водой, необходимо заменить функциональный модуль.

Сборка

Перед сборкой с труб и корпуса удалите грязь, если таковая имеется. Важная информация по клапанам SCA-X: полная пропускная способность достигается только тогда, когда шпиндель выкручен, и находится в положении обратной посадки т. е. против часовой стрелки (рис. 3).

Примечание:

Для клапанов SCA-X и CHV-X с размерами DN 15-40 важно сделать так, чтобы нижняя и верхняя части вставки были плотно свинчены (рис. 11) и чтобы данное винтовое соседние оставалось плотным в ходе переустановки конуса в корпусе.
Используйте динамометрический ключ для затяжки болтов (рис. 3).

Затяжка

Затяните болты при помощи динамометрического ключа до значений, указанных в таблице (рис. 3). Затяните сальник при помощи динамометрического ключа до значений, указанных в таблице (рис. 7).
Для замены используйте только подлинные детали производства компании Danfoss (включая сальники и прокладки). Материалы новых деталей сертифицированы для соответствующего хладагента.

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PORTUGUÊS

Instalação

Refrigerantes
Aplicável a HCFC, HFC, R717 (Amônia),
R744 (CO_2), Propano, Butano, Isobutano e Etano.
A válvula é recomendada apenas para uso em circuitos fechados. Para mais informações, entre em contato com a Danfoss.

Faixa de temperatura
–60/+150°C (–76/+302°F)
Faixa de temperatura
52 bar (754 psi)

A válvula deve ser instalada com o eixo na parte superior para cima verticalmente ou em posição horizontal (fig. 1). As válvulas SCA-X devem ser abertas manualmente sem o uso de ferramentas ou outros dispositivos. A válvula é projetada para suportar uma alta pressão interna. Entretanto, o sistema de tubulação deve ser desenhado para evitar golpes de líquido e reduzir o risco de pressão hidráulica causada pela expansão térmica. Deve-se assegurar que a válvula fique protegida contra transientes de pressão, como os "golpes de aríete" no sistema.

Direção do fluxo
Direcione o fluxo em direção ao cone conforme indicado por uma seta no corpo da válvula (fig. 1).

Soldagem
A tampa deve ser removida antes da soldagem (fig. 2) para evitar danos nos o-rings e vedações nas gaxetas e entre o corpo da válvula e a tampa, bem como o anel de teflon no assento de válvula. Tenha cuidado para não danificar o anel do cone de teflon e certifique-se de que a tampa toda esteja protegida contra sujeira e água enquanto estiver removida. Somente materiais e métodos de soldagem compatíveis com o material do corpo da válvula podem ser aplicados a ela. O corpo da válvula deve estar livre de tensão (cargas externas) após a instalação.
A válvula deve ser limpa internamente para remover resíduos da soldagem no final do processo e antes que a válvula seja montada novamente. Evite resíduos de solda e sujeira nas roscas do corpo e da tampa.
NÃO remova ou realize a manutenção do lubrificante/graxa de cor escura entre a rosca do eixo e a tampa. Caso o lubrificante/graxa tenha sido contaminado por sujeira, resíduos ou água, toda a tampa superior deve ser substituída.
As válvulas de retenção e bloqueio não podem ser montadas em sistemas em que o lado de saída da válvula está aberto à atmosfera. O lado de saída da válvula deve estar sempre conectado ao sistema ou tampado adequadamente, por exemplo, com um cap ou uma tampa soldados na extremidade.

Montagem
Remova os detritos da soldagem e qualquer sujeira dos canos e do corpo da válvula antes da montagem. Verifique se o cone foi totalmente parafusado para trás em direção à tampa antes que ele seja recolocado no corpo da válvula (fig. 3).

Importante para as válvulas SCA-X:
A capacidade total somente é obtida quando o eixo é parafusado para fora, "para dentro da tampa", isto é, no sentido anti-horário (fig. 3).

Torque
Aperte a tampa com uma chave de torque nos valores indicados na tabela (fig. 3).
Observe que a tabela (fig. 3) contendo o toque máximo deve ser respeitada e nunca excedida.
Importante para as válvulas SCA-X/CHV-X 50 - 125:
Para um fluxo ideal, o inserto deve ser instalado conforme o indicado em (fig. 10). De outra maneira, o valor kv ficará abaixo do indicado na brochura técnica.

Cores e identificação
As válvulas SCA-X e CHV-X são pintadas com uma base de tinta vermelha na fábrica. A identificação precisa da válvula é feita pelo anel de identificação verde na parte superior da tampa, assim como através da estampagem no corpo da válvula. A superfície externa do corpo da válvula deve ser protegida contra corrosão com uma camada protetora adequada após a instalação e a montagem.
Recomenda-se proteger a placa do nome quando a válvula é pintada novamente.

Manutenção

Prensa cabo (somente tipos SCA-X)
Ao executar serviços e manutenção, substitua somente a prensa cabo completa, que está disponível como peça de reposição. Como regra geral, a prensa cabo não deve ser removida se houver pressão interna na válvula. Entretanto, se as seguintes medidas de precaução forem tomadas, a prensa cabo pode ser removida com a válvula ainda sob pressão:

Contravedação (fig. 4)
Para executar a contravedação na válvula, gire o eixo no sentido anti-horário até que a válvula fique completamente aberta.

Equalização da pressão (fig. 5)
Em alguns casos, forma-se pressão atrás da prensa cabo. Neste caso, um volante ou uma arruela maior (pos. A) deve ser fixado na parte superior enquanto a pressão é atualizada. Pode-se equalizar a pressão aparafusando lentamente a prensa para fora.

Remoção da prensa cabo (fig. 6)
Agora a prensa cabo pode ser removido.

Desmontando a válvula (fig. 8).
Não remova a tampa enquanto a válvula ainda estiver sob pressão.

DN 15-40 (fig. 8a):
-Verifique se a junta (pos. A+B) não foi danificada.
-Se a junta de vedação (posição A) tiver sido exposta ao ar ou a mais refrigerantesdoqueoslistadosnesteguiadeinstalaçãopormaisdeeladeverá ser substituída em 6 meses.
-Verifique se o eixo está isento de arranhões e marcas de impacto.
-Se o anel de teflon do cone foi danificado, todo o conjunto do cone deve ser substituído.

DN 50-125 (fig. 8b):
-Verifique se a mola (pos. A) está intacta.
-Verifique se a junta (pos. B+E) não foi danificada.
-Se a junta de vedação (posição A) tiver sido exposta ao ar ou a mais refrigerantesdoqueoslistadosnesteguiadeinstalaçãopormaisdeeladeverá ser substituída em 6 meses.
-Verifique se o eixo (pos. C) está isento de arranhões e marcas de impacto.
-Se o anel de teflon do cone (pos. D) foi danificado, todo o conjunto do cone deve ser substituído.

Substituição do cone (fig. 9)
DN 15-40:
O anel de vedação (pos. C) impede que o cone caia. Puxe o cone para liberá-lo do castelo. Assegure-se de que a mola não se perdeu no processo. Remova a sujeira se houver. Monte o anel de vedação (pos. C) no cone. Monte a mola e o cone na tampa.
NÃO remova ou realize a manutenção do lubrificante/graxa de cor escura entre a rosca do eixo e a tampa. Caso o lubrificante/graxa tenha sido contaminado por sujeira, resíduos ou água, toda a tampa superior deve ser substituída.

Montagem
Remova a sujeira, se houver, dos canos e do alojamento antes da montagem. Importante para as válvulas SCA-X: A capacidade total somente é obtida quando o eixo é parafusado para fora, "dentro da tampa", isto é, no sentido anti-horário (fig. 3).

Observação:
Para os tamanhos DN 15-40 das válvulas SCA-X e CHV-X é importante garantir que a parte superior e inferior do inserto esteja firmemente aparafusada (fig. 11) e que esta conexão do parafuso seja mantida durante o reposicionamento do cone no corpo.
Use uma ferramenta de torque para apertar a tampa (fig. 3).

Aperto
Aperte a tampa com uma chave de torque nos valores indicados na tabela (fig. 3). Aperte a prensa cabo com uma chave de torque nos valores indicados na tabela (fig. 7).

Utilize somente peças originais Danfoss (incluindo prensa cabo e juntas) para as substituições. Os materiais das peças novas são certificados para o refrigerante relevante.
Em caso de dúvidas, entre em contato com a Danfoss.

Danfoss A/S
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MAYEKAWA Europe MYCOM

OIL FILTER FOR OF50
TYPE NYLON

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

Tel. +32 (0)2 757 90 75
www.mayekawa.eu
info@mayekawa.eu

Filter for refrigerator lubricants

Introduction

This filter is an innovative product designed with all plastic components , not only to be compatible for various kinds of refrigerants including ammonia but to be easy to dispose.

All adhesive eliminated not to cause medium migration which paper medium filter sometimes occurs , so that filter is able to keep higher and consistent cleanliness level of lubricants which coarse metal filters and paper filters are sometimes difficult to achieve.

■ Benefit

- Reliable , consistent filter performance , enable to keep lubricants cleaner.
- Crushable or Incinerable by structuring all components without metal.
- Reinforced bonding of components by applying heat bonding , all adhesives eliminated to avoid decomposition with Ammonia
- Compatible to various refrigerant and lubricant , thus enable to consolidate filter stocks.

■ Specification

Compatibility	Refrigerant — Ammonia. R22 Lubricant — PAG、PAO、Mineral Oil Alkyl Benzene. *Compatibility indicated by Division of Unit product.
Max Temperature	70℃
Rating	β_{20}>150
Differential pressure for filter change	0.1MPa
Collapse pressure of core	0.6MPa
Initial differential pressure	0.02MPa (65mm²/s @220L/min)
Material	Filter medium , core and end cap : Plastic

■ Element pressure drop factor

Multiply actual flow rate times factor to determine pressure drop with fluid at 32mm²/s, 0.9S.G. Correct for other viscosities by multiplying new viscosity in Viscosity/32 * new S.G/0.9.

Element △P factor

Length	NT grade
12	0,045

MAYEKAWA Europe MYCOM

STOP VALVES

TYPE SVA-S / -L

Mayekawa Europe NV/SA
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ENGINEERING TOMORROW

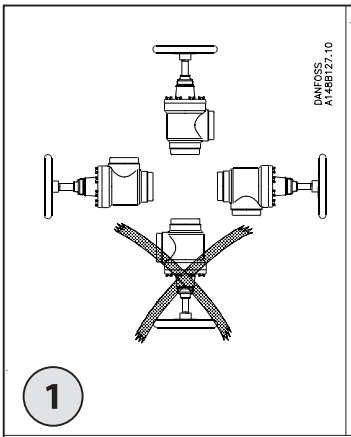
Installation guide

Shut-off Valves

SVA-S/L 15-200

UK CA 089 0879

148R9549



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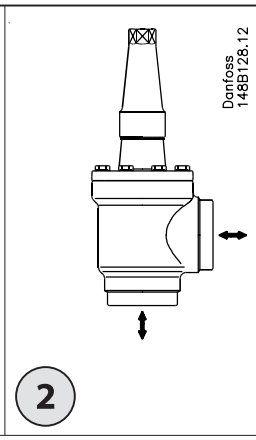

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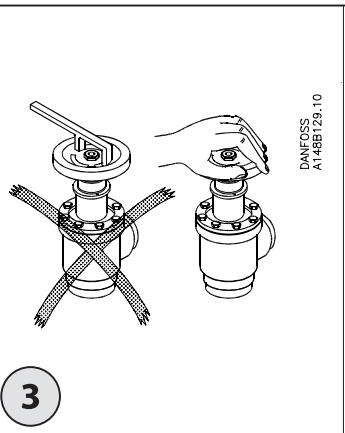

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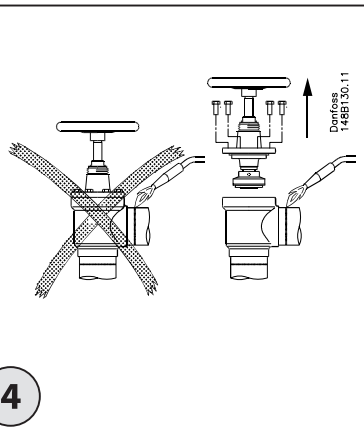

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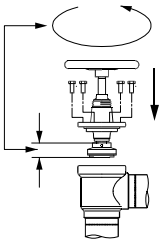

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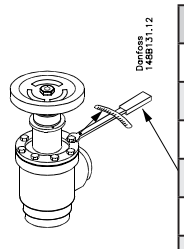
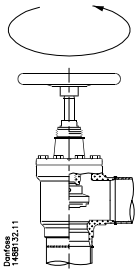


5b

Valve size	Max. Nm	Max. LB-feet
DN 15-20	21	15
DN 25-32-40-50	44	32
DN 65	74	54
DN 80	44	32
DN 100	75	53
DN 125-150	183	135
DN 200	370	272

Maintenance



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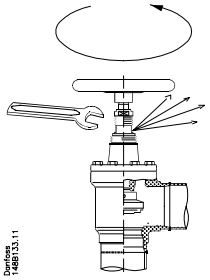

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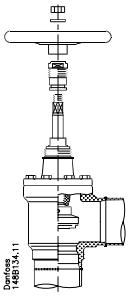

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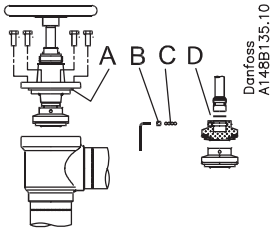

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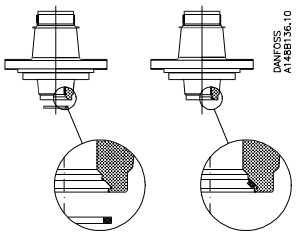
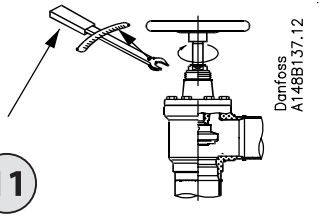


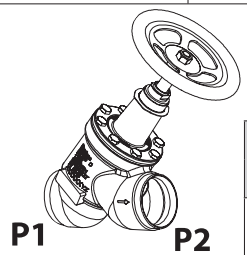
10

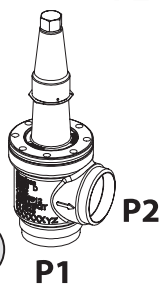
DN 80-200

Valve size	Max. Nm	Max. LB-feet
DN 15-20	50	37
DN 25-40	75	55
DN 50-65	95	70
DN 80-100	150	111
DN 125-150	250	184
DN 200	80	59



11





12

Valve size	Flow direction		
	P1 → P2	P2 → P1	P2 → P1
[DN]	Closing and opening pressure ΔP max. (P1-P2)	Closing pressure ΔP max. (P2-P1)	Opening pressure ΔP max. (P2-P1)
100	44 bar / 638 psi	52 bar / 754 psi	44 bar / 638 psi
125	33 bar / 478 psi	52 bar / 754 psi	33 bar / 478 psi
150	21 bar / 304 psi	52 bar / 754 psi	21 bar / 304 psi
200	14 bar / 203 psi	52 bar / 754 psi	14 bar / 203 psi

148R9549

Імпортер:ТОВ з ii "Данфосс ТОВ" 04080, Київ 80, п/с 168, Україна

Info for UK customers only : Danfoss Ltd., 22 Wycombe End, HP9 1NB, GB

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ENGLISH

Refrigerants
Applicable to HCFC, HFC, R717 (Ammonia), R744 (CO2) and all flammable refrigerants.
The valve is only recommended for use in closed circuits. For further information please contact Danfoss.

Pressure and temperature range
SVA-S/L (DN 15-200) 52 bar (754 psi) at –60 °C to +150 °C (–76 °F to +302 °F),

Installation
The valve must be installed with the spindle vertically upwards or in horizontal position (fig.1). Valves should be opened by hand without the use of tools or other devices (fig. 3). The valve is designed to withstand a high internal pressure. However, the piping system should be designed to avoid liquid traps and reduce the risk of hydraulic pressure caused by thermal expansion. It must be ensured that the valve is protected from pressure transients like "liquid hammer" in
the system.

Attention!
SVA are shut-off valves and must always be either fully closed or fully open. Half open positions are not allowed.

Recommended flow direction
To achieve optimum flow conditions, the valve should be installed with the flow towards the valve cone as indicated by the arrow on the side of the valve body (fig. 2). Flow in the opposite direction is also acceptable (fig. 2), but slightly reduces the kv- / Cv value.

Welding
The bonnet should be removed before welding (fig. 4) to prevent damage to the sealing parts in the packing gland and between the valve body and bonnet, as well as the teflon gasket in the
valve seat.
Be careful not to damage the teflon cone ring and make sure the complete bonnet is protected from dirt and water while removed.
Removing the bonnet can be omitted provided that: The temperature in the area between the valve body and bonnet during welding does not exceed +150°C/+302°F. This temperature depends on the welding method as well as on any cooling of the valve body during the
welding itself. (Cooling can be ensured by, for example, wrapping a wet cloth around the valve body.) Make sure that no dirt, welding debris etc. get into the valve during the welding procedure.
Only materials and welding methods, compatible with the valve housing material, must be welded to the valve housing. The valve
housing must be free from stresses (external loads) after installation.
The valve should be cleaned internally to remove welding debris on completion of welding and before the valve is reassembled.
Avoid welding debris and dirt in the threads of the housing and the bonnet.
Do NOT remove or service the dark colored grease between the spindle thread and the bonnet. In case the grease has been
contaminated with dirt, debris, particles or water the complete top part must be replaced.
Stop valves must not be mounted in systems where the outlet side of the valve is open to atmosphere. The outlet side of the valve must
always be connected to the system or properly capped off, for example with a welded-on end plate.

Assembly
Remove welding debris and any dirt from pipes and valve body before assembly. Check that the cone has been fully screwed back towards the bonnet before it is replaced in the valve body (fig. 5a).

Tightening
Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 5b). Please note that the table (fig. 5b) containing maximum torque must be adhered to and **never exceeded.**

Colours and identification
The SVA valves are painted with a red oxide primer in the factory. Precise identification of the valve is made via the ID ring at the top of the bonnet, as well as by the stamping on the valve body. The external surface of the valve housing must be guarded against corrosion with a
suitable protective coating after installation and assembly.
Protection of the ID ring when repainting the valve is recommended.

Maintenance
Packing gland
When performing service and mainte-nance, replace the complete packing gland only, which is available as a spare part. As a general rule, the packing gland must not be removed if there is internal pressure in the valve. However, if the following precautionary measures are taken, the packing gland can be removed with the valve still under pressure:
Backseating (fig. 6)
To backseat the valve, turn the spindle counterclockwise until the valve is fully open.

Pressure equalization (fig. 7)
In some cases, pressure forms behind the packing gland. Hence a handwheel or similar should be fastened on top of the spindle while the pressure is equal-ized. The pressure can be equalized by slowly screwing out the gland.

Removal of packing gland (fig. 8)
Handwheel and packing gland can now be removed.

Dismantling the valve (fig. 9)
Do not remove the bonnet while the valve is still under pressure.
Check that the flat gasket (pos. A) has not been damaged.
Check that the spindle is free of scratches and impact marks.
If the teflon cone ring has been damaged, the whole cone assembly must be replaced.

Replacement of the cone (fig. 9)
Unscrew the cone screw (pos. B) with an Allen key.
SVA-S/L 15-40..... 2.0 mm A/F
SVA-S/L 50-65..... 2.5 mm A/F
SVA-S/L 80-100.....4 mm A/F
SVA-S/L 125-150 .....5 mm A/F
SVA-S/L 200.....6 mm A/F
(An Allen key is included in the Danfoss Industrial Refrigeration gasket set).
To remove the balls compress the disk spring (pos. D) and remove the balls (pos. C).
Number of balls in pos. C:
SVA-S/L 10-20.....10 pcs.
SVA-S/L 25-65.....14 pcs.
SVA-S/L 80-200 .....13 pcs.
The cone can then be removed. Place the new cone on the spindle and remember to place the disk spring (pos. D) between the spindle and the cone. Compress the disk spring and replace the balls (pos. C). Refit the cone screw in again using Loctite No. 648. to ensure that the screw is properly fastened.
Do NOT remove or service the dark colored grease between the spindle thread and the bonnet. In case the grease has been contaminated with dirt, debris, particles or water the complete top part must be replaced.

Replacement of backseat seal (fig. 10)
For sizes DN 80-200 only: The valve backseat is a special teflon ring. If this is damaged, it must be replaced. Screw the spindle out of the bonnet. Carefully remove the original backseat seal and mount a new one in the angled contact surface directly inside the opening in the bonnet. Avoid folding and damage to the teflon ring, or damage to the contact surface at the top of the valve during assembly.

Assembly
Remove any dirt from the body before the valve is assembled. Check that the cone has been screwed back towards the bonnet before it is replaced in the valve body (fig. 5a).

Tightening
Tighten the bonnet with a torque wrench, to the values indicated in the table (fig. 5b). Please note that the table (fig. 5b) containing
maximum torque must be adhered to and never
exceeded.
Tighten the packing gland with a torque wrench, to the values indicated in the table (fig. 11).

DN 100-200 only
Max permissible pressure difference for closing/ opening according to EN12284 which is a part
of EN378-1:
The table in fig. 12 states the maximum pressures at which the valves can be operated manually and tightness can be achieved. Use only original Danfoss parts, including packing glands, sealing parts and gaskets for replacement. Materials of new parts are certified for the relevant refrigerant. In cases of doubt, please contact Danfoss.
Danfoss accepts no responsibility for errors and omissions. Danfoss Industrial Refrigeration reserves the right to make changes to products and specifications without prior notice.

DEUTSCH

Installation

Kältemittel

Anwendbar für HFCKW, HFKW, R717 (Ammoniak), R744 (CO2) und alle brennbaren Kältemitteln.

Das Ventil wird nur für den Einsatz in geschlossenen Kreisläufen empfohlen.

Für weitere Informationen wenden Sie sich bitte an Danfoss.

Druck- und Temperaturbereich

SVA-S/L (DN 15-200) sind für einen max. Betriebsdruck von 52 bar (754 psi) und einem Temperaturbereich von -60° C bis +150° C (-76° F bis +302° F) ausgelegt.

Installation

Das Ventil ist mit der Spindel vertikal nach oben oder in waagerechter Position zu montieren (Abb. 1). Ventile sollten mit der Hand ohne Anwendung von Werkzeug oder anderen Hilfsmitteln geöffnet werden (Abb. 3). Das Ventil ist für sehr hohe Innendrücke dimensioniert. Jedoch ist bei der Auslegung des Rohrsystems darauf zu achten, dass Kältemitteleinschlüsse vermieden werden, und dass das Risiko von durch thermische Expansion verursachtem hydraulischem Druck herabgesetzt wird. Es ist sicherzustellen, dass das Ventil gegen Druckschwingungen in der Anlage, wie "Flüssigkeitsschläge", geschützt ist.

Achtung!

SVA sind Absperrventile und müssen immer entweder vollständig geschlossen oder vollständig geöffnet sein. Halboffene Stellungen sind nicht zugelassen.

Empfohlene Durchflussrichtung

Um optimale Strömungsverhältnisse zu gewährleisten, sollte das Ventil mit Durchflussrichtung zum Ventilkegel, wie mit dem Pfeil auf der Seite des Ventilgehäuses angegeben, montiert werden (Abb. 2). Durchfluss in entgegengesetzte Richtung ist auch gestattet (Abb. 2), vermindert den kv- / Cv -Wert jedoch etwas.

Anschweißenden

Das Oberteil sollte vor dem Schweißen entfernt werden (Abb. 4), um eine Beschädigung der Dichtungen und des Ventilsitzes zu vermeiden. Achten Sie darauf, den Teflon-Konusring nicht zu beschädigen, und stellen Sie sicher, dass das komplette demontierte Oberteil vor Schmutz und Wasser geschützt ist.

Auf das Entfernen des Oberteils kann unter folgenden Voraussetzungen verzichtet werden: Es muss sicher gestellt werden, dass die Temperatur im Bereich der Dichtungen während des Schweißens nicht auf mehr als 150 °C ansteigt. Diese Temperatur hängt von der Schweißmethode und von der Kühlung des Ventilkörpers während des Schweißvorgangs ab. (Die Kühlung kann beispielsweise sichergestellt werden, indem ein feuchtes Tuch um den Ventilkörper gewickelt wird.) Stellen Sie sicher, dass während des Schweißens kein Schmutz und keine Schweißrückstände usw. in das Ventil gelangen.

Es dürfen nur Materialien und Schweißmethoden verwendet werden, die mit dem Material des Ventilgehäuses kompatibel sind. Das Ventilgehäuse muss nach der Installation frei von externen Spannungen sein (keine äußeren Lasten).

Reinigen Sie das Ventil vor dem erneuten Zusammenbauen von innen, um evtl. Schweißrückstände zu entfernen. Vermeiden Sie Schweißrückstände und Schmutz in den Gewindebohrungen des Gehäuses und des Oberteils. Das dunkle Schmierfett zwischen dem Spindelgewinde und dem Ventiloberteil darf NICHT entfernt oder gewartet werden. Falls das Schmierfett durch Schmutz, Rückstände, Partikel oder Wasser verunreinigt wurde, muss das Oberteil vollständig ausgetauscht werden.

Absperrventile dürfen nicht in Systemen verwendet werden, bei denen die Austrittsseite des Ventils nach außen hin offen ist. Die Austrittsseite des Ventils muss immer an die Anlage angeschlossen oder ordnungsgemäß verschlossen werden, z. B. mit einer angeschweißten Endplatte.

Zusammenbau

Vor dem Zusammenbau sind alle Schweiß-rückstände und eventueller Schmutz von Rohren und Ventilgehäuse zu entfernen. Der Kegel muss völlig gegen den Ventildeckel geschraubt sein bevor der Einbau in das Ventilgehäuse erfolgt (Abb. 5a).

Festspannen

Den Ventildeckel mit einem Dreh-momentschlüssel festspannen, für dies-bezügliche Werte siehe Tabelle (Abb. 5b).

Farben und Kennzeichnung

Die SVA-Ventile werden in der Fabrik mit einem roten Oxid-Grundanstrich versehen. Eine genaue Kennzeichnung des Ventils erfolgt mittels ID-Ring oben am Ventildeckel und ist auch in das Ventilgehäuse eingeschlagen. Die Außenoberfläche des Ventilgehäuses ist mit einer passenden Schutzschicht nach Installation und Zusammenbau gegen Korrosion zu schützen.

Beim erneuten Anstreichen des Ventils ist der ID-Ring zum Schutz abzudecken.

Wartung

Stopfbuchse

Bei Service- und Wartungsarbeiten ist immer nur die komplette Stopfbuchse auszu-tauschen, welche Bestandteil des Reparatur- bzw. Wartungssatzes ist. Prinzipiell darf die Stopfbuchse nur bei drucklosem Ventil entfernt werden. Unter Berücksichtigung folgender Vorsichtsmaß-nahmen kann die Stopfbuchse jedoch auch von einem unter Druck stehenden Ventil entfernt werden:

Rücksitzdichtung (Abb. 6)

Zur Aktivierung der Rücksitzdichtung des Ventils die Spindel gegen den Uhrzeigersinn drehen, bis das Ventil völlig offen ist.

Druckausgleich (Abb. 7)

Unter Umständen bildet sich hinter der Stopfbuchse Druck. Deswegen sollte, während der Druck ausgeglichen wird, am Spindelkopf ein Handrad oder ähnliches befestigt sein. Der Druck lässt sich dann durch langsames Herausdrehen der Stopfbuchse ausgleichen.

Ausbau der Stopfbuchse (Abb. 8)

Handrad und Stopfbuchse können jetzt entfernt werden.

Ausbau des Ventils (Abb. 9)

Den Ventildeckel nicht entfernen, solange das Ventil unter Druck steht.

Kontrollieren, dass der O-Ring (Pos. A) nicht beschädigt ist.

Kontrollieren, dass die Spindel frei von Riefen und Schlagkerben ist.

Ist der Teflonring am Kegel beschädigt, ist die gesamte Kegeleinheit auszutauschen.

Austausch des Kegels (Abb. 9)

Die Kegelschraube (Pos. B) mit einem Sechskantstiftschlüssel lösen.

SVA-S/L 15-40 ..... 2.0 mm A/F
SVA-S/L 50-65 ..... 2.5 mm A/F
SVA-S/L 80-100 ..... 4 mm A/F
SVA-S/L 125-150 ..... 5 mm A/F
SVA-S/L 200 ..... 6 mm A/F

(Ein Sechskantstiftschlüssel ist im Wartungs-satz von Danfoss Industrial Refrigeration enthalten).

Zum Entfernen der Kugeln die Federscheibe (Pos. D) zusammendrücken. Die Kugeln (Pos. C) können nun entfernt werden.

Anzahl Kugeln in Pos. C:

SVA-S/L 10-20 ..... 10 Stück
SVA-S/L 25-65 ..... 14 Stück
SVA-S/L 80-200 ..... 13 Stück

Anschließend lässt sich der Kegel ausbauen. Den neuen Kegel auf der Spindel platzieren. Hierbei die Federscheibe (Pos. D) Spindel und Konus nicht vergessen anzubringen. Die Federscheibe zusammendrücken und die Kugeln wieder an-bringen (Pos C). Die Kegelschraube wieder montieren und mit Loctite No. 648 fest angespannt sichern. Das dunkle Schmierfett zwischen dem Spindelgewinde und dem Ventiloberteil darf NICHT entfernt oder gewartet werden. Falls das Schmierfett durch Schmutz, Rückstände, Partikel oder Wasser verunreinigt wurde, muss das Oberteil vollständig ausgetauscht werden.

Austausch der Rücksitzdichtung (Abb. 10)

Ein spezieller Teflonring bildet den Ventilrücksitz. Er ist, wenn beschädigt, auszutauschen. Die Spindel aus dem Ventildeckel herausschrauben. Die ursprüngliche Rücksitzdichtung vorsichtig ausbauen und eine neue direkt auf der schrägen Kontaktfläche im Inneren der Öffnung des Ventildeckels montieren. Beim Zusammenbau sind ein Falten und die Beschädigung des Teflonrings und der Kontaktoberfläche am Deckel des Ventils zu vermeiden.

Zusammenbau

Vor dem Zusammenbau das Gehäuse sorgfältig von Schmutz reinigen. Kontrollieren, dass der Kegel völlig gegen den Ventildeckel geschraubt ist, bevor der Einbau in das Ventilgehäuse erfolgt (Abb. 5a).

Festspannen

Den Ventildeckel mit einem Drehmoment-schlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 5b). Es ist zu beachten, dass es sich bei diesen Werten um Maximalwerte handelt, und niemals über-schritten werden dürfen. Die Stopfbuchse mit einem Drehmoment-schlüssel festspannen, für diesbezügliche Werte siehe Tabelle (Abb. 11).

Nur DN 100–200

Maximal zulässige Druckdifferenz für das Öffnen/Schließen gemäß EN12284, die Bestandteil der EN378-1 ist:

Die Tabelle in Abb. 12 gibt die Maximaldrücke an, bis zu denen die Ventile manuell betätigt werden können und ihre Dichtigkeit erreicht wird.Zum Austausch nur Originalteile von Danfoss, einschließlich Stopfbuchsen, O-Ringe und Dichtungen, verwenden. Die Werkstoffe von Neuteilen sind für das betreffende Kältemittel zertifiziert.

Im Zweifelsfall bitte mit Danfoss Kontakt aufnehmen.

Danfoss lehnt jede Verantwortung für Fehler und Auslassungen ab. Danfoss Industrial Refrigeration behält sich das Recht zu Produkt- und Spezifikationsänderungen ohne vorherige Ankündigung vor.

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FRANÇAIS

Installation

Fluides frigorigènes

Applicable aux fluides frigorigènes HCFC, HFC, R717 (ammoniac), R744 (CO2) et à tous les fluides frigorigènes inflammables.
L'utilisation de la vanne est uniquement conseillée dans les circuits fermés. Pour plus d'informations, contactez Danfoss.

Plage de pressions et de températures

SVA-S/L (DN 15-200) 52 bar (754 psi) de –60 °C à 150 °C/de –76 °F à 302 °F).

Installation

La vanne doit être installée tige à la verticale et tournée vers le haut, ou à l'horizontale (fig. 1). Les vannes doivent être ouvertes manuellement sans avoir recours à des outils ou d'autres matériels (fig. 3). La vanne est conçue pour résister à une pression interne élevée. Toutefois, il convient de concevoir le circuit de façon à éviter les pièges à liquide et réduire les risques de formation d'une pression hydraulique sous l'effet de la dilatation thermique. Veillez à ce que la vanne soit protégée des variations de pression au sein du circuit comme les « coups de bélier ».

Attention !

Les SVA sont des vannes d'arrêt et doivent toujours être complètement fermées ou ouvertes. La position semi-ouverte est interdite.

Sens de débit recommandé

Pour atteindre des conditions de débit optimales, la vanne doit être installée avec le débit dirigé vers le cône de la vanne, tel qu'indiqué par la flèche située sur le côté du corps de la vanne (fig. 2). Un débit de sens opposé est également admis (fig. 2), mais réduit légèrement la valeur kv- / Cv.

Soudage

La partie supérieure doit être retirée avant le soudage (fig. 4) afin de ne pas endommager les joints toriques du presse étoupe, et entre le corps de la vanne et le capuchon, ainsi que le joint d'étanchéité en téflon du siège de la vanne.
Veiller à ne pas endommager la bague en téflon du cône. Vérifier que la partie interne une fois retirée est à l'abri de la saleté et de l'eau.
Le capuchon peut seulement rester en place si, pendant le soudage, la température dans la zone comprise entre le corps de vanne et le capuchon n'excède pas +150 °C/+302 °F. Cette température est fonction de la méthode de soudage ainsi que du refroidissement du corps de vanne pendant le soudage. (Le refroidissement peut être effectué, par exemple, en enveloppant le corps de vanne dans un linge humide.) Veiller à ce qu'aucune salissure, aucun débris de soudage, etc. ne s'introduise dans la vanne pendant le soudage.
Veiller à utiliser des matériaux et des procédures de soudage compatibles avec le matériau du boîtier de la vanne pour effectuer des soudures sur ce dernier. Aucune contrainte (charges externes) ne doit être exercée sur le boîtier de la vanne après l'installation.
L'intérieur de la vanne doit être nettoyé pour éliminer les débris de soudage une fois le soudage effectué et avant le montage de la vanne. Éviter que des débris de soudage et des salissures ne pénètrent dans les filetages du boîtier et le capuchon.
Ne PAS enlever ou nettoyer l'excédent de graisse foncée entre le filetage de la tige et la partie interne. En cas de contamination de la graisse par de la saleté, des débris, des particules ou de l'eau, la partie supérieure doit être entièrement remplacée.
Les vannes d'arrêt ne doivent en aucun cas être montées dans des systèmes où la sortie de la vanne est exposée à l'air. Le côté sortie de la vanne doit toujours être raccordé au système ou correctement couvert, par exemple à l'aide d'un embout soudé.

Montage

Éliminez les résidus de soudage et les impuretés des conduites et du corps de vanne avant de procéder au montage. Vérifiez que le cône a été entièrement revissé à l'arrière du capuchon avant de le replacer dans le corps de la vanne (fig. 5a).

Serrage

Serrez le capuchon à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 5b).
Veuillez noter que la valeur de couple maximale contenue dans le tableau (fig. 5b) doit être respectée et **ne doit en aucun cas être dépassée.**

Couleurs et identification

Les vannes SVA sont recouvertes en usine d'une couche de peinture primaire rouge. L'identification précise des vannes est effectuée à l'aide d'une bague d'identification au sommet du capuchon, ainsi que par un estampillage sur le corps de la vanne. La surface externe du corps de la vanne doit être protégée contre la corrosion à l'aide d'un revêtement de protection adapté appliqué après l'installation et le montage. Il est recommandé de protéger la plaque signalétique lors de l'application de la peinture sur la vanne.

Entretien

Presse étoupe

Lors des opérations de service et d'entretien, toujours remplacer le presse étoupe complet, disponible en pièce détachée. En règle générale, le presse étoupe ne doit pas être retiré si une pression interne est détectée dans la vanne. Toutefois, si les mesures de précaution suivantes sont prises, il est possible de remplacer le presse étoupe pendant que la vanne est sous pression:

Contre-siège (fig. 6)

Pour assurer l'étanchéité arrière de la vanne, effectuez une rotation de la tige dans le sens inverse des aiguilles d'une montre jusqu'à ouverture complète de la vanne.

Égalisation de la pression (fig. 7)

Dans certains cas, une pression se forme derrière le presse étoupe. Il est alors nécessaire de fixer un volant de manoeuvre ou un dispositif similaire (pos. A) au sommet de la tige lors de l'équilibrage de pression. Il suffit de dévisser lentement le presse étoupe pour équilibrer la pression.

Dépose du presse étoupe (fig. 8)

Le volant de manoeuvre et le presse étoupe peuvent maintenant être enlevés.

Démontage de la vanne (fig. 9)

Ne pas enlever le capuchon lorsque la vanne est encore sous pression.
Vérifiez que le joint torique (pos. B) n'a pas été endommagé.
Vérifiez que la tige est exempte de rayures et de marques d'impact.
Si la bague en téflon a été endommagée, le cône complet doit être remplacé.

Remplacement du cône (fig. 9)

Dévissez la vis du cône (pos. B) avec une clé Allen.

SVA-S/L 15-40	2,0 mm A/F
SVA-S/L 50-65	2,5 mm A/F
SVA-S/L 80-100	4 mm A/F
SVA-S/L 125-150	5 mm A/F
SVA-S/L 200	6 mm A/F

Une clé Allen est fournie dans le kit de joints d'étanchéité Danfoss Industrial Refrigeration. Pour retirer les billes, comprimez le ressort circulaire (pos. D) et retirez les billes (pos. C).
Nombre de billes dans pos. C :

SVA-S/L 10-20	10 pcs.
SVA-S/L 25-65	14 pcs.
SVA-S/L 80-200	13 pcs.

Le cône peut alors être retiré. Positionnez le nouveau cône sur la tige et veillez à placer le ressort circulaire (pos. D) entre la tige et le cône. Comprimez le ressort circulaire et replacez les billes (pos. C). Remettez la vis du cône en utilisant le produit Loctite n°648 pour garantir la fixation de la vis. Ne PAS enlever ou nettoyer l'excédent de graisse foncée entre le filetage de la tige et la partie interne. En cas de contamination de la graisse par de la saleté, des débris, des particules ou de l'eau, la partie supérieure doit être entièrement remplacée.

Remplacement du joint d'étanchéité de contre-siège (fig. 10)

Uniquement pour les tailles DN 80-200 :
Le contre-siège de la vanne est une bague spéciale en téflon. Si elle est endommagée, elle doit être remplacée. Dévissez la tige du capuchon. Retirez avec précaution le joint d'étanchéité du contre-siège et montez le nouveau sur la surface de contact coudée directement à l'intérieur de l'ouverture du capuchon. Lors du montage, évitez de plier ou d'endommager la bague en téflon, ou de détériorer la surface de contact au sommet de la vanne.

Montage

Éliminez toute impureté du corps de la vanne avant de procéder au montage. Vérifiez que le cône a été entièrement vissé sur le capuchon avant de le replacer dans le corps de la vanne (fig. 5a).

Serrage

Serrez le capuchon à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 5b).
Veuillez noter que la valeur de couple maximale contenue dans le tableau (fig. 5b) doit être respectée et ne doit en aucun cas être dépassée. Serrez le presse étoupe à l'aide d'une clé dynamométrique, conformément aux valeurs indiquées dans le tableau (fig. 11).

DN 100-200 uniquement

Différence de pression max. admissible pour la fermeture/l'ouverture conformément à la norme EN12284, qui fait partie de la norme EN378-1. Le tableau de la fig. 12 indique les pressions maximales auxquelles les vannes peuvent être actionnées manuellement et auxquelles l'étanchéité peut être atteinte.
N'utilisez que des composants Danfoss d'origine, en particulier pour tout remplacement du presse étoupe ou des joints toriques et d'étanchéité. Les matériaux des nouveaux composants sont homologués pour le fluide frigorigène utilisé.
En cas de doute, veuillez contacter Danfoss.
Danfoss n'assume aucune responsabilité quant aux éventuelles erreurs ou omissions. Danfoss Industrial Refrigeration se réserve le droit de modifier sans préavis ses produits et leurs spécifications.

ESPAÑOL

Instalación

Refrigerantes

Apto para HCFC, HFC, R-717 (amoníaco),
R-744 (CO_2) y todos los refrigerantes inflamables. Se recomienda limitar el uso de estas válvulas a circuitos cerrados. Si desea obtener más información, póngase en contacto con Danfoss.

Rangos de presión y temperatura

SVA-S/L (DN 15-200): 52 bar (754 psi), con temperaturas comprendidas entre –60 y +150 °C (entre –76 y +302 °F),
La válvula debe instalarse de forma que el eje quede en posición vertical y orientado hacia arriba o en posición horizontal (consulte la fig. 1). Las válvulas deben abrirse manualmente, sin hacer uso de herramientas u otros dispositivos (consulte la fig. 3). Son válvulas diseñadas para soportar una presión interna elevada. Sin embargo, el sistema de tuberías debe diseñarse de tal forma que se eviten las acumulaciones de líquido y se reduzca el riesgo asociado a la presión hidráulica generada por la expansión térmica. Debe garantizarse que la válvula se encuentre protegida frente a los fenómenos transitorios asociados a la presión que puedan producirse en el sistema (por ejemplo, el fenómeno conocido como "golpe de ariete").

Atención:

Las válvulas SVA son válvulas de cierre y siempre deben estar completamente cerradas o completamente abiertas. Nunca deben configurarse en posiciones intermedias.

Sentido de flujo recomendado

Para conseguir unas condiciones de flujo óptimas, la válvula debe instalarse de forma que el flujo se dirija hacia el cono de válvula, de acuerdo con el sentido indicado por la flecha situada en el costado del cuerpo de la válvula (consulte la fig. 2). El flujo también puede tener lugar en sentido contrario (consulte la fig. 2), aunque eso reduciría ligeramente los valores de kv y Cv.

Soldadura

La parte superior de la válvula debe desmontarse antes de realizar la soldadura (fig. 4) con el fin de evitar que se produzcan daños en los elementos de sellado situados en el prensaestopas y entre el cuerpo y la parte superior de la válvula, así como en la junta de teflón del asiento de la válvula. Tenga cuidado de no dañar el anillo cónico de teflón y asegúrese de proteger toda la parte superior de la válvula de la suciedad y el agua al extraerla. Únicamente puede dejarse montada la parte superior de la válvula si: durante el proceso de soldadura, la temperatura del área comprendida entre el cuerpo y la parte superior de la válvula no supera los +150 °C / +302 °F. Dicha temperatura depende del método de soldadura empleado, así como de la refrigeración que pueda aplicarse al cuerpo de la válvula durante la realización de la soldadura (la refrigeración puede asegurarse, por ejemplo, envolviendo el cuerpo de la válvula en un paño húmedo). Durante las operaciones de soldadura, asegúrese de que no se introduzcan en la válvula suciedad ni restos de materiales de soldadura, etc. Los materiales y métodos de soldadura aplicados al cuerpo de la válvula deben ser compatibles con el material de este. El cuerpo de la válvula no debe someterse a tensiones (cargas externas) tras su instalación. Al finalizar la soldadura y antes de volver a montar la válvula, deberá limpiarse el interior de esta para eliminar los restos de soldadura. No deben quedar restos de materiales de soldadura ni suciedad en las roscas del cuerpo y la parte superior de la válvula. NO elimine ni sustituya la grasa de color oscuro que se encuentra entre el eje roscado y la parte superior de la válvula. Si la grasa se contamina con suciedad, residuos, partículas o agua, deberá sustituirse toda la parte superior. No deberán montarse válvulas de cierre en sistemas en los que el lado de salida de la válvula quede abierto a la atmósfera. El lado de salida de la válvula siempre debe conectarse al sistema o cerrarse debidamente (por ejemplo, soldando una placa).

Montaje

Elimine los restos de materiales de soldadura y la suciedad de las tuberías y el cuerpo de la válvula antes de proceder a su montaje. Compruebe que el cono se encuentre completamente enroscado en el casquillo antes de volver a acoplarlo al cuerpo de la válvula (consulte la fig. 5a).

Apriete

Apriete el casquillo empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 5b). Tenga en cuenta que deben respetarse los valores de par de apriete máximos indicados en la tabla (consulte la fig. 5b), **sin superarlos en ningún caso.**

Colores e identificación

Las válvulas SVA llevan una imprimación de color rojo durante su fabricación. La identificación precisa de dichas válvulas se lleva a cabo por medio de un anillo característico de color verde situado en la parte superior del casquillo, así como de la estampación del cuerpo de las válvulas. La superficie externa de la carcasa de las válvulas debe protegerse frente a la corrosión aplicando un recubrimiento protector adecuado tras su instalación y montaje. Se recomienda proteger el anillo de identificación antes de pintar la válvula.

Mantenimiento

Prensaestopas

Sólo es preciso sustituir el conjunto del prensaestopas como parte de las operaciones de servicio y mantenimiento; este elemento se encuentra disponible como pieza de repuesto. Como norma general, el prensaestopas no debe desmontarse si el interior de la válvula se encuentra presurizado. No obstante, si se adoptan las precauciones siguientes, el prensaestopas puede desmontarse aunque la válvula se encuentre presurizada:

Sellado interno (consulte la fig. 6)

Para sellar internamente la válvula, gire el eje en sentido antihorario hasta que la válvula quede completamente abierta.

Igualación de presión (consulte la fig. 7)

En algunos casos, puede producirse una acumulación de presión tras el prensaestopas. Debido a ello, debe acoplarse un volante u otro elemento similar a la parte superior del eje mientras la presión se iguala. La presión puede igualarse desenroscando lentamente el prensaestopas.

Desmontaje del prensaestopas (consulte la fig. 8)

Una vez llevados a cabo los pasos anteriores, pueden desmontarse el volante y el prensaestopas.

Desensamblaje de la válvula (consulte la fig. 9)

No desmonte el casquillo mientras la válvula se encuentre presurizada.
Compruebe que la junta plana (pos. A) no presente daños.
Compruebe que el eje no presente arañazos ni marcas de golpes por impacto. Si el anillo de teflón del cono ha sufrido daños, deberá sustituir el conjunto del cono.

Sustitución del cono (consulte la fig. 9)

Desatornille el tornillo del cono (pos. B) utilizando una llave Allen adecuada:

SVA-S/L 15-40	2 , 0 m m A / F
SVA-S/L 50-65	2,5 mm A/F
SVA-S/L 80-100	4 mm A/F
SVA-S/L 125-150	5 mm A/F
SVA-S/L 200	6 mm A/F

Nota: el juego de juntas de la división de Refrigeración Industrial de wDanfoss incluye una llave Allen. Para desmontar las bolas, comprima el muelle del disco (pos. D) y extráigalas (pos. C).

Número de bolas (pos. C):

SVA-S/L 10-20	10 uds.
SVA-S/L 25-65	14 uds.
SVA-S/L 80-200	13 uds.

A continuación podrá desmontar el cono. Coloque el cono nuevo en el eje y sitúe el muelle del disco (pos. D) entre el eje y el cono. Comprima el muelle del disco y vuelva a colocar las bolas en su posición (pos. C). Monte el tornillo del cono utilizando el producto Loctite 648 para garantizar que dicho tornillo quede correctamente sujeto. NO elimine ni sustituya la grasa de color oscuro que se encuentra entre el eje roscado y la parte superior de la válvula. Si la grasa se contamina con suciedad, residuos, partículas o agua, deberá sustituirse toda la parte superior.

Sustitución del sello del asiento (consulte la fig. 10)

Sólo para los tamaños DN 80-200:
El asiento de la válvula es un anillo especial de teflón. Si está dañado deberá sustituirlo. Desenrosque el eje hasta separarlo del casquillo. Desmonte con cuidado el sello original del asiento y monte un sello nuevo en la superficie de contacto en ángulo, directamente en el interior de la abertura del casquillo. Durante el montaje, evite tanto plegar o dañar el anillo de teflón como producir daños en la superficie de contacto de la parte superior de la válvula.

Montaje

Elimine la suciedad que pueda existir en el cuerpo de la válvula antes de volver a montarla. Compruebe que el cono se encuentre completamente enroscado en el casquillo antes de volver a acoplarlo al cuerpo de la válvula (consulte la fig. 5a).

Apriete

Apriete el casquillo empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 5b). Tenga en cuenta que deben respetarse los valores de par de apriete máximos indicados en la tabla (consulte la fig. 5b), sin superarlos en ningún caso.
Apriete el prensaestopas empleando una llave dinamométrica y aplicando los valores de par de apriete especificados en la tabla (consulte la fig. 11).

Sólo para válvulas de tamaños DN 100-200

Presión diferencial máxima de apertura/cierre admisible según la norma EN 12284 (parte de la norma EN 378-1): La tabla de la fig. 12 recoge las presiones máximas a las que pueden accionarse manualmente las válvulas y las estanqueidades conseguidas. Use únicamente piezas de repuesto originales fabricadas por Danfoss (incluidos los prensaestopas, los elementos de sellado y las juntas). Los materiales con los que se fabrican las piezas de repuesto poseen las homologaciones pertinentes para el refrigerante correspondiente. En caso de duda, póngase en contacto con Danfoss. Danfoss no se hace responsable en ningún caso de los errores u omisiones que puedan producirse. La división de Refrigeración Industrial de Danfoss se reserva el derecho a realizar cambios en los productos y las especificaciones sin previo aviso.

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ITALIANO

Installazione

Refrigeranti

Applicabile a HCFC, HFC, R717 (ammoniaca),
R744 (CO_2) e tutti i refrigeranti infiammabili.
La valvola è raccomandata solo per l'utilizzo in circuiti chiusi. Per ulteriori informazioni, contattare Danfoss.

Campi pressione e temperatura

SVA-S/L (DN 15-200) 52 bar (754 psi) da –60°C a +150°C (da –76°F a +302°F),

Installazione

La valvola deve essere installata con lo stelo rivolto verticalmente verso l'alto o in posizione orizzontale (fig. 1). Le valvole devono essere aperte manualmente senza l'ausilio di attrezzi o altri dispositivi (fig. 3). La valvola è progettata per tollerare pressioni interne estremamente elevate. Tuttavia, il sistema di tubazioni deve essere progettato per prevenire trappole di liquido e ridurre il rischio di una pressione idraulica causata dall'espansione termica. È necessario assicurarsi che la valvola sia protetta da transitori di pressione come i "colpi d'ariete".

Attenzione!

Poiché rivestono la funzione di rubinetto manuale, le valvole SVA devono essere sempre completamente aperte o chiuse. Le posizioni di apertura parziale non sono ammesse.

Direzione del flusso raccomandata

Per ottenere le condizioni di flusso ottimali, la valvola deve essere installata con il flusso verso il cono valvola, come indicato dalla freccia sul lato del corpo valvola (fig. 2). Il flusso nella direzione opposta è anche consentito (fig. 2), ma ciò ridurrà leggermente il valore kv- / Cv.

Saldatura

Il coperchio deve essere rimosso prima della saldatura (fig. 4) per prevenire danni alle parti di tenuta nel premistoppa, fra il corpo valvola e il coperchio e alla guarnizione in teflon nella sede della valvola.
Fare attenzione a non danneggiare l'anello in teflon del cono e assicurarsi che il coperchio sia protetto per intero da sporcizia e acqua in fase di rimozione.
Il coperchio superiore non deve essere rimosso, se: la temperatura nell'area compresa tra il corpo valvola e il coperchio durante la saldatura non eccede +150 °C/+302 °F. Questa temperatura dipende dal metodo di saldatura e da un eventuale raffreddamento del corpo valvola durante la saldatura stessa (il raffreddamento può essere assicurato, ad esempio, avvolgendo un panno umido intorno al corpo valvola). Assicurarsi che sporco, detriti di saldatura, ecc., non penetrino nella valvola durante la procedura di saldatura.
Solo materiali e metodi di saldatura compatibili con il materiale dell'involucro della valvola devono essere applicati all'involucro della valvola. L'involucro della valvola deve essere esente da sollecitazioni (carichi esterni) dopo l'installazione.
La valvola deve essere pulita internamente per rimuovere i detriti della saldatura al completamento dell'operazione e prima che la valvola sia rimontata. Evitare che detriti di saldatura e sporcizia si depositino nelle filettature dell'involucro e del coperchio.
NON rimuovere né intervenire sul grasso scuro tra la filettatura dell'asta e il coperchio. Nel caso in cui il grasso sia stato contaminato da sporco, detriti, particelle o acqua, è necessario sostituire interamente la parte superiore.
Le valvole di intercettazione non devono essere montate in impianti in cui il lato uscita della valvola sia esposto all'atmosfera. Il lato uscita della valvola deve sempre essere collegato all'impianto o correttamente bloccato, ad esempio saldando una piastra terminale.

Montaggio

Rimuovere i residui di saldatura e lo sporco dai tubi e dal corpo valvola prima del montaggio. Verificare che il cono sia stato completamente avvitato in direzione del coperchio prima che venga sostituito nel corpo valvola (fig. 5a).

Serraggio

Serrare il coperchio con una chiave dinamometrica, ai valori indicati nella tabella (fig. 5b).
Notare che è sempre necessario rispettare le coppie massime riportate nella tabella (fig. 5b); le coppie massime non devono essere mai superate.

Colori e identificazione

Le valvole SVA sono pitturate con un primer ossidico rosso in fabbrica. Un'identificazione precisa della valvola è possibile tramite l'anello di identificazione sulla parte superiore del coperchio e tramite la stampigliatura sul corpo valvola. La superficie esterna dell'involucro della valvola deve essere protetta contro la corrosione con un rivestimento protettivo idoneo dopo l'installazione e il montaggio.
Si raccomanda di proteggere l'anello di identificazione quando la valvola viene riverniciata.

Manutenzione

Premistoppa

Quando si effettua un intervento di riparazione o manutenzione, sostituire solo il premistoppa completo, disponibile come ricambio. Come regola generale, il premistoppa non deve essere rimosso se pressione interna è presente nella valvola. Tuttavia, se ci si attiene alle seguenti misure cautelative, il premistoppa può essere rimosso con la valvola ancora sotto pressione:

Controtenuta (fig. 6)

Per posizionare la valvola in controtenuta, ruotare lo stelo in senso antiorario fino a quando la valvola non è completamente aperta.

Equalizzazione della pressione (fig. 7)

In alcuni casi, la pressione si accumula dietro al premistoppa. Un volantino (o simile) deve essere quindi fissato sulla parte superiore dello stelo mentre la pressione è equalizzata. La pressione può essere equalizzata avvitando lentamente il premistoppa.

Rimozione del premistoppa (fig. 8)

Il volantino e il premistoppa possono essere ora rimossi.

Smontaggio della valvola (fig. 9)

Non rimuovere il coperchio mentre la valvola è ancora sotto pressione.
-Controllare che la guarnizione piatta (pos. A) non abbia subito danni.
-Verificare che lo stelo sia privo di graffi e segni di impatto.
-Se l'anello in teflon del cono è danneggiato, l'intero gruppo cono deve essere sostituito.

Sostituzione del cono (fig. 9)

Svitare la vite del cono (pos. B) con una chiave allen.

SVA-S/L 15-40	2,0 mm A/F
SVA-S/L 50-65	2,5 mm A/F
SVA-S/L 80-100	4 mm A/F
SVA-S/L 125-150	5 mm A/F
SVA-S/L 200	6 mm A/F

(Una chiave allen è inclusa nel set delle guarnizioni Danfoss Industrial Refrigeration).
Per rimuovere le sfere, comprimere la molla a disco (pos. D) e quindi rimuovere le sfere (pos. C).
Numero di sfere in pos. C:

SVA-S/L 10-20	10 pz.
SVA-S/L 25-65	14 pz.
SVA-S/L 80-200	13 pz.

Il cono può essere quindi rimosso. Posizionare il nuovo cono sullo stelo e ricordarsi di inserire la molla a disco (pos. D) tra lo stelo e il cono. Comprimere la molla a disco e sostituire le sfere (pos. C). Rimontare nuovamente la vite del cono utilizzando Loctite n. 648 per assicurare che la vite sia ben fissata.
NON rimuovere né intervenire sul grasso scuro tra la filettatura dell'asta e il coperchio. Nel caso in cui il grasso sia stato contaminato da sporco, detriti, particelle o acqua, è necessario sostituire interamente la parte superiore.

Sostituzione della controtenuta (fig. 10)

Solo per dimensioni DN 80-200:
La controtenuta della valvola è uno speciale anello in teflon. Se è danneggiata, deve essere sostituita. Rimuovere lo stelo dal coperchio. Rimuovere con cautela la controtenuta e montarne una nuova nella superficie di contatto angolata direttamente all'interno dell'apertura del coperchio. Evitare di piegare e danneggiare l'anello in teflon o di danneggiare la superficie di contatto nella parte superiore della valvola durante l'assemblaggio.

Montaggio

Rimuovere eventuale sporcizia dal corpo prima del montaggio della valvola. Verificare che il cono sia stato avvitato in direzione del coperchio prima che venga montato nel corpo valvola (fig. 5a).

Serraggio

Serrare il coperchio con una chiave dinamometrica, ai valori indicati nella tabella (fig. 5b).
Notare che è sempre necessario rispettare le coppie massime riportate nella tabella (fig. 5b); le coppie massime non devono essere mai superate.
Serrare il premistoppa con una chiave dinamometrica, ai valori indicati nella tabella (fig. 11).

Solo DN 100-200

Differenza di pressione massima consentita per la chiusura/apertura secondo EN12284, parte di EN378-1:
La tabella nella Fig. 12 Indica le pressioni massime alle quali le valvole possono essere azionate manualmente e la tenuta conseguita.
Utilizzare solo parti originali Danfoss, incluso premistoppa, componenti di tenuta e guarnizioni, per la sostituzione. I materiali dei nuovi componenti sono certificati per il refrigerante pertinente.
In caso di dubbi, contattare Danfoss.
Danfoss non si assume alcuna responsabilità per errori ed omissioni. Danfoss Industrial Refrigeration si riserva il diritto di apportare modifiche a prodotti e specifiche senza alcun preavviso.

中文

安装
制冷剂
适用于 HCFC, HFC, R717（氨），
R 744(Co 2)以及所有可燃性制冷剂。
建议该阀门仅用于闭合线路。详情请与 Danfoss 联系。
压力和温度范围
SVA-S/L (DN 15-200) 52 bar (754 psi), –60 °C 至 +150 °C (–76 °F 至 +302 °F),
安装
安装该阀门时，顶部轴必须垂直向上或呈水平位置（图1）。阀门应手动打开，不能使用工具或其他装置（图3）。该阀门可以承受很高的内部压力。但是，管道系统的设计应避免液阱并减少热膨胀所造成的液压风险。必须确保该阀门不受系统中“液锤”等压力动态的影响。

注意!
SVA为关闭阀，必须始终完全关闭或完全打开。不允许处于半开位置。
建议流向
如需取得最佳流量条件，安装阀门时流量应朝向阀锥，与阀体侧上的箭头方向一致（图2）。也可以反向流动（图2），但kv-/Cv值会稍微减少。
焊接
在焊接之前应取下阀盖（图4），防止对填料中以及阀体和阀盖之间的密封部件、阀座内的特氟龙垫圈造成损坏。

请小心，不要损坏特氟龙阀芯，并确保阀盖在取下时不会沾到土和水。

在下列情况中，无需拆卸阀盖： 焊接期间，阀体和阀盖之间区域的温度小于 +150° C/+302° F。 此温度取决于焊接工艺，以及阀体在焊接过程中的冷却情况。（例如给阀体盖上一条湿布，这样可确保阀体的冷却。）焊接过程中，务必要防止灰尘、焊接碎屑等异物进入阀体内。
只有与阀体材料相兼容的材料和焊接方法才能焊接在阀体上。 安装完毕后，阀体不得再承受任何压力（外部负载）。
焊接结束后且在重新装配阀门之前，应当清洗阀门内部，以清除焊接碎屑。 避免外壳和阀盖的螺纹上沉积焊接碎屑和灰尘。
切勿清除或维护主轴螺纹和阀盖之间的深色油脂。 因为油脂已被土、杂质、颗粒物或水污染，必须更换整个顶部零件。
截止阀不得安装在阀门出口端与大气联通。 阀门出口侧必须始终与系统连接或密封，例如与焊接端板。
组装
在组装之前清除管道和阀体中的焊接碎片和灰尘。检查阀锥在阀体内被更换之前，已经完全向阀帽方向拧回（图5a）。
拧紧
使用扭矩扳手拧紧螺帽，并达到表中规定的数值（图5b）。
请务必遵守包含最大扭矩的该表（图5b），切勿超过。
色彩和识别
SVA 阀门在工厂使用红丹底漆粉刷。通过阀帽顶部的 ID 环和阀体上的冲压可以准确识别阀门。安装和组装后，阀套外表面必须使用适当的保护层防止腐蚀。
重新粉刷阀门时建议对 ID 环进行保护。
维护
填料
在进行维修和维护时候，仅更换作为备件的整套填料。一般来说，如果阀门内有内部压力，不得移除填料。但是，如果采取以下预防措施，可以在阀门处于压力下时移除填料。
后座（图6）
如需对阀门进行后座，应逆时针转动轴，直至阀门完全打开。
压力均衡（图7）
在某些情况下，压力在填料后形成。因此，压力均衡期间应拧紧轴顶部的手轮或类似装置。可以通过慢慢拧出填料使压力均衡。
移除填料（图8）
现在可以清除手轮和填料。
拆卸阀门（图9）
请勿在阀门处于压力下时移除阀帽。
检查平垫圈（位置A）是否受到损坏。
检查轴是否有刮伤或撞击痕迹。
如果特氟龙阀锥环受损，必须更换整个阀锥总成。
更换阀锥（图9）
使用艾伦内六角扳手拧松轴螺钉（位置B）。

SVA-S/L 15-40	2.0 毫米 A/F
SVA-S/L 50-65	2.5 毫米 A/F
SVA-S/L 80-100	4 毫米 A/F
SVA-S/L 125-150	5 毫米 A/F
SVA-S/L 200	6 毫米 A/F

(Danfoss 行业制冷垫圈套装中包括艾伦内六角扳手。
如需移除滚珠，应按下盘簧（位置D）并移除滚珠（位置C）。
位置C的滚珠数量：

SVA-S/L 10-20	10个
SVA-S/L 25-65	14个
SVA-S/L 80-200	13个

然后便可以移除阀锥。将新的阀锥放在轴上，并将盘簧（位置D）放在轴和阀锥之间。按下盘簧并更换滚珠（位置C）。使用648号 Loctite 重新安装阀锥螺钉，确保螺钉正常拧紧。
切勿清除或维护主轴螺纹和阀盖之间的深色油脂。 因为油脂已被土、杂质、颗粒物或水污染，必须更换整个顶部零件。
更换后座密封（图10）
仅用于尺寸 DN 80-200：
阀门后座为特制特氟龙环。如果它受到损坏，必须更换。将轴从阀帽中拧出。小心移除原始后座密封，并直接在阀帽开口内呈角状的接触表面安装新的后座密封。在组装期间应避免折叠或损坏特氟龙环，或损坏阀门顶部的接触表面。
组装
在组装阀门之前应清除阀体上的所有灰尘。在阀体内被更换之前，检查阀锥是否已经向阀帽方向拧回（图5a）。
拧紧
使用扭矩扳手拧紧螺帽，并达到表中规定的数值（图5b）。请务必遵守包含最大扭矩的该表（图5b），切勿超过。 使用扭矩扳手拧紧填料，并达到表中规定的数值（图11）。
仅限DN 100-200
根据EN12284（这是EN378-1），可允许的最大关闭/开启压差为：图12中的表格显示了可以手动操作阀门时的最大压力，以及能够达到的最大紧密性。
务必使用原装Danfoss零件进行更换，包括填料、密封部件和垫圈。新零件的材料应经证明适合相关制冷剂。
如有疑问请与Danfoss联系。
Danfoss不承担由于错误或疏忽导致的责任。Danfoss Industrial Refrigeration 保留对产品和规格进行变更的权利，恕不另行通知。

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POLSKI

Montaż zaworu

Czynniki chłodnicze

Dotyczy czynników chłodniczych HCFC, HFC, R717 (amoniak), R744 (CO_2) i wszystkich łatwopalnych czynników chłodniczych.

Zalecane są do wykorzystywania wyłączniew obiegach zamkniętych. Aby uzyskać więcej informacji, należy skontaktować się z firmą Danfoss.

Zakres ciśnienia i temperatury

SVA-S/L (DN 15–200) 52 bary (754 psi) przy temp. od -60°C do +150°C (-76°F do +302°F)

Montaż zaworu

Zawór należy zamontować z wrzecionem skierowanym pionowo do góry lub w pozycji poziomej (rys. 1). Zawory powinny być otwierane ręką, bez użycia narzędzi ani innych urządzeń (rys. 3). Zawór został tak zaprojektowany, aby wytrzymał wysokie ciśnienie. Jednak układ rurociągów powinień być zaprojektowany tak, aby uniknąć zamkniętych przestrzeni cieczowych i zmniejszyć ryzyko wzrostu ciśnienia spowodowanego rozszerzalnością cieplną. Należy zapewnić ochronę zaworu przed impulsami wysokiego ciśnienia wynikającymi z uderzń cieczowych.

Uwaga!

Zawory SVA to zawory odcinające i muszą być zawsze albo całkowicie zamknięte, albo całkowicie otwarte. Ustawianie zaworów w pozycji częściowo otwartej jest niedozwolone.

Zalecany kierunek przepływu

W celu uzyskania optymalnych warunków przepływu zawór powinien być zainstalowany w taki sposób, aby przepływ był skierowany pod grzybek zaworu, zgodnie ze strzałką znajdującą się na korpusie zaworu (rys. 2). Przepływ w przeciwnym kierunku jest również dopuszczalny (rys. 2), jednak lekko zmniejsza współczynnik kv- / Cv.

Spawanie

Przed spawaniem należy zdemontować pokrywę zaworu (rys. 4), aby zapobiec uszkodzeniu elementów uszczelniających znajdujących się w dławnicy i pomiędzy korpusem a pokrywą zaworu oraz teflonowej uszczelki w gnieździe zaworu.

Należy zachować ostrożność, aby nie uszkodzić teflonowego pierścienia stożkowego, oraz upewnić się, czy podczas demontażu pokrywa jest chroniona przed kurzem i wodą.

Można nie demontować pokrywy pod warunkiem, że: temperatura otoczenia między korpusem zaworu a pokrywą podczas spawania nie przekracza +150°C/+302°F. Temperatura zależy od metody spawania, jak również od sposobu chłodzenia korpusu zaworu podczas spawania. (Chłodzenie można zapewnić między innymi poprzez owinięcie korpusu zaworu mokrą szmatą). Należy się upewnić, czy podczas spawania do zaworu nie dostał się kurz, okruchy spawalnicze itd.

Podczas spawania elementów do korpusu zaworu można wykorzystywać wyłącznie materiały i metody spawania zgodne z materiałem korpusu zaworu. Po montażu korpus zaworu nie może podlegać zewnętrznym naprężeniom mechanicznym.

Po zakończeniu spawania, przed złożeniem zaworu należy oczyścić wnętrze zaworu z zanieczyszczeń mechanicznych po spawaniu. Nie pozostawiać okruchów spawalniczych ani zanieczyszczeń w gwintach korpusu i pokrywy.

NIE należy usuwać ani poprawiać warstwy ciemnego smaru między gwintem wrzeciona a pokrywą. Jeśli smar został zanieczyszczony kurzem, okruchami spawalniczymi, innymicząstkami lub wodą, należy wymienić całą górną część. Zawory odcinające nie mogą być montowane w instalacjach, w których wylot zaworu jest otwarty do atmosfery. Wylot zaworu musi być zawsze podłączony do instalacji lub należycie zaślepiony np. przyspawaną dennicą.

Montaż elementów zaworu

Przed złożeniem zaworu należy usunąć z rur oraz z korpusu zaworu okruchy spawalnicze i wszelkie zanieczyszczenia. Przed umieszczeniem grzybka w korpusie zaworu upewnić się, że grzybek jest całkowicie wykręcony w stronę pokrywy (rys. 5a).

Dokręcenie

Dokręcić pokrywę kluczem dynamometrycznym momentem podanym w tabeli (rys. 5b).

Należy pamiętać, aby zawsze stosować podane w tabeli (rys. 5b) wartości maksymalnego momentu i **nigdy ich nie przekraczać.**

Kolory i identyfikacja

Zawory SVA są malowane w fabryce czerwonym podkładem gruntującym. Zawór można precyzyjnie zidentyfikować za pomocą pierścienia identyfikacyjnego znajdującego się na górze pokrywy oraz cechy numeratora na korpusie zaworu. Po złożeniu i zamontowaniu zaworu należy zabezpieczyć jego zewnętrzną powierzchnię przed korozją, odpowiednią powłoką ochronną.

Przed przystąpieniem do malowania zaworu zaleca się zabezpieczenie pierścienia identyfikacyjnego.

Serwis

Dławnica

Podczas wykonywania prac serwisowych i konserwacyjnych wymieniać wyłącznie kompletną dławnicę, która jest dostępna jako część zapasowa. Generalnie nie wolno demontować dławnicy, gdy zawór jest pod ciśnieniem. Jednakże, jeśli zostaną podjęte poniższe środki zapobiegawcze, będzie można wymontować dławnicę z zaworu, wewnątrz którego panuje ciśnienie.

Pełne wykręcenie wrzeciona (rys. 6)

Aby całkowicie wykręcić wrzeciono, należy obracać go w lewo, aż do pełnego otwarcia zaworu.

Wyrównywanie ciśnień (rys. 7)

W niektórych przypadkach pod dławnicą tworzy się ciśnienie. W związku z tym przed wyrównywaniem ciśnień należy przymocować pokrętło (kółko ręczne) zamontowane na górnym końcu trzpienia. Ciśnienia można wyrównać przez powolne wykręcanie dławnicy.

Demontaż dławnicy (rys. 8)

Można teraz zdemontować pokrętło i dławnicę.

Demontaż elementów zaworu (rys. 9)

Nie demontować pokrywy, gdy wewnątrz zaworu nadal panuje ciśnienie.

Sprawdzić, czy płaska uszczelka (poz. A) nie jest uszkodzona.

Sprawdzić, czy na wrzecionie nie ma zarysowań i/lub śladów uderzeń. Jeśli uszkodzony jest teflonowy pierścień grzybka, należy wymienić cały zespół grzybka.

Wymiana grzybka (rys. 9)

Wykręcić wkręt grzybka (poz. B) kluczem imbusowym.

SVA-S/L 15–40 ..... 2,0 mm pod klucz
SVA-S/L 50–65 ..... 2,5 mm pod klucz
SVA-S/L 80–100 ..... 4 mm pod klucz
SVA-S/L 125–150 ..... 5 mm pod klucz
SVA-S/L 200 ..... 6 mm pod klucz

(Klucz imbusowy znajduje się w zestawie uszczelek firmy Danfoss Industrial Refrigeration).

W celu wyjęcia kulek należy ścisnąć sprężynę talerzykową (poz. D) i wyjąć kulki (poz. C).

Liczba kulek w poz. C:

SVA-S/L 10–20 ..... 10 szt.
SVA-S/L 25–65 ..... 14 szt.
SVA-S/L 80–200 ..... 13 szt.

Można teraz zdjąć grzybek. Założyć nowy grzybek na wrzeciono, pamiętając o umieszczeniu sprężyny talerzykowej (poz. D) pomiędzy wrzecionem a grzybkiem. Ścisnąć sprężynę talerzykową i wymienić kulki (poz. C). Posmarować gwint wkrętu grzybka klejem Loctite 648, aby zapewnić właściwe unieruchomienie wkrętu, i wkręcić wkręt.

NIE należy usuwać ani poprawiać warstwy ciemnego smaru między gwintem wrzeciona a pokrywą. Jeśli smar został zanieczyszczony kurzem, okruchami spawalniczymi, innymi cząstkami lub wodą, należy wymienić całą górną część.

Wymiana uszczelnienia komory dławnicy przy wrzecionie w położeniu wykręconym (rys. 10)

Tylko rozmiary DN 80–200:

Uszczelnienie komory dławnicy przy wykręconym wrzecionie tworzy specjalny pierścień teflonowy. Jeśli jest uszkodzony, należy go wymienić. Wykręcić wrzeciono z pokrywy zaworu. Ostrożnie wyjąć istniejące uszczelnienie komory dławnicy przy wrzecionie w położeniu wykręconym i założyć nowe, na skośnej powierzchni styku bezpośrednio w otworze pokrywy zaworu. Podczas zakładania nie dopuścić do zgięcia lub uszkodzenia pierścienia teflonowego bądź do uszkodzenia powierzchni styku w górnej części zaworu.

Montaż elementów zaworu

Przed zmontowaniem zaworu oczyścić dokładnie wnętrze korpusu. Przed umieszczeniem grzybka w korpusie zaworu upewnić się, że grzybek jest wykręcony w stronę pokrywy (rys. 5a).

Dokręcenie

Dokręcić pokrywę kluczem dynamometrycznym momentem podanym w tabeli (rys. 5b). Należy pamiętać, aby zawsze stosować podane w tabeli (rys. 5b) wartości maksymalnego momentu i nigdy ich nie przekraczać.

Dokręcić dławnicę kluczem dynamometrycznym momentem podanym w tabeli (rys. 11).

Tylko DN 100–200

Maks. dopuszczalna różnica ciśnień zamknięcia/otwarcia zgodnie z normą EN12284, która wchodzi w skład normy EN378-1:

W tabeli na rys. 12 podano maksymalne ciśnienia, przy których można ręcznie obsługiwać zawory i uzyskać szczelność.

Używać wyłącznie oryginalnych części zamiennych Danfoss, łącznie z dławnicami, elementami uszczelniającymi i uszczelkami. Materiały nowych części posiadają atest potwierdzający możliwość użytkowania ich z danym czynnikiem chłodniczym.

W razie wątpliwości należy skontaktować się z firmą Danfoss.

Firma Danfoss nie przyjmuje żadnej odpowiedzialności za błędy i uchybienia. Firma Danfoss Industrial Refrigeration rezerwuje sobie prawo do wprowadzania zmian w produktach i danych technicznych bez wcześniejszego powiadomienia.

РУССКИЙ

Хладагенты
Пригодны для систем на ГХФУ, ГФУ, R717 (аммиак), R744 (CO2) и всех воспламеняющихся хладагентах.
Рекомендуется использовать клапаны только в закрытых контурах.
Для получения дополнительной информации обращайтесь в компанию Danfoss.

Диапазон давления и температуры
SVA-S/L (DN 15-200): 52 бар (754 фунта/кв. дюйм) при температуре от –60°C до +150°C (от –76°F до +302°F),

Монтаж
При установке клапана шпиндель должен быть направлен вертикально вверх или горизонтально (рис. 1). Клапаны необходимо открывать вручную, без использования инструментов или других приспособлений (рис. 3). Клапаны выдерживают очень высокое внутреннее давление. Однако система трубопроводов должна быть спроектирована так, чтобы избежать появления участков, в которых может задерживаться жидкий хладагент, и таким образом понизить риск возникновения гидроудара при тепловом расширении. Необходимо обеспечить защиту клапана от изменений давления в системе, таких как «гидравлический удар».

Внимание!
SVA являются отсечными клапанами и должны всегда быть полностью закрыты или полностью открыты. Промежуточное положение не допускается.

Рекомендуемое направление потока
Для достижения оптимальных условий потока клапаны должны устанавливаться таким образом, чтобы поток был направлен к конусу клапана, как указано стрелкой на боковой стороне корпуса клапана (рис. 2). Также допускается поток в обратном направлении (рис. 2), но при этом немного снижается значение Kv / Cv.

Сварка
Перед проведением сварочных работ необходимо разобрать клапан (рис. 4), чтобы избежать повреждения уплотнительных колец и тефлоновых уплотнений функционального модуля.
Осторожно, не повредите тефлоновое уплотнение. Необходимо обеспечить защиту снятого функционального модуля от грязи и воды. Разбор клапана не обязателен, если температура между корпусом клапана и функциональным модулем во время сварки не превысит +150°C. Эта температура зависит от метода сварки, а также от наличия охлаждения корпуса клапана во время проведения сварочных работ (охлаждение можно обеспечить, обернув корпус клапана влажной тканью). Следите за тем, чтобы в ходе сварочных работ в клапан не попало никакой грязи, сварочной окалины и т. п.
Использоваться должны только материалы и методы сварки, совместимые с материалом корпуса клапана. После монтажа корпус клапана не должен подвергаться внешним воздействиям или нагрузкам. После завершения сварочных работ, перед сборкой клапана необходимо очистить внутреннюю поверхность клапана от грязи и окалины. Не допускайте попадания окалины и грязи в резьбовые соединения между корпусом и функциональным модулем (крышкой). Не удаляйте и не наносите дополнительную смазку на резьбовое соединение шпинделя. Если смазка загрязнена мусором, частицами или водой,необходимо заменить функциональный модуль.
Запрещается устанавливать запорные клапаны в системах, где выходной штуцер сообщен с атмосферой. Выходной штуцер должен быть всегда соединен с системой, либо должен быть заглушен при помощи приваренной пластины или специальной заглушки.

Сборка
Перед сборкой удалите с труб и корпуса клапана окалину и грязь любого характера. Перед заменой конуса в корпусе клапана (рис. 5в) убедитесь, что он полностью выкручен до штока.

Затяжка
Затяните шток при помощи динамометрического ключа до значений, указанных в таблице (рис. 5b). Внимание! Никогда не превышайте максимальные значения момента затяжки, приведенные в таблице (рис. 5b).

Цвета и идентификация
На заводе клапаны SVA окрашиваются оксидной грунтовкой красного цвета. Точная идентификация клапана производится по опознавательному кольцу в верхней части штока, а также благодаря оттиску на корпусе клапана. Необходимо обеспечить защиту наружной поверхности корпуса клапана от коррозии при помощи соответствующего защитного покрытия после монтажа и сборки.
При повторной окраске клапана рекомендуется обеспечить защиту опознавательного кольца.

Техническое обслуживание
Сальник
При выполнении технического обслуживания заменяйте только комплектный сальник. Запасные сальники имеются в наличии. Как правило, запрещается удалять сальник, если клапан находится под давлением. Однако, если принимаются следующие меры предосторожности, сальник можно вынуть, даже если клапан все еще находится под давлением:

Посадка на верхнее седло (рис. 6)
Для посадки клапана на верхнее седло поверните шпиндель против часовой стрелки до полного открытия клапана.

Выравнивание давления (рис. 7)
В некоторых случаях за сальником возникает давление. Поэтому, в процессе выравнивания давления, наверху шпинделя закрепляется маховик или аналогичное устройство. Давление можно выровнять, медленно откручивая сальник.

Демонтаж сальника (рис. 8)
Теперь можно снять маховик и сальник.

Разборка клапана (рис. 9)
Запрещается демонтировать шток, пока клапан находится под давлением.
-Убедитесь, что плоская прокладка (поз. A) не повреждена.
-Убедитесь, что на шпинделе отсутствуют царапины или следы ударов.
-Если тефлоновое конусное кольцо было повреждено, замене подлежит весь конус в сборе.

Замена конуса (рис. 9)
Отвинтите винт конуса (поз. B) с помощью торцевого ключа.
SVA-S/L 15-40..... 2,0мм по зеву
SVA-S/L 50-65..... 2,5 мм по зеву
SVA-S/L 80-100 .....4 мм по зеву
SVA-S/L 125-150 .....5 мм по зеву
SVA-S/L 200.....6 мм по зеву
(Торцевой ключ включен в комплект сальников Danfoss Industrial Refrigeration). Для снятия шариков сожмите тарельчатую пружину (поз. D) и вынте их (поз. C).

Количество шариков в поз. C:
SVA-S/L 10-20.....10 шт.
SVA-S/L 25-65.....14 шт.
SVA-S/L 80-200 .....13 шт.
После этого конус можно снять. Установите новый конус на шпиндель и не забудьте установить тарельчатую пружину (поз. D) между шпинделем и конусом. Сожмите тарельчатую пружину и замените шарики (поз. C). Вставьте винт конуса обратно на место, используя фиксатор Loctite № 648 для надежного закрепления винта.
Не удаляйте и не наносите дополнительную смазку на резьбовое соединение шпинделя. Если смазка загрязнена мусором, частицами или водой,необходимо заменить функциональный модуль.

Замена уплотнения седла задней посадки (рис. 10)
Только для размеров DN 80-200:
Заднее седло (упор) клапана представляет собой специальное тефлоновое кольцо. В случае повреждения, его необходимо заменить. Выкрутите шпиндель из наконечника. Осторожно выньте старое заднее седло и установите новое в наклонной контактной поверхности непосредственно в отверстии штока. Во время сборки избегайте сгибания и повреждения тефлонового кольца или повреждения контактной поверхности в верхней части клапана.

Сборка
Перед сборкой клапана удалите с корпуса грязь любого характера. Перед заменой конуса в корпусе клапана (рис. 5a) убедитесь, что он вывенчен до наконечника.

Затяжка
Затяните наконечник при помощи динамометрического ключа до значений, указанных в таблице (рис. 5b). Внимание! Никогда не превышайте максимальные значения момента затяжки, приведенные в таблице (рис. 5b). Затяните сальник при помощи динамометрического ключа до значений, указанных в таблице (рис. 11).

Только DN 100-200
Максимально допустимый перепад давления для закрытия/открытия в соответствии со стандартом EN12284, который является частью стандарта EN378-1:
В таблице на рис. 12 указаны максимальные значения давления, при которых клапанами можно управлять вручную и может быть обеспечена герметичность. Для замены используйте только подлинные детали производства компании Danfoss, включая сальники, уплотнительные детали и прокладки. Материалы новых деталей сертифицированы для соответствующего хладагента.
В случае сомнения обращайтесь в компанию Danfoss. Компания Danfoss не несет ответственность за ваши ошибки и упущения. Подразделение Danfoss Industrial Refrigeration сохраняет за собой право на внесение изменений в изделия и спецификации без предварительного уведомления.

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PORTUGUÊS

Instalação

Refrigerantes

Aplicável a HCFC, HFC, R717 (amônia),
R744 (CO_2) e todos os refrigerantes inflamáveis.
A válvula é recomendada apenas para uso em circuitos fechados. Para mais informações, entre em contato com a Danfoss.

Faixa de pressão e temperatura

SVA-S/L (DN 15-200) 52 bar (754 psi) a –60°C a +150°C (–76°F a +302°F),

Instalação

A válvula deve ser instalada com o fuso verticalmente para cima ou em posição horizontal (fig. 1). As válvulas devem ser abertas manualmente sem o uso de ferramentas ou outros dispositivos (fig. 3). A válvula é projetada para suportar uma alta pressão interna. Entretanto, o sistema de tubulação deve ser desenhado para evitar armadilhas de líquido e reduzir o risco de pressão hidráulica causada pela expansão térmica. Deve-se assegurar que a válvula fique protegida contra transitórios de pressão, como os "golpes de aríete" no sistema.

Atenção!

SVA são válvulas de bloqueio e devem sempre estar totalmente abertas ou fechadas. Posições parcialmente abertas não são permitidas.

Direção de fluxo recomendada

Para atingir condições ideais de fluxo, a válvula deve ser instalada com o fluxo na direção do cone da válvula conforme indicado pela seta na lateral do corpo da válvula (fig. 2). O fluxo na direção oposta também é aceitável (fig. 2), mas reduz levemente o valor kv- / Cv.

Soldagem

A tampa deve ser removida antes da soldagem (fig. 4) para evitar danos nos o-rings e vedações nas gaxetas e entre o corpo da válvula e a tampa, bem como o anel de teflon no assento de válvula.
Tenha cuidado para não danificar o anel do cone de teflon e certifique-se de que a tampa toda esteja protegida contra sujeira e água enquanto estiver removida.
A remoção da tampa pode ser ignorada contanto que: durante a soldagem, a temperatura na área entre o corpo e a tampa da válvula não exceda +150 °C/+302 °F. Essa temperatura depende do método de soldagem e de qualquer resfriamento do corpo da válvula durante a soldagem em si. (O resfriamento pode ser feito, por exemplo, enrolando um pano molhado ao redor do corpo da válvula.) Certifique-se de que poeiras, resíduos de soldagem, etc. não entrem da válvula durante o processo de soldagem. Somente materiais e métodos de soldagem compatíveis com o material do corpo da válvula podem ser aplicados a ela. O corpo da válvula deve estar livre de tensão (cargas externas) após a instalação.
A válvula deve ser limpa internamente para remover resíduos da soldagem no final do processo e antes que a válvula seja montada novamente. Evite resíduos de solda e sujeira nas roscas do corpo e da tampa.
NÃO remova ou realize a manutenção do lubrificante/graxa de cor escura entre a rosca do eixo e a tampa. Caso o lubrificante/graxa tenha sido contaminado por sujeira, resíduos ou água, toda a tampa superior deve ser substituída. As válvulas de bloqueio não podem ser montadas em sistemas em que o lado de saída da válvula fique aberto à atmosfera. O lado de saída da válvula deve estar sempre conectado ao sistema ou tampado adequadamente, por exemplo, com um cap ou uma tampa soldados na extremidade.

Montagem

Remova os detritos da soldagem e qualquer sujeira dos canos e do corpo da válvula antes da montagem. Verifique se o cone foi totalmente parafusado para trás em direção a tampa antes que ele seja recolocado no corpo da válvula (fig. 5a).

Aperto

Aperte a tampa com um torquímetro nos valores indicados na tabela (fig. 5b).
Observe que a tabela (fig. 5b) contendo o torque máximo deve ser respeitada e nunca excedida.

Cores e identificação

As válvulas SVA são pintadas com uma base de zarcão na fábrica. A identificação precisa da válvula é feita pelo anel de identificação na parte superior da tampa, assim como através da estampagem no corpo da válvula. A superfície externa do corpo da válvula deve ser protegida contra corrosão com uma camada protetora adequada após a instalação e a montagem.
Recomenda-se proteger o anel de identificação quando a válvula é pintada novamente.

Manutenção

Prensa gaxeta

Ao executar serviços e manutenção substitua somente a prensa gaxeta completa, que está disponível como peça de reposição. Como regra geral, a prensa gaxeta não deve ser removida se houver pressão interna na válvula. Entretanto, se as seguintes medidas de precaução forem tomadas, a prensa gaxeta pode ser removida com a válvula ainda sob pressão:

Contra vedação (fig. 6)

Para executar a contra vedação na válvula, gire o fuso no sentido anti-horário até que a válvula fique completamente aberta.

Equalização da pressão (fig. 7)

Em alguns casos, a pressão se forma atrás da prensa gaxeta. Neste caso, um volante ou dispositivo similar deve ser fixado na parte superior enquanto a pressão é atualizada. Pode-se equalizar a pressão aparafusando lentamente a prensa para fora.

Remoção da prensa gaxeta (fig. 8)

Agora o volante e a prensa gaxeta podem ser removidos.

Desmontando a válvula (fig. 9).

Não remova a tampa enquanto a válvula ainda estiver sob pressão.
-Verifique se a junta plana (pos. A) não foi danificada.
-Verifique se o fuso está isento de arranhões e marcas de impacto.
-Se o anel de teflon do cone foi danificado, todo o conjunto do cone deve ser substituído.

Substituição do cone (fig. 9)

Solte o parafuso do cone (pos. B) com uma chave allen.

SVA-S/L 15-40	2,0 mm A/F
SVA-S/L 50-65	2,5 mm A/F
SVA-S/L 80-100	4 mm A/F
SVA-S/L 125-150	5 mm A/F
SVA-S/L 200	6 mm A/F

(Uma chave allen está incluída no conjunto de juntas de refrigeração industrial Danfoss).
Para remover as esferas, pressione a mola de disco (pos. D) e remova as esferas (pos. C).
Número de esferas em posição C:

SVA-S/L 10-20	10 pcs.
SVA-S/L 25-65	14 pcs.
SVA-S/L 80-200	13 pcs.

O cone pode ser removido. Coloque o novo cone no fuso e lembre-se de colocar a mola de disco (pos. D) entre o fuso e o cone. Comprima a mola de disco e substitua as esferas (pos. C). Reencaixe o parafuso do cone usando Loctite No. 648 para garantir que o parafuso seja fixado adequadamente.
NÃO remova ou realize a manutenção do lubrificante/graxa de cor escura entre a rosca do eixo e a tampa. Caso o lubrificante/graxa tenha sido contaminado por sujeira, resíduos ou água, toda a tampa superior deve ser substituída.

Substituição da contra vedação (fig. 10)

Somente para tamanhos DN 80-200:
A contra vedação da válvula é uma anel especial de teflon. Caso ele seja danificado, deve ser substituído. Parafuse o fuso para liberá-lo da tampa. Remova cuidadosamente a contra vedação original e monte uma nova na superfície de contato angular diretamente dentro da abertura na tampa. Evite dobrar ou danificar o anel de teflon ou danificar a superfície de contato na parte superior da válvula durante a montagem.

Montagem

Remova qualquer sujeira do corpo antes de montar a válvula. Verifique se o cone foi totalmente parafusado para trás em direção a tampa antes que seja recolocado no corpo da válvula (fig. 5a).

Aperto

Aperte a tampa com um torquímetro nos valores indicados na tabela (fig. 5b).
Observe que a tabela (fig. 5b) contendo o torque máximo deve ser respeitada e **nunca excedida**.
Aperte a prensa gaxeta com um torquímetro nos valores indicados na tabela (fig. 11).

Apenas DN 100-200

Máxima diferença de pressão permitida para fechamento/abertura, de acordo com a norma EN12284 que é uma parte da EN378-1:
A tabela da fig. 12 dispõe as pressões máximas que as válvulas podem ser operadas manualmente e qual aperto pode ser obtido.
Utilize somente peças originais Danfoss, incluindo prensa gaxetas, peças de vedação e juntas para as substituições. Os materiais das peças novas são certificados para o refrigerante relevante.
Em caso de dúvidas, entre em contato com a Danfoss do Brasil Ind. e Com. Ltda.
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MAYEKAWA Europe MYCOM

OIL MANAGEMENT VALVES

TYPE
SSO / UVU / ORV /
OF / DOF / TR

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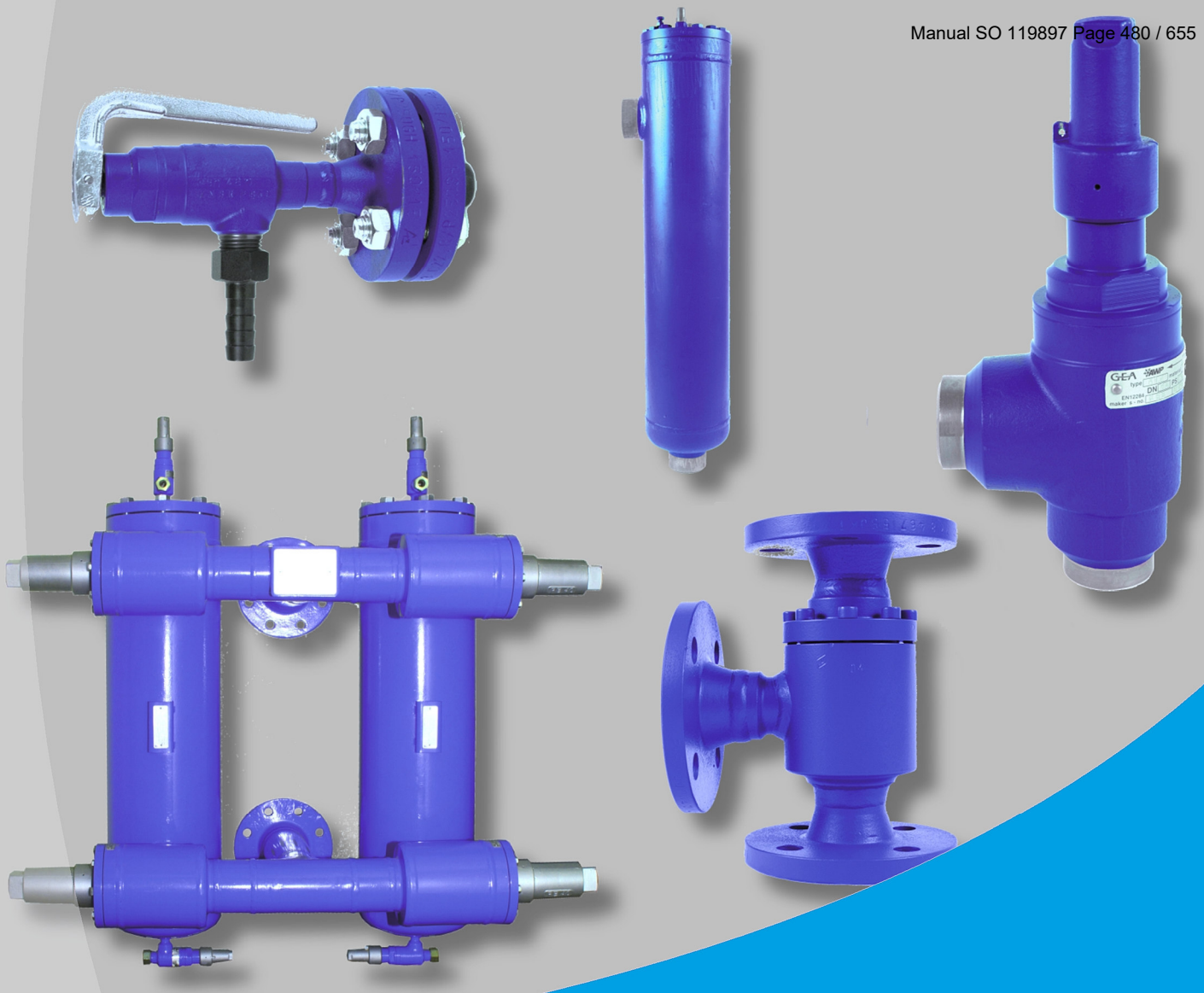

12. Ölmanagementventile
Oil Management Valves

SSO, UVU, ORV, OF, DOF, TR
Stahl, Edelstahl / Steel, Stainless Steel

AWP we love refrigeration

awpvalves.com

SSO / UVU / ORV / OF / DOF / TR

SSO: Schnellschlussventil für Ölablass
Quick-closing oil drain valve

SSO	Anschluss connection	Form design	Werkstoff material	Ventiltyp valve type	Seite page
SSO	Werkstoffe / materials				12.3
SSO PS25 / PS40	Anschweißenden butt welding ends		St	**SSO AE**	12.4
			NIRO	**SSO AE NIRO**	12.5
	Flanschenden flanged ends		St	**SSO FL**	12.6
SSO-AVR PS25 / PS40	Anschweißenden butt welding ends	Durchgang straightway	St	**SSO-AVR D AE / DV**	12.7
			NIRO	**SSO-AVR D AE / DV NIRO**	12.8
		Eck angle	St	**SSO-AVR E AE / DV**	12.9
			NIRO	**SSO-AVR E AE / DV NIRO**	12.10
	Flanschenden flanged ends	Durchgang straightway	St	**SSO-AVR D FL / DV**	12.11
		Eck angle	St	**SSO-AVR E FL / DV**	12.12

UVU: Überströmventil - gegendruckunabhängig
Overflow valve - independent of back-pressure

UVU	Anschluss connection	Form design	Werkstoff material	Ventiltyp valve type	Seite page
UVU	Werkstoffe / materials				12.13
UVU PS25 / PS40	Anschweißenden butt welding ends		St	**UVUA/B AE**	12.14
			NIRO	**UVUA/B AE NIRO**	12.15
	Flanschenden flanged ends		St	**UVUA/B FL**	12.16
			NIRO	**UVUA/B FL NIRO**	12.17
	Lötende solder ends		St	**UVUA/B LE**	12.18
			NIRO	**UVUA/B LE NIRO**	12.19
	Schraubenden screwed ends		St	**UVUA/B SE**	12.20
			NIRO	**UVUA/B SE NIRO**	12.21

ORV: Öldruck-Regulierventil
Oil-pressure regulating valve

ORV	Anschluss connection	Form design	Werkstoff material	Ventiltyp valve type	Seite page
ORV	Werkstoffe / materials				12.22
ORV PS25 / PS40	Anschweißenden butt welding ends		St	**ORVA AE**	12.23
	Flanschenden flanged ends		St	**ORVA FL**	12.24

OF: Ölfilter
Oil filter

OF	Anschluss connection	Form design	Werkstoff material	Ventiltyp valve type	Seite page
OF	Werkstoffe / materials				12.25
OF PS25 / PS40	Anschweißenden butt welding ends		St	**OF AE**	12.26
	Flanschenden flanged ends		St	**OF FL**	12.27
	Lötenden solder ends		St	**OF LE**	12.28

DV = optional Deckelverlängerung / optional cover extension St = Stahl / steel NIRO = nicht rostender Edelstahl / stainless steel

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SSO / UVU / ORV / OF / DOF / TR

DOF: Doppelölfilter
Double oil filter

DOF	Anschluss connection	Form design	Werkstoff material	Ventiltyp valve type	Seite page
DOF	Werkstoffe / materials				12.29
DOF FL PS25 / PS40	Flanschenden flanged ends		St	**DOF FL / EPE**	12.30

TR: Temperaturregler
Thermostatic 3-way valve

TR	Anschluss connection	Form design	Werkstoff material	Ventiltyp valve type	Seite page
TR	Werkstoffe / materials				12.31
TR PS25 / PS40	Anschweißenden butt welding ends		St	**TR AE / NH3**	12.32
	Anschweißenden butt welding ends		NIRO	**TR AE / NH3 NIRO**	12.33
	Flanschenden flanged ends		St	**TR FL / NH3**	12.34
	Flanschenden flanged ends		NIRO	**TR FL / NH3 NIRO**	12.35
Information	UV UM + ST Schraubenden / screwed connections				12.36
	Druckbereich Federn / Spring ranges				12.37
	Temperaturbereiche für Temperatur-Regelelemente / Temperature ranges for temperature regulating elements				12.38
	Vergleich europäische/amerikanische Werkstoffe / Comparison American vs. European material numbers				12.39
	Codierung Anschlüsse Klein- und Serviceventile / Connection codes for service valves and small valves				12.40
	DIN-FL Vorschweißflansche - DIN / Welding neck flanges - DIN				12.41/12.42
	EN-FL Vorschweißflansche - EN / Welding neck flanges - EN				12.43/12.44
	ANSI-FL Vorschweißflansche - glatt / Welding neck flanges - raised face				12.45
	AWP-FL Vorschweißflansche - AWP / Welding neck flanges - AWP				12.46
	Rechtliche Hinweise / Legal Note				12.47

St = Stahl / steel NIRO = nicht rostender Edelstahl / stainless steel

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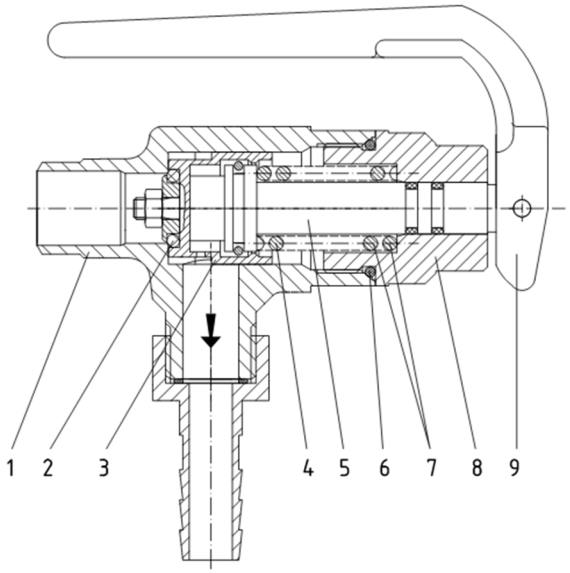
SSO Werkstoffe / materials

Benennung und Materialien / naming and materials
SSO - Schnellschlussventile für Ölablass / quick-closing oil drain valves



	Einzelteil / part:	Werkstoff Stahlventile material steel valves	Werkstoff Edelstahlventile material stainless steel valves
1	Gehäuse / body	S355J2 1.0577	X5CrNi18-10 1.4301
2	O-Ring Ventilteller / o-ring valve disc	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
3	Dichtkolben / tight piston	X8CrNiS18-9 1.4305	X8CrNiS18-9 1.4305
4	Feder / spring	SH	SH
5	Spindel / stem	X8CrNiS18-9 1.4305	X8CrNiS18-9 1.4305
6	O-Ring Ventildeckel / o-ring valve cover	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
7	O-Ring Ventilspindel / o-ring valve stem	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
8	Deckel / cover	S355J2 1.0577	X8CrNiS18-9 1.4305
9	Handhebel / lever	Aluminium / aluminum AlSi10Mg	Aluminium / aluminum AlSi10Mg

* abhängig vom verwendeten Kältemittel / depending on used refrigerant

GEA Refrigeration Technologies

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SSO Stahl / steel

Schnellschlussventil für Ölablass
Quick-closing oil drain valve

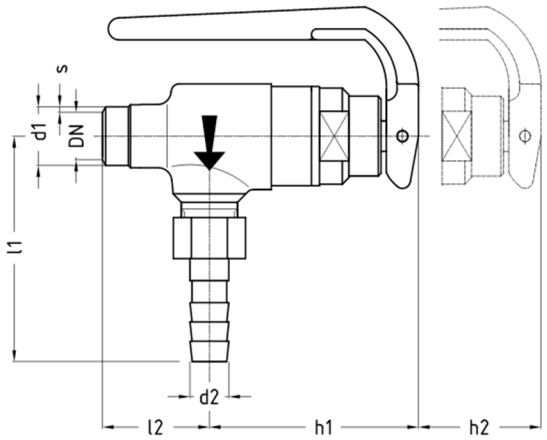
für Kältemaschinenöle mit Anteilen von natürlichen Kältemittel nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

SSO AE
AE - Anschweißenden / butt welding ends

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge

TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS



Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 ISO series 1		ANSI Sched 40						
DN	INCH	d1	s	d1	s	l1	l2	d2	h1	h2
15	1/2"	21,3	2,0	21,3	2,8	160	81	14,5	261	40

h2 = Ausbaumaß / dismantling measure

GEA Refrigeration Technologies

GEA AWP GmbH

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info.awpvalves@gea.com, www.awpvalves.com

SSO Edelstahl / stainless steel

Schnellschlussventil für Ölablass
Quick-closing oil drain valve

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

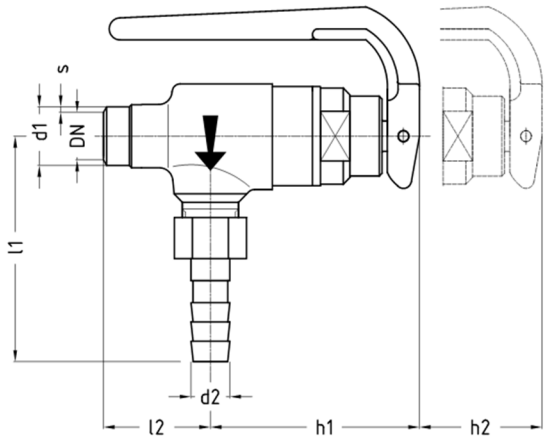
SSO AE NIRO

AE - Anschweißenden / butt welding ends

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge

TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS



Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 ISO series 1		ANSI Sched 40						
DN	INCH	d1	s	d1	s	l1	l2	d2	h1	h2
15	1/2"	21,3	2,0	21,3	2,8	160	81	14,5	261	40

h2 = Ausbaumaß / dismantling measure

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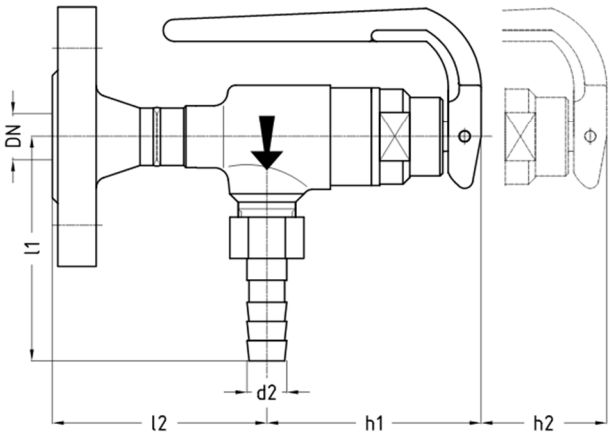
SSO FL
FL - Flanschende / flanged ends

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge

TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS



Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:							
		AWP DN15 PN25	PN25 DIN 2634 EN1092-1	PN40 DIN 2635 EN1092-1	ANSI 300 RF				
DN	INCH	l2	l2	l2	l2	l1	d2	h1	h2
15	1/2"	71,5	78	78	88	82	14,5	78	40

h2 = Ausbaumaß / dismantling measure

DIN/EN-Flanschdichtflächen serienmäßig Nut DIN2512 / DIN/EN-flange facing standard groove DIN2512

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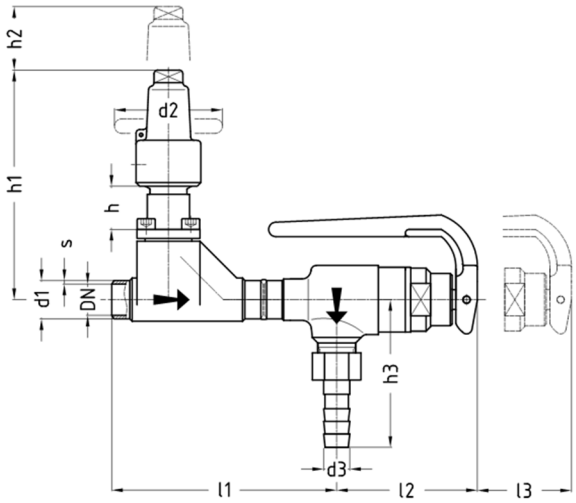
SSO-AVR Stahl / steel

Schnellschlussventil für Ölablass - mit Absperrventil
Quick-closing oil drain valve - with shut-off valve

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

SSO-AVR D AE
SSO-AVR D AE DV
D - Durchgang / straighway
AE - Anschweißenden / butt welding ends
DV - Deckelverlängerung / cover extension

! AVR um 90° gedreht gezeichnet !
! AVR drawing turn in 90° !



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 / ISO series 1		ANSI Sched 40											
DN	INCH	d1	s	d1	s	l1	l2	l3	h	h*)	h1	h1*)	h2	h3	d3	d2
15	1/2"	21,3	2,0	21,3	2,8	125	78	40	22	54	128	160	35	82	14,5	60

*) = für Ventil mit Deckelverlängerung / for valve with cover extension l3 + h2 = Ausbaumaß / dismantling measure

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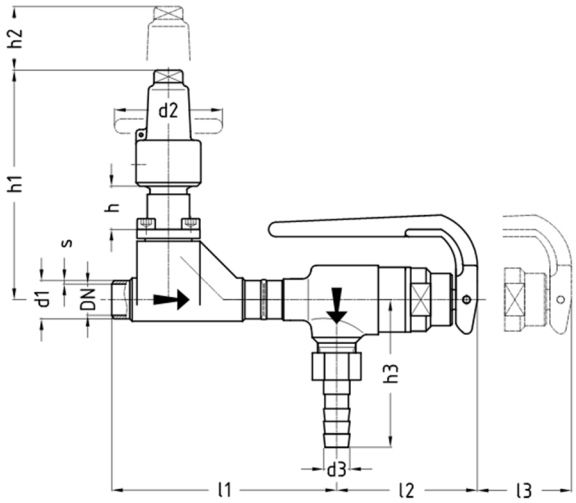
SSO-AVR D AE NIRO
SSO-AVR D AE DV NIRO

D - Durchgang / straighway
AE - Anschweißenden / butt welding ends
DV - Deckelverlängerung / cover extension

! AVR um 90° gedreht gezeichnet !
! AVR drawing turn in 90° !



Druck- / Temperatureinsatzgrenzen:
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PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 / ISO series 1		ANSI Sched 40												
DN	INCH	d1	s	d1	s	l1	l2	l3	h	h*)	h1	h1*)	h2	h3	d3	d2
15	1/2"	21,3	2,0	21,3	2,8	125	78	40	22	54	128	160	35	82	14,5	60

*) = für Ventil mit Deckelverlängerung / for valve with cover l3 + h2 = Ausbaumaß / dismantling measure

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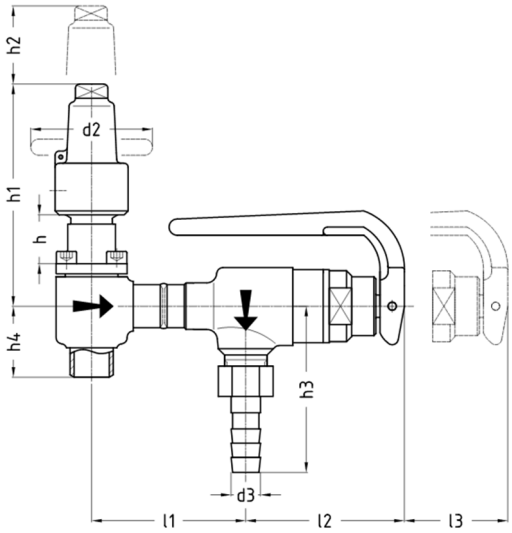
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

SSO-AVR E AE
SSO-AVR E AE DV

E - Eck / angle
AE - Anschweißenden / butt welding ends
DV - Deckelverlängerung / cover extension

! AVR um 90° gedreht gezeichnet !
! AVR drawing turn in 90° !



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 ISO series 1		ANSI Sched 40													
DN	INCH	d1	s	d1	s	l1	l2	l3	h	h*)	h1	h1*)	h2	h3	h4	d3	d2
15	1/2"	21,3	2,0	21,3	2,8	76	80	40	22	54	110	143	35	82	35	14,5	60

l3 + h2 = Ausbaumaß / dismantling measure
*) = für Ventil mit Deckelverlängerung / for valve with cover extension

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SSO-AVR E AE NIRO
SSO-AVR E AE DV NIRO

E - Eck / angle
AE - Anschweißenden / butt welding ends
DV - Deckelverlängerung / cover extension

! AVR um 90° gedreht gezeichnet !
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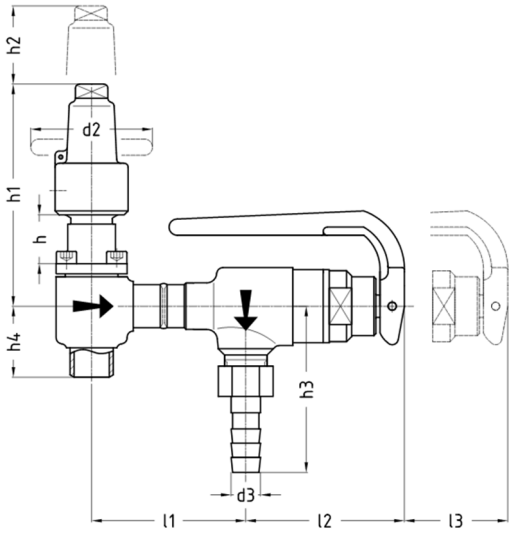

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 ISO series 1		ANSI Sched 40													
DN	INCH	d1	s	d1	s	l1	l2	l3	h	h*)	h1	h1*)	h2	h3	h4	d3	d2
15	1/2"	21,3	2,0	21,3	2,8	76	80	40	22	54	110	143	35	82	35	14,5	60

*) = für Ventil mit Deckelverlängerung / for valve with cover extension l3 + h2 = Ausbaumaß / dismantling measure

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SSO Stahl / steel

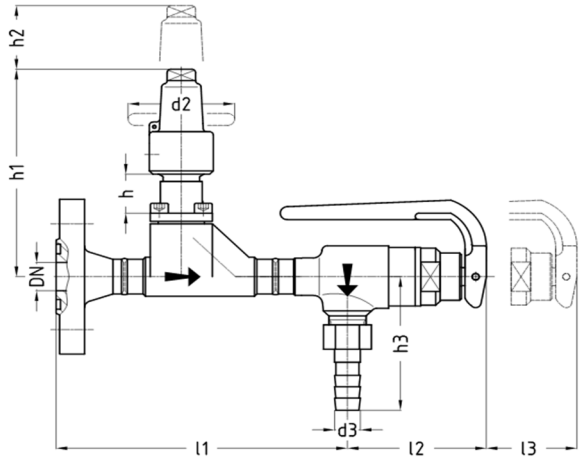
Schnellschlussventil für Ölablass mit Absperrventil - Spindelabdichtung mit elastischem PTFE-Ring
Quick-closing oil drain valve with shut-off valve - stem-sealing with elastic PTFE-Ring

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

SSO-AVR D FL
SSO-AVR D FL DV

AVR - Absperrventil / shut-off valve
D - Durchgang / straightway
FL - Flanschende / flanged ends
DV - Deckelverlängerung / cover extension

! AVR um 90° gedreht gezeichnet !
! AVR drawing turn in 90° !



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:													
		AWP DN15 PN25	PN25 DIN 2634 EN1092-1	PN40 DIN 2635 EN1092-1	ANSI 300 RF										
DN	INCH	l1	l1	l1	l1	l2	l3	h	h*)	h1	h1*)	h2	h3	d3	d2
15	1/2"	158	164	164	174	78	40	22	54	128	160	35	82	14,5	60

*) für Ventil mit Deckelverlängerung / for valve with extended cover , l3/h2 = Ausbaumaß / dismantling measure
DIN/EN-Flanschdichtflächen serienmäßig Nut DIN2512 / DIN/EN-flange facing standard groove DIN2512

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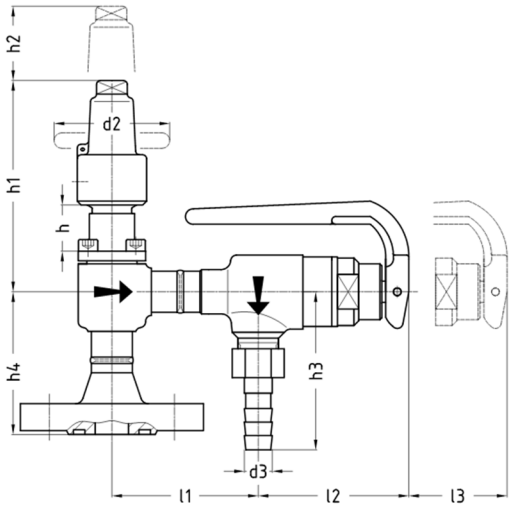
für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

SSO-AVR E FL
SSO-AVR E FL DV

AVR - Absperrventil / shut-off valve
E - Eck / angle
FL - Flanschende / flanged ends
DV - Deckelverlängerung / cover extension

! AVR um 90° gedreht gezeichnet !
! AVR drawing turn in 90° !



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

Mit O-Ring CR / with o-ring CR

DN / INCH	PN	-35	-10	+50	+120	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Mit O-Ring HNBR / with o-ring HNBR

DN / INCH	PN	-40	-10	+50	+150	TS [°C]
DN 15 1/2"	PN25	18,3	25	25	25	PS [bar]
	PN40	29,4	40	40	40	PS [bar]

Öffnungsdruck- / Opening pressure:

DN / INCH	Öffnungsdruck [bar] Opening pressure [bar]	
DN 15 ½"	26 - 28	
	46 - 50	(kundenspez. Lösung) / (customized solution)

Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:														
		AWP DN15 PN25	PN25 DIN 2634 EN1092-1	PN40 DIN 2635 EN1092-1	ANSI 300 RF											
DN	INCH	h4	h4	h4	h4	l1	l2	l3	h	h*)	h1	h1*)	h2	h3	d3	d2
15	1/2"	68	74	74	88	72	80	40	22	54	110	143	35	82	14,5	60

*) für Ventil mit Deckelverlängerung / for valve with extended cover , l3/h2 = Ausbaumaß / dismantling measure

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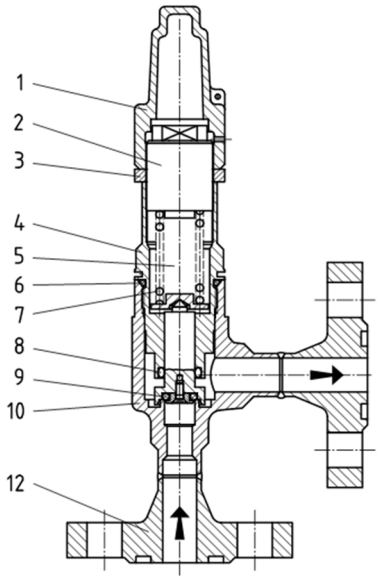
12.12

UVU Werkstoffe / materials

Benennung und Materialien / naming and materials
UVU – Überströmventile / overflow valves



	Einzelteil / part:	Werkstoff Stahlventile material steel valves	Werkstoff Edelstahlventile material stainless steel valves
1	Kappe / cap	Aluminium / aluminum AlSi10Mg	Aluminium / aluminum AlSi10Mg
2	Einstellschraube / adjustment screw	X8CrNiS18-9 1.4305	X8CrNiS18-9 1.4305
3	Deckel / cover	S355J2 1.0577	X8CrNiS18-9 1.4305
4	Feder / spring	SH	SH
8	O-Ring Ventilteller / o-ring valve disc	CR, NBR, HNBR, EPDM, PTFE*	CR, NBR, HNBR, EPDM, PTFE*
9	Gehäuse / body	X5CrNi18-10 1.4301	X5CrNi18-10 1.4301
12	Flansch / flange	P250GH 1.0460	X6CrNiTi18-10 1.4541
14	O-Ring Deckel / o-ring cover	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
15	federbelasteter Nutring / spring loaded u-ring	PTFE	PTFE

* abhängig vom verwendeten Kältemittel / depending on used refrigerant

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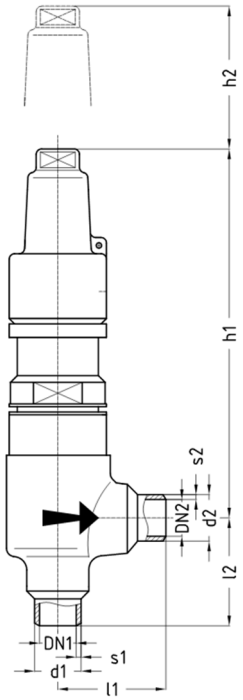
UVU Stahl / steel

Überströmventil - gegendruckunabhängig
Overflow valve - independent of back-pressure

für natürliche Kältemittel (NH3, CO2) und nicht korrosive Gase nach EN 378-1 sowie Kältemaschinenöle
for natural refrigerants (Ammonia, CO2) and non-corrosive gases acc. to EN 378-1 as well as for refrigeration oils

UVUA AE
UVUB AE

A - PTFE-Sitzdichtung / PTFE seat sealing
B - Elastomere Sitzdichtung / elastomer seat sealing
AE - Anschweißenden / butt welding ends



Hinweis / instruction:
Das UVU ist ein Überströmventil, das sich auch im Ölkreislauf ausgezeichnet bewährt hat.
UVU is an on overflow valve, also reliable and well-proven in oil circuits.

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 8...15	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]
	PN63	47,2	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to:															Ansprechdruckbereich / set pressure range	
		ISO Reihe 1 ISO series 1						ANSI Sched 40										h1*) für / for
DN1	**DN2**	**d1**	**s1[1)]**	**s1[2)]**	**d2**	**s2[1)]**	**s2[2)]**	**d1**	**s1**	**d2**	**s2**	**l1**	**l2**	**h1**	**h1*)**	**h2**	**bar**	**bar**
8	**8**	13,5	1,8	1,8	13,5	1,8	1,8	13,7	2,2	13,7	2,2	40	40	148	175	32	**4-63**	**28-63**
10	**10**	17,2	1,8	1,8	17,2	1,8	1,8	17,1	2,3	17,1	2,3	40	40	148	175	32	**4-63**	**28-63**
15	**15**	21,3	2,0	2,0	21,3	2,0	2,0	21,3	2,8	21,3	2,8	40	40	148	175	32	**4-63**	**28-63**

1) PN25 / PN40 2) PN63 h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure

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UVU Edelstahl / stainless steel

Überströmventil - gegendruckunabhängig
Overflow valve - independent of back-pressure

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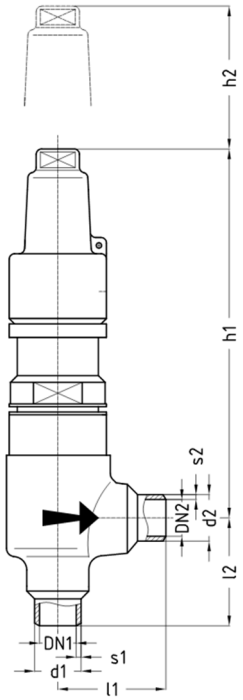
UVUA AE NIRO
UVUB AE NIRO

A - PTFE-Sitzdichtung / PTFE seat sealing
B - Elastomere Sitzdichtung / elastomer seat sealing
AE - Anschweißenden / butt welding ends



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Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 8...15	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]
	PN63	63	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to:															Ansprechdruckbereich / set pressure range	
		ISO Reihe 1 ISO series 1						ANSI Sched 40									h1*) für / for	
DN1	**DN2**	**d1**	**s1[1)]**	**s1[2)]**	**d2**	**s2[1)]**	**s2[2)]**	**d1**	**s1**	**d2**	**s2**	**l1**	**l2**	**h1**	**h1*)**	**h2**	**bar**	**bar**
8	**8**	13,5	1,8	1,8	13,5	1,8	1,8	13,7	2,2	13,7	2,2	40	40	148	175	32	**4-63**	**28-63**
10	**10**	17,2	1,8	1,8	17,2	1,8	1,8	17,1	2,3	17,1	2,3	40	40	148	175	32	**4-63**	**28-63**
15	**15**	21,3	2,0	2,0	21,3	2,0	2,0	21,3	2,8	21,3	2,8	40	40	148	175	32	**4-63**	**28-63**

1) PN25 / PN40 2) PN63 h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure

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UVU Stahl / steel

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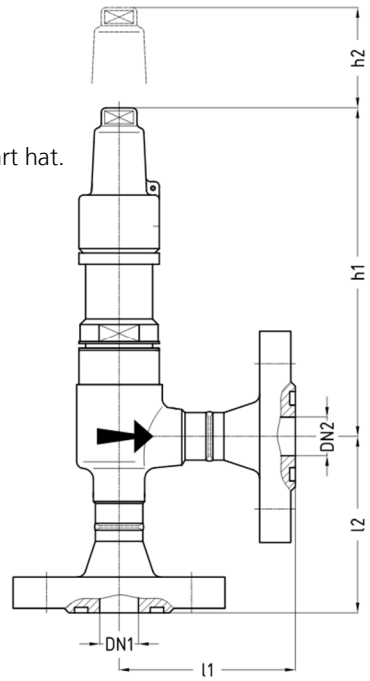
UVUA FL
UVUB FL

A - PTFE-Sitzdichtung / PTFE seat sealing
B - Elastomere Sitzdichtung / elastomer seat sealing
FL - Flanschenden / flanged ends



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Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
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DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 10...15	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]
	PN63	47,2	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:													Ansprechdruckbereich / set pressure range	
		AWP DN10-15 PN25		PN25 DIN 2634 EN1092-1		PN40 DIN 2635 EN1092-1		PN63 DIN 2636 EN1092-1		ANSI 300 RF						h1*) für / for
DN1	DN2	l1	l2	l1	l2	l1	l2	l1	l2	l1	l2	h1	h1*)	h2	bar	bar
10	10	72	72	76	76	76	76	86	86			148	175	32	4-63	28-63
15	15	72	72	79	79	79	79	86	86	93	93	148	175	32	4-63	28-63

h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure
DIN/EN-Flanschdichtflächen serienmäßig Nut DIN2512 / DIN/EN-flange facing standard groove DIN2512

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UVU Edelstahl / stainless steel

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Overflow valve - independent of back-pressure

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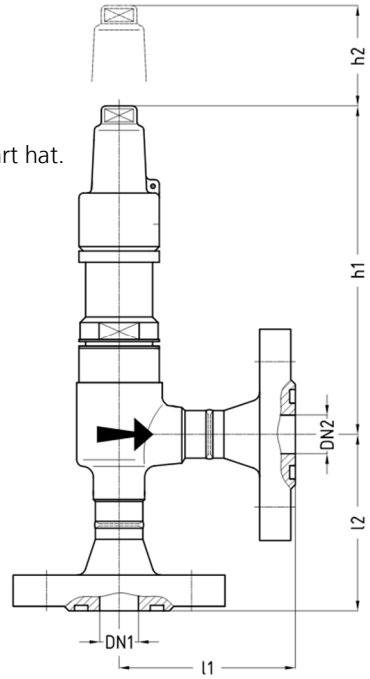
UVUA FL NIRO
UVUB FL NIRO

A - PTFE-Sitzdichtung / PTFE seat sealing
B - Elastomere Sitzdichtung / elastomer seat sealing
FL - Flanschenden / flanged ends



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Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

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DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 10...15	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]
	PN63	63	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:													Ansprechdruckbereich / set pressure range	
		AWP DN10-15 PN25		PN25 DIN 2634 EN1092-1		PN40 DIN 2635 EN1092-1		PN63 DIN 2636 EN1092-1		ANSI 300 RF						h1*) für / for
DN1	DN2	l1	l2	l1	l2	l1	l2	l1	l2	l1	l2	h1	h1*)	h2	bar	bar
10	10	72	72	76	76	76	76	86	86			148	175	32	4-63	28-63
15	15	72	72	79	79	79	79	86	86	93	93	148	175	32	4-63	28-63

h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure
DIN/EN-Flanschdichtflächen serienmäßig Nut DIN2512 / DIN/EN-flange facing standard groove DIN2512

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UVU Stahl / steel

Überströmventil - gegendruckunabhängig
Overflow valve - independent of back-pressure

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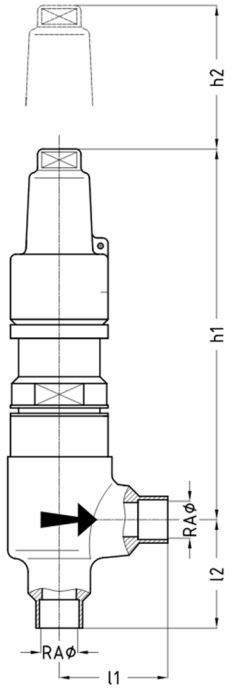
UVUA LE
UVUB LE

A - PTFE-Sitzdichtung / PTFE seat sealing
B - Elastomere Sitzdichtung / elastomer seat sealing
LE - Lötenden / solder ends



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Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 10...15	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]
	PN63	47,2	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Lötenden gemäß: / solder ends acc. to:						Ansprechdruckbereich / set pressure range	
									h1*) für / for
DN1	DN2	RAØ	l1	l2	h1	h1*)	h2	bar	bar
10	10	12	40	40	148	175	32	4-63	28-63
15	15	15	40	40	148	175	32	4-63	28-63
15	15	18	40	40	148	175	32	4-63	28-63

h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure

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UVUA LE NIRO
UVUB LE NIRO

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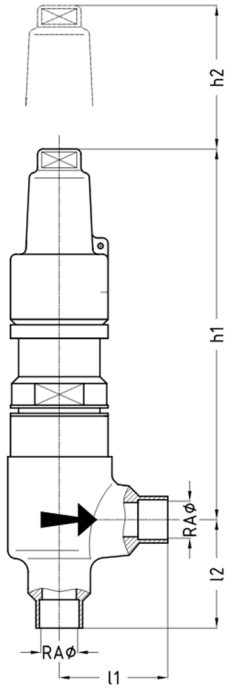
B - Elastomere Sitzdichtung / elastomer seat sealing
LE - Lötenden / solder ends



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DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 10...15	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]
	PN63	63	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Lötenden gemäß: / solder ends acc. to:						Ansprechdruckbereich / set pressure range h1*) für / for	
DN1	**DN2**	**RAØ**	**l1**	**l2**	**h1**	**h1*)**	**h2**	**bar**	**bar**
10	**10**	**12**	40	40	148	175	32	**4-63**	**28-63**
15	**15**	**15**	40	40	148	175	32	**4-63**	**28-63**
15	**15**	**18**	40	40	148	175	32	**4-63**	**28-63**

h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure

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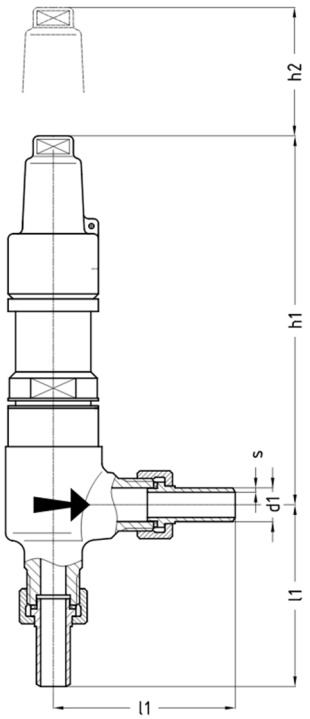
UVUA SE
UVUB SE

A - PTFE-Sitzdichtung / PTFE seat sealing
B - Elastomere Sitzdichtung / elastomer seat sealing
SE - Schraubenden / screwed ends



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DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 15	PN25	18,7	25	25	25	PS [bar]
	PN40	30	40	40	40	PS [bar]
	PN63	47,2	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Lötenden gemäß: / solder ends acc. to:							Ansprechdruckbereich / set pressure range h1*) für / for	
DN	**DN**	**Gewinde / Rohrdurchmesser**	**d1**	**s**	**l1**	**h1**	**h1*)**	**h2**	**bar**	**bar**
15	**G 1/2"**	**M22x1,5 RA15**	15,0	2,0	73	148	175	32	**4-63**	**28-63**
15	**G 1/2"/G 1"**	**G1/2"**			40	148	175	32	**4-63**	**28-63**

h1*) = gilt für Ansprechdrücke 28-63 bar h2 = Ausbaumaß / dismantling measure

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12.20

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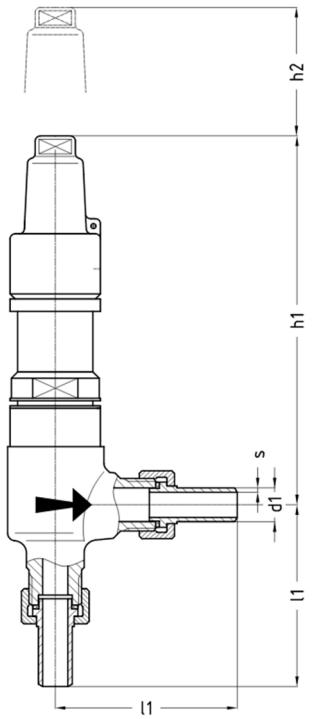

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DN / INCH UVUA	PN	-60	-10	+50	+180	TS [°C]
DN / INCH UVUB	PN	-50	-10	+50	+110	TS [°C]
UVUA/UVUB DN 15	PN25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	PS [bar]
	PN63	63	63	63	63	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Lötenden gemäß: / solder ends acc. to:							Ansprechdruckbereich/ set pressure range	h1*) für / for
DN	**DN**	**Gewinde / Rohrdurchmesser**	**d1**	**s**	**l1**	**h1**	**h1*)**	**h2**	**bar**	**bar**
15	**G 1/2"**	**M22x1,5 RA15**	15,0	2,0	73	148	175	32	**4-63**	**28-63**
15	**G 1/2"/G 1"**	**G1/2"**			40	148	175	32	**4-63**	**28-63**

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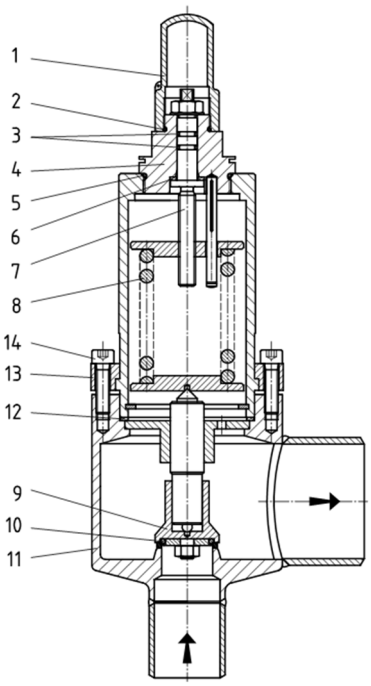
ORV Werkstoffe / materials

Benennung und Materialien / naming and materials
ORV - Öldruck-Regulierventile / oil-pressure regulating valves



	Einzelteil / part:	Werkstoff Stahlventile material steel valves	Werkstoff Edelstahlventile material stainless steel valves
1	Kappe / cap	Aluminium / aluminum AlSi10Mg	Aluminium / aluminum AlSi10Mg
2	O-Ring Ventilkappe / o-ring valve cap	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
3	O-Ring Ventilspindel / o-ring valve stem	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
4	Deckel / cover	S355J2 1.0577	X8CrNiS18-9 1.4305 X5CrNi18-10 1.4301 X2CrNi19-11 1.4306
5	O-Ring Deckel / o- ring cover	CR, NBR, HNBR, EPDM, PTFE*	CR, NBR, HNBR, EPDM, PTFE*
6	Rückdichtung / back seat	PTFE	PTFE
7	Spindel / stem	X8CrNiS18-9 1.4305	X8CrNiS18-9 1.4305
8	Feder / spring	SH	SH
9	Dichtkolben / tight piston	X8CrNiS18-9 1.4305	X8CrNiS18-9 1.4305
10	O-Ring Ventilteller / o- ring valve disc	CR, NBR, HNBR, EPDM, PTFE*	CR, NBR, HNBR, EPDM, PTFE*
11	Gehäuse / body	S355J2 1.0577 P235GH 1.0345	X5CrNi18-10 1.4301 GX5CrNiMoNb19-11-2 1.4581
12	Flachdichtring Deckel / flat seal ring cover	AFM30	AFM30
13	Loser Ring / loose ring	S355J2 1.1.0570	X8CrNiS18-9 1.4305
14	Schrauben / screews	8.8	A2-70

* abhängig vom verwendeten Kältemittel / depending on used refrigerant

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12.22

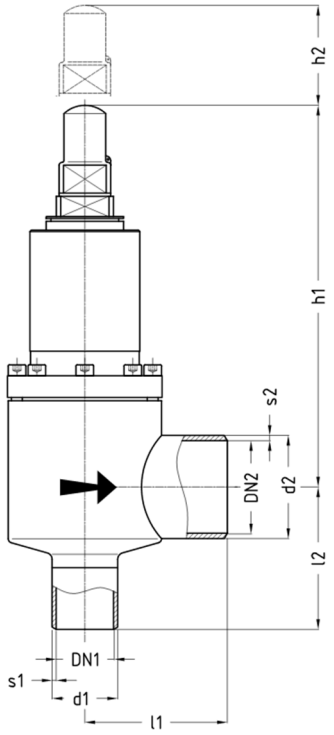
ORV Stahl / steel

Öldruck-Regulierventil
Oil-pressure regulating valve

für natürliche Kältemittel (NH3, CO2) und nicht korrosive Gase nach EN 378-1 sowie Kältemaschinenöle
for natural refrigerants (Ammonia, CO2) and non-corrosive gases acc. to EN 378-1 as well as for refrigeration oils

ORVA AE

A - PTFE-Sitzdichtung / PTFE seat sealing
AE - Anschweißenden / butt welding ends



Hinweis / instruction:
Das ORV ist ein gegendruckabhängiges Überströmventil.
Für DN15 – 32 bitte UVAB wählen (Kapitel 11) wählen.

ORV is an overflow valve, depending on back-pressure.
For DN15 – 32 select UVAB please (chapter 11).

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-60	-40	-25	-10	+50	+150	TS [°C]
DN 40…50 1 1/2"…2"	PN25	7,3	18,3	18,7	25	25	25	PS [bar]
	PN40	11,8	29,4	30	40	40	40	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to:												
		ISO Reihe 1 ISO series 1				ANSI Sched 40								Einstellbereich / range of adjustment
DN1	DN2	d1	s1	d2	s2	d1	s1	d2	s2	l1	l2	h1	h2	bar
40	65	48,3	2,6	76,1	2,9	48,3	3,7	76,1	5,2	105	105	295	100	1-6
50	65	60,3	2,9	76,1	2,9	60,3	3,9	76,1	5,2	115	115	295	100	1-6

h2 = Ausbaumaß / dismantling measure

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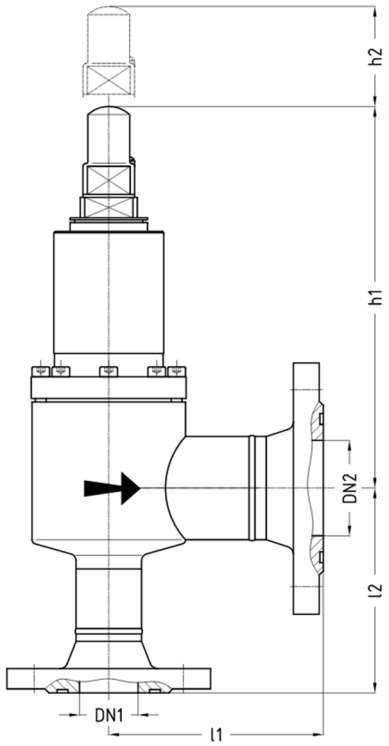
ORV Stahl / steel

Öldruck-Regulierventil
Oil-pressure regulating valve

für natürliche Kältemittel (NH3, CO2) und nicht korrosive Gase nach EN 378-1 sowie Kältemaschinenöle
for natural refrigerants (Ammonia, CO2) and non-corrosive gases acc. to EN 378-1 as well as for refrigeration oils

ORVA FL

A - PTFE-Sitzdichtung / PTFE seat sealing
FL - Flanschenden / flanged ends



Hinweis / instruction:
Das ORV ist ein gegendruckabhängiges Überströmventil.
Für DN15 – 32 bitte UVAB wählen (Kapitel 11) wählen.

ORV is an overflow valve, depending on back-pressure.
For DN15 – 32 select UVAB please (chapter 11).

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Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-60	-40	-25	-10	+50	+150	TS [°C]
DN 40…50 1 1/2"…2"	PN25	7,3	18,3	18,7	25	25	25	PS [bar]
	PN40	11,8	29,4	30	40	40	40	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:										
		AWP DN40-50 PN40		PN25 DIN 2634 EN1092-1		PN40 DIN 2635 EN1092-1		ANSI 300 RF				Einstellbereich / range of adjustment
DN1	**DN2**	**l1**	**l2**	**l1**	**l2**	**l1**	**l2**	**l1**	**l2**	**h1**	**h2**	**bar**
40	**65**	160	145	158	151	158	151	183	175	295	100	**1-6**
50	**65**	170	159	168	164	168	164	193	186	295	100	**1-6**

h2 = Ausbaumaß / dismantling measure
DIN/EN-Flanschdichtflächen serienmäßig Nut DIN2512 / DIN/EN-flange facing standard groove DIN2512

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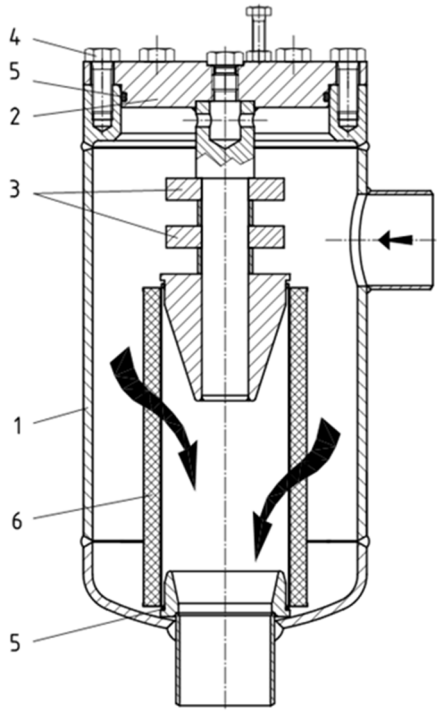
OF Werkstoffe / materials

Benennung und Materialien / naming and materials
OF - Ölfilter / oil filters



	Einzelteil / part:	Werkstoff Stahlventile material steel valves	Werkstoff Edelstahlventile material stainless steel valves
1	Gehäuse / body	S355J2 1.0577 P235GH 1.0345	
2	Deckel / cover	S355J2 1.0577	
3	Magnet / magnet	Hartferrite Ox / hard ferrites Ox	
4	Schraube / screws	8.8; A2-70	
5	O-Ring / o-ring	CR, NBR, HNBR, EPDM, FPM*	
6	Filter / filter	Edelstahlgewebe / stainless steel mesh Papiervlies / fibrous web paper	

* abhängig vom verwendeten Kältemittel / depending on used refrigerant

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OF Stahl / steel

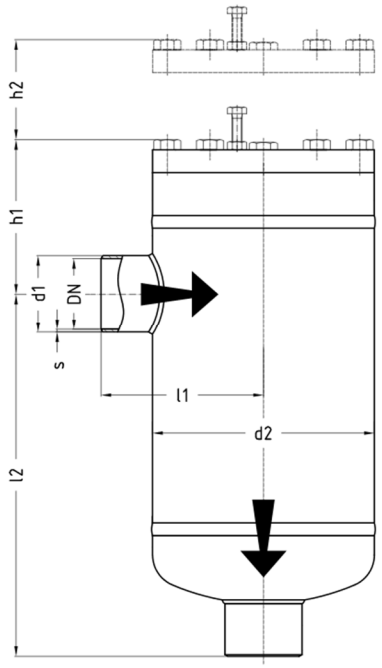
Ölfilter
Oil filter

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

OF AE

AE - Anschweißenden / butt welding ends

Optional / optional:
Edelstahlgewebe in 40µm, 25µm oder 10µm oder Papiervlies 10µm.
Stainless steel mesh in 40µm, 25µm or 10µm or fibrous web paper 10µm.



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20...80 3/4"...3"	PN25	12,5	18,7	25	25	25	PS [bar]
	PN40	20	30	40	40	40	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to:													
		ISO Reihe 1 ISO series 1		ISO Reihe 2 ISO series 2		ANSI Sched 40							Filtervolumen filter volume		Filterpatrone filter cartridge
DN	INCH	d1	s	d1	s	d1	s	l1	l2	h1	h2	d2	3,5l	13,8l	Typ/type
15	1/2"	21,3	2,0	20,0	2,5	21,3	2,8	120	230	115	200	140	x		A90
20	3/4"	26,9	2,3	25,0	2,5	26,7	2,9	120	230	115	200	140	x		A90
25	1"	33,7	2,6	32,0	3,0	33,4	3,4	120	230	115	200	140	x		A90
32	1 1/4"	42,4	2,6	38,0	3,0	42,2	3,6	120	230	115	200	140	x		A90
40	1 1/2"	48,3	2,6	45,0	3,0	48,3	3,7	120	230	115	200	140	x		A90
50	2"	60,3	2,9	57,0	3,2	60,3	3,9	120	230	115	200	140	x		A90
50	2"	60,3	2,9	57,0	3,2	60,3	3,9	160	360	155	260	219		x	A160
65	2 1/2"	76,1	2,9	76,1	3,6	73,0	5,2	160	360	155	260	219		x	A160
80	3"	88,9	3,2	88,9	4,0	88,9	5,5	160	360	155	260	219		x	A160
100	4"	114,3	3,6	108,0	4,0	114,3	6,0	200	360	180	260	219		x	A160

h2 = Ausbaumaß / dismantling measure

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OF Stahl / steel

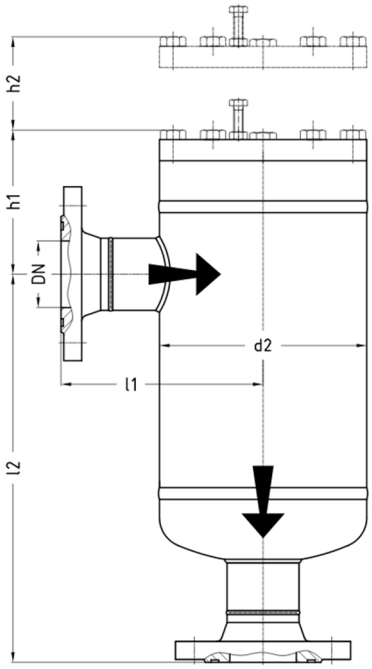
Ölfilter
Oil filter

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

OF FL

FL - Flanschende / flanged ends

Optional / optional:
Edelstahlgewebe in 40µm, 25µm oder 10µm oder Papiervlies 10µm.
Stainless steel mesh in 40µm, 25µm or 10µm or fibrous web paper 10µm.



Druck- / Temperatureinsatzgrenzen:
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TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20...80 3/4"...3"	PN25	12,5	18,7	25	25	25	PS [bar]
	PN40	20	30	40	40	40	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Flanschende gemäß: / flanged ends acc. to:											
		PS25 DIN 2634 EN1092-1		PS40 DIN 2635 EN1092-1		ANSI 300 RF					Filervolumen filter volume		Filterpatrone filter cartridge
DN	**INCH**	**l1**	**l2**	**l1**	**l2**	**l1**	**l2**	**h1**	**h2**	**d2**	**3,5l**	**13,8l**	**Typ/type**
15	**1/2"**	159	269	159	269	173	283	115	200	140	**x**		A90
20	**3/4"**	161	271	161	271	179	288	115	200	140	**x**		A90
25	**1"**	161	271	161	271	183	293	115	200	140	**x**		A90
32	**1 1/4"**	163	273	163	273	186	296	115	200	140	**x**		A90
40	**1 1/2"**	166	276	166	276	189	299	115	200	140	**x**		A90
50	**2"**	169	279	169	279	191	301	115	200	140	**x**		A90
50	**2"**	209	409	209	409	231	431	155	260	219		**x**	A160
65	**2 1/2"**	213	413	213	413	237	437	155	260	219		**x**	A160
80	**3"**	219	419	219	419	240	440	155	260	219		**x**	A160
100	**4"**	266	326	266	326	282	342	180	260	219		**x**	A160

h2 = Ausbaumaß / dismantling measure

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OF Stahl / steel

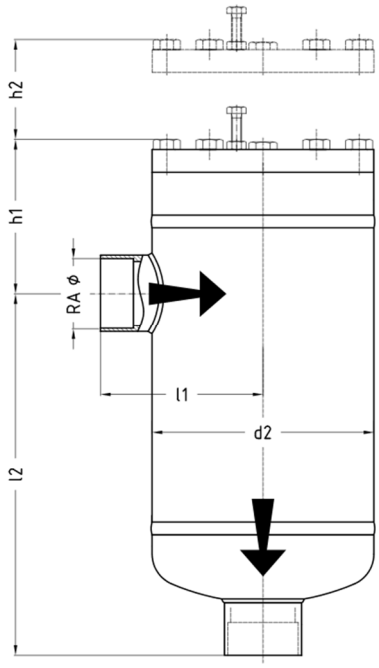
Ölfilter
Oil filter

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

OF LE

LE - Lötenden / solder ends

Optional / optional:
Edelstahlgewebe in 40µm, 25µm oder 10µm oder Papiervlies 10µm.
Stainless steel mesh in 40µm, 25µm or 10µm or fibrous web paper 10µm.



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20...80 3/4"...3"	PN25	12,5	18,7	25	25	25	PS [bar]
	PN40	20	30	40	40	40	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:	Lötenden gemäß: / solder ends acc. to:						Filervolumen filter volume		Filterpatrone filter cartridge
DN	**RAØ**	**l1**	**l2**	**h1**	**h2**	**d2**	**3,5l**	**13,8l**	**Typ/type**
15	**18**	120	230	115	200	140	**x**		A90
20	**22**	120	230	115	200	140	**x**		A90
25	**28**	120	230	115	200	140	**x**		A90
32	**35**	120	230	115	200	140	**x**		A90
40	**42**	120	230	115	200	140	**x**		A90
50	**54**	120	230	115	200	140	**x**		A90
50	**54**							**x**	A160
65	**64**							**x**	A160
65	**76**	auf Anfrage / on request						**x**	A160
80	**89**							**x**	A160
100	**108**							**x**	A160

h2 = Ausbaumaß / dismantling measure

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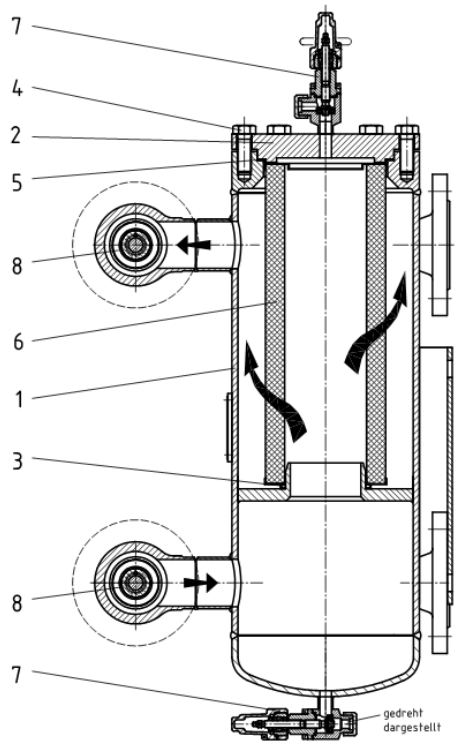
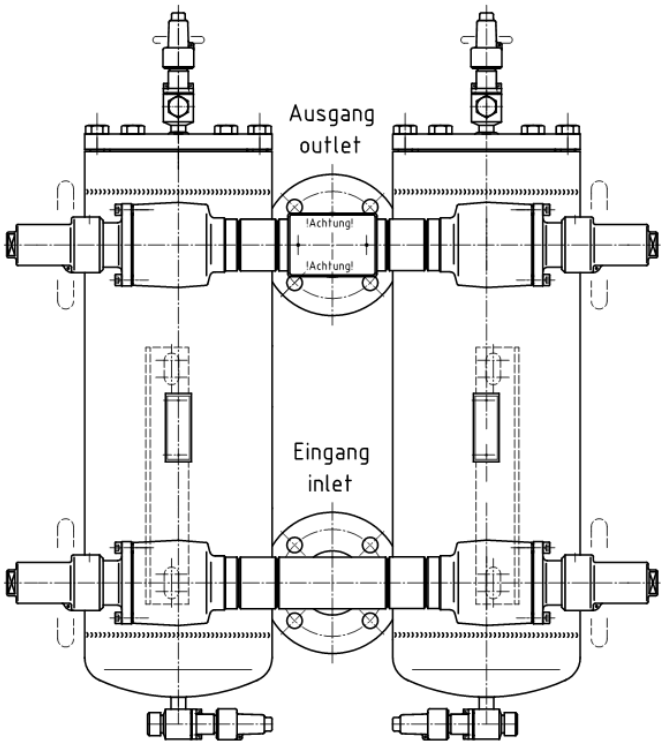
DOF Werkstoffe / materials

Benennung und Materialien / naming and materials
DOF - Doppelölfilter / double oil filters





	Einzelteil / part:	Werkstoff Stahlventile material steel valves	Werkstoff Edelstahlventile material stainless steel valves
1	Gehäuse / body	S355J2 1.0577 P235GH 1.0345	
2	Deckel / cover	S355J2 1.0577	
3	O-Ring / o-ring	CR	
4	Schraube / screws	8.8; A2-70	
5	Flachdichtung / flat sealing ring	AFM asbestfrei / AFM asbestos free	
6	Filter / filter	Papiervlies / fibrous web paper	
7	Serviceventil HRS / service valve HRS	Siehe Kapitel 1 / see chapter 1	
8	Absperrventil AVR / shut-off valve AVR	Siehe Kapitel 2 / see chapter 2	

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DOF Stahl / steel

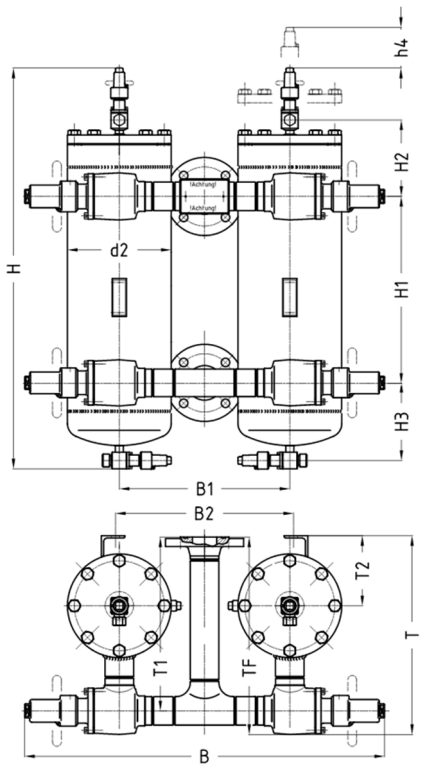
Doppelölfilter
Double oil filter

für Kältemaschinenöle mit Anteilen von natürlichen Kältemitteln nach EN 378-1
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

DOF FL
DOF FL EPE

FL - Flanschende / flanged ends
EPE - EPE-Elemente / EPE elements

Ausstattung / equipment:
Filterelemente mit Papiervlies 10µm.
Filter elements with fibrous web paper 10µm



Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-60	-40	-25	-10	+50	+150	TS [°C]
DN 20…80 3/4"…3"	PN25	7,3	18,3	18,7	25	25	25	PS [bar]
	PN40	11,8	29,4	30	40	40	40	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Flanschende gemäß: / flanged ends acc. to: PS25 DIN 2634 EN1092-1		PS40 DIN 2635 EN1092-1		ANSI 300 RF												Filterelememte filter elements
DN	INCH	TF	T1	TF	T1	TF	T1	H	H1	H2	H3	h4	B	B1	B2	T	T2	d2	Nr. / no.:
20	3/4"	303	273	303	273	320	290	575	235	126	135	245	580	308	340	302	122	170	EPE 361
25	1"	311	273	311	273	333	295	575	235	126	135	245	530	308	340	306	122	170	EPE 361
32	1 1/4"	311	273	311	273	334	296	575	235	126	135	245	530	308	340	306	122	170	EPE 361
40	1 1/2"	406	358	406	358	429	381	655	250	161	165	270	570	330	376	414	148	220	EPE 561
40	1 1/2"	406	358	406	358	429	381	800	395	161	165	395	570	330	376	414	148	220	EPE 901
50	2"	413	365	413	365	435	387	655	250	161	165	270	600	360	376	426	154	220	EPE 561
50	2"	413	365	413	365	435	387	800	395	161	165	395	600	360	376	426	154	220	EPE 901
65	2 1/2"	405	347	405	347	429	371	800	395	161	165	395	685	324	376	402	148	220	EPE 901
65	2 1/2"	405	347	405	347	429	371	945	520	171	175	520	685	324	376	402	148	220	EPE 1401
80	3"	421	350	421	350	442	371	945	520	171	175	520	745	374	376	438	156	220	EPE 1401

h4 = Ausbaumaß / dismantling measure
Achtung! Bitte bei Bestellung den Volumenstrom l/min, Viskosität des Öls, gewünschter Druckverlust und die Durchflussrichtung angeben!
* pro DOF werden 2 EPE-Elemente benötigt, O-Ring ist im Element enthalten, Deckeldichtung muss separat bestellt werden.
Attention! Please specify the volume flow rate l/min, viscosity of oil, requested pressure decrease and direction of flow by ordering!
* each DOF requires 2 EPE-Elements, O-Ring is included within the element, bonnet gasket has to be ordered separately.

GEA Refrigeration Technologies

GEA AWP GmbH **12.30**

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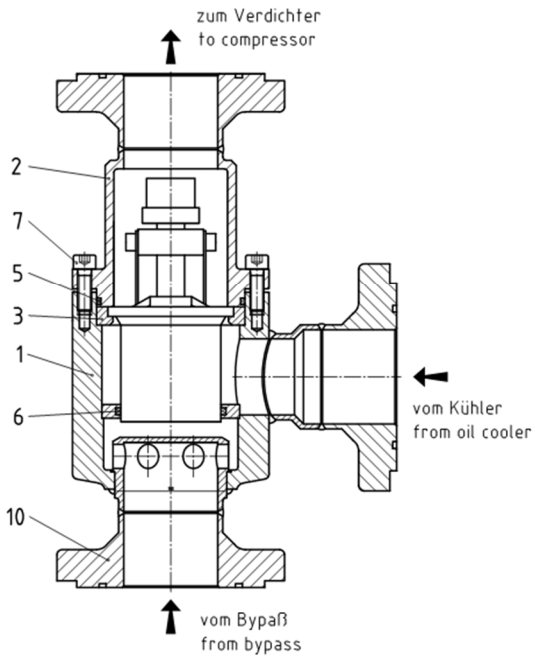
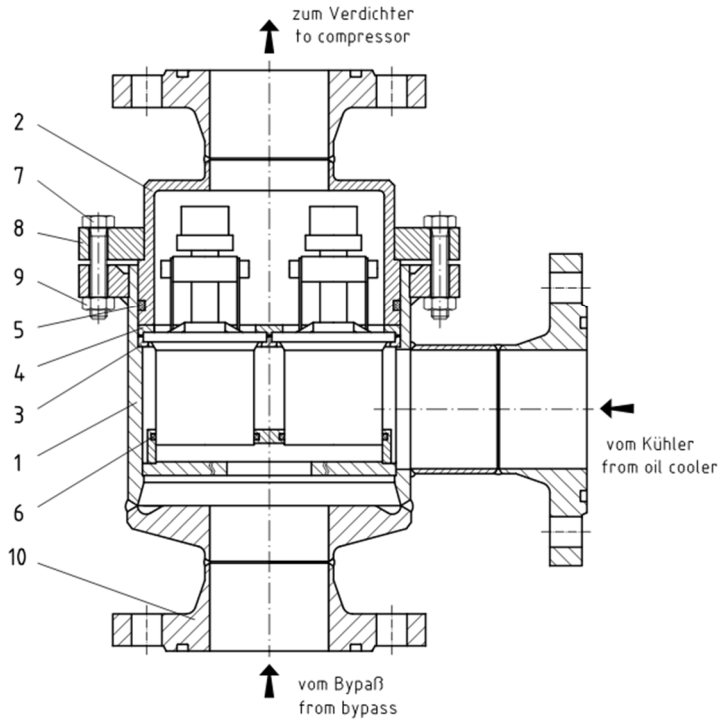
TR Werkstoffe / materials

Benennung und Materialien / naming and materials
TR - Temperaturregler / thermostatic 3-way valves

DN 20 – 50



DN 65 – 150



	Einzelteil / part:	Werkstoff Stahlventile material steel valves	Werkstoff Edelstahlventile material stainless steel valves
1	Gehäuse / body	S355J2 1.0577 P235GH 1.0345	X5CrNi18-10 1.4301
2	Deckel / cover	S355J2 1.0577 P265GH 1.0425	X5CrNi18-10 1.4301
3	Führungsring / lead ring	S235JR 1.0038	X5CrNi18-10 1.4301
4	Anruckplatte / platen	S235JR 1.0038	X5CrNi18-10 1.4301
5	O-Ring / o-ring	CR, NBR, HNBR, EPDM, FPM*	CR, NBR, HNBR, EPDM, FPM*
6	Kolbenring / piston ring	PTFE	PTFE
7	Deckelschraube / cover screw	8.8	A2-70
8	Deckelflansch / cover flange	S355J2 1.0570	X8CrNiS18-9 1.4305
9	Deckelmutter / cover nut	8	A2
10	Flansch / flange	P250GH 1.0460 P355NL1 1.0566	X6CrNiTi18-10 1.4541

* abhängig vom verwendeten Kältemittel / depending on used refrigerant

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TR Stahl / steel

Temperaturregler
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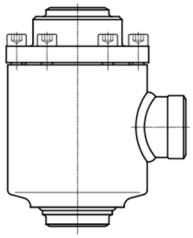
for refrigeration oils with contents of natural refrigerants acc. to EN 378-1

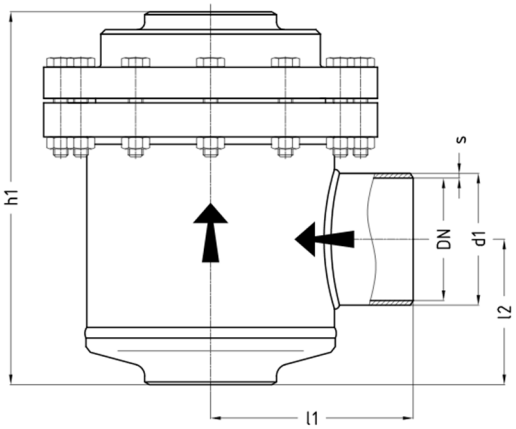
TR AE
TR AE NH3

AE - Anschweißenden / butt welding ends
NH3 - Regelelemente / elements



DN 20 – 50

DN 65 – 150



Achtung / attention:
Bitte bei Bestellung die Nenntemperatur angeben!
Please specify the nominal temperature by ordering!

Druck- / Temperatureinsatzgrenzen:
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20…50 3/4"…2"	PN25	12,5	18,7	25	25	25	PS [bar]
	PN40	20	30	40	40	40	PS [bar]
DN 65…150 2 1/2"…6"	PN25	12,5	18,7	25	25	25	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 / ISO series 1		ANSI Sched 40					Anzahl von Regelelementen number of elements
DN	**INCH**	**d1**	**s**	**d1**	**s**	**l1**	**l2**	**h1**	**Stück / apiece**
20	**3/4"**	26,9	2,3	26,7	2,9	66,0	77,0	158,0	**1**
25	**1"**	33,7	2,6	33,4	3,4	66,0	80,0	161,0	**1**
32	**1 1/4"**	42,4	2,6	42,2	3,6	73,0	67,0	148,0	**1**
40	**1 1/2"**	48,3	2,6	48,3	3,7	75,0	67,0	148,0	**1**
50	**2"**	60,3	2,9	60,3	3,9	87,0	78,0	211,0	**1**
65	**2 1/2"**	76,1	2,9	73,0	5,2	135,0	90,0	238,0	**2**
80	**3"**	88,9	3,2	88,9	5,5	137,0	99,0	253,0	**2**
100	**4"**	114,3	3,6	114,3	6,0	213,5	130,5	318,0	**4**
125	**5"**	139,7	4,0	141,3	6,6	229,5	229,0	442,5	**6**
150	**6"**	168,3	4,5	168,3	7,1	259,0	271,0	498,0	**8**

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TR Edelstahl / stainless steel

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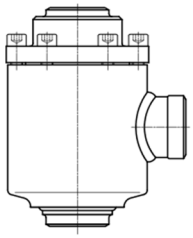
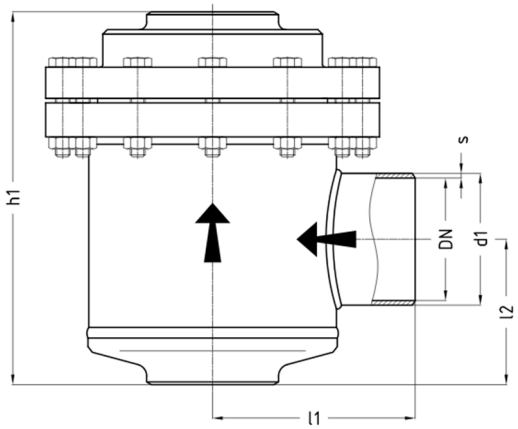
TR AE NIRO
TR AE NH3 NIRO

AE - Anschweißenden / butt welding ends
NH3 - Regelelemente / elements



DN 20 – 50

DN 65 – 150



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DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20…50 3/4"…2"	PN25	25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	40	PS [bar]
DN 65…150 2 1/2"…6"	PN25	25	25	25	25	25	PS [bar]

Abmessungen / dimensions in mm:

Nominal size:		Anschweißenden gemäß: / butt welding ends acc. to: ISO Reihe 1 ISO series 1		ANSI Sched 40					Anzahl von Regelelementen number of elements
DN	INCH	d1	s	d1	s	l1	l2	h1	Stück / apiece
20	3/4"	26,9	2,3	26,7	2,9	66,0	77,0	158,0	1
25	1"	33,7	2,6	33,4	3,4	66,0	80,0	161,0	1
32	1 1/4"	42,4	2,6	42,2	3,6	73,0	67,0	148,0	1
40	1 1/2"	48,3	2,6	48,3	3,7	75,0	67,0	148,0	1
50	2"	60,3	2,9	60,3	3,9	87,0	78,0	211,0	1
65	2 1/2"	76,1	2,9	73,0	5,2	135,0	90,0	238,0	2
80	3"	88,9	3,2	88,9	5,5	137,0	99,0	253,0	2
100	4"	114,3	3,6	114,3	6,0	213,5	130,5	318,0	4
125	5"	139,7	4,0	141,3	6,6	229,5	229,0	442,5	6
150	6"	168,3	4,5	168,3	7,1	259,0	271,0	498,0	8

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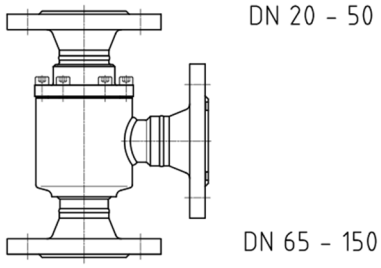
TR FL
TR FL NH3

FL - Flanschenden / flanged ends
NH3 - Regelelemente / elements



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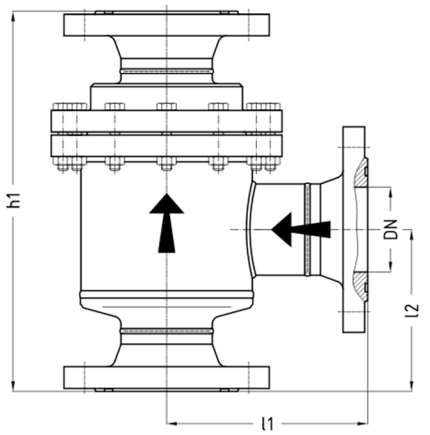
DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20…50 3/4"…2"	PN25	12,5	18,7	25	25	25	PS [bar]
	PN40	20	30	40	40	40	PS [bar]
DN 65…150 2 1/2"…6"	PN25	12,5	18,7	25	25	25	PS [bar]



Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:													
		AWP DN20 PN25 DN25-80 PN40		PN25 DIN 2634 EN1092-1		PN40 DIN 2635 EN1092-1		ANSI 150 RF		ANSI 300 RF		AWP	DIN	ANSI 150	ANSI 300	Anzahl von Regelelementen number of elements
DN	INCH	l1	l2	l1	l2	l1	l2	l1	l2	l1	l2	h1	h1	h1	h1	Stück / pieces
20	3/4"	92,0	99,0	100,0	107,0	100,0	107,0	112,0	119,0	117,0	124,0	204,5	221,5	248	258	1
25	1"	104,0	111,0	100,0	107,0	100,0	107,0	116,0	123,0	122,0	129,0	229,5	221,5	254	266	1
32	1 1/4"	112,0	118,0	110,0	116,0	110,0	116,0	125,0	131,0	133,0	139,0	237,5	233,5	266	282	1
40	1 1/2"	106,5	114,5	113,0	121,0	113,0	121,0	129,0	137,0	136,3	144,5	226,5	239,5	274	288	1
50	2"	122,0	131,0	127,0	136,0	127,0	136,0	143,0	151,0	148,8	157,5	298,5	308,5	341	353	1
65	2 1/2"	189,5	144,5	188,0	143,0	188,0	143,0	205,0	191,0	212,0	198,0	347,0	344,0	380	394	2
80	3"	191,5	153,5	196,0	158,0	196,0	158,0	207,0	169,0	217,0	179,0	362,0	371,0	395	415	2
100	4"			279,5	196,5	279,5	196,5	291,5	208,5	300,5	217,5		450,0	478	496	4
125	5"			299,5	299,0	299,5	299,0	320,0	319,5	330,0	329,5		582,5	623	643	6
150	6"			336,0	348,0	336,0	348,0	349,5	361,5	359,5	371,5		652,0	678	698	8

DIN/EN-Flanschdichtflächen serienmäßig Feder/Nut DIN2512 / DIN/EN-flange facing standard tongue/groove DIN2512

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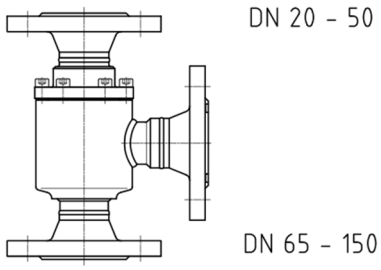
TR FL NH3 NIRO
FL - Flanschenden / flanged ends
NH3 - Regelelemente / elements



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Please specify the nominal temperature by ordering!

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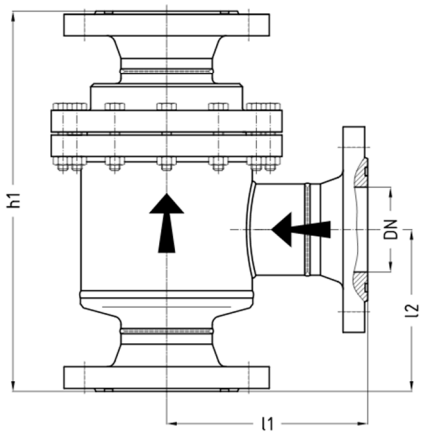
Pressure- / temperature limits of application:

PS: max. zulässiger Betriebsdruck in bar ü / max. allowable working pressure in bar gauge
TS: den zulässigen Betriebsüberdrücken (PS) zugeordnete zulässige Betriebstemperatur in °C / max. allowable working temperature in °C, associated with PS

DN / INCH	PN	-35	-25	-10	+50	+120	TS [°C]
DN 20…50 3/4"…2"	PN25	25	25	25	25	25	PS [bar]
	PN40	40	40	40	40	40	PS [bar]
DN 65…150 2 1/2"…6"	PN25	25	25	25	25	25	PS [bar]



Abmessungen / dimensions in mm:

Nominal size:		Flanschenden gemäß: / flanged ends acc. to:														
		AWP DN20 PN25 DN25-80 PN40		PN25 DIN 2634 EN1092-1		PN40 DIN 2635 EN1092-1		ANSI 150 RF		ANSI 300 RF		AWP	DIN	ANSI 150	ANSI 300	Anzahl von Regelelementen number of elements
DN	INCH	l1	l2	l1	l2	l1	l2	l1	l2	l1	l2	h1	h1	h1	h1	Stück / apiece
20	3/4"	92,0	99,0	100,0	107,0	100,0	107,0	112,0	119,0	117,0	124,0	204,5	221,5	248	258	1
25	1"	104,0	111,0	100,0	107,0	100,0	107,0	116,0	123,0	122,0	129,0	229,5	221,5	254	266	1
32	1 1/4"	112,0	118,0	110,0	116,0	110,0	116,0	125,0	131,0	133,0	139,0	237,5	233,5	266	282	1
40	1 1/2"	106,5	114,5	113,0	121,0	113,0	121,0	129,0	137,5	136,3	144,5	226,5	239,5	274	288	1
50	2"	122,0	131,0	127,0	136,0	127,0	136,0	143,0	151,5	148,8	157,5	298,5	308,5	341	353	1
65	2 1/2"	189,5	144,5	188,0	143,0	188,0	143,0	205,0	191,0	212,0	198,0	347,0	344,0	380	394	2
80	3"	191,5	153,5	196,0	158,0	196,0	158,0	207,0	169,0	217,0	179,0	362,0	371,0	395	415	2
100	4"			279,5	196,5	279,5	196,5	291,5	208,5	300,5	217,5		450,0	478	496	4
125	5"			299,5	299,0	299,5	299,0	320,0	319,5	330,0	329,5		582,5	623	643	6
150	6"			336,0	348,0	336,0	348,0	349,5	361,5	359,5	371,5		652,0	678	698	8

DIN/EN-Flanschdichtflächen serienmäßig Feder/Nut DIN2512 / DIN/EN-flange facing standard tongue/groove DIN2512

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12.35

GEA INTERNAL

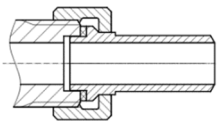
Zubehör / Fittings

UV UM + ST Schraubenden / screwed connections

GEA AWP – Armaturen mit Schraubenden können mit einer Vielzahl von Verschraubungen bestellt werden um den jeweiligen Anforderungen zu genügen. Untenstehende Auflistung zeigt Fittings / Ventilkombinationen die derzeit hergestellt werden.

GEA AWP valves with screwed ends can be equipped with a wide range of fittings in order to fulfill respective requirements. The listing below shows those valve / fitting combinations which are currently manufactured by GEA AWP.

Fittings Überströmventile / fittings overflow valves

Fittinggruppe/ fitting group	Ventilbezeichnung / valve name	Code fittinge/ fittings code	Anschlüsse / connections	
UM + ST Überwurfmutter mit Schweißtülle / cap nut and weld nipple				
UM + ST 	**UVUA SE G1/2" / G1/2"** **UVUB SE G1/2" / G1/2"**	00060F07A5A0A101	**E:** **A:**	G1/2" mit / with UM + ST 13.5 x 1.8 mm
	UVUA SE G1/2" / G1" **UVUB SE G1/2" / G1"**	00060F07A5A0A101 00060F07A5A0B601	**E:** **A:**	G1/2" mit / with UM + ST 13.5 x 1.8 mm G1" mit / with UM + ST 21.3 x 2.0 mm

E: = Eintritt / inlet // A: = Austritt / outlet

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Anhang / appendix

Einstelldruckbereiche von Federn für Überströmventile und Öldruck-Regulierventile
Set pressure ranges of springs of overflow valves and oil-pressure regulating valves

Ansprechdruckbereiche bar / set pressure ranges bar:

	Ventiltyp / valve type **UVAA / UVAB**		Ventiltyp / valve type **UVUA / UVUB**	Ventiltyp / valve type **UVUB** (Baulänge F)	Ventiltyp / valve type **UVR/UVRK**	Ventiltyp / valve type **ORVA**	
PS	**DN 6/15**	**DN 20/32**	**alle DN / all DN**	**Ersatz ORVA**	**DN 20**	**DN40/65**	**DN 50/65**
25	1-1,9	1-1,9	4-7,9 (bar)	1-6	2-8	1-6	1-6
	2-4,9	2-4,9	8-11,9				
	5-7,9	5-9,9	12-19,9				
	8-13,9	10-15,9	20-25,0				
	14-19,9	16-19,9					
	20-25	20-25					
40			20-27,9				
			28-35,9				
			36-40,0				
63			36-44,9				
			45-63				

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Anhang / appendix

Temperaturbereiche für Temperatur-Regelelemente
Temperature ranges for temperature regulating elements

DN size	Nenntemperatur °C Nominal temperature °C	Regelbereich °C Regulating range °C	AWP-Code
20 – 40	30	25 - 34	736135
20 – 40	35	30 – 40	736130
20 – 40	38	33 – 42	736114
20 – 40	43	38 – 47	736104
20 – 40	49	44 – 55	736109
20 – 40	55	49 – 60	736103
20 – 40	60	55 – 66	736119
20 – 40	66	60 – 71	736122
20 – 40	71	66 – 77	736123
50 – 150	32	27 – 35	736138
50 – 150	35	30 – 41	736140
50 – 150	38	35 – 43	736121
50 – 150	41	35 – 45	736118
50 – 150	43	38 – 47	736112
50 – 150	46	40 – 50	736105
50 – 150	49	44 – 54	736101
50 – 150	55	52 – 60	736102
50 – 150	57	54 – 63	736139
50 – 150	60	57 – 66	736129
50 – 150	63	60 – 69	736137
50 – 150	66	63 – 71	736133
50 – 150	71	68 - 77	736136

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Anhang / appendix

Vergleich europäische / amerikanische Werkstoffe
Comparison American vs. European material numbers

GEA AWP - Ventile enthalten Einzelteile in unterschiedlichen Werkstoffen. Die folgende Tabelle enthält alle Werkstoffe, die GEA AWP für drucktragende Teile verwendet und listet die amerikanischen Vergleichswerkstoffe auf.

GEA AWP valves contain several components made from different materials. The following table includes all European and corresponding American material numbers, which are used for the pressure related valve parts.

Europäischer Werkstoff European material numbers			**Amerikanischer Vergleichswerkstoff Corresponding American material numbers**	
Werkstoffnummer material number	Kurzname steel name	Norm standard	Werkstoffnorm material standard	Sorte grade
Armaturen aus C-Stahl / steel valves				
1.0345	P235GH, TC1 +N	DIN EN 10216-2	ASTM A106	A + B
1.0038	S235JR +N	DIN EN 10025-2	ASTM A570	36
1.0425	P265GH	DIN EN 10028-2	ASTM A516	60
1.0577	S355J2 +N	DIN EN 10025-2	ASTM A516	65
1.6220	G20Mn5 +QT	DIN EN 10213	ASTM A352	LCC
1.0460	C22.8	VdTÜV 350/3	ASTM A105	-
Armaturen aus TT-Stahl / low temp steel valves				
1.0451	P215NL +N	DIN EN 10216-4	ASTM A333	6
1.0452	P255QL +QT	DIN EN 10216-4		
1.0566	P355NL1 +N	DIN EN 10028-3 DIN 17103 VdTÜV 354/3	ASTM A662 ASTM A420 ASTM A350	B WPL6 LF2
1.0488	TStE 285	DIN 17103 VdTÜV 352/3	ASTM A662 ASTM A350	A LF2
1.6220	G20Mn5 +QT	DIN EN 10213	ASTM A352	LCC
Armaturen aus Edelstahl / stainless steel valves				
1.4301	X5CrNi18-10	DIN EN 10216-5 DIN EN 10028-7 DIN EN 10222-5 DIN EN 1092-1	ASTM A312 ASTM A240 ASTM A182	TP304 304 F304
1.4581	GX5CrNiMoNb19-11-2	DIN EN 10213	ASTM A351	CF10M

Durchgangsventile in nicht standardmäßiger Ausführung (z.B. abweichende Werkstoffe, Abnahme durch Dritte) sind nur in Schrägsitzform lieferbar.

Straightway valves of not standard design (e.g. deviant materials, inspection by third parties) are available only in y-type form.

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Anhang / appendix

Codierung Anschlüsse Klein- und Serviceventile
Connection codes for service valves and small valves

GEA AWP - Ventile können mit einer Vielzahl von Anschlussvarianten hergestellt werden:
GEA AWP valves are produced with a wide range of different connections:

DN	Gewinde / Thread	Code
DN8	M12x1,5 RA6	AL
DN8	M12x1,5-keg	AY
DN8	M14x1,5 RA8	A4
DN8	M16x1,5 RA8	A5
DN8	M16x1,5 RA10	A6
DN8	M16x1,5-i	AZ
DN8	M16x1,5-keg	AC
DN8	M18x1,5 RA10	A7
DN8	M18x1,5 RA12	A8
DN8	M20x1,5 RA12	A9
DN8	M22x1,5 RA14	AA
DN8	M22x1,5 RA15	AB
DN8	M22x1,5	A0
DN8	M22x1,5-keg	AD
DN20	M26x1,5 RA18	AS
DN20	M30x2 RA22	AT
DN8	G1/4"	AF
DN8	G1/4"-keg	AG
DN8	G1/4"-i	AH
DN8	G3/8"	AK
DN8	G3/8"-i	AM
DN8	G3/8" RA10	AJ
DN8	G1/2"	A1
DN8	G1/2"-lks	A2
DN8	G1/2" RA12	AN
DN8	G1/2"-i	AU
DN8	G1/2" UM *)	AV
DN8	G1/2" **)	AW
DN8	G1/2"-keg	AX
DN20	G3/4"	AE
DN20	G3/4" RA18	AP
DN8	1/4"NPT-male	A3
DN8	1/4"NPT-female	AR
DN8	3/8"NPT-male	AI
DN8	3/8"NPT-female	B2
DN8	1/2"NPT-male	B0
DN8	1/2"NPT-female	B1
DN20	3/4''NPT-male	B3
DN8	M10-a	B4
DN20	G1"	B6
DN8	G3/8'' BSPT-male	B7
DN8	G3/8'' BSPT-female	B8
DN8	3/8-18 NPTF-male	B9
DN8	R3/8''-keg	BA

i = Innengewinde / internal thread / a = Außengewinde / outside thread

Anschweißenden / Welding ends		Abmessung / Dimensions	Code
DN6	R1	Ø10,2x1,6	C0
	ANSI 40	Ø1/8"x1,7	C1
	ANSI 80	Ø1/8"x2,4	C2
DN8	R1	Ø13,5x1,8	D0
	ANSI 40	Ø1/4"x2,2	D1
	ANSI 80	Ø1/4"x3,0	D2
	12x2	Ø12x2,0	D3
	12x3	Ø12x3,0	D4
	R1 Verl. L2=130 Niro	Ø13,5x1,8	D5
	R1 Verl. L2=130 C-St.	Ø13,5x1,8	D6
DN10	R1	Ø17,2x1,8	E0
	ANSI 40	Ø3/8"x2,3	E1
	ANSI 80	Ø3/8"x3,2	E2
	R2	Ø15x2,5	E3
	18x3	Ø18x3,0	E4
	R1 Verl. L2=130 Niro	Ø17,2x1,8	E5
	R1 Verl. L2=130 C-St.	Ø17,2x1,8	E6
	16x4 Verl.L2=130Niro	Ø16x4,0	E7
	17,2x2	Ø17,2x2,0	E8
	R1 Verl. L2=120 C-St.	Ø17,2x1,8	E9
	R1 Verl. L2=140 Niro	Ø17,2x1,8	EA
	R1 Verl. L2=140 C-St.	Ø17,2x1,8	EB
	R1 Verl. L2=60 Niro	Ø17,2x1,8	EC
	R1 Verl. L2=60 C-St.	Ø17,2x1,8	ED
	18x4 Verl.L2=140 Niro	Ø18x4,0	EE
	18x4 Verl.L2=140C-St	Ø18x4,0	EF
	18x4 Verl.L2=60 Niro	Ø18x4,0	EG
	18x4 Verl.L2=60 C-St.	Ø18x4,0	EH
DN15	R1	Ø21,3x2,0	F0
	ANSI 40	Ø1/2"x2,8	F1
	ANSI 80	Ø1/2"x3,7	F2
	R2	Ø20x2,5	F3
	R1 Verl. L2=130 Niro	Ø21,3x2,0	F5
	R1 Verl. L2=130 C-St.	Ø21,3x2,0	F6
	R1 Verl. L2=180 NIRO	Ø21,3x2,0	F7
	ANSI 80 L2=130 C-St	Ø21,3x3,7	F8

*) drehbar mit Gehäuse verschweißt /
swiveling with body welds together

**) für einteilige Blindmutter / for one-piece blind nut

Diese Anschlüsse können mit Zubehör ausgerüstet werden. / These connections might be equipped with fittings.

	Zubehör	fittings	Kurzbez. / shortcut	Code
UM+ST	Überwurfmutter mit Schweißtülle	cap nut with tail	UM+ST	1
BM	Blindmutter	blind nut	BM	2
DM	Doppelmutter links/rechts	double nut left/right	DM	3
UM+SKB	Überwurfmutter mit Schweißkugelbuchse	cap nut with weld ball type nipple	UM+SKB	4
UM+SR	Überwurfmutter mit Schneidring	cap nut with cutting ring	UM+SR	5
UM+SLT	Überwurfmutter mit Schlauchtülle	cap nut with hose nipple	UM+SLT	6
DM+Adapter	Doppelmutter mit Adapter G1/2"-a/G1/4"-i	double nut left/right with adaptor G1/2''-a/G1/4''-i	DM+Adapter	7
UM+KKR	Überwurfmutter mit Klemmkeilring	cap nut with wedge ring	UM+KKR	9

GEA Refrigeration Technologies

GEA AWP GmbH **12.40**

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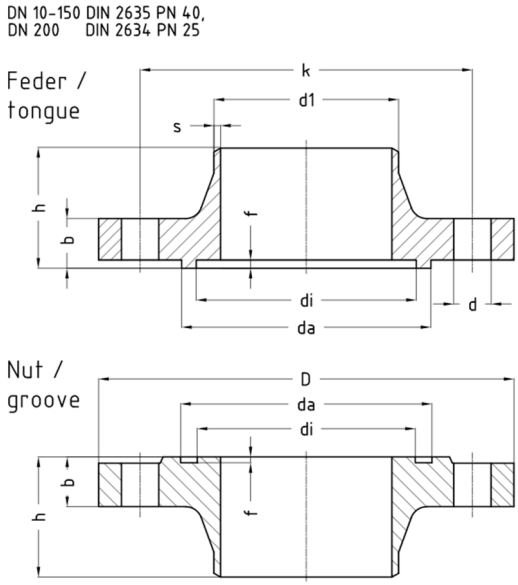
DIN-FL

Vorschweißflansche - DIN 2634/2635
Welding neck flanges - DIN 2634/2635

DIN-FL N
DIN-FL F
DIN-FL C
DIN-FL D
FL - Flansch / flange
Form N - Nut / groove, DIN 2512
Form F - Feder / tongue, DIN 2512
Form C - glatte Dichtleiste / raised face, (Rz160) DIN2526
Form D - glatte Dichtleiste / raised face, (Rz 40) DIN2526



Einbaulängen / lengths in mm:

DIN2634 PN25 DN10-150 / DIN 2635 PN40 DN10-400																				
	Anschweißenden / butt welding ends									Dichtleistenausführung / types of contact face						Schrauben / screws DIN 931			Dichtring / sealring DIN 2691	
	Reihe 1 series 1		Reihe 2 series 2							Nut / groove			Feder / tongue							
DN	d1	s	d1	s	b	k	h	d	D	di	da	f	di	da	f	Anzahl quantity	Gewinde thread	Länge length	di	da
10	17,2	1,8	15,0	2,5	16	60	35	14	90	23	35	2,5	24	34	4,0	4	M 12	45	24	34
15	21,3	2,0	20,0	2,5	16	65	38	14	95	28	40	2,5	29	39	4,0	4	M 12	45	29	39
20	26,9	2,3	25,0	2,5	18	75	40	14	105	35	51	2,5	36	50	4,0	4	M 12	50	36	50
25	33,7	2,6	32,0	3,0	18	85	40	14	115	42	58	2,5	43	57	4,0	4	M 12	50	43	57
32	42,4	2,6	38,0	3,0	18	100	42	18	140	50	66	2,5	51	65	4,0	4	M 16	55	51	65
40	48,3	2,6	45,0	3,0	18	110	45	18	150	60	76	2,5	61	75	4,0	4	M 16	55	61	75
50	60,3	2,9	57,0	3,2	20	125	48	18	165	72	88	2,5	73	87	4,0	4	M 16	60	73	87
65	76,1	2,9	76,1	3,6	22	145	52	18	185	94	110	2,5	95	109	4,0	8	M 16	60	95	109
80	88,9	3,2	88,9	4,0	24	160	58	18	200	105	121	2,5	106	120	4,0	8	M 16	65	106	120
100	114,3	3,6	108,0	4,0	24	190	65	22	235	128	150	3,0	129	149	4,5	8	M 20	70	129	149
125	139,7	4,0	133,0	4,0	26	220	68	26	270	154	176	3,0	155	175	4,5	8	M 24	80	155	175
150	168,3	4,5	159,0	4,5	28	250	75	26	300	182	204	3,0	183	203	4,5	8	M 24	80	183	203
200	219,1	6,3			34	320	88	30	375	238	260	3,0	239	259	4,5	12	M 27	100	239	259
250	273,0	7,1			38	385	105	33	450	291	313	3,0	292	312	4,5	12	M 30	110	292	312
300	323,9	8,0			42	450	115	33	515	342	364	3,0	343	363	4,5	16	M 30	120	343	363
350	355,6	8,8			46	510	125	36	580	394	422	3,5	395	421	5,0	16	M 33	130	395	421
400	406,4	11,0			50	585	135	39	660	446	474	3,5	447	473	5,0	16	M 36	140	447	473

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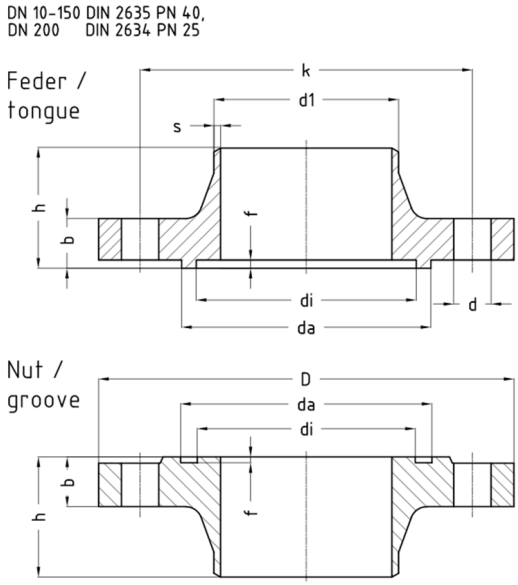
DIN-FL

Vorschweißflansche - DIN 2634/2636/2637
Welding neck flanges - DIN 2634/2636/2637

DIN-FL N
DIN-FL F
DIN-FL C
DIN-FL D
FL - Flansch / flange
Form N - Nut / groove, DIN 2512
Form F - Feder / tongue, DIN 2512
Form C - glatte Dichtleiste / raised face, (Rz160) DIN2526
Form D - glatte Dichtleiste / raised face, (Rz40) DIN2526



Einbaulängen / lengths in mm:

DIN 2634 PN25 DN200-500

	Anschweißenden / butt welding ends Reihe 1 series 1							Dichtleistenausführung / types of contact face Nut / groove			Feder / tongue			Schrauben / screws DIN 931			Dichtring / sealring DIN 2691	
DN	**d1**	**s**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**f**	**di**	**da**	**f**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**da**
200	219,1	6,3	30	310	80	26	360	238	260	3,0	239	259	4,5	12	M 24	90	239	259
250	273,0	7,1	32	370	88	30	425	291	313	3,0	292	312	4,5	12	M 27	90	292	312
300	323,9	8,0	34	430	92	30	485	342	364	3,0	343	363	4,5	16	M 27	100	343	363
350	355,6	8,0	38	490	100	33	555	394	422	3,5	395	421	5,0	16	M 30	110	395	421
400	406,4	8,8	40	550	110	36	620	446	474	3,5	447	473	5,0	16	M 33	120	447	473
500	508,0	10,0	44	660	125	36	730	548	576	3,5	549	575	5,0	20	M 33	130	549	575

DIN2636 PN63 DN10-40 / DIN 2637 PN100 DN10-40

DN	**d1**	**s**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**f**	**di**	**da**	**f**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**Da**
10	17,2	2,0	20	70	45	14	100	23	35	2,5	24	34	4,0	4	M 12	55	24	34
15	21,3	2,0	20	75	45	14	105	28	40	2,5	29	39	4,0	4	M 12	55	29	39
20	26,9	2,6	22	90	48	18	130	35	51	2,5	36	50	4,0	4	M 16	60	36	50
25	33,7	2,6	24	100	58	18	140	42	58	2,5	43	57	4,0	4	M 16	65	43	57
32	42,4	2,9	24	110	60	22	155	50	66	2,5	51	65	4,0	4	M 20	70	51	65
40	48,3	2,9	26	125	62	22	170	60	76	2,5	61	75	4,0	4	M 20	70	61	75

DIN 2636 PN63 DN50-125

DN	**d1**	**S**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**f**	**di**	**da**	**f**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**da**
50	60,3	2,9	26	135	62	22	180	72	88	2,5	73	87	4,0	4	M 20	75	73	87
65	76,1	3,2	26	160	68	22	205	94	110	2,5	95	109	4,0	8	M 20	75	95	109
80	88,9	3,6	28	170	72	22	215	105	121	2,5	106	120	4,0	8	M 20	75	106	120
100	114,3	4,0	30	200	78	26	250	128	150	3,0	129	149	4,5	8	M 24	90	129	149
125	139,7	4,5	34	240	88	30	295	154	176	3,0	155	175	4,5	8	M 27	100	155	175

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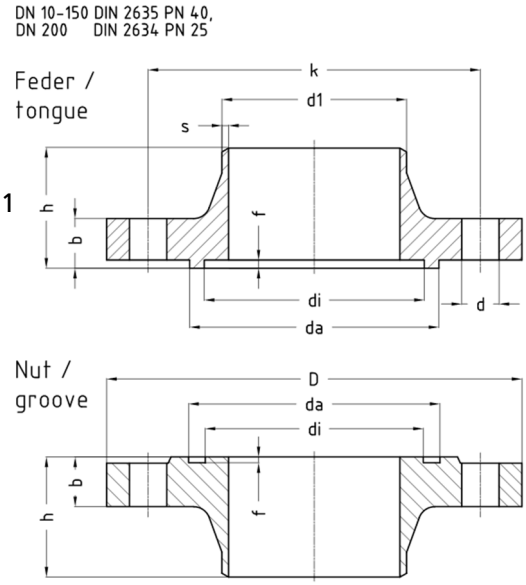
DIN EN-FL

Vorschweißflansche - DIN EN 1092-1
Welding neck flanges - DIN EN 1092-1

DIN EN-FL D
DIN EN-FL C
DIN EN-FL B1
DIN EN-FL B2

FL - Flansch / flange
Form D - Nut / groove, DIN EN 1092-1
Form C - Feder / tongue, DIN EN 1092-1
Form B1 - glatte Dichtleiste / raised face (Rz50) DIN EN 1092-1
Form B2 - glatte Dichtleiste / raised face (Rz12,5) DIN EN 1092-1



Einbaulängen / lengths in mm:

DIN EN 1092-1 PN25 DN10-150 / PN40 DN10-400																				
	Anschweißenden / butt welding ends									Dichtleistenausführung / types of contact face						Schrauben / screws DIN 931			Dichtring / sealring DIN 2691	
	Reihe 1 series 1		Reihe 2 series 2							Nut / groove			Feder / tongue							
DN	**d1**	**s**	**d1**	**s**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**f**	**di**	**da**	**f**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**da**
10	17,2	1,8	15,0	2,5	16	60	35	14	90	23	35	4,0	24	34	4,5	4	M 12	45	24	34
15	21,3	2,0	20,0	2,5	16	65	38	14	95	28	40	4,0	29	39	4,5	4	M 12	45	29	39
20	26,9	2,3	25,0	2,5	18	75	40	14	105	35	51	4,0	36	50	4,5	4	M 12	50	36	50
25	33,7	2,6	32,0	3,0	18	85	40	14	115	42	58	4,0	43	57	4,5	4	M 12	50	43	57
32	42,4	2,6	38,0	3,0	18	100	42	18	140	50	66	4,0	51	65	4,5	4	M 16	55	51	65
40	48,3	2,6	45,0	3,0	18	110	45	18	150	60	76	4,0	61	75	4,5	4	M 16	55	61	75
50	60,3	2,9	57,0	3,2	20	125	48	18	165	72	88	4,0	73	87	4,5	4	M 16	60	73	87
65	76,1	2,9	76,1	3,6	22	145	52	18	185	94	110	4,0	95	109	4,5	8	M 16	60	95	109
80	88,9	3,2	88,9	4,0	24	160	58	18	200	105	121	4,0	106	120	4,5	8	M 16	65	106	120
100	114,3	3,6	108,0	4,0	24	190	65	22	235	128	150	4,5	129	149	5,0	8	M 20	70	129	149
125	139,7	4,0	133,0	4,0	26	220	68	26	270	154	176	4,5	155	175	5,0	8	M 24	80	155	175
150	168,3	4,5	159,0	4,5	28	250	75	26	300	182	204	4,5	183	203	5,0	8	M 24	80	183	203
200	219,1	6,3			34	320	88	30	375	238	260	4,5	239	259	5,0	12	M 27	100	239	259
250	273,0	7,1			38	385	105	33	450	291	313	4,5	292	312	5,0	12	M 30	110	292	312
300	323,9	8,0			42	450	115	33	515	342	364	4,5	343	363	5,0	16	M 30	120	343	363
350	355,6	8,8			46	510	125	36	580	394	422	5,0	395	421	5,5	16	M 33	130	395	421
400	406,4	11,0			50	585	135	39	660	446	474	5,0	447	473	5,5	16	M 36	140	447	473

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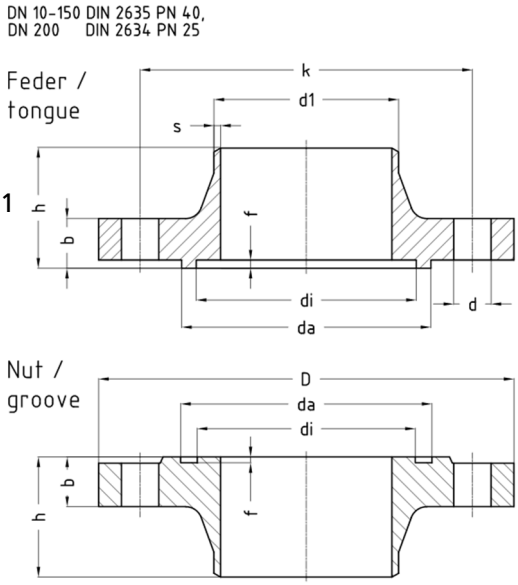
DIN EN-FL

Vorschweißflansche - DIN EN 1092-1
Welding neck flanges - DIN EN 1092-1

DIN EN-FL D
DIN EN-FL C
DIN EN-FL B1
DIN EN-FL B2

FL - Flansch / flange
Form D - Nut / groove, DIN EN 1092-1
Form C - Feder / tongue, DIN EN 1092-1
Form B1 - glatte Dichtleiste / raised face, (Rz50) DIN EN 1092-1
Form B2 - glatte Dichtleiste / raised face, (Rz12,5) DIN EN 1092-1



Einbaulängen / lengths in mm:

DIN EN 1092-1 PN25 DN200-500

	Anschweißenden / butt welding ends Reihe 1 series 1							Dichtleistenausführung / types of contact face Nut / groove			Feder / tongue			Schrauben / screws DIN 931			Dichtring / sealring DIN 2691	
DN	**d1**	**s**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**f**	**di**	**da**	**f**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**da**
200	219,1	6,3	30	310	80	26	360	238	260	4,5	239	259	5,0	12	M 24	90	239	259
250	273,0	7,1	32	370	88	30	425	291	313	4,5	292	312	5,0	12	M 27	90	292	312
300	323,9	8,0	34	430	92	30	485	342	364	4,5	343	363	5,0	16	M 27	100	343	363
350	355,6	8,0	38	490	100	33	555	394	422	5,0	395	421	5,5	16	M 30	110	395	421
400	406,4	8,8	40	550	110	36	620	446	474	5,0	447	473	5,5	16	M 33	120	447	473
500	508,0	10,0	44	660	125	36	730	548	576	5,0	549	575	5,5	20	M 33	130	549	575

DIN EN 1092-1 PN63 DN10-40 / PN100 DN10-40

DN	**d1**	**s**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**F**	**di**	**da**	**f**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**Da**
10	17,2	2,0	20	70	45	14	100	23	35	4,0	24	34	4,5	4	M 12	55	24	34
15	21,3	2,0	20	75	45	14	105	28	40	4,0	29	39	4,5	4	M 12	55	29	39
20	26,9	2,6	22	90	48	18	130	35	51	4,0	36	50	4,5	4	M 16	60	36	50
25	33,7	2,6	24	100	58	18	140	42	58	4,0	43	57	4,5	4	M 16	65	43	57
32	42,4	2,9	24	110	60	22	155	50	66	4,0	51	65	4,5	4	M 20	70	51	65
40	48,3	2,9	26	125	62	22	170	60	76	4,0	61	75	4,5	4	M 20	70	61	75

DIN EN 1092-1 PN63 DN50-125

DN	**d1**	**S**	**b**	**k**	**h**	**d**	**D**	**di**	**da**	**f**	**di**	**da**	**F**	**Anzahl quantity**	**Gewinde thread**	**Länge length**	**di**	**da**
50	60,3	2,9	26	135	62	22	180	72	88	4,0	73	87	4,5	4	M 20	75	73	87
65	76,1	3,2	26	160	68	22	205	94	110	4,0	95	109	4,5	8	M 20	75	95	109
80	88,9	3,6	28	170	72	22	215	105	121	4,0	106	120	4,5	8	M 20	75	106	120
100	114,3	4,0	30	200	78	26	250	128	150	4,5	129	149	5,0	8	M 24	90	129	149
125	139,7	4,5	34	240	88	30	295	154	176	4,5	155	175	5,0	8	M 27	100	155	175

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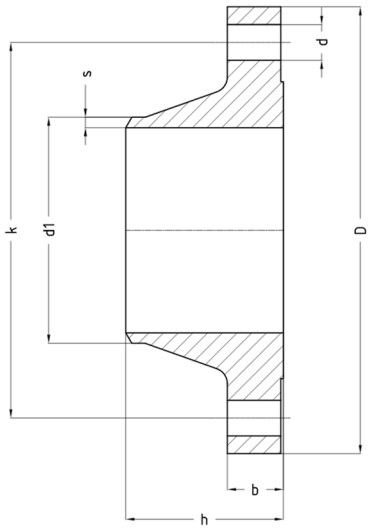
ANSI-FL

Vorschweißflansche - ANSI B 16.5 glatte Dichtleiste
Welding neck flanges - ANSI B 16.5 raised face

ANSI-FL 150lbs RF
ANSI-FL 300lbs RF
FL - Flansch / flange



Flächenbearbeitung mit großem und kleinem Vorsprung / Rücksprung /
Flächenbearbeitung mit großer und kleiner Feder / Nut nach ANSI B 16.5
Large and small male / female facings /
Large and small tongue / groove facings 150-2500lbs / sq. in see ANSI B 16.5

Einbaulängen / lengths in mm :

Nominale size		Anschweißenden gemäß: / butt welding ends acc. to:													
		ANSI		ANSI-FL 150lbs RF / sq. in					Schrauben / screws DIN 931	ANSI-FL 300lbs RF / sq. in					Schrauben / screws DIN 931
DN	INCH	d1	s	b	k	h	d	D	Anzahl quantity	b	k	h	d	D	Anzahl quantity
15	1/2"	21,3	2,8	11,2	60,5	47,8	15,7	88,9	4	14,2	66,5	52,3	15,7	95,2	4
20	3/4"	26,7	2,9	12,7	69,9	52,3	15,7	98,6	4	15,7	82,5	57,1	19,0	117,3	4
25	1"	33,4	3,4	14,2	79,2	55,6	15,7	108,0	4	17,5	88,9	62,0	19,0	123,9	4
32	1 1/4"	42,2	3,6	15,7	88,9	57,2	15,7	117,3	4	19,0	98,5	65,0	19,0	133,3	4
40	1 1/2"	48,3	3,7	17,5	98,6	62,0	15,7	127,0	4	20,6	114,3	68,3	22,3	155,4	4
50	2"	60,3	3,9	19,1	120,7	63,5	19,1	152,4	4	22,3	127,0	69,8	19,0	165,1	6
65	2 1/2"	73,0	5,2	22,4	139,7	69,9	19,1	177,8	4	25,4	149,3	76,2	22,3	190,5	8
80	3"	88,9	5,5	23,9	152,4	69,9	19,1	190,5	4	28,4	168,1	79,2	22,3	209,5	8
100	4"	114,3	6,0	23,9	190,5	76,2	19,1	228,6	8	31,7	200,1	85,8	22,3	254,0	8
125	5"	141,3	6,6	23,9	215,9	88,9	22,4	254,0	8	35,0	234,9	98,5	22,3	279,4	8
150	6"	168,3	7,1	25,4	241,3	88,9	22,4	279,4	8	36,5	269,7	98,5	22,3	317,5	12
200	8"	219,1	8,2	28,4	298,5	101,6	22,4	342,9	8	41,1	330,2	111,2	25,4	381,0	12
250	10"	273,0	9,3	30,2	362,0	101,6	25,4	406,4	12	47,7	387,3	117,3	28,4	444,5	16
300	12"	323,8	10,3	31,8	431,8	114,3	25,4	482,6	12	50,8	450,8	130,0	31,7	520,7	16
350	14"	355,6	11,1	35,1	476,3	127,0	28,4	533,4	12	53,8	514,3	142,7	31,7	584,2	20
400	16"	406,4	12,7	36,6	539,8	127,0	28,4	596,9	16	57,1	571,5	146,0	35,0	647,7	20

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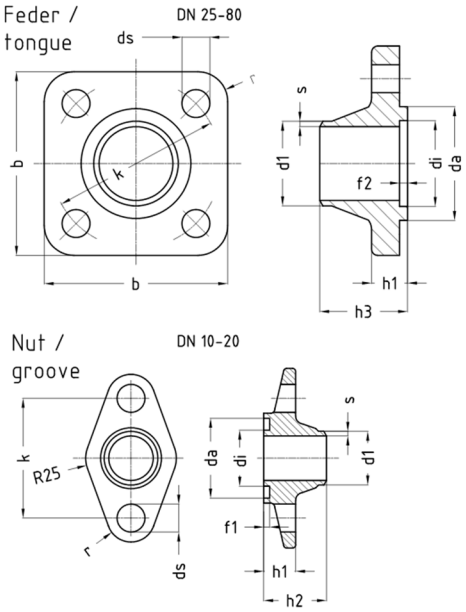
AWP-FL

Vorschweißflansche - AWP
Welding neck flanges - AWP

AWP-FL N
AWP-FL F
FL - Flansch / flange
N - Nut / groove
F - Feder / tongue



Einbaulängen / lengths in mm:

AWP-FL PN25 DN10-20 / PN40 DN25-80																									
	Anschweißenden / butt welding ends											Dichtleistenausführung / types of contact face								Schrauben / screws DIN 931			Dichtring / sealring DIN 2691	
	Reihe 1 / series 1		Reihe 2 / series 2		ANSI							Nut / groove				Feder / tongue				Anzahl/ quantity	Gewinde/ thread	Länge/ length		
DN	**d1**	**s**	**d1**	**s**	**d1**	**s**	**b**	**k**	**r**	**h1**	**ds**	**di**	**da**	**f1**	**h2**	**di**	**da**	**f2**	**h3**				**di**	**da**
10	17,2	1,8	15,0	2,5	17,1	2,3	88	60	13	16	14	28	40	3	31,5	29	39	4	32,0	2	M 12	45	29	39
15	21,3	2,0	20,0	2,5	21,3	2,8	88	60	13	16	14	28	40	3	31,5	29	39	4	32,0	2	M 12	45	29	39
20	26,9	2,3	25,0	2,5	26,7	2,9	88	60	13	16	14	28	40	3	31,5	29	39	4	32,0	2	M 12	45	29	39
25	33,7	2,6	32,0	3,0	33,4	3,4	92	85	15	18	14	42	58	3	44,0	43	57	4	44,0	4	M 12	50	43	57
32	42,4	2,6	38,0	3,0	42,2	3,6	92	85	15	18	14	42	58	3	44,0	43	57	4	44,0	4	M 12	50	43	57
40	48,3	2,6	45,0	3,0	48,3	3,7	92	85	15	18	14	42	58	3	38,5	43	57	4	38,5	4	M 12	50	43	57
50	60,3	2,9	57,0	3,2	60,3	3,9	132	135	20	28	18	84	96	3	43,0	85	95	4	43,0	4	M 16	75	A85x95*	
65	76,1	2,9	76,1	3,6	73,0	5,2	132	135	20	28	18	84	96	3	53,5	85	95	4	53,5	4	M 16	75	A85x95*	
80	88,9	3,2	88,9	4,0	88,9	5,5	132	135	20	28	18	84	96	3	53,5	85	95	4	53,5	4	M 16	75	A85x95*	

* = nach DIN 7603 / acc. to DIN 7603

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Anhang / appendix

Rechtlicher Hinweis
Legal Note

Rechtlicher Hinweis

GEA AWP Armaturen sind gemäß den GEA AWP Betriebsvorschriften zu handhaben.
Die in den Betriebsvorschriften genannten Sicherheitshinweise sind zu beachten.
Es liegt eine Gefahrenanalyse für GEA AWP Armaturen vor.

Die Handhabung der GEA AWP Armaturen hat ausschließlich durch autorisierte Personen zu erfolgen.
Dabei sind die Hinweise zum Gebrauch persönlicher Schutzausrüstung (PSA) zu beachten.
Die GEA AWP Armaturen sind bestimmungsgemäß einzusetzen.

Dieser Katalog wurde sorgfältig erstellt und geprüft, kann aber dennoch Fehler enthalten. Die im Katalog gemachten technischen Angaben sind keine vertraglich zugesicherten Eigenschaften. Die technischen Angaben sind nur dann verbindlich, wenn Sie von uns schriftlich bestätigt wurden.

Wir behalten uns technische Änderungen vor.

Weitere Informationen zu unseren Konformitätserklärungen, Betriebsvorschriften, Berechnungsprogramm und den allgemeinen Geschäftsbedingungen finden Sie auf unserer Internetseite www.awpvalves.com im Register Tools/Downloads.

Es gelten unsere allgemeinen Geschäftsbedingungen.

Legal Note

GEA AWP valves should be handled in accordance with the GEA AWP operating instructions.
The safety notes mentioned inside the operating instructions have to be considered.
A risk analysis for GEA AWP valves is available.

To handle GEA AWP valves is permitted for authorized personnel only.
The advice to use personnel protective equipment (PPE) has to be considered.
GEA AWP valves have to be used as intended.

This catalogue had been established carefully and had been reviewed in detail, nevertheless it might contain mistakes. The catalogue data is not contractually-guaranteed. The catalogue data is mandatory after confirmed in a written form by us.

Technical data are subject to change.

Other information to our declaration of conformity, operating instructions, calculation program and the standard business terms finds them on our Internet page www.awpvalves.com in the register Tools/Downloads.

Our standard business terms are valid.

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we love refrigeration

We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

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2016-08

2201T0JE-HO-MP-N_2021.01.

MYCOM

Oil Pump
MP Series User Manual
M50P/M60P/M80P/M100P/M125P

Important

Before use, throughly read and understand the contents of this manual in order to properly operate, inspect, or maintain the equipment.

Keep this manual in a safe place readily accessible for future reference.

The specifications of this product are subject to change without prior notice.

MAYEKAWA MYCOM

Preface

Thank you for purchasing our Oil Pump MP Series (hereinafter referred to as the “Product”).

This User Manual (hereinafter referred to as the “Manual”) contains detailed safety information, and operation and maintenance procedures of the Product so that you can correctly understand how to handle the Product and operate it safely and efficiently.

Be sure to read the Manual before installing or operating the Product.

Keep the Manual near the Product so that you can refer to it whenever you are uncertain about the Product.

Revision History

Document Name		Document No.	Date of First Issue
Oil Pump MP Series User Manual		**2201T0JE-HO-MP-N_2021.01.**	**2016-10-31**
Rev. No.	**Issue Date**	**Description of Changes**	**Prepared/Approved by:**
00	2016-10-31	Overall revision of the original issue due to reissue as an electronic edition	Kaiho, Takenouchi/ Kato
01	2021-01-05	Addition of text, revision of parts list	Takita/Muta

Warranty and Disclaimer

Warranty Clauses

If malfunctions or damages occur under proper usage and conditions following documents such as specifications or instruction manual of this product, or, if MAYEKAWA judges that malfunctions or damages are related to design or manufacture of the product, and if the malfunctions or damages are within the warranty period, MAEKAWA will repair this product or replace parts without any charges.

The warranty period is “12 months from factory shipment of this product”. However, if any separate agreement has been concluded, such an agreement will have the priority in principle.

Disclaimer Clauses (Exclusion of Warranty Clauses)

Please note that we disclaim any responsibility for malfunction and/or damage to this product in case of the following incidents:

- Malfunction or damage of this product caused by force majeure such as windstorm, intense rainfall, flood, tidal wave, earthquake, land subsidence, thunderbolt, fire, etc.
- Malfunction, damage, or defect to this product due to abuse or misuse such as storing this product outdoors or in hot and humid locations and start-and-stop.
- Malfunction or damage caused by devices or equipment not provided by MAYEKAWA including operation control methods of those devices or equipment.
- Malfunction or damage due to operation of this product outside the operation limits as described in this manual.
- Malfunction or damage caused by the usage of refrigerants, gases, and/or lubricants which are not approved by MAYEKAWA for this product as described in this manual.
- Malfunction or damage caused by maintenance or inspection procedures which are not recommended by MAYEKAWA.
- Malfunction or damage caused by parts which are not MAYEKAWA genuine.
- Malfunction or damage caused by parts which are not MAYEKAWA genuine.
- MAEKAWA shall not be liable to buyer for any incidental, indirect, special or consequential damages that buyer may suffer in relation to this product.

Important Information

Intended Use of This Product

This Product is a general-purpose oil pump intended for use in freezers, refrigerators, and air-conditioning systems. Do not use this Product for any purpose other than its intended use or outside the scope of the specification. For specifications of the Product, refer to Chapter 2, Section 2.2, “Specifications”.

Be sure to perform maintenance items described in this Manual safely and appropriately.

Important Information for Safe Use of This Product

Although MAYEKAWA pays a lot of attention to the safety measures for this product, all hazards including potential hazards caused by human errors, or due to environmental conditions cannot be anticipated.

There are guidelines that must be followed to ensure proper use of this product. However, the warnings in this manual and safety labels on this product are not all inclusive. When operating the product, pay extreme caution on personnel safety as well as on items described in this manual or required by common safety practice.

Important rules for safety work with this product that apply to all workers including managers and supervisors are listed below.

Before using this product, carefully read and fully understand the contents written in this manual and pay attention to safety.

- Operation, maintenance, and inspection of this product should be performed by qualified personnel educated about the fundamentals of the product and trained about hazards involved and measures to avoid danger.
- Do not allow any person other than those educated on the fundamental expertise of the product and trained about hazards involved and measures to avoid dangers to approach the product while it is operating or during maintenance.
- Comply with all related federal/national and local codes and regulations.
- To prevent accidents, do not perform any operation or maintenance other than those described in this manual and do not use this product for any unintended purpose.
- Replace the parts with the MYCOM genuine parts.
- To prevent accidents, not only workers but also managers should actively promote and behave according to the safety guidelines in the workplace.
- When closing or opening valves during work, apply lockout/tagout procedure to prevent the valves from closing or opening accidentally during the work.

[Lockout] To lock with a key in order to keep people, except the workers involved, from operating the product.

“Lockout” is a safety procedure to make sure that machines or equipment are property shut off and not able to be started up again by locking the power source to them.

Lockout is not just simply turning off the switches to stop the power supply, but includes immobilizing them with a key or similar device to prevent unauthorized access.
Lockout devices are devices such as keys, covers, and latches, to immobilize and shut-off switches, valves, opening and closing levers, etc.

[Tagout] To prevent any inappropriate work by hanging tag plates indicating like “work in progress”.

“Tag-out” means to clearly indicate that a device is in lockout and that operation of the device is prohibited. The sole purpose of the tag plates such as prohibition of operation or commissioning is to warn others that it is prohibited to operate the locked out product. It should always be accompanied by a suitable lockout device to make operation impossible.

Observe the following precautions when performing maintenance work on electrical control.

- Electrical maintenance of the product must be performed by certified/qualified personnel and only those who have been trained in the potential danger and its avoidance relevant to the electrical control of the product.
- Before servicing or inspecting electrical equipment or devices, turn "OFF" the main and control power, and perform the lockout/tag-out procedure to prevent the power from being restored during the intervention.

During maintenance work, make sure that the power supply on the power source side is shut off and perform lockout/tag-out to prevent the product from being accidentally turned on.

About this Manual

- This product may be modified without prior notice. Therefore, the specifications of your actual machine may differ from the descriptions in this manual. If case you have any questions, contact your sales offices or service centers. For each sight of MAYEKAWA, refer to following URL. http://www.mayekawa.com/about/network/
- This manual is in English. If any other language is required it is the customer’s responsibility to prepare instructions for safety education and operation instructions.
- This manual is copyrighted. Drawings and technical references including this manual shall not, in whole or part, be copied, photocopied, or reproduced into any electronic medium or machine-readable form without prior permission from MAYEKAWA.
- Photographs or drawings included in this manual may differ from the specifications of actual product.
- If this manual is lost or damaged, immediately place a purchase order to your local sales office or service center for a new manual. Using the product without the manual may result in safety issues.
- In the event that this product or the compressor package is resold, don’t forget to supply this manual together with the product.

Construction of this Manual

Title of Chapter/Section	Description details
Preface	Describes the outline of this manual and how to read it.
Warranty and Disclaimer	Describes clauses and coverage of warranty. Exemption of warranty clauses is described as disclaimer.
Important Information	Describes important information related to this product and this manual.
1. Safety	Describes safety information for the worker, safety rules for this product, and management details regarding work safety required for handling the product.

Title of Chapter/Section	Description details
2. Configuration and Specifications of Oil Pump	Describes the main components that constitute the Product in addition to the features, specifications and application limits of this Product.
3. Installation	Describes the installation procedure of this Product.
4. Precautions for Operation	Describes the precautions to be followed when using the Product.
5. Maintenance and Inspection	Describes the inspection points and interval, and assembly/disassembly procedures.
6. Relevant Materials	This Manual includes illustrated parts breakdown and parts list.

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1. Safety

1.1. Observation/Prevention

1.1.1. Observance (Do's)

■ Matters to be observed during operation

- Be sure to install safety devices and protective equipment.
- Regularly check if the installed safety devices and protective equipment operate properly.
- If any of the safety devices or protective equipment does not operate properly or a malfunction of the Product occurs, immediately stop the operation, contact the responsible supervisor, and follow their instructions.
- If the machine stops due to unknown reasons, immediately inform your supervisor. Do not restart the machine until the supervisor determines the machine's safety and provides proper instructions for a safe restart of the compressor.
- Some types of refrigerants are toxic and/or generate bad odors which can cause oxygen deficiency. Make sure to ventilate the working area sufficiently to prevent asphyxiation.
- Some refrigerants and refrigeration compressor oils may be corrosive, decomposable, or toxic. Make sure to obtain their Safety Data Sheets (SDS) and strictly follow the mentioned instructions.
- When stopping the compressor for a long time, turn "OFF" the main motor, heater, and control power. Close the suction and discharge side shut-off valves.

■ Do's on Maintenance

- When performing work with at least two or more persons, thoroughly confirm the work procedure and clearly understand each others work before commencement.
- Always turn "OFF" and use the lockout /tag-out procedure for the main motor, control and other devices before troubleshooting, setup, cleaning, maintaining, or inspecting this product. Also, make sure that the power is NOT turned on accidentally during the intervention.
- Before troubleshooting, setup, cleaning, servicing or inspecting this product, apply the lockout / tag-out procedure to the liquid supply stop valves and valves in the upstream and downstream of the compressor so that they do not open accidentally during the work.
- Some types of refrigerants are toxic and/or generate bad odors which can cause oxygen deficiency. Make sure to ventilate the working area sufficiently to prevent asphyxiation.
- Some refrigerants and refrigerant oils may be corrosive, decomposable, or toxic. Make sure to obtain their Safety Data Sheets (SDS) and strictly follow the mentioned instructions.
- After working on the machine, always store the used tools at specified places and make sure that no tools are left in or around the machine.

■ Do's on Lockout/Tagout after Turning off the Power

- Prepare lockout / tag-out devices for the main breakers in the power lines to the main motor and control cabinet.
- By applying the lockout/tag-out procedure after turning off the power, you can prevent any other personnel from restoring the power inadvertently. It enhances the safety of the personnel working on the power supply equipment and the package.
- If there are any possibilities of danger during work (especially during cleaning, maintenance, inspection, or troubleshooting), turn the main motor and control power "OFF" and perform a lockout/tag-out procedure.

- Before working on the package for troubleshooting, setup, cleaning, maintenance and/or inspection, it is recommended to always perform a lockout/tag-out procedure to the main motor and control power. It is also recommended to check if the lockout/tag-out procedure has been performed according to good practice.
- Turn off the power and perform lockout/tag-out before working on the package. Clearly notify the workers of the necessity of lockout/tagout.
  - It is assumed that workers do not perform lockout/tagout of the main motor and control power before starting work because it is troublesome, and only turn "OFF" the main motor and control power.
  - It is assumed that workers only turn off main motor and control power and do not lockout/tagout the main motor and control power, because they think it is not important.
- Upon completion of the work, the worker responsible for the lockout/tag-out must remove the lockout/tag-out device.

■ Do's about Personal Protective Equipment (PPE)

- Prepare and use personal protective equipment which is in accordance with the area’s safety standards.
- Check the function of each PPE before use.
- Wear appropriate work cloth and avoid loose clothing.
- Do not wear any neckties or jewelry that can get entangled in the moving or rotating parts. A helmet is recommended for the protection against head injuries
- Empty your pockets to prevent objects from falling into the machine.

■ Do's about Handling of Hazardous and Toxic Substances

- Obtain Safety Data Sheets (SDS) from manufacturers/suppliers of hazardous and toxic substances.
- Check the SDS and follow the handling instructions recommended by the manufacturers to handle and store those substances.

■ Do's about Handling Emergency Situation

- Develop an emergency action procedure in accordance with the legal regulations and post it at a safe and easy to reach place.

■ Do's about Waste Oil, Fluid, and Materials

- Disposal of refrigerant and waste oil from the compressor are subject to a number of environmental protection regulations. Follow the local, state or federal acts and regulations as well as your company's rules, when disposing of such waste oil, fluid and materials.
- Dispose the Product as an industrial waste.

■ Other Do's

- Keep the floor around the freezing, refrigeration, and/or air conditioning packages clean and provide a safety aisle.
- Use the safety aisle only to move around the equipment. Keep the safety aisle free under all circumstances to ensure safe passage when required.
- If water or oil is spilled on the compressor or the floor, immediately wipe it off to prevent workers from injury caused by slipping.

1.1.2. Prohibition (Don’ts)

- Do not remove or relocate any safety devices, including electrical interfaces.
- Do not disable any safety device by short-circuiting or bypassing without any permission.
- Do not leave the compressor unsafe and unattended, by removing the safety cover or some other safety measures.
- Do not touch, clean, or lubricate any part of the compressor (especially moving parts) when the compressor is operating.
- Do not touch relays or electric systems such as terminal block with bare hands when activating the power.

1.2. Warning signs

The Product uses the following means to alert workers about potential hazards.

- Use of signal words throughout the Manual.

1.2.1. Signal words and their meanings

In this Manual, the signal words are categorized into four types as shown in Table 1-1 depending on the degree of hazard.
If these signal words are ignored, it may lead to serious injury, or in the worst case, loss of life.
Also, serious damage to the Product itself or the ancillary equipment may result. Be sure to observe the instructions given in the signal words.

Table 1-1 Signal words and their meanings

Type	Meaning
Danger	Indicates a hazard that, if ignored, is highly likely to result in death or serious injury.
Warning	Indicates a potential hazard that, if ignored, may result in death or serious injury.
Caution	Indicates a potential hazard that, if ignored, may result in minor or moderate injury.
Caution	Indicates a potential hazard that, if ignored, may result in property damage.

1.2.2. Safety labels

The section shows the different types of safety labels and their positions affixed on the compressor.
Always follow the warnings instructed on the safety label.

WARNING

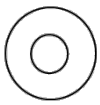
Make sure to follow the instructions mentioned on the safety labels. Failure to do so may result in personal injury, death, or property damage.
Do not smear, cover, or remove the safety labels.
If the safety labels are damaged or missing, purchase new labels and install them onto their proper positions according to this manual.

【POINT】

Inform our service centers the product name and safety label number when placing a purchase order for safety labels.

■ Types of Safety Labels

Table 1-2 Safety Label

No.	Safety label	Remarks
1	EM01FC-001 Rev.00 DO NOT REMOVE FROM OIL PUMP **IMPORTANT NOTICE FOR INITIAL START-UP** 1.-MANUALLY ROTATE THE PUMP TOWARDS THE DIRECTION INDICATED BY THE ROTATION ARROW. 2.-INSTALL PUMP IN PACKAGE UNIT. 3.-OPEN COOLING SYSTEM OIL SUCTION VALVE. 4.-OPEN COOLING SYSTEM OIL DISCHARGE VALVE. 5.-CHECK IF WORKING ROTATION OF OIL PUMP IS CW OR CCW. 6.-START PUMP DRIVE MOTOR. 7.-CHECK CORRECT OIL FLOW OF REFRIGERATION SYSTEM. 	

■ Affixing Positions of Safety Labels

Figure 1-1 shows the location of the safety label.
The number in the figure correspond to the ones used in Table 1-2

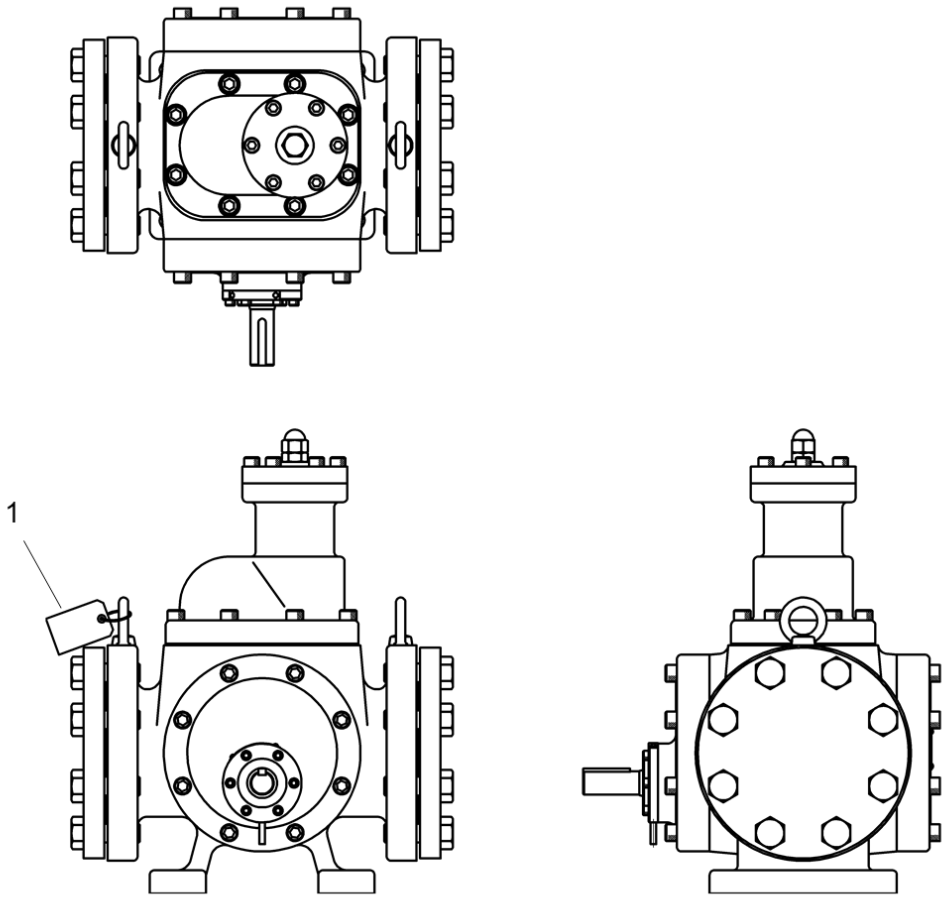


Figure 1-1 Safety Label Location

1.3. Residual risk

The following information is given provided that the Product is operated, inspected, or maintained in common package applications. However, it is impossible to identify every possible hazard source in the package used by the customer.
Foresee appropriate countermeasures for hazardous sources applicable to your systems.

Table 1-2 Hazard sources

Danger source		Predicted hazard	Measures to be taken in operation	Measures to take during cleaning, inspection, or replacement of parts
A	Coupling between motor and pump	• Entanglement caused by contact	• Install coupling covers and prohibit opening • Avoid contact	• Shut off and lockout/tagout of motor's main power and control power
B	Motor terminal	• Electric shock caused by live wiring contact and electrical leakage	• Avoid contact • Do not open terminal box • Do not touch terminal box	• Shut off and lockout/tagout of motor's main power and control power
C	Casing	• Burn caused by contact • Contact with or inhalation of hazardous substances caused by leaking and blowing off refrigerant, etc.	• Sufficient ventilation • Wear protective gear equipment • Sufficient ventilation • Gas leakage detection	• Wear protective gear • Work in temperatures below 40 °C • Appropriate refrigerant handling • Sufficient ventilation
D	Piping			
E	Lubrication piping and joints			
F	Noises	• Hearing disabilities caused by noises	• Wear protective gear	• —

1.4. Safety devices

For safe use and protection of the compressor, make sure to foresee and install safety devices to the compressor that comply with the regulations and the following descriptions.

Safety devices must be properly and periodically maintained and inspected. It is important to include maintenance and inspection of safety devices in the periodical maintenance/inspection schedule. Make sure to provide users of the compressor with necessary information on types, attachment positions, functions, inspection method of the safety devices.

Warning

- **Please inspect the operation of all safety protection devices before starting the compressor. If any kind of malfunction and/or wrong operation is detected, immediately take measures to resolve the hazardous situation. Operating the compressor with faulty safety devices can lead to dangerous situations for personnel and environment.**

1.4.1 Emergency stop button

■ Overview/Function/Purpose

The emergency stop buttons are used to stop the compressor operation immediately if an emergency occurs to the compressor.

■ Installation Locations

On the control panel of the Product and in the operation control room

■ Stop/Reset Methods

Be sure to clearly express how to stop/restart operation in writing to notify all workers who operate the Product.

■ Inspection Method/Cycle

The emergency stop button must be checked for operation before commissioning, and on a regular basis. Be sure to clearly express the inspection method and interval of the emergency stop button in writing to notify all workers who operate the Product.

1.4.2 Breakers for the Main Motor Power and Control Power (with Lockout/Tagout Devices)

■ Overview/Function/Purpose

Turn off the main motor and control power, and if there are any possibilities of danger during work (especially during cleaning, maintenance, inspection, or troubleshooting), lockout/tagout devices must be set up for breakers of the main motor and control powers to prevent injury to workers in case the power is turned on accidentally during work.

■ Installation sites

Circuit breaker for motor main power and control power

■ Methods of Performing and Releasing Lockout/Tagout

In accordance with the regulations created by Occupational Safety & Health Administration (OSHA) and other authorities, make sure to clearly indicate methods of performing and releasing lockout/tagout and provide users of this compressor with the necessary information.

■ Inspection Method/Cycle

Please consult the unit instruction manual for inspection procedures.

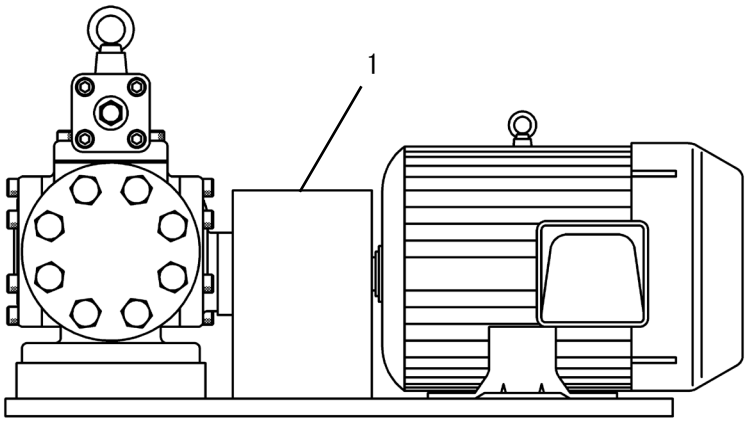
1.4.3 Safety cover (for driving system)

■ Overview, function, and objective

The safety cover is used to prevent workers from coming into contact with or getting caught in the driving system of the Product.

■ Installation sites

Driving system



No.	Name
1	Safety cover for driving system

Fig.1-1 Installation of safety cover for driving system

■ Inspection method and inspection interval

Be sure to clearly express the inspection method and interval of the safety cover in writing to notify all workers who operate the Product.

Chapter 2 Configuration and Specifications of Oil Pump

2.1 Configuration of oil pump

2.1.1 Sectional views

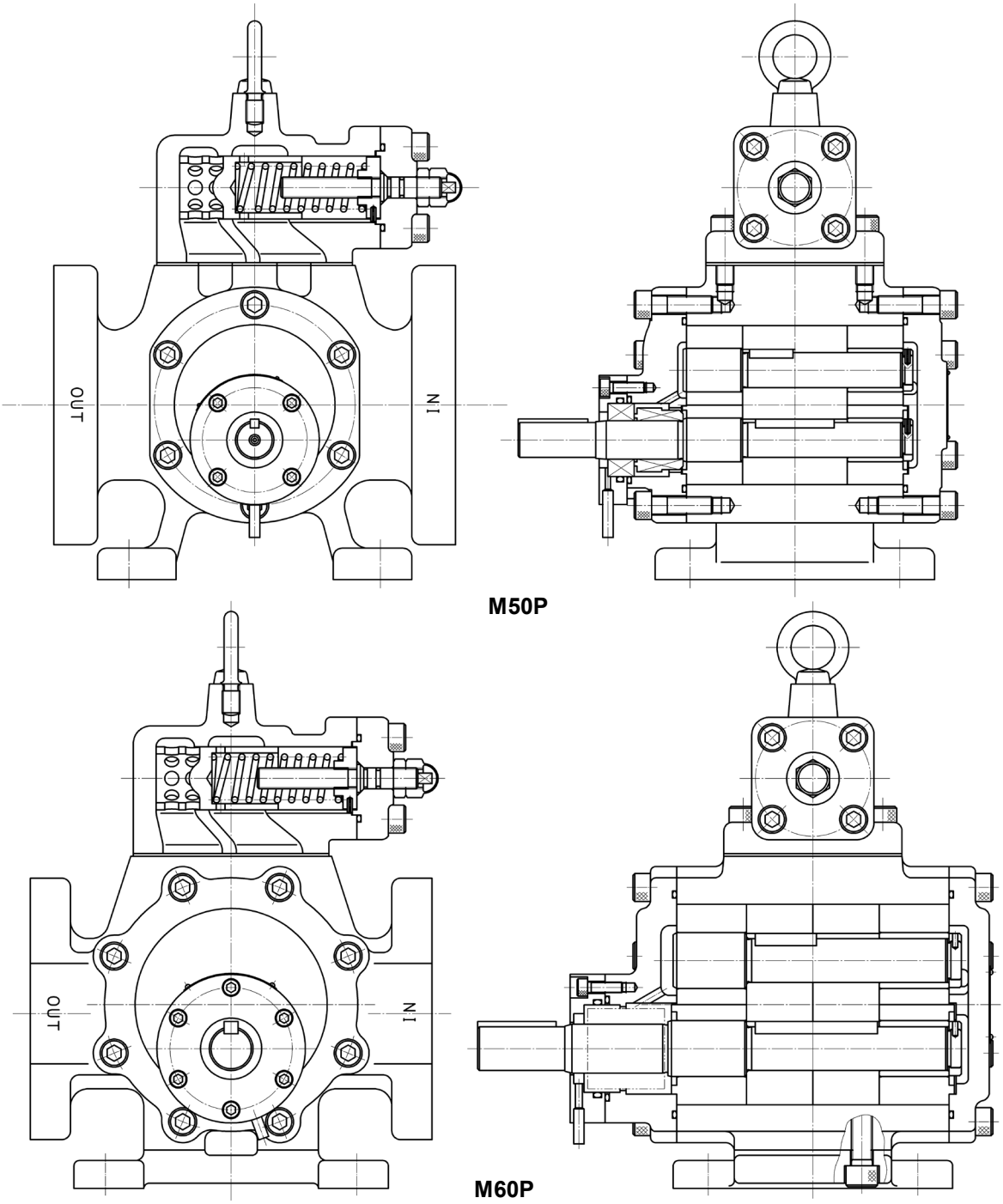
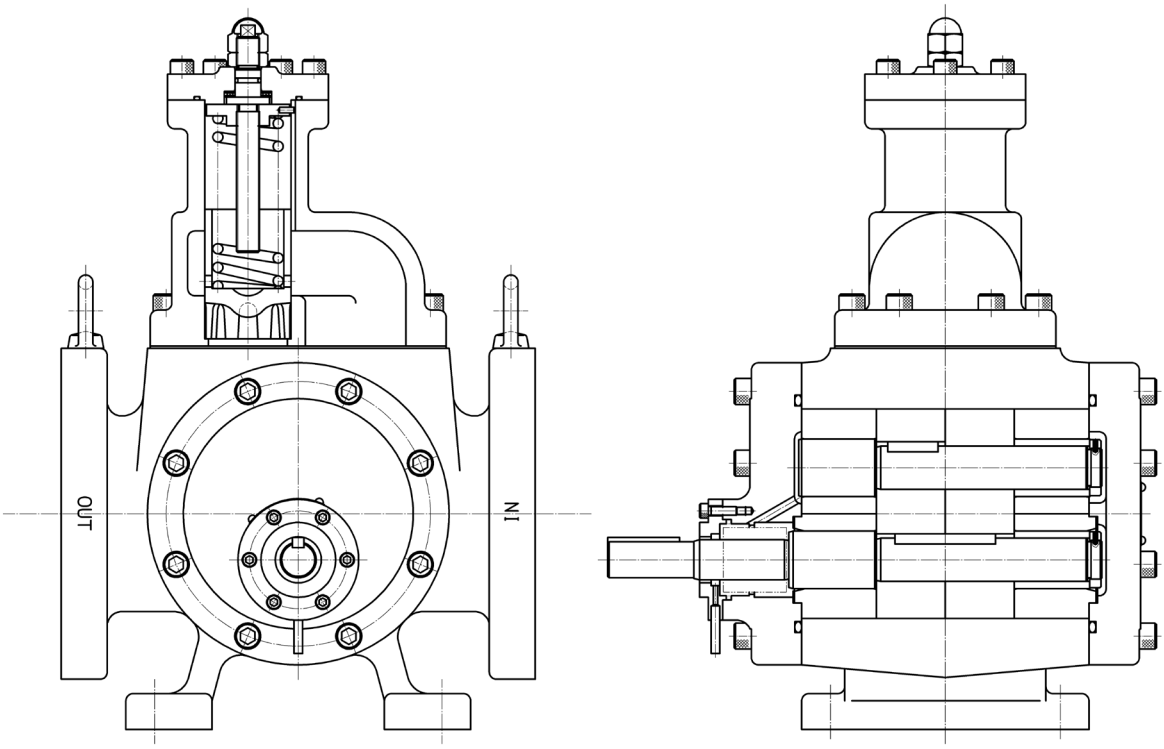
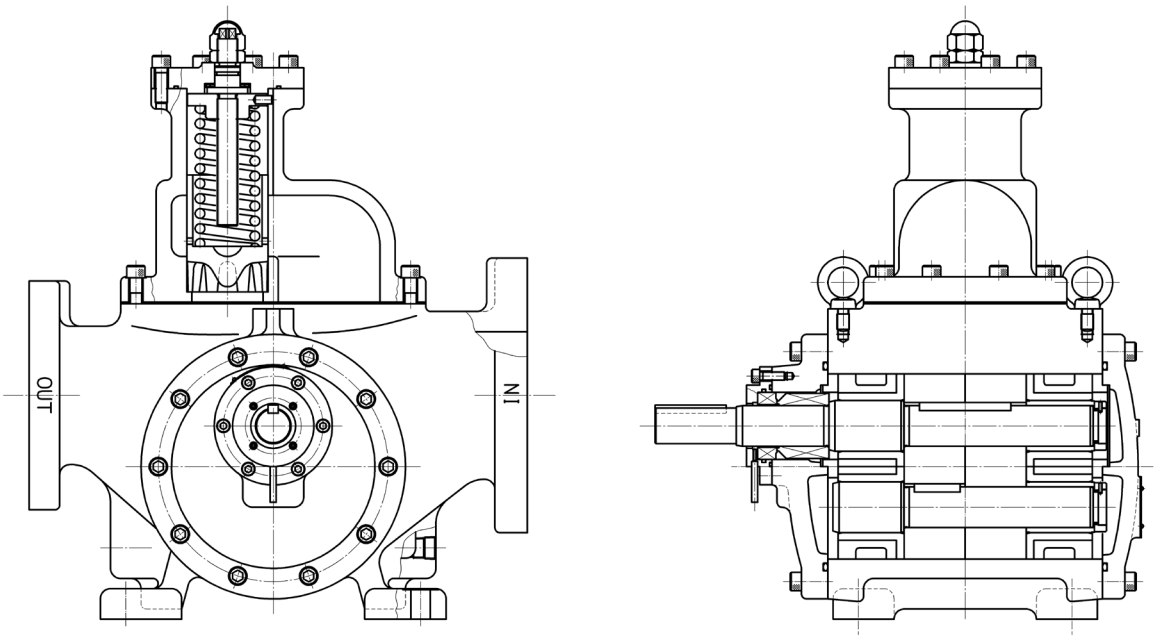


Fig. 2-1 Sectional views (M50P & M60P)

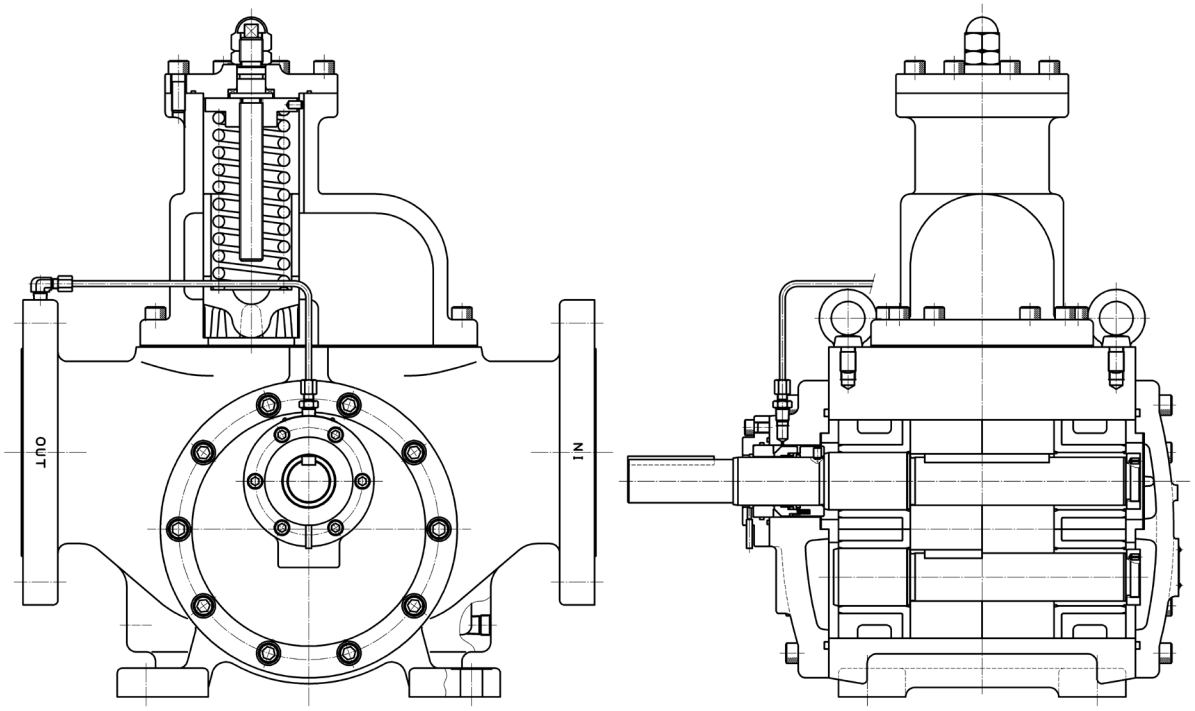


M80P



M100

Fig. 2-2 Sectional views (M80P & M100P)



M125

Fig. 2-3 Sectional views (M125P)

2.1.2 Configuration of oil pump

There are many different types of oil pumps. This pump is classified as a rotary positive-displacement pump, and is referred to as a gear pump in general.
This gear pump makes oil move through the clearances between the casing and a pair of the rotors (male and female).
The oil that flows in from the suction flange is drawn to the clearances between the casing and the male and female rotors through the suction port in the casing, and is carried by the rotating rotors to the discharge port of the pump.
Since the pump is equipped with a relief valve, it requires no external equipment to adjust the differential pressure before and after the pump.

2.1.3 Accessories and peripheral equipment

■ Pressure gauge and thermometer

To operate the oil pump properly, install pressure gauge and thermometer on the piping.
The following illustrates an example of measuring equipment installation.
The pressure gauge and thermometer must be operated within the operating range stated in the specifications.

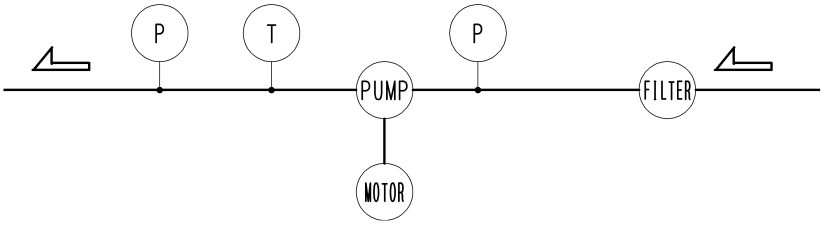


Fig. 2-4 Installation example

The pressure gauge and thermometer must be inspected and calibrated at regular intervals. Replace any measuring equipment that cannot be calibrated.

2.2 Specifications of oil pump

2.2.1 Specifications

■ Standard specifications

Table 2-1 Standard specifications

Model	M50P	M60P	M80P	M100P	M125P
Designed pressure (MPaG)	2.6				
Maximum discharge pressure (MPaG)	2.5	2.2	2.5		
Applicable viscosity range (cSt)	3 - 500				
Maximum operating temperature (ºC)	80				
Relief valve adjustment range (MPaG)	0.10 - 0.39				
Rotational direction	Clockwise (CW) Viewed from the inlet shaft side Right: suction, Left: discharge			Counterclockwise (CCW) Viewed from the inlet shaft end Right: suction, Left: discharge	

■ Capacity

Table 2-2 Capacity

Model		50 Hz			60 Hz		
		Number of revolutions min^{-1}	Discharge capacity L/min	Shaft power kW	Number of revolutions min^{-1}	Discharge capacity L/min	Shaft power kW
M50P	6PM	950	62	0.53	1150	75	0.64
	4PM	1450	98	0.85	1750	119	1.08
M60P	6PM	950	127	1.1	1150	156	1.34
	4PM	1450	201	1.8	1750	244	2.28
M80P	8PM	720	204	1.79	860	245	2.13
	6PM	950	272	2.36	1150	329	2.97
	4PM	1450	418	3.98	1750	505	4.87
M100P	8PM	720	407	3.37	860	487	4.21
	6PM	950	536	4.81	1150	649	6.23
	4PM	1450	819	8.73	1750	-	-
M125P	8PM	720	784	6.6	860	941	8.4
	6PM	950	1046	9.8	1150	1268	12.8

Note: In the table shown above, the oil viscosity and the differential pressure are 50 cSt and 0.3 MPa, respectively.

■ Flange size

Table 2-3 Flange size

		M50P	M60P	M80P	M100P	M125P
Flange size	Suction side	JIS 20K 50A	JIS 20K 50A	JIS 20K 100A	JIS 20K 125A	ANSI #300 6"
	Discharge side	JIS 20K 50A	JIS 20K 50A	JIS 20K 100A	JIS 20K 100A	ANSI #300 6"

■ Flange force and moment

Install piping so that the load and moment applied to the oil pump flange fall within the range specified in Table 2-4 shown below.

Table 2-4 Flange allowable load and moment

Model	Flange size (A)	Allowable load (N)		Moment (Nm)	
		F (x, y or z)	F (total)	M (x, y or z)	M (total)
M50P	50	295	420	145	210
M60P	50	295	420	145	210
M80P	100	505	720	260	385
M100P	100	505	720	260	385
M100P	125	610	870	325	480
M125P	150 (6")	720	1020	385	565

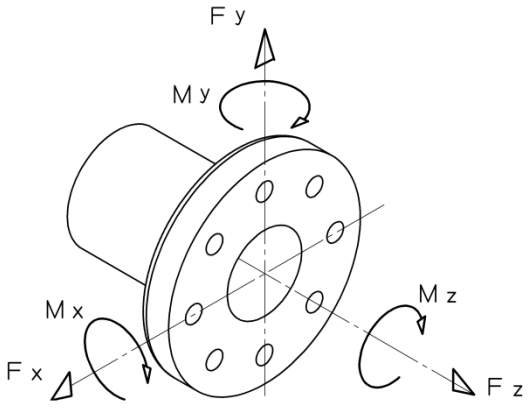


Table 2-5 Flange allowable load and moment

■ Vibrations

Table 2-5 lists the reference values for vibration velocity and measurement directions of the oil pump.

Vibrations of the oil pump may vary greatly depending on the operating conditions or surrounding environment.

When measuring vibrations of the oil pump, make sure that neither sympathetic vibration nor resonance is occurring in the frame or piping.

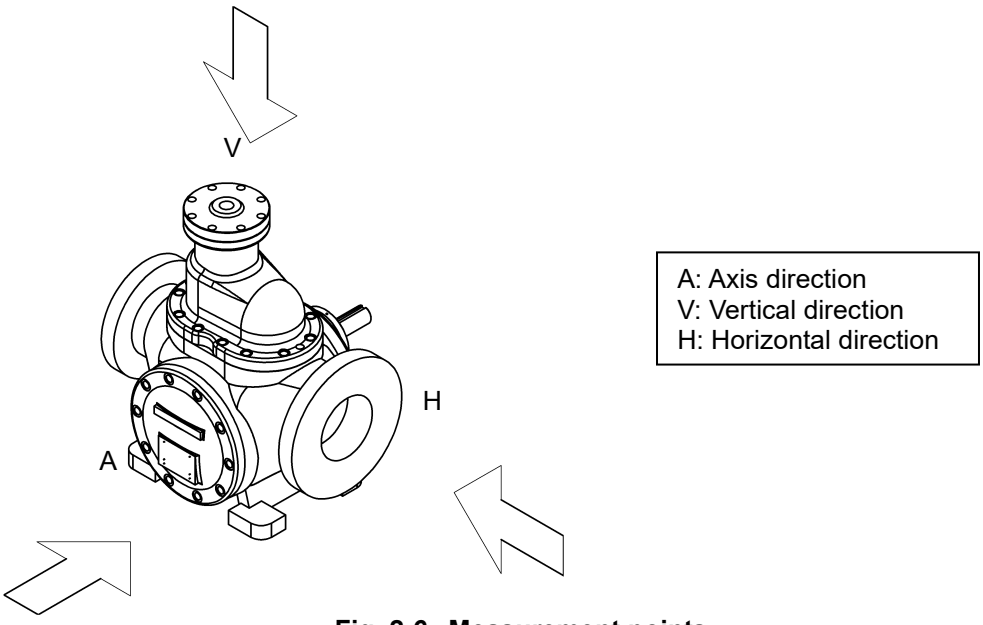


Fig. 2-6 Measurement points

Table 2-5 Reference values for vibration speed

Vibration speed (A, V, H) (mm/s, rms)	M50P M60P M80P M100P	M125P
0.28	A	A
0.71		
1.12	B	
1.8		B
2.3	C	
2.8		C
4.5	D	D
7.1		

A: Good, B: Caution, C: Warning, D: Stop

* Resonance and sympathetic vibration should not occur within the range of the rated speed.
  Frequency range: 10 to 1000 Hz
  The vibration speed is taken as vibration measurement parameter, of which value must be expressed with root-mean-square (rms) value.

■ Noise level

Table 2-6 lists the reference values for the noise level.
Actual noise level may vary greatly depending on the operating conditions or surrounding environment. (The figures are for reference.)

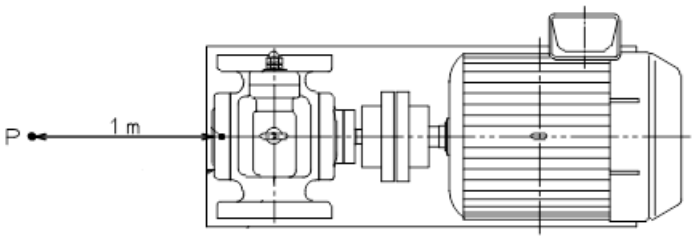


Fig. 2-7 Noise level measurement points

Table 2-6 Noise level

Model	Noise level (dB(A))
M50P	68
M60P	70
M80P	72
M100P	73
M125P	83

* The noise levels were measured with the equipment used in a shipping inspection, with a distance of 1 m from the front side of the pump and a speed being taken as 950 min^{-1}.
They are not guaranteed values.

■ Mass of oil pump

Table 2-7 Mass of oil pump

	M50P	M60P	M80P	M100P	M125P
Mass (kg)	35	40	135	200	325

2.2.2 Model number details

Basic information Supplementary information

M50P - 4P M - R H 01

Presence of built-in relief valve
01: with built-in relief valve, standard type
02: w/o built-in relief valve, specific type

Temperature of used liquid
S: Standard temp. (80 ºC max.), standard type
H: High temp. (130 ºC max.), specific type
L: Low temp. (-40 ºC min.), specific type
Supported only in M50P, M80P and M100P

Direction of oil flow
R: Left:suction, Right:discharge, viewed from the inlet shaft side
M50P, M60P and M80P, Rotational direction = Counterclockwise (CCW)
M100P and M125P, Rotational direction = Clockwise (CW)
L: Right:suction, Left:discharge, viewed from the inlet shaft side
M50P, M60P and M80P, Rotational direction = Clockwise (CW)
M100P and M125P, Rotational direction = Counterclockwise (CCW)

Drive shaft
M: Male rotor drive

Number of poles in the motor used
4P: driven by 4 poles
6P: driven by 6 poles
8P: driven by 8 poles

Pump name
M50P: Pump having rotors with an external diameter of 50 mm
M60P: Pump having rotors with an external diameter of 60 mm
M80P: Pump having rotors with an external diameter of 80 mm
M100P: Pump having rotors with an external diameter of 100 mm
M125P: Pump having rotors with an external diameter of 125 mm

2.2.3 Outer dimensions

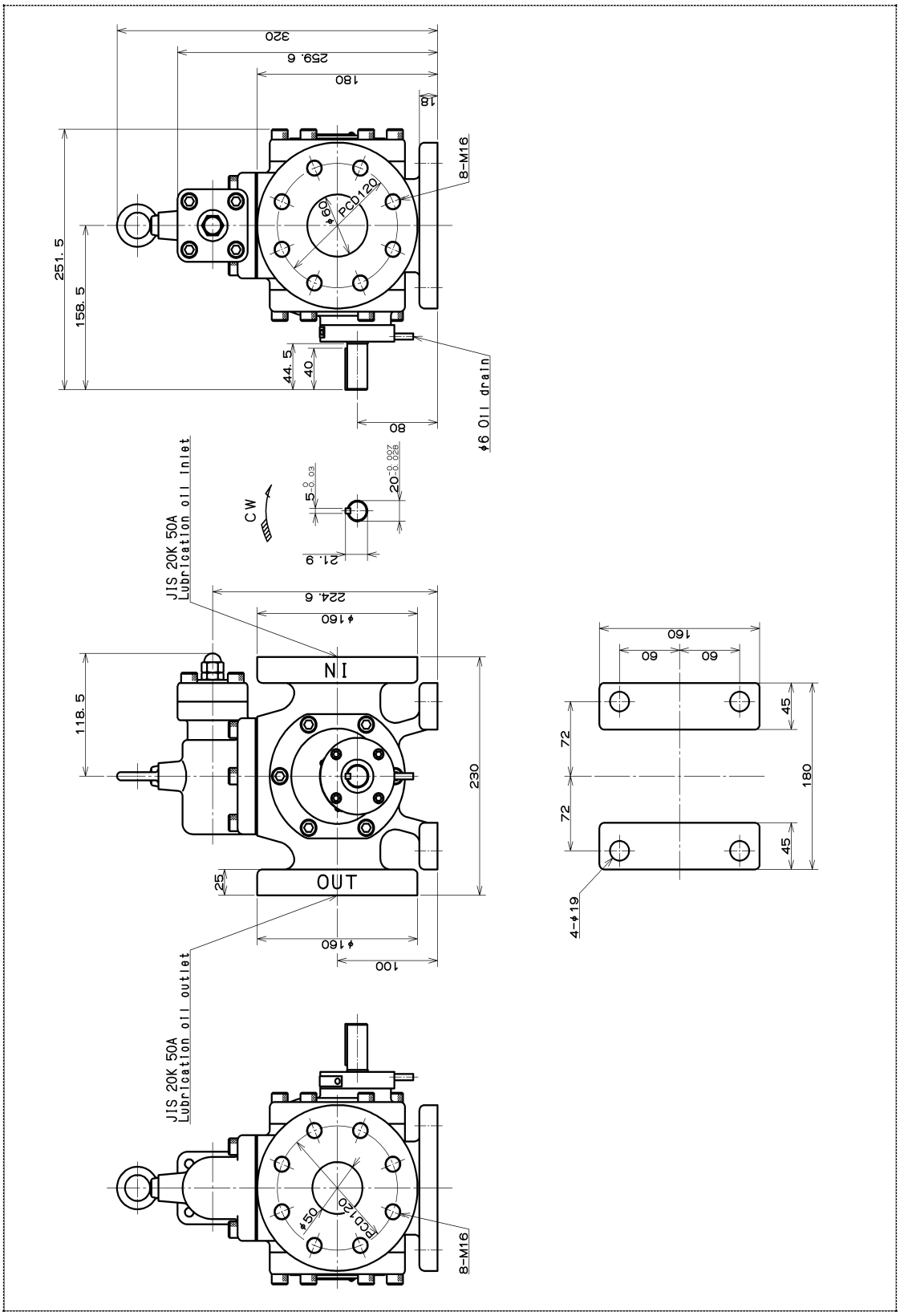


Fig. 2-8 Diagram of outer dimensions (M50P)

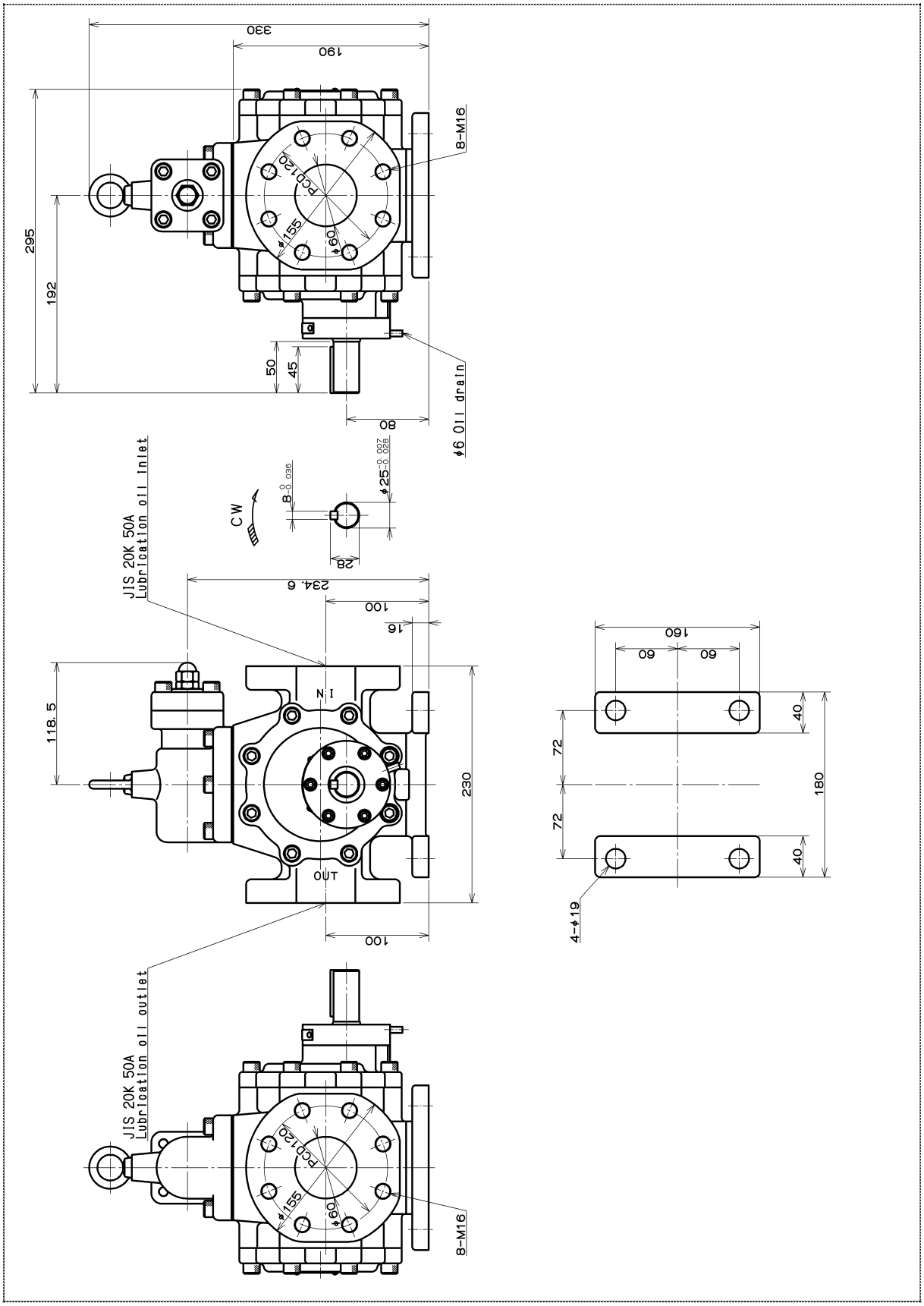


Fig. 2-9 Diagram of outer dimensions (M60P)

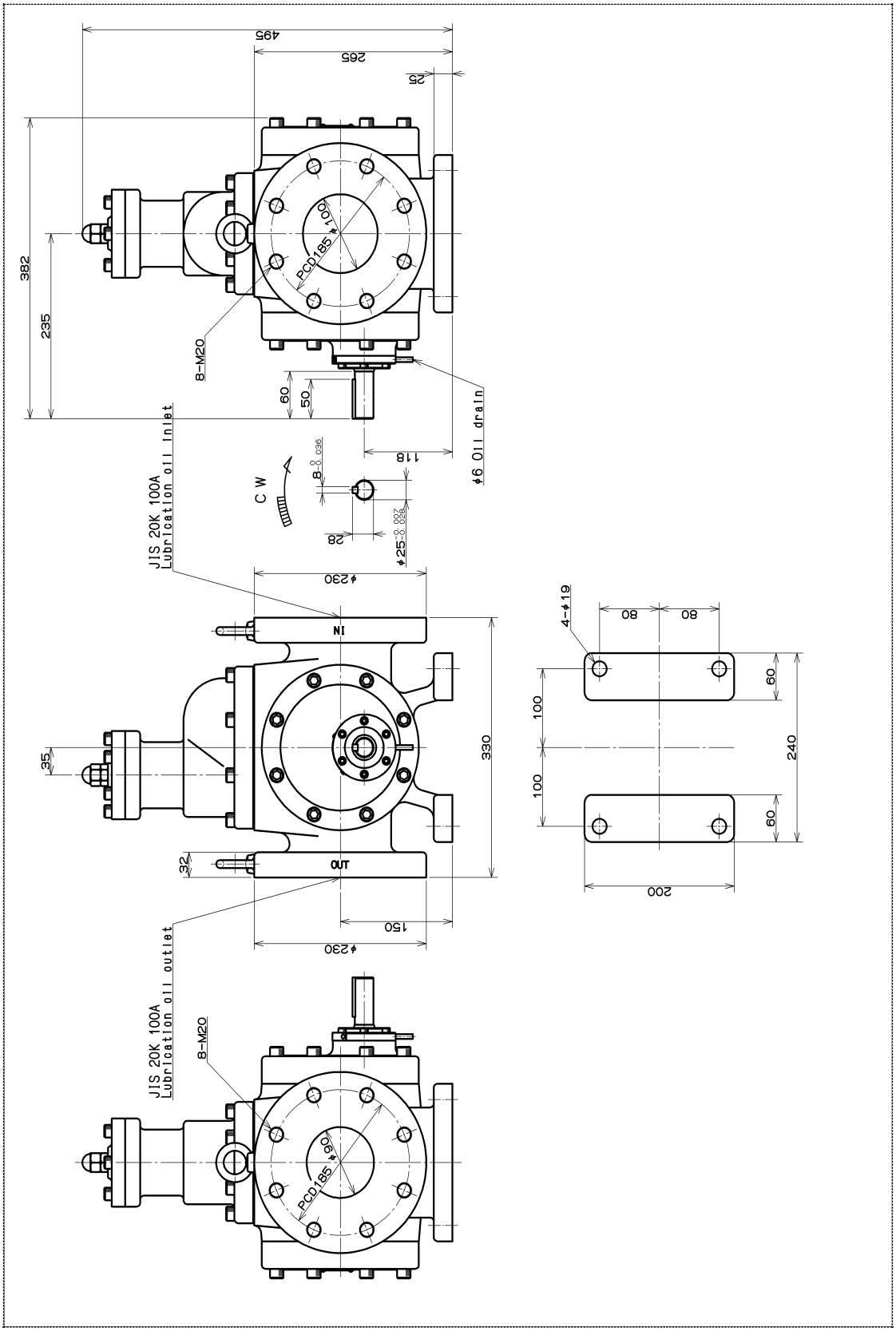


Fig. 2-10 Diagram of outer dimensions (M80P)

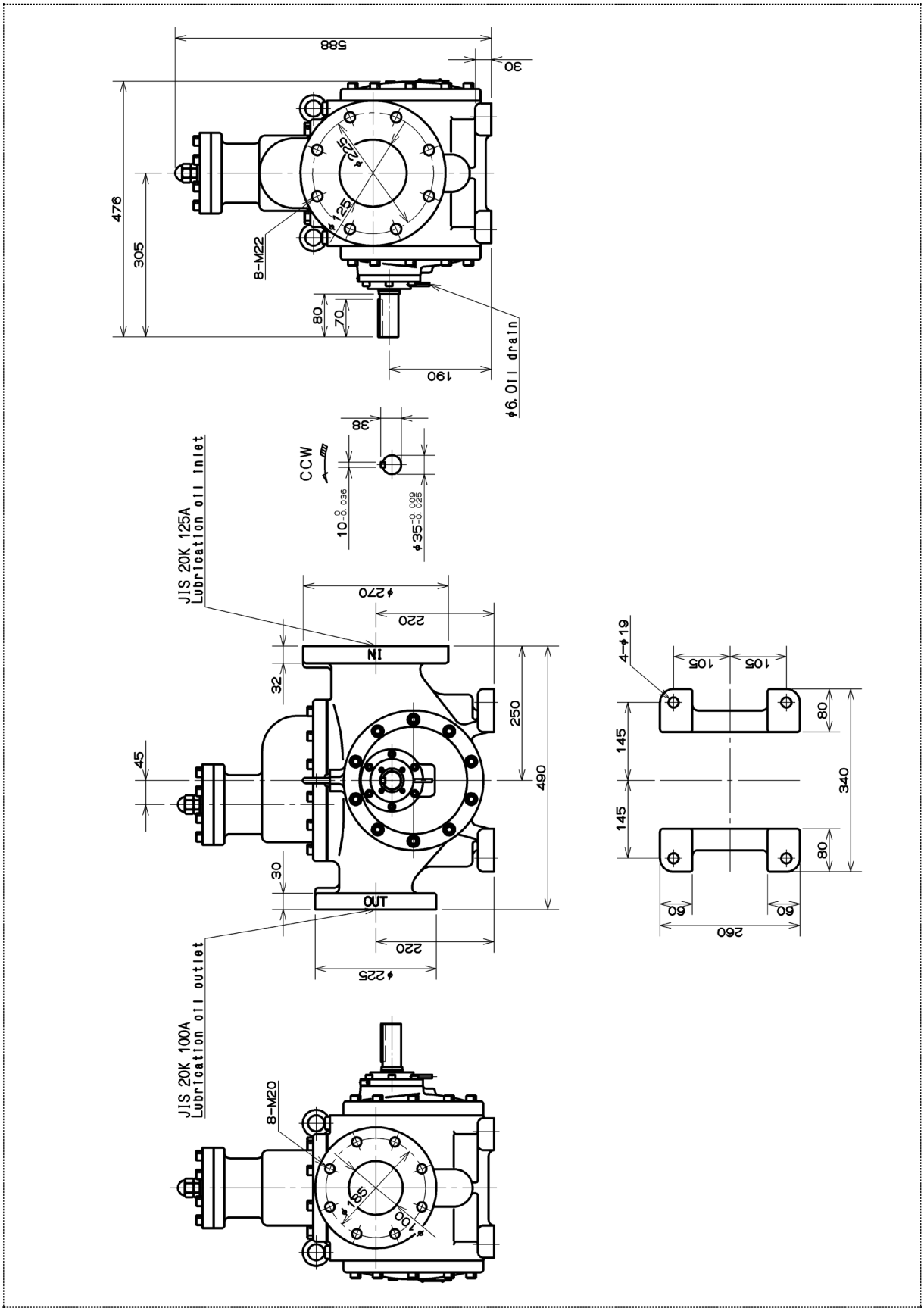


Fig. 2-11 Diagram of outer dimensions (M100P)

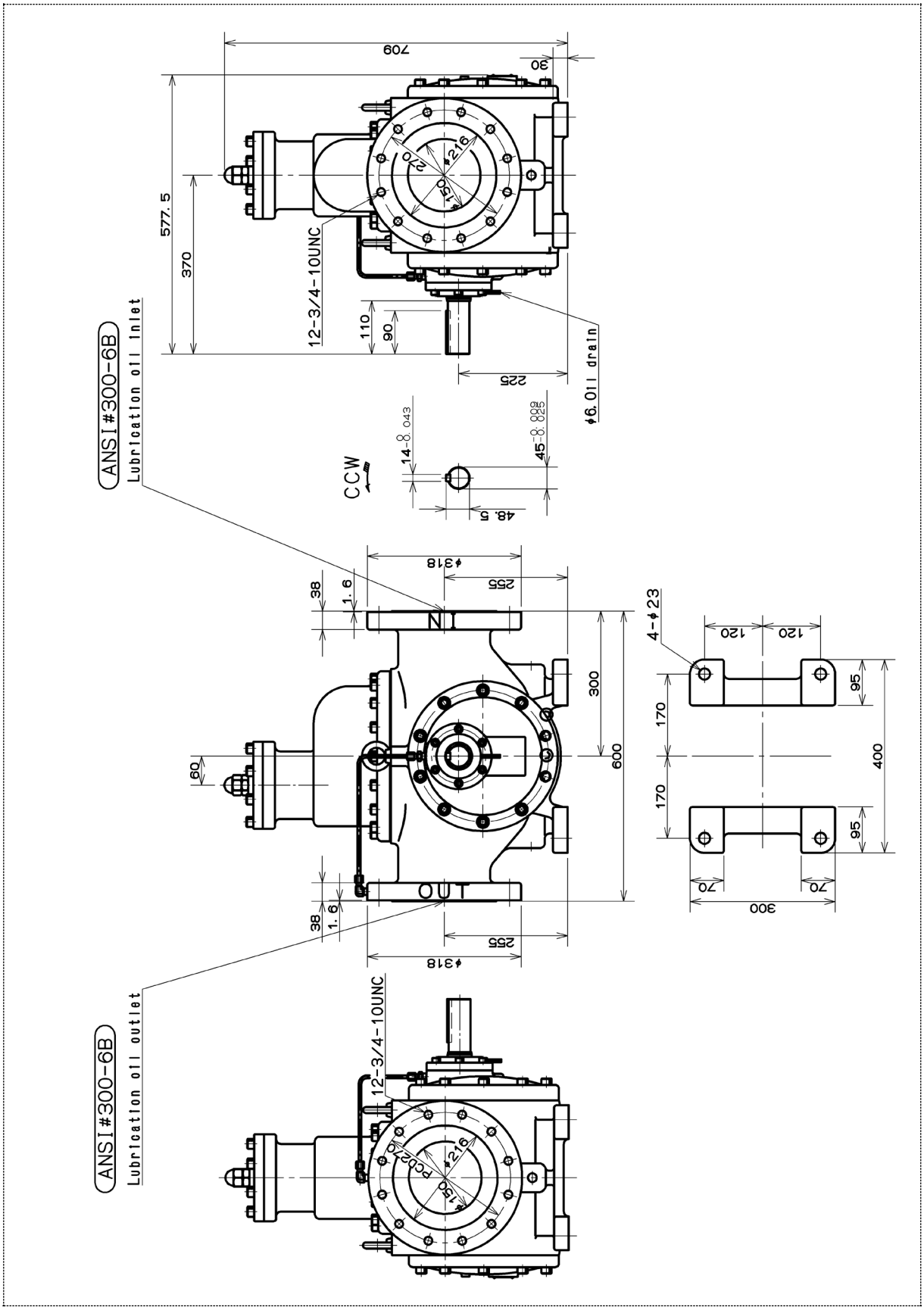


Fig. 2-12 Diagram of outer dimensions (M125P)

Chapter 3 Installation

3.1 Safety precautions during installation

Hint

- This chapter, “Installation”, describes installation procedure assuming that the oil pump is installed to the general type freezer, refrigerator, or air-conditioning system.
  If your installation to a freezer, refrigerator or air-conditioning system does not apply to that described here, prepare your own installation procedure with thorough consideration for safety by referring to this chapter, and carry out the installation.
  If you have any questions, contact our sales office or service center.

- The installation work of the oil pump may require qualified person. The oil pump must be installed by a predetermined qualified person in accordance with the laws and regulations applied to the country to which the oil pump is delivered.
- Before starting the installation work, carefully read and fully understand this chapter and relevant materials.
- All the work related to electricity must be performed by electricians.
- Never enter or bring any part of the body under the lifted oil pump.

3.2 Installation work

3.2.1 Unpacking

Check the oil pump for irregularity including damage.

Hint

- If the oil pump is damaged or missing any of its parts, contact our sales office or service center.
- The packing materials that become no longer necessary must be properly disposed of in accordance with the applicable laws and regulations, and your voluntary restrictions.

3.2.2 Storage

When you store the oil pump before use, store it indoors.

3.2.3 Lifting posture and position of center of gravity

When a crane is used to lift the oil pump, do not exceed the rated load of the crane.
When you lift the oil pump, lift it slowly. Do not lift it fast and furious such as moving it from side to side and up and down.
When you lift the oil pump by supporting it at two points, select an appropriate hoist so that the angle between the lifting chains becomes 60 degrees or less.
Never enter the area under the lifted oil pump.

M50P & M60P (lifted with a single hook)

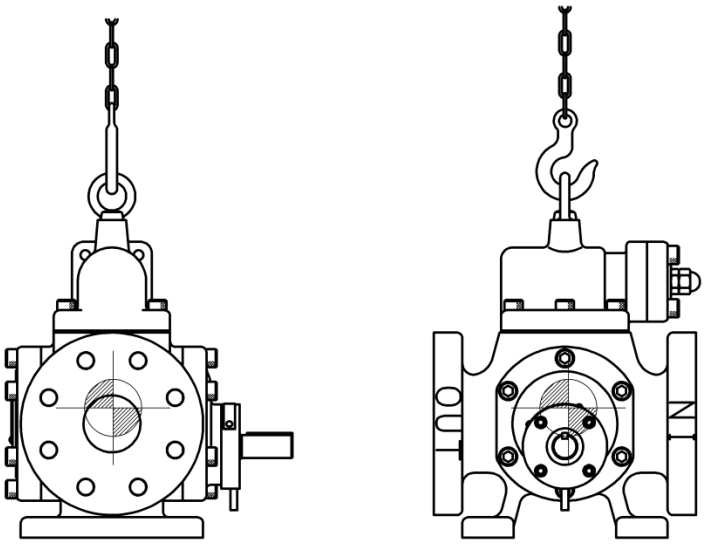


Fig. 3-1 Lifting posture and position of center of gravity (M50P & M60P)

M80P (lifted with 2 hooks)

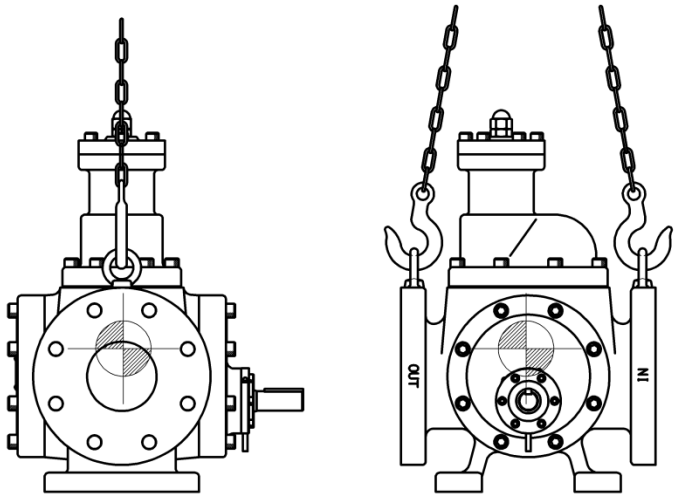


Fig. 3-2 Lifting posture and position of center of gravity (M80P)

M100P (lifted with 2 hooks)

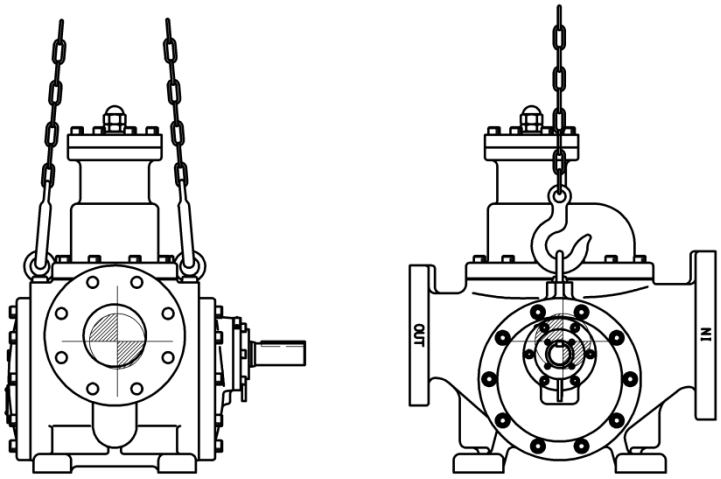


Fig. 3-3 Lifting posture and position of center of gravity (M100P)

M125P (lifted with 2 hooks)

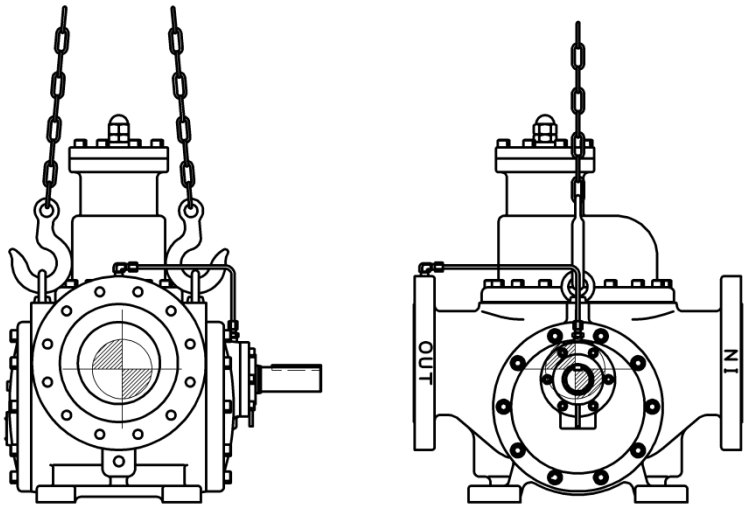


Fig. 3-4 Lifting posture and position of center of gravity (M125P)

3.2.4 Transportation

Danger

- **Fall of a lifted oil pump may result in serious injury or death. Ensure that no one enters the area under the lifted oil pump.**

1. To perform the lifting work, prepare appropriate lifting equipment suitable for the mass of the oil pump to be lifted, and tools having capability of lifting it within the allowable range of the rated load.
2. Provide an adequate space to perform safe lifting work.
3. Be sure to inspect the lifting equipment and tools before use.
4. When you lift the oil pump alone, hook the lifting equipment to the eye bolts attached to the oil pump.
5. Check that the transportation path is free from any obstacles that can hinder smooth transport, according to the size of the oil pump.
6. Before lifting the oil pump, make sure that the lifting equipment aligns with the center of gravity of the oil pump.
7. Before lifting the oil pump, instruct all workers to stay away from the lifting site.
8. Prior to the lifting work, give a signal (with voice or gesture) for starting the work to the workers who are working together. Do not start the lifting work unless the given signal (with voice or gesture) is fully understood.
9. Hoist the oil pump slowly until just before it leaves the ground.
10. Lift the oil pump until it completely leaves the ground, and make sure that it is not tilting. If the oil pump is inclined, rewind the lifting chain and adjust the pump position. Then, wind the lifting chain again.
11. The oil pump must be lifted slowly. Lifting the oil pump fast and furious may damage part of the lifting equipment or oil pump.
12. Once the lifting starts, keep watching whether the lifting equipment functions properly. Make sure that it is not tilted.
13. When moving the lifted oil pump, be sure to use a guiding rope.
14. When moving the oil pump, keep people away from the area where the pump travels, and ensure safety.
15. Do not bring the pump above the safety aisles unless absolutely necessary.
16. Do not place the pump on the safety aisles. The safety aisles must be kept free of obstructions, so that people can easily get through them at any time.
17. When placing the oil pump on the floor, clear the area where it will be placed in advance. Prevent the pump from being tilted or becoming out of balance.
18. Before the oil pump is placed on the floor, notify workers around the pump that it will be placed on the floor.
19. When placing the pump on the floor, slowly move it downward, paying attention not to subject it to a strong impact and cause damage to it.

3.2.5 Preparation for installation

■ Installation space

For the outer dimensions of the oil pump, refer to Chapter 2, Section 2.2.3, “Outer dimensions”.
The following diagrams and table show the minimum amount of space required for performing assembly or disassembly of the oil pump.
Provide adequate maintenance space that allows easy operation, cleaning, maintenance, or inspection of the oil pump by referring to the following diagrams and table.

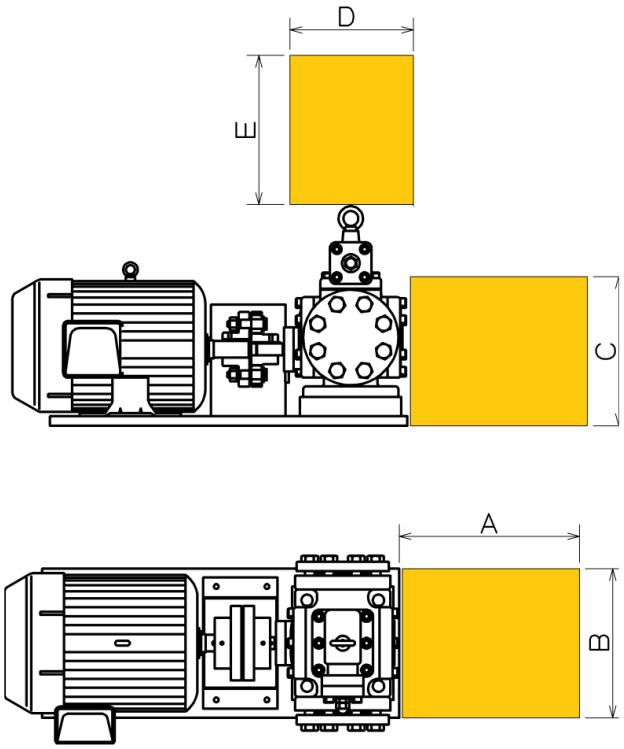


Fig. 3-5 Minimum amount of space required for maintenance

Table 3-1 List of minimum amount of space required for maintenance

(mm)

	A	B	C	D	E
M50P	250	230	200	250	150
M60P	300	230	200	300	150
M80P	400	330	270	400	250
M100P	500	500	300	500	300
M125P	600	600	300	600	350

■ Lighting

Provide adequate lighting that allows easy operation, cleaning, maintenance, and inspection of the oil pump.

■ Ventilation

Install a ventilating fan to the places where natural ventilation is insufficient, in accordance with the applicable laws and regulations.

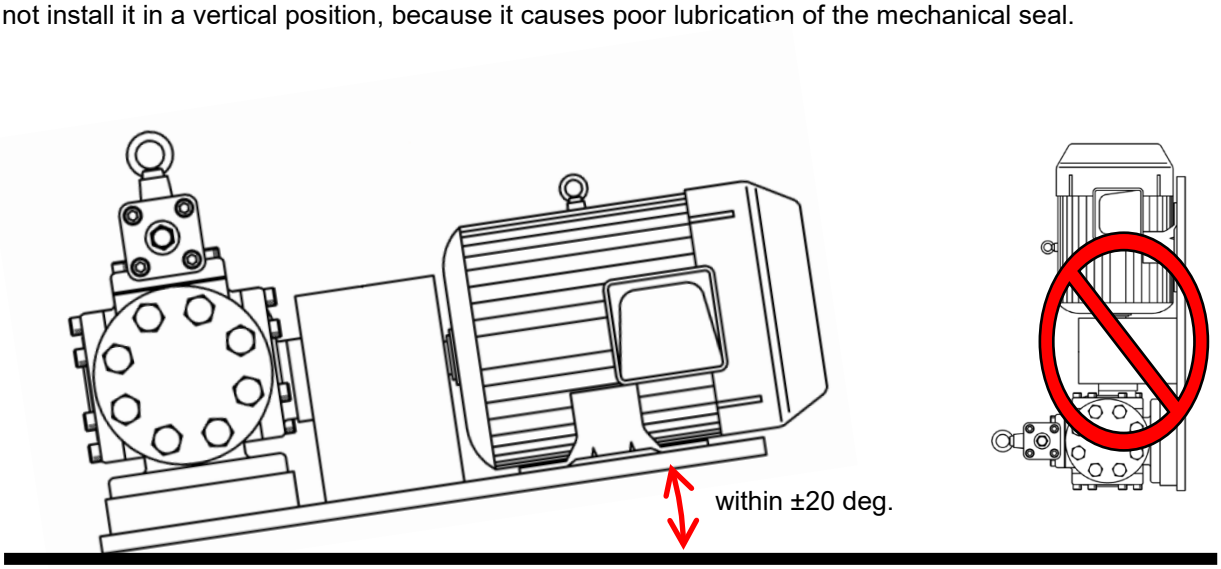
3.2.6 Installation

■ Installation

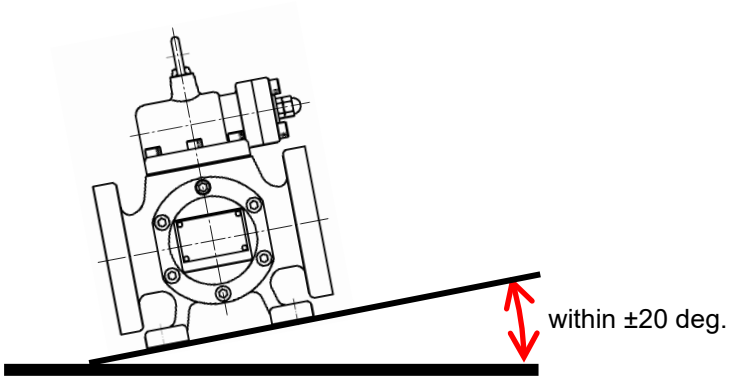
1) Installation position
   Install the pump so that the height of the suction port is lower than the oil level of the piping and oil tanks, and do not suck gas during start-up and operation.

2) Foundation or base for installation
   The foundation or base to which the oil pump is installed must be high in rigidity, because it plays an important role in terms of securing the oil pump so as to align with the motor, and properly transmitting the motor drive torque to the oil pump.

3) Installation angle
   Install the pump horizontally within ±20° for each direction.
   Do not install it in a vertical position, because it causes poor lubrication of the mechanical seal.



Horizontal



Horizontal

■ Centering

When you are finished with installing the oil pump and piping, perform “Centering” to align the shaft centers of the oil pump and motor. Perform the centering work so that each of the measured eccentric error and tilt error will fall within the allowable range shown in the following Table 3-2.

Table 3-2 Allowable value of centering

Model	M50P/M60P/M80P/M100P/M125P
Eccentric error (mm)	0.1
Tilt error (mm)	0.1

◎ Inadequate centering may cause trouble during operation, such as heat generation, excessive wearing, vibrations, or noise in the bearings of the pump and motor. This reduces the service life of the pump and motor.

◎ Be sure to perform the centering after piping work is complete.

■ Piping

- Before performing the piping work, cover all openings of the oil pump so as to keep it free from foreign matters. Be sure to remove the cover when connecting a pipe to the pump.
- It is necessary to pay attention not to subject the oil pump flange to excessive force due to the welding distortion of the pipe. (Failure to observe this may result in inadequate centering.)
- When performing the piping work at the suction side of the oil pump, reduce the equipment used (e.g., elbows, pipe bends, or valves) so as to make the suction resistance as small as possible. For the strainer at the suction side, a 100 to 200 mesh strainer is required.

3.2.7 Checking after installation

By referring to the following items to be checked after installation of a oilpump, the customers must develop their own check list and checking method according to the freezer, refrigerator or air-conditioning system to which the pump is installed.

■ Wiring works of equipment such as automatic control

- Wiring between the control board and each switch
- The starting method of the motor (automatic/semiautomatic) and the rotational direction
- The insulation resistance of the motor

■ Gas leakage test and coolant leakage test

It is the responsibility of the customers to conduct both the gas leakage and coolant leakage tests.

Danger

- **Do not use oxygen or flammable gas for the gas leakage test. There is a risk of explosion.**

Caution

- **When carbon dioxide (CO_2) is used for the gas leakage test for the oilpump using ammonia (NH_3), ammonium carbonate may be deposited. This may cause the equipment to malfunction.**

Chapter 4 Precautions for Operation

Danger

- **Before conducting inspection or maintenance, turn off the motor main power and control power. Also, prevent the power switches from being accidentally turned on during inspection or maintenance. When any of the power switches is turned on during inspection or maintenance, the motor or the oil pump starts running. This may cause damage to the equipment, or cause workers to be caught in the rotating shaft. This may also result in an electric shock at current-carrying part.**

Warning

- **When turning on or off the power of each equipment, be careful for the electric shock.**

4.1 Precautions before operation

1) Temporarily remove the coupling. Operate the motor alone to check the rotational direction of the motor, and then put the coupling back.
2) Fully open the suction valve, and check if the oil is properly supplied.
3) After ensuring that the oil is supplied, fully open the discharge valve.
   Adjust the relief valve after starting operation.
4) Rotate the coupling in the predetermined rotational direction by hands to check if it rotates smoothly. If the motor does not rotate smoothly, never start operation unless the cause is removed.
5) To start operation, supply power to the equipment for a short period of time. During that period, make sure that the oil pressure properly rises and there is no abnormality with the equipment, and then start continuous operation.

4.2 Precautions during operation

1) When continuous operation starts, check the following: suction and discharge pressures; abnormal vibrations and noise; abnormal leakage from the seal; abnormal current being applied to the motor if an ammeter is available.
2) If there is an abnormality with the pressure, vibration, noise, leakage or current value, immediately stop the motor, remove the cause of the abnormality, and then restart the operation.

4.2.1 Adjustment of relief valve

1) The pressure can be adjusted by the relief valve during operation.
2) Remove the hexagon cap nut (32) on the top of the relief valve.
3) Loosen the hex nut (31) securing the adjusting bolt (27).
4) Adjust the discharge pressure by rotating the adjusting bolt with a wrench.

- Viewed from the top of the adjusting bolt,
  rotating the adjusting bolt clockwise increases the pressure
  rotating the adjusting bolt counterclockwise decreases the pressure

- The following table shows the guideline for the amount of pressure increase per one rotation of the adjusting bolt and the maximum effective number of rotations of the adjusting bolt.

Table 4-1 Guideline for the amount of pressure increase and maximum effective number of rotations

Model	M50P / M60P	M80P	M100P	M125P
Amount of pressure increase per rotation (MPa)	0.020 to 0.025	0.025 to 0.030	0.035 to 0.045	0.03 to 0.04
Maximum effective number of rotations	16	16	12	16

5) When the required pressure is reached, firmly tighten the hex nut (31) to secure the adjusting bolt, and install the hex cap nut (32).

4.2.2 Terminating operation

Close the suction and discharge valves after ensuring that the motor has completely stopped.

4.2.3 Prolonged discontinuation of use

When the oil pump is not going to be used for a long period of time, close the suction and discharge valves, and turn off the motor main power, heater power and control panel power.

4.2.4 Restarting after prolonged discontinuation of use

Refer to Chapter 4, Section 4.1, “Precautions before operation”, in this Manual.

4.2.5 Additional precautions for handling

1）Use the pump within the range of operating conditions stated in the specifications.
2）Do not subject the pump to a strong impact. Do not forcibly put the pump into a package.

Chapter 5 Maintenance and Inspection

5.1 Precautions for maintenance and inspection

- Before starting maintenance and inspection after having removed the coolant, turn off the motor main power, control power and power supplies to each device and valves, and then prevent all switches from being turned on by accident. Be sure to place a tag with a warning message, such as “DO NOT OPERATE”, on it. (lock-out/tag-out).
- Even when the manual valves are closed, be sure to prevent them from being accidentally operated, and to place a tag on them to prohibit operation. (lock-out/tag-out)
- Before disassembling, inspecting or handling the oil pump, make sure that you have fully understood how to disassemble and assemble it properly. This Manual describes only the key points about the servicing of the oil pump, and does not describe the complete procedures of assembling and disassembling the oil pump.
- If complete disassembly and assembly of the oil pump is required, contact our branch or sales office near you.
- When the Product requires replacement of any of its parts, always use MYCOM genuine ones. Use of any parts other than genuine ones may result in unexpected malfunction of the Product.
- Do not modify the oil pump or any parts of the oil pump without prior permission from Mayekawa Mfg. Otherwise, it may lead to a damage or failure to maintain the function of the oil pump.
- To disassemble or assemble the oil pump, use the specified tools that are appropriate for use.
- Before disassembling and inspecting the oil pump, make sure that the pressure in the oil pump has dropped to the atmospheric pressure.
- Do not start the work until the temperatures of the hot areas drop to room temperature.
- Exercise extra care when handling heavy equipment, and use auxiliary tools such as stud bolts (safety bolts).
- Heavy equipment must be handled by using a lifting equipment such as a crane, or by a collaborative work consisting of two or more workers.
- In a collaborative work consisting of two or more workers, all workers must understand the work activities and the work having been assigned to each worker.
- The power supply of each device must be operated by a qualified person, and be careful for the electric shock.
- If qualification is required in working on other electrical equipment or structure, be sure to have the work carried out by a qualified person.

5.2 Regular inspection

Hint

- Fill out the operation log sheet regarding operating conditions, regular inspection, and details of maintenance and inspection of the compressor. Keeping an accurate record of the operation log will make it possible to operate a freezer, refrigerator, or air-conditioning system efficiently and safely. Also, in the event of failure, it helps you identify the causes of the failure promptly and accurately.

5.2.1 Daily inspection

Table5-1 Daily inspection

Item		Remarks
Oil pump	Feeding pressure of oil	
	Oil level (Oil quantity)	
	Oil temperature	
	Oil leakage from mechanical seal	3 mL/h or lower: normal 3 to 9 mL/h : needs to be monitored 9 mL/h or higher: needs to be inspected
	Abnormal noise	
	Abnormal vibrations	
	Leakage inspection	
Others	Current value of motor	
	Temperature inside machine room	

5.2.2 Monthly inspection

Table 5-2 Monthly inspection

Inspection item		Remarks
Oil pump	Check coupling for looseness.	

5.2.3 Semiannual inspection

Table 5-3 Semiannual inspection

Inspection item		Remarks
Oil pump	Pressure gauge	Perform calibration with a standard pressure gauge. Pressure gauge with an error exceeding the amount of its minimum scale must be replaced.
	Thermometer	Thermometer with an error exceeding the amount of its minimum scale must be replaced.

5.3 Disassembly and inspection (Overhaul)

Perform maintenance, disassembly and inspection of the oil pump in accordance with the information given below.

The inspection interval varies significantly depending on the usage conditions, the type and condition of the oil, or the equipment. The following table shows the recommended intervals to overhaul the oil pump according to the usage conditions.

Table 5-4 Guideline for overhaul interval

Classification	Application example	Guideline for overhaul interval
Relatively stable operating conditions	Freezer and refrigeration system	5 years or 40,000 hours
Relatively fluctuating operating conditions	Ice making and chiller system	4 years or 30,000 hours
Relatively fluctuating operating conditions with frequent start/stop operations	Heat pump system	3 years or 20,000 hours

Note 1: This guideline is applied only if the oil pump is operated within the allowable operating range.
Note 2: This guideline is applied only if the separately prescribed daily inspection and regular inspection are performed.
Note 3: The inspection must be performed at the specified period of time interval or after the specified hours of operation, whichever comes first.
Note 4: This guideline does not imply the warranty period.

■ Parts that need to be replaced in overhaul of oil pump

Table 5-5 List of parts that need to be replaced in overhaul

Part No.	Part Name	Q'ty	Remarks
9-1	Drive shaft bearing	2	Replace if there is an abnormality.
9-2	Idle shaft bearing	2	Replace if there is an abnormality.
14	Mechanical seal assembly	1 set	
16	O-ring	2	
18	O-ring	1	
34	Gasket	1	
35	O-ring	1	
36	O-ring	1	

Note 1: For M100P and M125P, parts No. 9-1 and 9-2 are identical.
Note 2: For M80P, part No.18 is not used.

5.4 Disassembly

Danger

- **Before conducting inspection or maintenance, turn off the motor main power and control power. Also, prevent the power switches from being accidentally turned on during inspection or maintenance. When any of the power switches is turned on during inspection or maintenance, the motor or the oil pump starts running. This may cause damage to the equipment, or cause workers to be caught in the rotating shaft. This may also result in an electric shock at current-carrying part.**

Warning

- **When turning on or off the power of each equipment, be careful for the electric shock.**
- **When you overhaul the oil pump or strainer, expose the inside of each equipment to the atmosphere. High pressure oil or gas remaining inside the pump may blow out from the pump when it is disassembled, resulting in shock, suffocation, faint or burn.**
- **When replacing parts, be sure to use MYCOM genuine ones. Use of any parts other than genuine ones may cause the Product or other devices to be damaged or ruptured during operation.**
- **Exercise extra care when handling heavy equipment, and use a crane if necessary. Otherwise, the oil pump itself or any of its parts might fall and strike a worker.**
- **A crane or other similar equipment must be operated by a qualified person. Operation by unqualified person may result in a fall accident.**

Caution

- **To disassemble or assemble the oil pump, use the specified tools that are appropriate for use.**
  Use of a worn, damaged or improper tool may result in injury.

5.4.1 M50P & M60P

■ Disassembly pump unit

1) Remove the coupling and dismount the pump from the base.

2) Remove the set screw from the coupling, and pull out the coupling from the shaft.

3) For the pump with a built-in relief valve, dismount the relief valve (24) from the pump unit.

4) Remove the hexagon socket head cap screw (23) at the seal holder (8) side, and detach the seal holder.

5) Remove the hexagon socket head screw (22) at the seal cover (6) side, and detach the seal cover.

6) The seal cover (6) is mated with the mating part of the drive shaft bearing (9-1).

7) Loosen the set screws (141/M50P and 141/M60P), and remove the mechanical seal (14) so as not to scratch the seal surface. (See Fig.5-1 and Fig.5-2)

8) Remove the hexagon socket head cap screw (22) at the bearing cover (7) side, and dismount the bearing cover.

9) Pull out the rotor from the motor side to the bearing cover side.
Since the rotors (3 and 4) are mated with each other, the bearings (9-1 and 9-2) can be pulled out in the similar manner.
The bearing is mated with the gear casing. If it cannot be pulled out with your hand, lightly tap on the head of the shaft with a plastic hammer.
However, if the temperature of the bearing section is 30 ºC or higher, wait until it drops to 30 ºC or lower.

10) Pull out the bearing at the seal cover side.

Note: The gear and the shaft cannot be disassembled.

■ Disassembly of relief valve

1) Remove the hexagon socket head cap screw (37), and dismount the relief valve unit (24) from the oil pump.

2) Remove the domed cap nut (32), and completely loosen the relief pressure adjusting bolt (27) by turning it in the direction to decrease the relief pressure (counterclockwise).

3) Remove the hexagon nut (31), and pull out the hexagon socket head cap screw (37).

4) Remove the shell flange (25).
At this time, the adjusting bolt (27) and the spring guide (28) both come off.

5) Pull out the adjusting bolt (27) from the shell flange (25).
Since the O-ring (36) is inserted, the adjusting bolt (27) can be easily removed when you pull it while lightly rotating it.
To remove the spring guide (28), rotate it clockwise.

6) Pull out the spring (29) and the piston (26) from the relief valve unit.
Since the piston is installed with an appropriate clearance from the relief valve unit, it can easily come off when you turn the relief valve unit upside down.

5.4.2 M80P

■ Disassembly of pump unit

1) Remove the coupling and dismount the pump from the base.

2) Remove the set screw on the coupling, and pull out the coupling from the shaft.

3) For the pump with a built-in relief valve, dismount the relief valve (24) from the pump unit.

4) Remove the hexagon socket head cap screw (23) at the seal holder (8) side, and detach the seal holder.

5) Remove the hexagon socket head screw (22) at the seal cover (6) side, and detach the seal cover.

6) The seal cover (6) is mated with the mating part of the drive shaft bearing (9-1).

7) Loosen the set screw (141), and remove the mechanical seal (14) so as not to scratch the seal surface. (See Fig.5-3)

8) Remove the hexagon socket head cap screw (22) at the bearing cover (7) side, and dismount the bearing cover.

9) Pull out the rotor from the motor side to the bearing cover side.
Since the rotors (3 and 4) are mated with each other, the bearings (9-1 and 9-2) can be pulled out in the similar manner. The bearing is mated with the gear casing. If it cannot be pulled out with hands, lightly tap on the head of the shaft with a plastic hammer.
However, if the temperature of the bearing section is 30 ºC or higher, wait until it drops to 30 ºC or lower.

10) Pull out the bearing at the seal cover side.

Note: The gear and the shaft cannot be disassembled.

■ Disassembly of relief valve

1) Remove the hexagon socket head cap screw (37-1), and dismount the relief valve unit (24) from the oil pump.

2) Remove the domed cap nut (32), and completely loosen the relief pressure adjusting bolt (27) by turning it in the direction to decrease the relief pressure (counterclockwise).

3) Remove the hexagon nut (31), and pull out the hexagon socket head cap screw (37-2).

4) Remove the shell flange (25).
   At this time, the adjusting bolt (27) and the spring guide (28) both come off.

5) Pull out the adjusting bolt (27) from the shell flange (25).
   Since the O-ring (36) is inserted, the adjusting bolt (27) can be easily removed when you pull it while lightly rotating it.
   To remove the spring guide (28), rotate it clockwise.

6) Pull out the spring (29) and the piston (26) from the relief valve unit.
   Since the piston is installed with an appropriate clearance from the relief valve unit, it can easily come off when you turn the relief valve unit upside down.

5.4.3 M100P

■ Disassembly of pump unit

1) Remove the coupling and dismount the pump from the base.

2) Remove the set screw securing the coupling to the shaft, and pull out the coupling from the shaft.

3) For the pump with a built-in relief valve, dismount the relief valve (24) from the pump unit.

4) Remove the hexagon socket head cap screw (23-1) at the seal cover side, and detach the seal holder (8).

5) The seal cover (6) is “mated with” the mating part of the spacer (10). Remove the seal cover (6) by slightly pulling it out.

6) Loosen the set screw (141), and remove the mechanical seal (14) so as not to scratch the seal surface. (See Fig.5-4)

7) Pull out the hexagon socket head cap screw (22-2) at the bearing cover (7) side, and dismount the bearing cover.

8) Pull out the rotor from the shaft side to the bearing cover side. Since the rotors (3 and 4) are mated with each other, the bearings (9) can be pulled out in the similar manner.
   The bearing is mated with the gear casing. If it cannot be pulled out with hands, lightly tap on the head of the shaft with a plastic hammer.
   However, if the temperature of the bearing section is 30 ºC or higher, wait until it drops to 30 ºC or lower.

9) Pull out the bearing at the seal cover side.

Note: The gear and the shaft cannot be disassembled.

■ Disassembly of relief valve

1) Remove the hexagon socket head cap screw (37-1), and dismount the relief valve unit (24) from the oil pump.

2) Remove the domed cap nut (32), and completely loosen the relief pressure adjusting bolt (27) by turning it in the direction to decrease the relief pressure (counterclockwise).

3) Remove the hexagon nut (31), and pull out the hexagon socket head cap screw (37-2).

4) Remove the shell flange (25).
At this time, the adjusting bolt (27) and the spring guide (28) both come off.

5) Pull out the adjusting bolt (27) from the shell flange (25).
Since the O-ring (36) is inserted, the adjusting bolt (27) can be easily removed when you pull it while lightly rotating it.
To remove the spring guide (28), rotate it clockwise.

6) ull out the spring (29) and the piston (26) from the relief valve unit.
Since the piston is installed with an appropriate clearance from the relief valve unit, it can easily come off when you turn the relief valve unit upside down.

5.4.4 M125P

■ Disassembly of pump unit

1) Remove the coupling and dismount the pump from the base.

2) Remove the set screw securing the coupling to the shaft, and pull out the coupling from the shaft.

3) For the pump with a built-in relief valve, dismount the relief valve (24) from the pump unit.

4) Remove the hexagon socket head cap screw (23-1) at the seal cover side, and detach the seal holder (8).

5) The seal cover (6) is “mated with” the mating part of the spacer (10). Remove the seal cover (6) by slightly pulling it out.

6) Loosen the set screw (141), and remove the mechanical seal (14) ~~smoothly~~ so as not to scratch the seal surface. (See Fig.5-5)

7) Pull out the hexagon socket head cap screw (22-2) at the bearing cover (7) side, and dismount the bearing cover.

8) Pull out the rotor from the shaft side to the bearing cover side. Since the rotors (3 and 4) are mated with each other, the bearings ~~(9-1 and 9-2)~~ (9) can be pulled out in the similar manner.
The bearing is mated with the gear casing. If it cannot be pulled out with hands, lightly tap on the head of the shaft with a plastic hammer.
However, if the temperature of the bearing section is 30 ºC or higher, wait until it drops to 30 ºC or lower.

9) Pull out the bearing at the seal cover side.

Note: The gear and the shaft cannot be disassembled.

■ Disassembly of relief valve

Dismount the relief valve unit (24) from the oil pump.

1) Remove the domed cap nut (32).
2) Completely loosen the relief pressure adjusting bolt (27) by rotating it counterclockwise.
3) Remove the hexagon nut (31).
4) Remove the hexagon socket head cap screws (37-1 and 37-2).
5) Pull out the shell flange (25).
   At this time, the adjusting bolt (27) and the spring guide (28) both come off.
6) From the shell flange (25), remove the O-ring (36) and the adjusting bolt (27) to which the thrust bearing (30) is incorporated.
7) To dismount the spring guide (28), rotate it clockwise.
8) Pull out the spring (29) and the piston (26) from the relief valve unit (24).

5.5 Reassembly

As for whether to replace the disassembled parts or not, each must be determined according to the value measured during disassembly and the guidelines for replacing parts.
To place an order for spare parts or accessories, please include the model number and serial number of your oil pump in addition to the order information, e.g., part name, part number, and order quantity.
For part names and numbers, refer to Chapter 6, Section 6.1, “Illustrated parts breakdown” and Section 6.2, “Parts list”.

Danger

- **Do not use oxygen or flammable gas for the gas leakage test. Failure to observe this may result in an explosion.**

Warning

- **When replacing parts, be sure to use MYCOM genuine ones. Use of any parts other than genuine ones may cause the oil pump or other devices to be damaged or ruptured during operation. Also, there is a high risk of electric shock due to electric leakage.**

Caution

- **To disassemble or assemble the oil pump, use the specified tools that are appropriate for use. Before using any tools, be sure to fully understand how to use them and their properties. Use of a worn, damaged or improper tool may result in injury.**
- **Prepare appropriate personal protective equipment, such as safety shoes, protective glasses and gas mask, and wear them as required.**
- **Parts can be slippery due to oil; exercise care not to drop them. If any of the parts falls and strikes a worker on the body, personal injury may result.**
- **Provide an adequate space to perform a work. Placing tools on the floor or loose wiring may lead to a hazardous situation, causing a worker to trip on them.**
- **Always keep the floor clean. Leaving oil or other liquid as it is on the floor will allow the floor surface to become slippery and may result in a hazardous situation, causing a worker to be injured by tripping. Do not leave oil or any liquid on the floor. Wipe it immediately.**
- **Keep the tools clean at all times during work. Leaving oil on a tool will allow it to become slippery and may result in personal injury. Foreign substances entering the oil pump during operation may cause damage to the oil pump.**
- **The number in the parentheses indicates a part number in the parts list.**

Caution

- **Before replacing a part, check if it is the correct one.**
- **Clean the part thoroughly with kerosene. Wipe off deteriorated oil or rust adhered to the part with sandpaper.**
- **Immediately before assembling, prepare new lubrication oil in an oil feeder, and feed or apply it to the sliding surfaces.**
- **When you finish washing a part, dry it with compressed air, or wipe it with a cotton cloth or a non-woven cloth for servicing. Do not use synthesis fiber or wool because they are fluffy and do not absorb oil.**
- **In order to ensure airtightness, apply oil to both sides of the gasket to be used on the tightening surface. Remove any piece of gasket stuck on the tightening surface by using a grinding stone.**
- **Dirt and oil adhere to the tools once they have been used for disassembling. Before use, clean the tools by washing or wiping.**
- **To properly tighten the bolts, at first slightly tighten all bolts, and then tighten them with a specified torque in a crisscross pattern.**
  When tightening various types of locking bolts used in the MP series, observe the torques described in Chapter 6, Section 6.3 “Table 6-6 List of bolt & nut tightening torques” in this Manual.

5.5.1 M50P & M60P

■ Assembly of pump unit

1) Wash each part.
   Before cleaning the cover, be sure to remove the O-ring.
   Wipe the O-ring with a dry, clean cloth, while exercising care not to scratch it.

2) Place the rotors (3 and 4) in the gear casing.
   Insert them in the casing from the bearing cover (7) side, which is the opposite of disassembly.
   Since the pump is designed to provide a clearance between the rotor and the casing, the rotors can be easily installed.

3) Insert the bearings (9-1 and 9-2).
   Apply an adequate amount of oil to the journal section and the bearing surfaces.
   The bearings have designated direction for installation. Install them so that the clearance groove on each bearing surface faces the discharge side.
   Confusing the suction side with the discharge side will result in excessive noise or vibrations of the pump, and end up with galling or burning of the bearing.

4) Install the bearing cover (7).
   Be sure to mount the O-ring (16).
   Apply an adequate amount of oil to the O-ring.
   Pull out the bearing out, place the spigot jointing part of the cover on the bearing, push it into the gear casing, and install it while lifting it lightly.
   If the bearing is installed without pulling out, it may cause no end clearance.

5) Check the End Clearance.
   If oil is applied to each part, manage it with the following dimensions.
   If the end clearance is not within the standard value, check if there is any foreign matter caught in the end clearance.

Models	End clearance standard value (mm)
50P	0.063～0.208
60P	0.120～0.270

NOTE: Dimensions with oil applied to parts

■ Installation of mechanical seal (M50P)

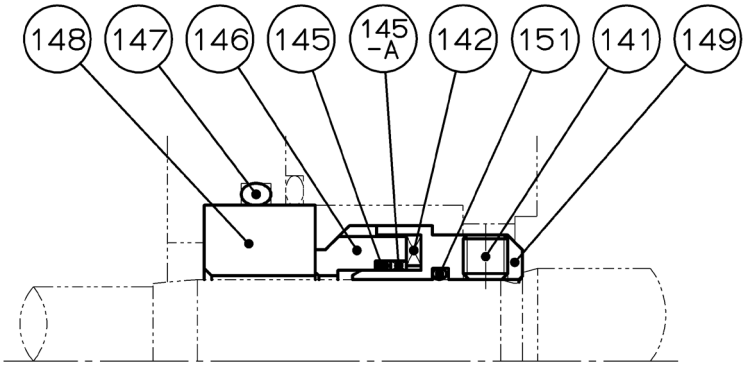


Fig. 5-1 Cross-sectional view of mechanical seal assembly (M50P)

Table 5-6 List of mechanical seals (M50P)

No.	Part Name	Remarks	No.	Part Name	Remarks
141	Set screw		147	O-ring	JISB2401 P42
142	Wave washer		148	Insert	
145	O-ring	AS568-022	149	Collar	
145-A	Adapter		151	O-ring	AS568-020
146	Seal ring				

1) Remove the seal ring (146), and check that the following items are included: O-ring (145), adapter (145-A) and wave washer (142).
   Note: Place the removed parts on a dry, clean cloth.

2) Apply oil to the O-ring (151) and making sure that the set screw (141) is fully loosened, insert the collar (149) until it reaches the stepped section of the shaft, and firmly tighten the set screw (141).

3) Install the wave washer (142) and the adapter (145-A) to the collar (149) in that order.

4) Apply oil to the O-ring (145), install it to the seal ring (146), and then install the seal ring to the collar.
   Note: The O-ring must be installed to the seal ring first. If the seal ring is installed to the collar before the O-ring is installed to it, it may scratch the O-ring when installing it to the seal ring.

5) Apply oil to the O-ring (16) and install it to the seal cover (6). Tighten with a hexagon socket head cap screw (22).

6) Apply oil to the O-ring (18) and install it to the seal cover (6).

7) Apply oil to the O-ring (147) and attach it to the groove of the O-ring of the seal holder (8).

8) Install the insert (148) to the seal holder.

9) Apply oil to the sliding surfaces of the seal ring and the insert, and install the seal holder to the seal cover and tighten with a hexagon socket head cap screw (23). This completes the assembly in a specified dimension.

   Note: Be sure to install the O-ring (18) to the seal cover.

■ Installation of mechanical seal (M60P)

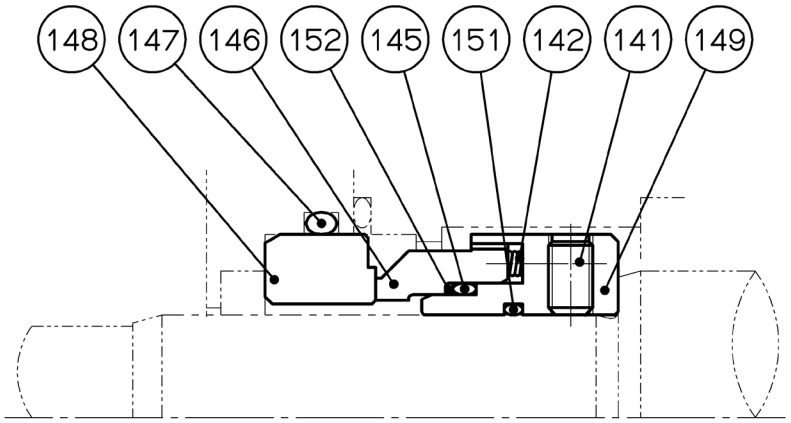


Fig. 5-2 Cross-sectional view of mechanical seal assembly (M60P)

Table 5-7 List of mechanical seals (M60P)

No.	Part Name	Remarks	No.	Part Name	Remarks
141	Set screw		148	Insert	
142	Spring	6 pieces	149	Collar	
145	O-ring	AS568-027	151	O-ring	AS568-024
146	Seal ring		152	Backup ring	
147	O-ring	JISW1516 G4			

1) Remove the seal ring (146), and check that the following parts are included: O-ring (145), Backup ring (152) and spring (142).
   Note: Place the removed parts on a dry, clean cloth.

2) Install the spring (142).

3) Apply oil to the O-ring (145). After installing it on the collar (149) attach the Backup ring (152), and install the seal ring.
   Note: Install the O-ring to the collar first.

4) Apply oil to the O-ring (151) and making sure that the set screw (141) is fully loosened, insert the collar (149) until it reaches the stepped section of the shaft, and firmly tighten the set screw.

5) Apply oil to the O-ring (16) and install it to the seal cover (6). Tighten with a hexagon socket head cap screw (22).

6) Apply oil to the O-ring (18) and install it to the seal cover (6).

7) Apply oil to the O-ring (147) and attach it to the groove of the O-ring of the seal holder (8).

8) Install the insert (148) to the seal holder.

9) Apply oil to the sliding surfaces of the seal ring and the insert, and install the seal holder to the seal cover and tighten with a hexagon socket head cap screw (23). This completes the assembly in a specified dimension.

   Note: Be sure to install the O-ring (18) to the seal cover.

■ Assembly of relief valve

Assembly is almost the reverse of disassembly.
Clean each part before assembly. Wipe off dirt from the O-ring with a dry, clean cloth. Replace the O-rings if they are losing elasticity or cracked.

1) Install the piston (26) and the spring (29).
   Apply oil to the periphery of the piston and insert it with care not to scratch it.

2) Install the adjusting bolt (27) to the shell flange (25).
   At this time, exercise care not to scratch the O-ring of the adjusting bolt.
   Install the hexagon nut (31) to the adjusting bolt.

3) Attach the spring guide (28) to the adjusting bolt.
   If the spring guide is not fully inserted, the pressure of the spring will be applied to the shell flange, making it difficult to install the shell flange.
   Screw in the spring guide as far as it goes.

4) Install the shell flange, in which the adjusting bolt is incorporated, to the relief valve unit (24).
   At this time, the locking pin (33) must be aligned with the groove of the relief valve unit.
   Note that the shell flange and the relief valve unit are mated with the mating part.
   Be sure to install the O-ring (35) on the shell flange.

5) Finally, tighten the domed cap nut (32). This complete the assembly of the relief valve unit.
   When installing the relief valve unit to the pump unit, exercise care not to confuse the direction.
   (The domed cap nut of the relief valve must be placed at the suction side.)
   For detailed information about the hydraulic adjustment of the relief valve, refer to Chapter 4, Section 4.2.1, “Adjustment of relief valve” in this Manual.

5.5.2 M80P

■ Assembly of pump unit

1) Wash each part.
   Before cleaning the cover, be sure to remove the O-ring.
   Wipe the O-ring with a dry, clean cloth, while exercising care not to scratch it.

2) Place the rotors (3 and 4) in the gear casing.
   Insert them in the casing from the bearing cover (7) side, which is the opposite of disassembly.
   Since the pump is designed to provide a clearance between the rotor and the casing, the rotors can be easily installed.

3) Insert the bearings (9-1 and 9-2).
   Apply an adequate amount of oil to the journal section and the bearing surfaces.
   The bearings have designated direction for installation. Install them so that the clearance groove on each bearing surface faces the discharge side.
   Confusing the suction side with the discharge side will result in excessive noise or vibrations of the pump, and end up with galling or burning of the bearing.

4) Install the bearing cover (7).
   Be sure to mount the O-ring (16).
   Apply an adequate amount of oil to the O-ring.

5) Check the End Clearance.
   If oil is applied to each part, manage it with the following dimensions.
   If the end clearance is not within the standard value, check if there is any foreign matter caught in the end clearance.

Models	End clearance standard value (mm)
80P	0.120～0.270

NOTE: Dimensions with oil applied to parts

■ Installation of mechanical seal

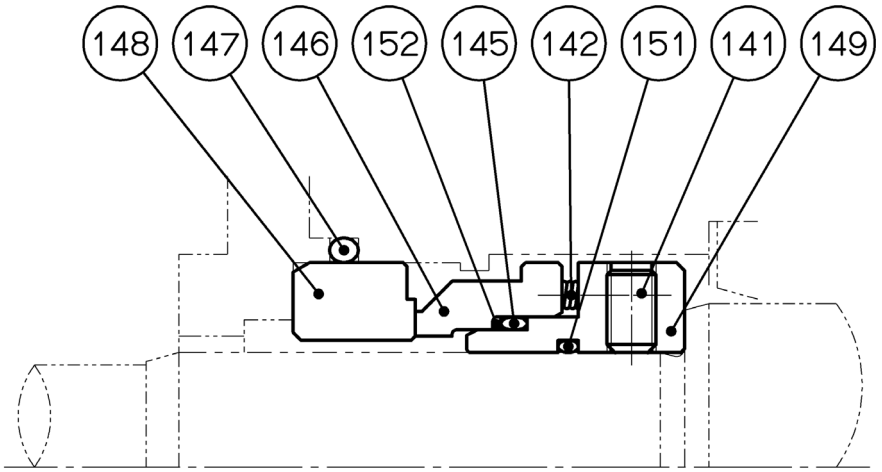


Fig. 5-3 Cross-sectional view of mechanical seal assembly (M80P)

Table 5-8 List of mechanical seals (M80P)

No.	Part Name	Remarks	No.	Part Name	Remarks
141	Set screw		148	Insert	
142	Spring	6 pieces	149	Collar	
145	O-ring	AS568-027	151	O-ring	AS568-024
146	Seal ring		152	Backup ring	
147	O-ring	JISW1516 G4			

1) Remove the seal ring (146), and check that the following parts are included: O-ring (145), Backup ring (152) and spring (142).
   Note: Place the removed parts on a dry, clean cloth.

2) Install the spring (142).

3) Apply oil to the O-ring (145). After installing it on the collar (149) attach the Backup ring (152), and install the seal ring (146).
   Note: Install the O-ring to the collar first.

4) Apply oil to the O-ring (151) and making sure that the set screw (141) is fully loosened, insert the collar (149) until it reaches the stepped section of the shaft, and firmly tighten the set screw.

5) Install the seal cover (6).

6) Install the O-ring (147) to the seal cover (6).

7) Set the insert (148) to the seal holder (8), and then install the seal holder (8) to the seal cover (6). This completes the assembly in a specified dimension. Exercise care not to scratch the O-ring.

■ Assembly of relief valve

Assembly is almost the reverse of disassembly.
Clean each part before assembly. Wipe off dirt from the O-ring with a dry, clean cloth.
Replace the O-rings if they are losing elasticity or cracked.

1) Install the piston (26) and the spring (29).
   Apply oil to the periphery of the piston and insert it with care not to scratch it.

2) Install the thrust bearing (30) to the adjusting bolt (27).

3) Install the adjusting bolt (27) to the shell flange (25).
   At this time, exercise care not to scratch the O-ring of the adjusting bolt (27).
   Install the hexagon nut (31) to the adjusting bolt (27).

4) Attach the spring guide (28) to the adjusting bolt (27).
   If the spring guide (28) is not fully inserted, the pressure of the spring will be applied to the shell flange, making it difficult to install the shell flange.
   Screw in the spring guide as far as it goes.

5) Install the shell flange, in which the adjusting bolt (27) is incorporated, to the relief valve unit (24).
   At this time, the locking pin (33) must be aligned with the groove of the relief valve unit.
   Note that the shell flange and the relief valve unit are mated with the mating part.
   Be sure to install the O-ring (35) on the shell flange.

6) Finally, tighten the domed cap nut (32). This complete the assembly of the relief valve unit.
   When installing the relief valve unit to the pump unit, exercise care not to confuse the direction.
   (The domed cap nut of the relief valve must be placed at the discharge side.)
   For detailed information about the hydraulic adjustment of the relief valve, refer to Chapter 4, Section 4.2.1, “Adjustment of relief valve” in this Manual.

5.5.3 M100P

■ Assembly of pump unit

1) Wash each part.
   Before cleaning the cover, be sure to remove the O-ring.
   Wipe the O-ring with a dry, clean cloth, while exercising care not to scratch it.

2) Place the rotors (3 and 4) in the gear casing.
   Insert them in the casing from the bearing cover (7) side, which is the opposite of disassembly.
   Since the pump is designed to provide a clearance between the rotor and the casing, the rotors can be easily installed.

3) Insert the bearings (9-1 and 9-2).
   Apply an adequate amount of oil to the journal section and the bearing surfaces.
   The bearings have designated direction for installation. Install them so that the clearance groove on each bearing surface faces the discharge side.
   Confusing the suction side with the discharge side will result in excessive noise or vibrations of the pump, and end up with galling or burning of the bearing.

4) Insert the spacer (10) into the bearing cover (7), and install the bearing cover (7) on the gear casing.
   Be sure to mount the O-ring (16).
   Apply an adequate amount of oil to the O-ring.

5) Check the End Clearance.
   If oil is applied to each part, manage it with the following dimensions.
   If the end clearance is not within the standard value, check if there is any foreign matter caught in the end clearance.

Models	End clearance standard value (mm)
100P	0.170～0.250

NOTE: Dimensions with oil applied to parts

■ Installation of mechanical seal

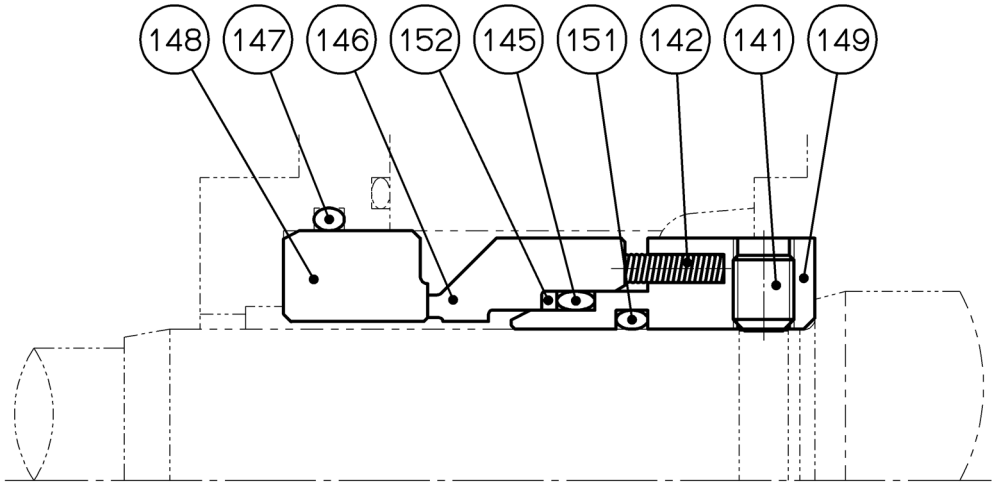


Fig. 5-4 Cross-sectional view of mechanical seal assembly (M100P)

Table 5-9 List of mechanical seals (M100P)

No.	Part Name	Remarks	No.	Part Name	Remarks
141	Set screw		148	Insert	
142	Spring	8 pieces	149	Collar	
145	O-ring	JISB2401 G45	151	O-ring	JISB2401 G40
146	Seal ring		152	Backup ring	
147	O-ring	JISW1516 G9			

1) Remove the seal ring (146), and check that the following parts are included: O-ring (145), Backup ring (152) and spring (142).
   Note: Place the removed parts on a dry, clean cloth.

2) Install the spring (142).

3) Apply oil to the O-ring (145). After installing it on the collar (149) attach the Backup ring (152), and install the seal ring (146).
   Note: Install the O-ring to the collar first.

4) Apply oil to the O-ring (151) and making sure that the set screw (141) is fully loosened, insert the collar (149) until it reaches the stepped section of the shaft, and firmly tighten the set screw (141).

5) Install the seal cover (6).

6) Apply oil to the O-ring (147) and install it to the seal holder (8).

7) Install the insert (148) of the mechanical seal to the seal holder (8).

8) Install the seal holder (8) to the seal cover (6). This completes the assembly in a specified dimension.

■ Assembly of relief valve

Assembly is almost the reverse of disassembly.
Clean each part before assembly. Wipe off dirt from the O-ring with a dry, clean cloth.
Replace the O-rings if they are losing elasticity or cracked.

1) Install the piston (26) and the spring (29).
   Apply oil to the periphery of the piston and insert it with care not to scratch it.

2) Install the thrust bearing (30) to the adjusting bolt (27).

3) Install the adjusting bolt (27) to the shell flange (25).
   At this time, exercise care not to scratch the O-ring of the adjusting bolt (27).
   Install the hexagon nut (31) to the adjusting bolt (27).

4) Attach the spring guide (28) to the adjusting bolt (27).
   If the spring guide (28) is not fully inserted, the pressure of the spring will be applied to the shell flange, making it difficult to install the shell flange.
   Screw in the spring guide as far as it goes.

5) Install the shell flange, in which the adjusting bolt (27) is incorporated, to the relief valve unit (24).
   At this time, the locking pin (33) must be aligned with the groove of the relief valve unit.
   Note that the shell flange and the relief valve unit are mated with the mating part.
   Be sure to install the O-ring (35) on the shell flange.

6) Finally, tighten the domed cap nut (32). This complete the assembly of the relief valve unit.
   When installing the relief valve unit to the pump unit, exercise care not to confuse the direction.
   (The domed cap nut of the relief valve must be placed at the discharge side.)
   For detailed information about the hydraulic adjustment of the relief valve, refer to Chapter 4, Section 4.2.1, “Adjustment of relief valve” in this Manual.

5.5.4 M125P

■ Assembly of pump unit

1) Wash each part.
   Before cleaning the cover, be sure to remove the O-ring.
   Wipe the O-ring with a dry, clean cloth, while exercising care not to scratch it.

2) Place the rotors (3 and 4) in the gear casing.
   Insert them in the casing from the bearing cover (7) side, which is the opposite of disassembly.
   Since the pump is designed to provide a clearance between the rotor and the casing, the rotors can be easily installed.

3) Insert the bearings (9-1 and 9-2).
   Apply an adequate amount of oil to the journal section and the bearing surfaces.
   The bearings have designated direction for installation. Install them so that the clearance groove on each bearing surface faces the discharge side.
   Confusing the suction side with the discharge side will result in excessive noise or vibrations of the pump, and end up with galling or burning of the bearing.

4) Insert the spacer (10) into the bearing cover (7), and install the bearing cover (7) on the gear casing.
   Be sure to mount the O-ring (16).
   Apply an adequate amount of oil to the O-ring.

5) Check the End Clearance.
   If oil is applied to each part, manage it with the following dimensions.
   If the end clearance is not within the standard value, check if there is any foreign matter caught in the end clearance.

Models	End clearance standard value (mm)
125P	0.170～0.250

NOTE: Dimensions with oil applied to parts

■ Installation of mechanical seal

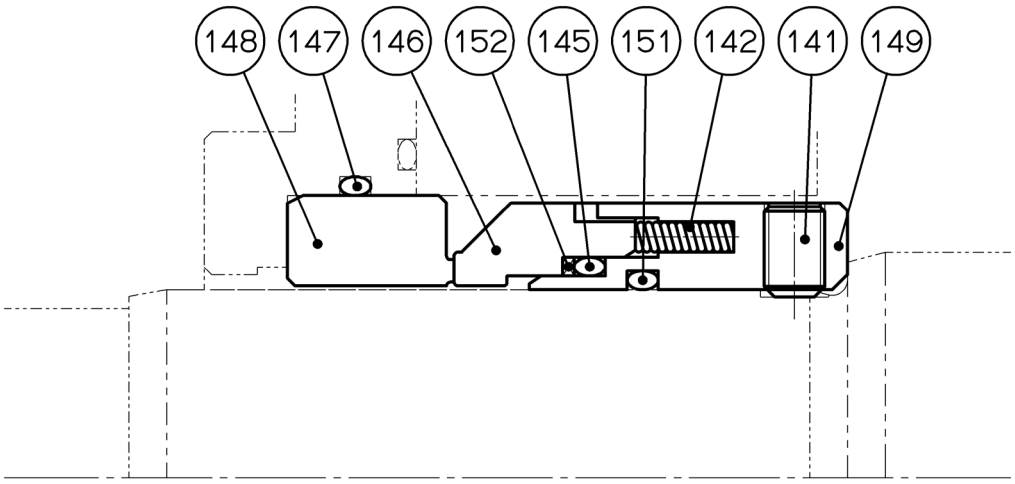


Fig. 5-5 Cross-sectional view of mechanical seal assembly (M125P)

Table 5-10 List of mechanical seals (M125P)

No.	Part Name	Remarks	No.	Part Name	Remarks
141	Set screw		148	Insert	
142	Spring	8 pieces	149	Collar	
145	O-ring	AS568-138	151	O-ring	AS568-136
146	Seal ring		152	Backup ring	
147	O-ring	JISB2401 G75			

1) Remove the seal ring (146), and check that the following parts are included: O-ring (145), Backup ring (152) and spring (142).
   Note: Place the removed parts on a dry, clean cloth.

2) Install the spring (142).

3) Apply oil to the O-ring (145). After installing it on the collar (149) attach the Backup ring (152), and install the seal ring (146).
   Note: Install the O-ring to the collar first.

4) Apply oil to the O-ring (151) and making sure that the set screw (141) is fully loosened, insert the collar (149) until it reaches the stepped section of the shaft, and firmly tighten the set screw (141).

5) Install the seal cover (6).

6) Apply oil to the O-ring (147) and install it to the seal holder (8).

7) Install the insert (148) of the mechanical seal to the seal holder (8).

8) Install the seal holder (8) to the seal cover (6). This completes the assembly in a specified dimension.

■ Assembly of relief valve

Assembly is almost the reverse of disassembly.
Clean each part before assembly. Wipe off dirt from the O-ring with a dry, clean cloth.
Replace the O-rings if they are losing elasticity or cracked.

1) Apply oil to the piston (26).

2) Install the piston (26) and the spring (29) to the relief valve unit (24).

3) Fit in O-ring (36) to the adjusting bolt (27).

4) Insert the thrust bearing (30) to the adjusting bolt (27).

5) Install the adjusting bolt (27) to the shell flange (25).

6) Attach the spring guide (28) to the adjusting bolt (27).

7) Apply oil to the O-ring (35).

8) Install the O-ring (35) to the shell flange (25).

9) Install the shell flange (25) to the relief valve unit (24).
   Note: At this time, the locking pin (33) must be aligned with the groove of the relief valve unit (24).

10) Tighten the hexagon nut (31) and the domed cap nut (32).
   Note: When installing the relief valve, exercise care not to confuse the direction.
   (The domed cap nut of the relief valve must be placed at the discharge side.)
   For detailed information about the hydraulic adjustment of the relief valve, refer to Chapter 4, Section 4.2.1, “Adjustment of relief valve” in this Manual.

Chapter 6 Relevant Materials

6.1 Illustrated parts breakdown

6.1.1 M50P & M60P

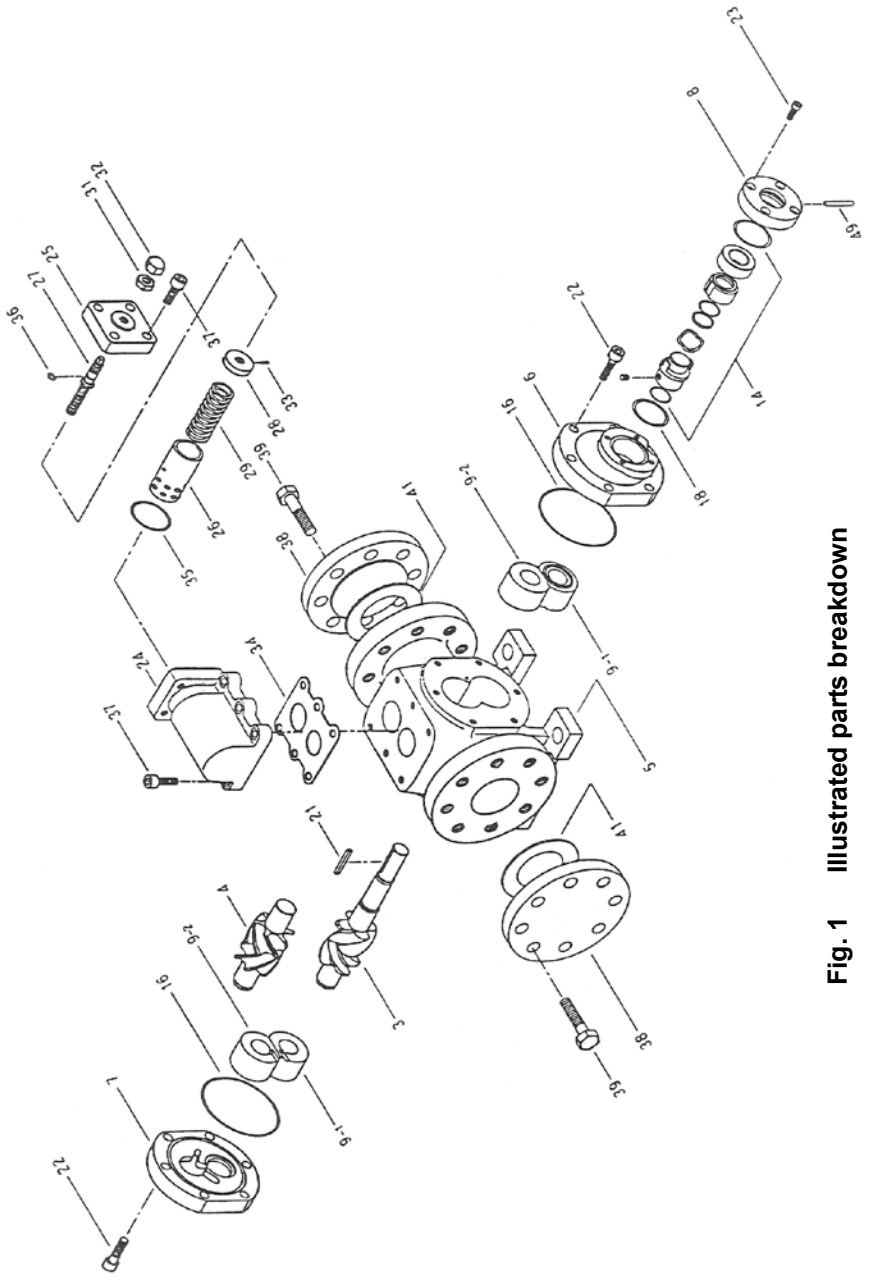


Fig. 1 Illustrated parts breakdown

Fig. 6-1 Ilustrated parts breakdown for M50P & M60P

6.1.2 M80P

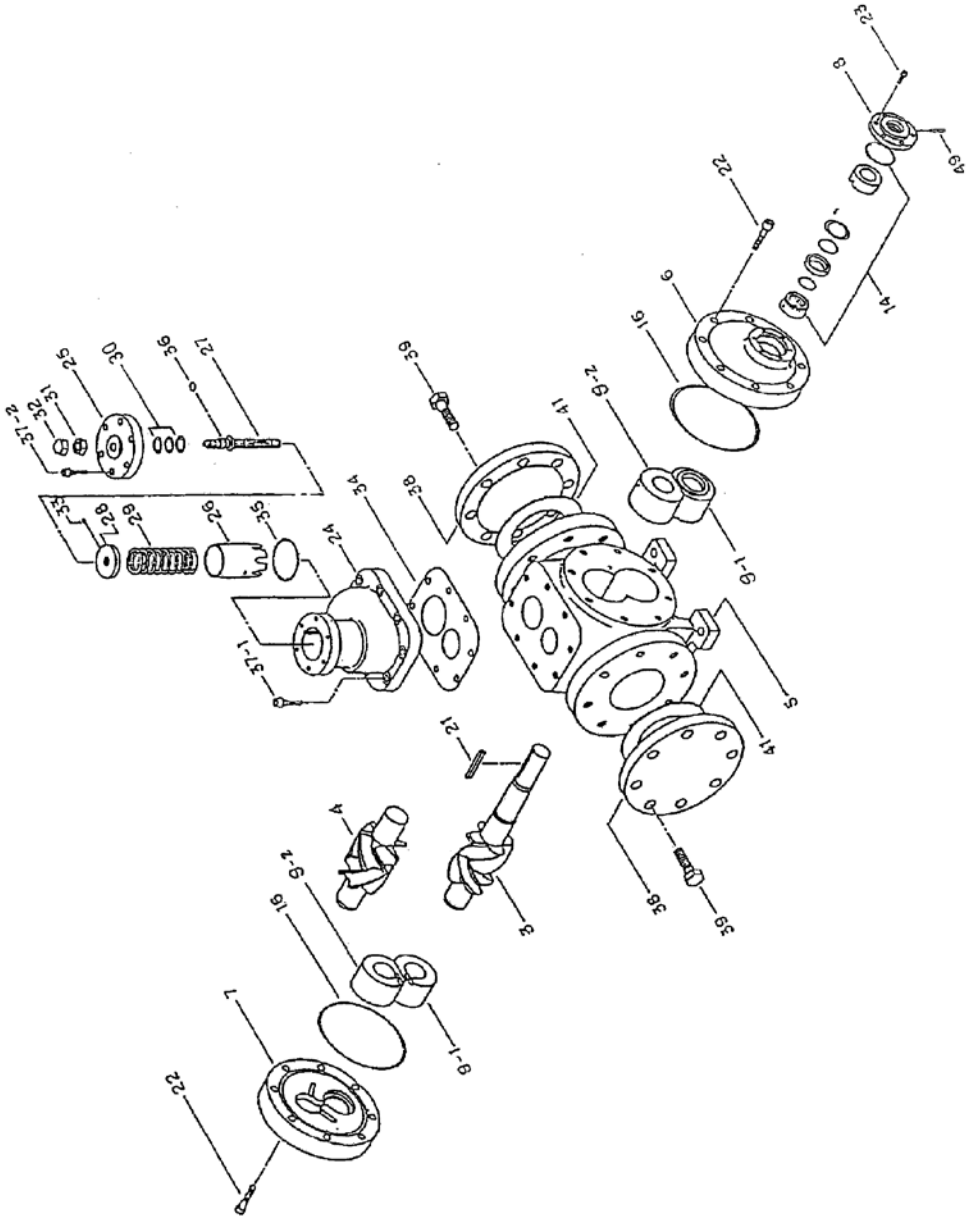


Fig. 6-2 Illustrated parts breakdown for M80P

6.1.3 M100P

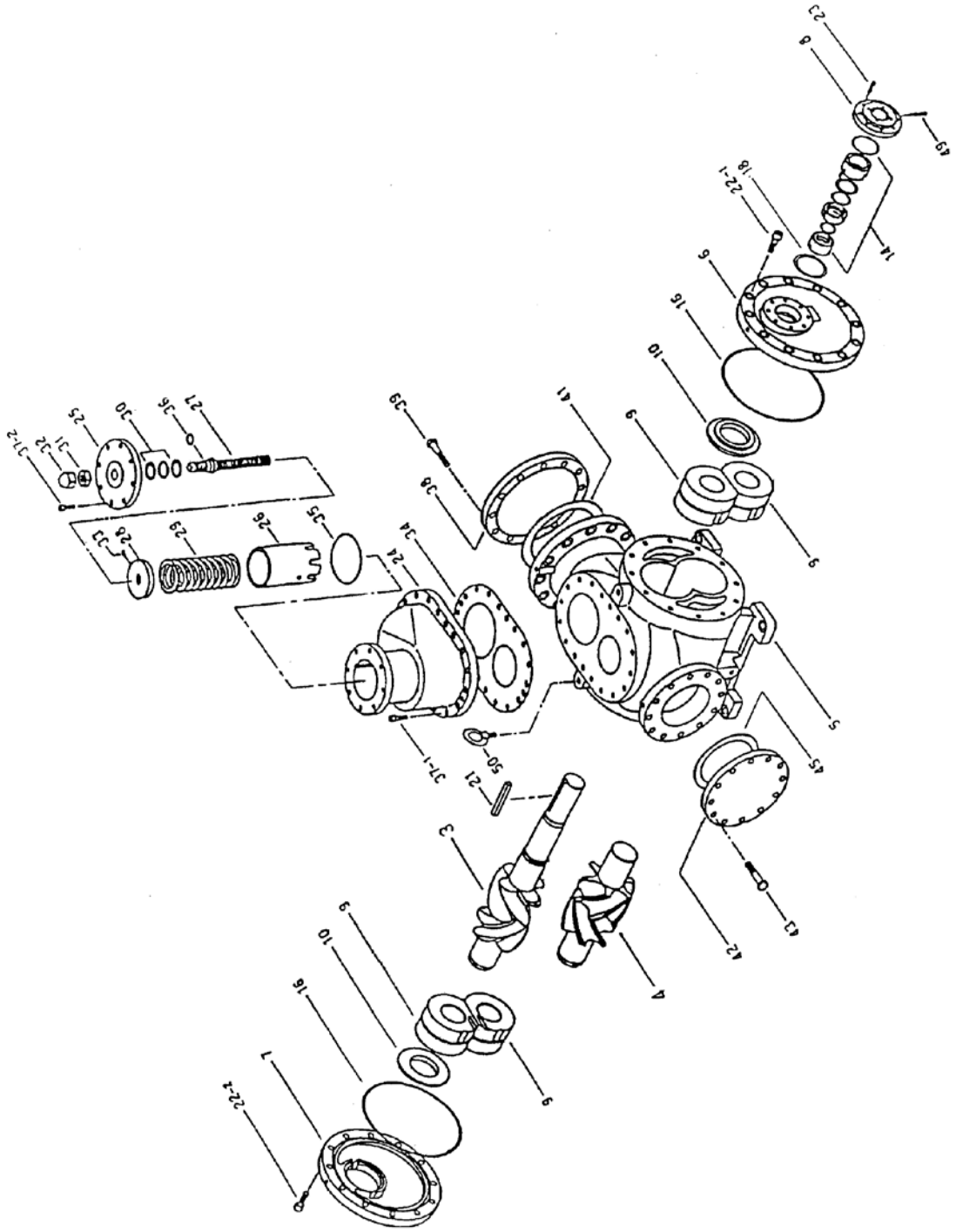


Fig. 6-3 Illustrated parts breakdown for M100P

6.1.4 M125P

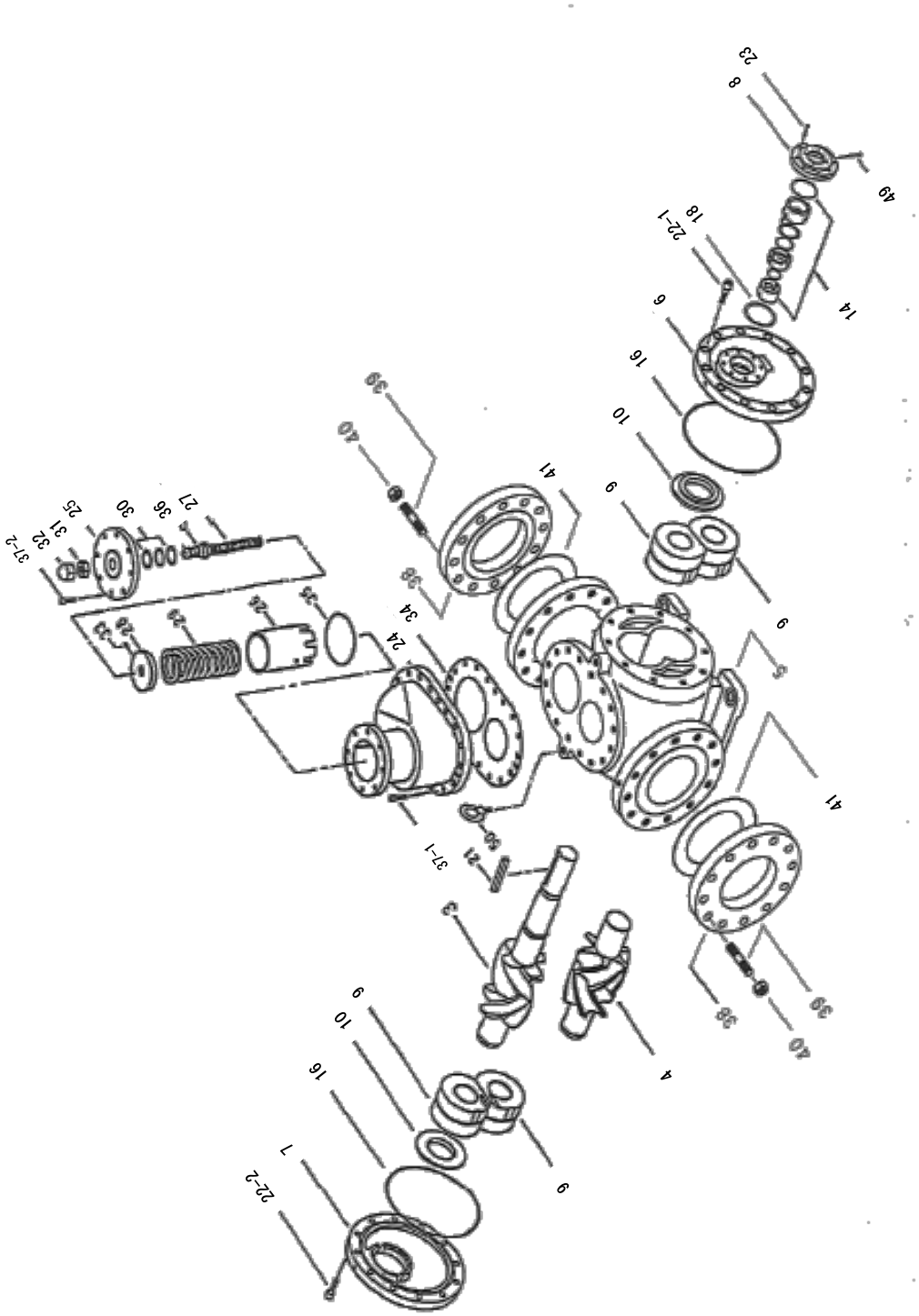


Fig. 6-4 Illustrated parts breakdown for M125P

6.2 Parts list

6.2.1 M50P

Table 6-1 Parts list for M50P

No.	Part Name	Part No.	Q'ty	Remarks
3	Drive rotor	-	1	
4	Idle rotor	-	1	
-	Gear assembly	DM00300-MM050M	1 set	CW
5	Gear casing	DM00500-050	1	
6	Seal cover	DM00600-050	1	
7	Bearing cover	DM00700-050	1	
8	Seal retainer	DM00800-050	1	
9-1	Drive bearing	-	1 set	AJ1, 2 pcs.
9-2	Idle bearing	-	1 set	AJ1, 2 pcs.
-	Bearing Set	DM0099-A05	1 set	Standard
-	Bearing Set	DM0099-C05	1 set	Option (Low temperature)
-	Bearing Set	DM0099-W05	1 set	Option (High temperature)
14	Mechanical seal assembly	DM01400-050T	1 set	Standard (HNBR)
14	Mechanical seal assembly	DM01400-050RT	1 set	M50P R
16	O-ring	PA12-095	2	JISB2401 G95
18	O-ring	PA12-045	1	JISB2401 G45
21	Key	DM02100-4	1	5 × 5 × 40, Rounded at one end
22	Hexagon socket head cap screw	NB35410-035	12	M10 × 35
23	Hexagon socket head cap screw	NB35406-020	8	M6 × 20
24	Relief valve body	DM02400-050	1	
25	Body flange	DM02500-050	1	
26	Piston	DM02600-050	1	
27	Adjusting bolt	DM02701-050	1	
28	Spring guide		1	
29	Spring	DM02900-050	1	
31	Hexagon nut	NC320-12	1	M12, 3 types
32	Domed cap nut	NC921-12	1	M12, 3 shapes
33	Locking pin	NE3203-008	1	ϕ 3 × 8
34	Gasket	DM03410-050	1	
35	O-ring	PA12-045	1	JISB2401 G45
36	O-ring	PA11-009	1	JISB2401 P9
-	Relief valve assembly	DM7029-050	1	M50P N
-	Relief valve assembly	DM7029-050R	1	M50P R
37	Hexagon socket head cap screw	NB35410-030	10	M10 × 30
38	Flange	DM03800-050B	2	JIS20K 50A BL RF
39	Hexagon head bolt	NB12016-055	16	M16 × 55
41	Flange gasket	PL021-050	2	JIS20K 50A RF
47	Rotation arrow plate	-	1	Unavailable as spare

49	Spring pin	NE3206-030	1	ϕ 6 × 30, For drain
-	O-ring set, Oil Pump	DM7109-N05	1 set	Standard (NBR)
-	O-ring set, Oil Pump	DM7109-B05	1 set	Option (FKM)

6.2.2 M60P

Table 6-2 Parts list for M60P

No.	Part Name	Part No.	Q'ty	Remarks
3	Drive rotor	-	1	
4	Idle rotor	-	1	
-	Gear assembly	DM00300-MM060	1 set	CW
-	Gear assembly	DM00300-MMG060	1 set	CCW
5	Gear casing	DM00500-060	1	
6	Seal cover	DM00600-060	1	
7	Bearing cover	DM00700-060	1	
8	Seal retainer	DM00800-060	1	
9-1	Drive bearing	DM0099-A06	1 set	AJ1, 2 pcs.
9-2	Idle bearing	DM0099-A06	1 set	AJ1, 2 pcs.
-	Bearing set	DM0099-A06	1 set	Standard
-	Bearing set	DM0099-W06	1 set	Option (High temperature)
14	Mechanical seal assembly	DM01400-080T	1 set	Standard (HNBR)
14	Mechanical seal assembly	DM01400-080RT	1 set	M60P/80P (FKM)
16	O-ring	PA12-125	2	JISB2401 1A G125
18	O-ring	PA12-055	1	JISB2401 1A G55
21	Key	DM02100-10	1	8 × 7 × 45, Rounded at one end
22	Hexagon socket head cap screw	NB35410-030	16	M10 × 30
23	Hexagon socket head cap screw	NB35406-020	6	M6 × 20
24	Relief valve body	DM02400-050	1	
25	Body flange	DM02500-050	1	
26	Piston	DM02600-050	1	
27	Adjusting bolt	DM02701-050	1	
28	Spring guide		1	
29	Spring	DM02900-050	1	
31	Hexagon nut	NC320-12	1	M12, 3 types
32	Domed cap nut	NC921-12	1	M12, 3 shapes
33	Locking pin	NE3203-008	1	ϕ 3 × 8
34	Gasket	DM03410-050	1	
35	O-ring	PA12-045	1	JISB2401 G45
36	O-ring	PA11-009	1	JISB2401 P9
-	Relief valve assembly	DM7029-050	1	M50P N
-	Relief valve assembly	DM7029-050R	1	M50P R
37	Hexagon socket head cap screw	NB35410-030	10	M10 × 30
38	Flange	DM03800-050B	2	JIS20K 50A BL RF
39	Hexagon head bolt	NB12016-045	16	M16 × 45
41	Flange gasket	PL021-050	2	JIS20K 50A RF
47	Rotational arrow plate	-		
49	Spring pin	NE3206-030	1	ϕ 6 × 30, For drain
-	O-ring	DM7109-N06	1 set	Standard (NBR)

-	O-ring	DM7109-B06	1 set	Option (FKM)

6.2.3 M80P

Table 6-3 Parts list for M80P

No.	Part NameD	Part No.	Q'ty	Remarks
3	Drive rotor	-	1	
4	Idle rotor	-	1	
-	Gear assembly	DM00300-MM080	1 set	CW
-	Gear assembly	DM00300-MMG080	1 set	CCW
5	Gear casing	DM00500-080	1	
6	Seal cover	DM00600-080	1	
7	Bearing cover	DM00700-080	1	
8	Seal retainer	DM00800-080	1	
9-1	Drive bearing	DM0099-A08	1 set	AJ1, 2 pcs.
9-2	Idle bearing	DM0099-A08	1 set	AJ1, 2 pcs.
-	Bearing set	DM0099-A08	1 set	Standard
-	Bearing set	DM0099-W08	1 set	Option (High temperature)
-	Bearing set	DM0099-C08	1 set	Option (Low temperature)
14	Mechanical seal assembly	DM01400-080T	1 set	Standard (HNBR)
14	Mechanical seal assembly	DM01400-080RT	1 set	M60P/80P (FKM)
16	O-ring	PA12-155	2	JISB2401 G155
21	Key	DM02100-5	1	8 × 7 × 50, Rounded at one end
22	Hexagon socket head cap screw	NB35412-050	16	M12 × 50
23	Hexagon socket head cap screw	NB35406-020	6	M6 × 20
24	Relief valve body	DM02400-080	1	
25	Body flange	DM02500-080	1	
26	Piston	DM02600-080	1	
27	Adjusting bolt	DM02701-080	1	
28	Spring guide		1	
29	Spring	DM02900-080	1	
30	Thrust needle bearing assembly	DM03009-080	1 set	M80P Needle
31	Hexagon nut	NC320-16	1	M16, 3 types
32	Domed cap nut	NC921-16	1	M16, 3 shapes
33	Locking pin	NE3204-010	1	ϕ 4 × 10
34	Gasket	DM03410-080	1	
35	O-ring	PA12-070	1	JISB2401 1A G70
36	O-ring	PA11-014	1	JISB2401 1A P14
-	Relief valve assembly	DM7029-080	1	M80P N
-	Relief valve assembly	DM7029-080R	1	M80P R
37-1	Hexagon socket head cap screw	NB35412-040	8	M12 × 40
37-2	Hexagon socket head cap screw	NB35410-035	6	M10 × 35
38	Flange	DM03800-100B	2	JIS20K 100A BL RF
39	Hexagon head bolt	NB12020-060	16	M20 × 60

41	Flange gasket	PL021-100	2	JIS20K 100A RF
49	Spring pin	NE3206-030	1	ϕ 6 × 30, For drain
-	O-ring set	DM7109-N08	1 set	Standard (NBR)
-	O-ring set	DM7109-B08	1 set	Option (FKM)

6.2.4 M100P

Table 6-4 Parts list for M100P

No.	Part Name	Part No.	Q'ty	Remarks
3	Drive rotor	-	1	
4	Idle rotor	-	1	
-	Gear assembly	DM00300-MM100	1 set	CCW
-	Gear assembly	DM00300-MMG100	1 set	CW
5	Gear casing	DM00500-100	1	M100P
6	Seal cover	DM00600-100	1	M100P
7	Bearing cover	DM00700-100	1	M100P
8	Seal retainer	DM00800-100	1	M100P
9	Bearing	DM0099-A10	1 set	AJ1, 4 pcs.
-	Bearing set	DM0099-A10	1 set	Standard
-	Bearing set	DM0099-W10	1 set	Option (High temperature)
-	Bearing set	DM0099-C10	1 set	Option (Low temperature)
10	Spacer	DM01000-100	2	
14	Mechanical seal assembly	DM01400-100T	1 set	Standard (HNBR)
14	Mechanical seal assembly	DM01400-100RT	1 set	Option (FKM)
16	O-ring	PA12-195	2	JISB2401 G195
18	O-ring	PA12-075	1	JISB2401 G75
21	Key	DM02100-6	1	10 × 8 × 70, Rounded at one end
22-1	Hexagon socket head cap screw	NB35412-045	10	M12 × 45
22-2	Hexagon socket head cap screw	NB35412-040	10	M12 × 40
23	Hexagon socket head cap screw	NB35408-025	6	M8 × 25
24	Relief valve body	DM02400-100	1	
25	Body flange	DM02500-100	1	
26	Piston	DM02600-100	1	M100P
27	Adjusting bolt	DM02701-050	1	
28	Spring guide		1	
29	Spring	DM02900-100	1	M100P
30	Thrust needle bearing assembly	DM03009-100	1 set	M100P Needle
31	Hexagon nut	NC320-20	1	M20, 3 types
32	Domed cap nut	NC921-20	1	M20, 3 shapes
33	Locking pin	NE3208-016	1	ϕ 8 × 16
34	Gasket	DM03410-100	1	M100P
35	O-ring	PA12-100	1	JISB2401 1A G100
36	O-ring	PA11-021	1	JISB2401 1A P21
-	Relief valve assembly	DM7029-100	1	M100P N
-	Relief valve assembly	DM7029-100R	1	M100P R
37-1	Hexagon socket head cap screw	NB35412-045	12	M12 × 45
37-2	Hexagon socket head cap screw	NB35412-035	8	M12 × 35
38	Flange	DM03800-125B	1	JIS20K 125A BL RF

39	Hexagon head bolt	NB12022-065	8	M22 × 65
40	Nut	-	8	M22
41	Flange gasket	PL021-125	1	JIS20K 125A RF
42	Flange	DM03800-100B	1	JIS20K 100A BL RF
43	Hexagon head bolt	NB12020-060	8	M20 × 60
44	Nut	-	8	M20
45	Flange gasket	PL021-100	1	JIS20K 100A RF
49	Spring pin	NE3206-030	1	ϕ 6 × 30, For drain
50	Eye bolt	NB600-12	2	M12
-	O-ring	DM7109-N10	1 set	Standard (NBR)
-	O-ring	DM7109-B10	1 set	Option (FKM)

6.2.5 M125P

Table 6-5 Parts list for M125P

No.	Part Name	Part No.	Q'ty	Remarks
3	Drive rotor	-	1	
4	Idle rotor	-	1	
-	Gear assembly	DM00300-MM125	1 set	CCW
-	Gear assembly	DM00300-MMG125	1 set	CW
5	Gear casing	DM00500-125	1	
6	Seal cover	DM00600-125	1	
7	Bearing cover	DM00700-125	1	
8	Seal retainer	DM00800-125	1	
9	Bearing	-	4	
-	Bearing set	DM0099-W125	1 set	Option (High temperature)
10	Spacer	DM01000-125	2	
14	Mechanical seal assembly	DM01400-125T	1 set	O-ring (HNBR)
		DM01400-125R		O-ring (FKM)
16	O-ring	PA12-240	2	JISB2401 G240
18	O-ring	PA12-085	1	JISB2401 G85
21	Key	DM02100-7	1	14 × 9 × 90, Rounded at one end
22-1	Hexagon socket head cap screw	NB35414-055	10	M14 × 55
22-2	Hexagon socket head cap screw	NB35414-050	10	M14 × 50
23	Hexagon socket head cap screw	NB35410-030	6	M10 × 30
24	Relief valve body	DM02400-125	1	
25	Body flange	DM02500-125	1	
26	Piston	DM02600-125	1	
27	Adjusting bolt	DM02700-125	1	
28	Spring guide	DM02800-125	1	
29	Spring	DM02900-125	1	M125P
30	Thrust bearing	DM03009-125	1 set	
31	Hexagon nut	NC320-24	1	M24
32	Domed cap nut	NC921-24	1	M24
33	Locking pin	NE3208-016	1	ϕ 8 × 16
34	Gasket	DM03410-125	1	M125P
35	O-ring	PA12-120	1	JISB2401 G120
36	O-ring	PA11-024	1	JISB2401 P24
37-1	Hexagon socket head cap screw	NB35414-050	16	M14 × 50
37-2	Hexagon socket head cap screw	NB35414-040	8	M14 × 40
38	Counter flange	CZA01-300C06B	2	ANSI #300-6" BL RF
39	Stud bolt	NBU603/4-10UNC	24	3/4-10UNC
40	Nut	NCU1503/4-10UNC	24	3/4-10UNC
41	Flange gasket	PL300-150	2	ANSI #300-6" RF
49	Spring pin	NE3206-030	1	ϕ 6 × 30, For drain
50	Eye bolt	NB600-16	2	M16

-	O-ring	DM7109-N125	1 set	Standard (NBR)
-	O-ring	DM7109-B125	1 set	Option (FKM)

Caution

- **Unless otherwise specified in the remarks, the material of the O-rings is common to that of the code number of HNBR-80. Otherwise, the part number of O-rings varies depending on the material of each O-ring.**
  When you place an order for O-ring(s) of which material is different from the standard material, please contact us.

6.3 Tightening torques of bolts and nuts

Table 6-6 List of bolt & nut tightening torques

Model	Part No.	Tightening position	Tightening torque (N·m)	Q'ty	Remarks
M50P	22	Seal cover	50	12	Hexagon socket head cap screw, M10 × 35
	23	Seal holder	10	4	Hexagon socket head cap screw, M6 × 20
	37	Relief valve flange	50	10	Hexagon socket head cap screw, M10 × 30
	39	Suction/discharge port flange	110	16	Hexagon head bolt M16 × 55
M60P	22	Seal cover	50	16	Hexagon socket head cap screw, M10 × 30
	23	Seal holder	10	6	Hexagon socket head cap screw, M6 × 20
	37	Relief valve flange	50	10	Hexagon socket head cap screw, M10 × 30
	39	Suction/discharge port flange	110	16	Hexagon head bolt, M16 × 45
	65	Casing stand	90	4	Hexagon socket head cap screw, M12 × 30
M80P	22	Seal cover	90	16	Hexagon socket head cap screw, M12 × 50
	23	Seal holder	10	6	Hexagon socket head cap screw, M6 × 20
	37-1	Relief valve flange	90	8	Hexagon socket head cap screw, M12 × 40
	37-2	Relief valve unit	50	6	Hexagon socket head cap screw, M10 × 35
	39	Suction/discharge port flange	140	16	Hexagon head bolt, M20 × 60
M100P	22-1	Seal cover	90	10	Hexagon socket head cap screw, M12 × 45
	22-2	Bearing cover	90	10	Hexagon socket head cap screw, M12 × 40
	23	Seal holder	25	6	Hexagon socket head cap screw, M8 × 25
	37-1	Relief valve flange	90	12	Hexagon socket head cap screw, M12 × 45
	37-2	Relief valve unit	90	8	Hexagon socket head cap screw, M12 × 35
	39	Suction port flange	160	8	Hexagon head bolt, M22 × 70
	43	Discharge port flange	140	8	Hexagon head bolt, M20 × 65
M125P	22-1	Seal cover	140	10	Hexagon socket head cap screw, M14 × 55
	22-2	Bearing cover	140	10	Hexagon socket head cap screw, M14 × 50
	23	Seal holder tightening	50	6	Hexagon socket head cap screw, M10 × 30
	37-1	Relief valve flange	140	16	Hexagon socket head cap screw, M14 × 50
	37-2	Relief valve unit	140	8	Hexagon socket head cap screw, M14 × 40
	39	Suction/discharge port flange	140	24	Stud bolt 3/4-10UNC

6.4 Materials of O-ring used in oil pump

Table 6-7 Materials of O-ring

(Mechanical seal section)

Working fluid	Material of O-ring
Ammonia	HNBR
Hydrofluorocarbon (HFC)	
Carbon dioxide	
Methane trifluoride (R23)	FKM
Propane	
Propylene	
Natural gas	
City gas	
Helium	

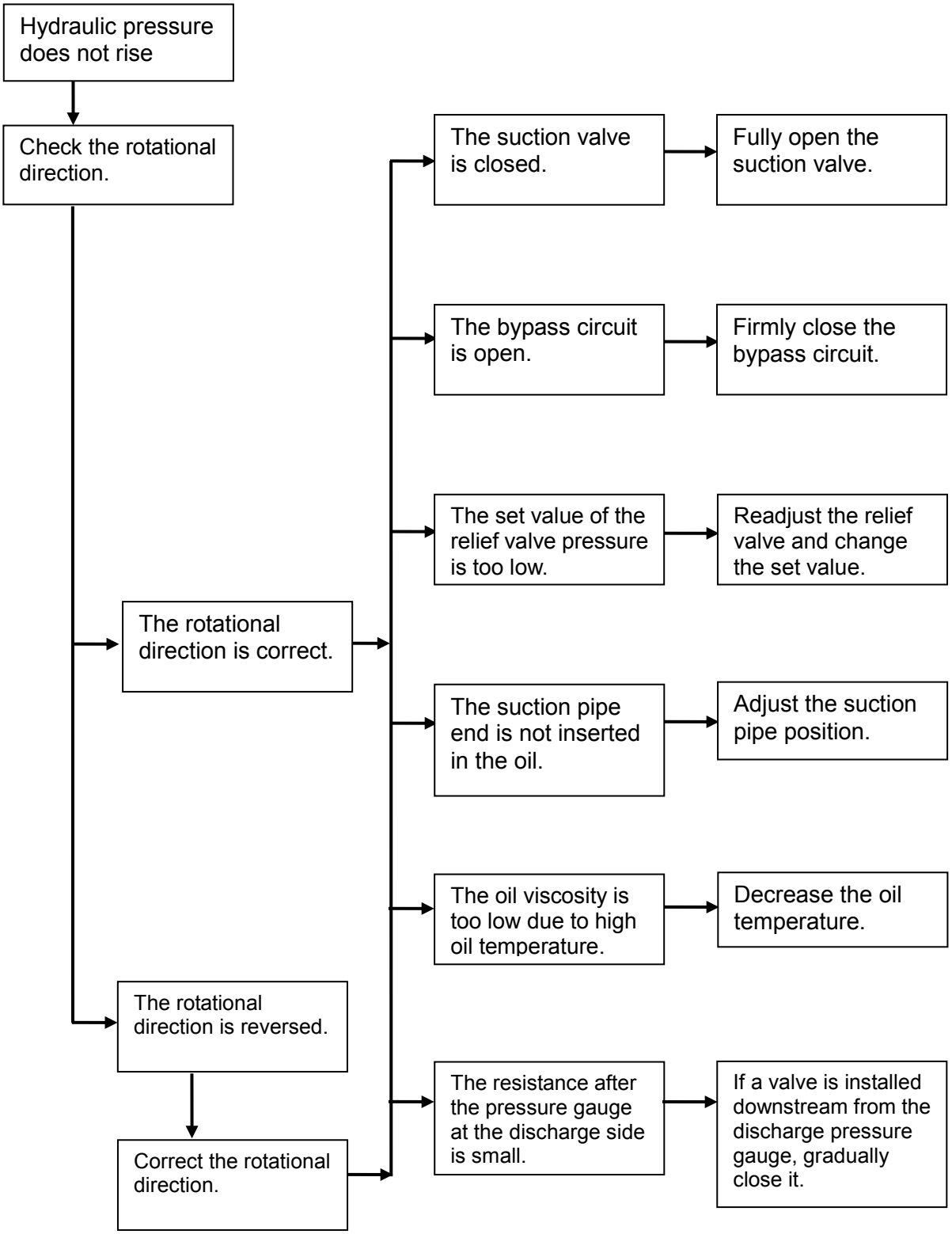
Table6-8 Materials of O-ring

(Casing section)

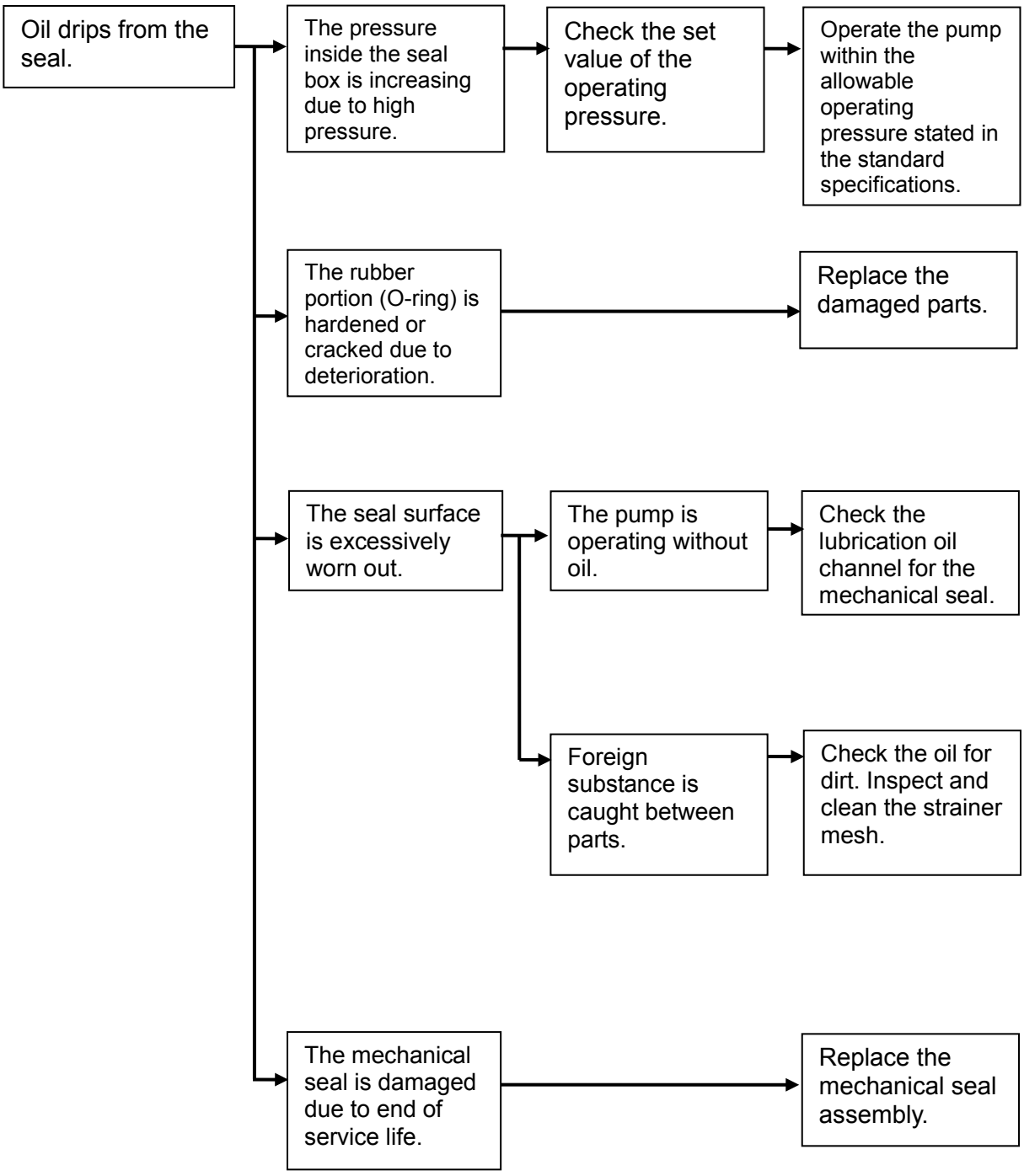
Working fluid	Material of O-ring
Ammonia	NBR
Hydrofluorocarbon (HFC)	
Carbon dioxide	HNBR
Methane trifluoride (R23)	FKM
Propane	
Propylene	
Natural gas	
City gas	
Helium	

6.5 Troubleshooting

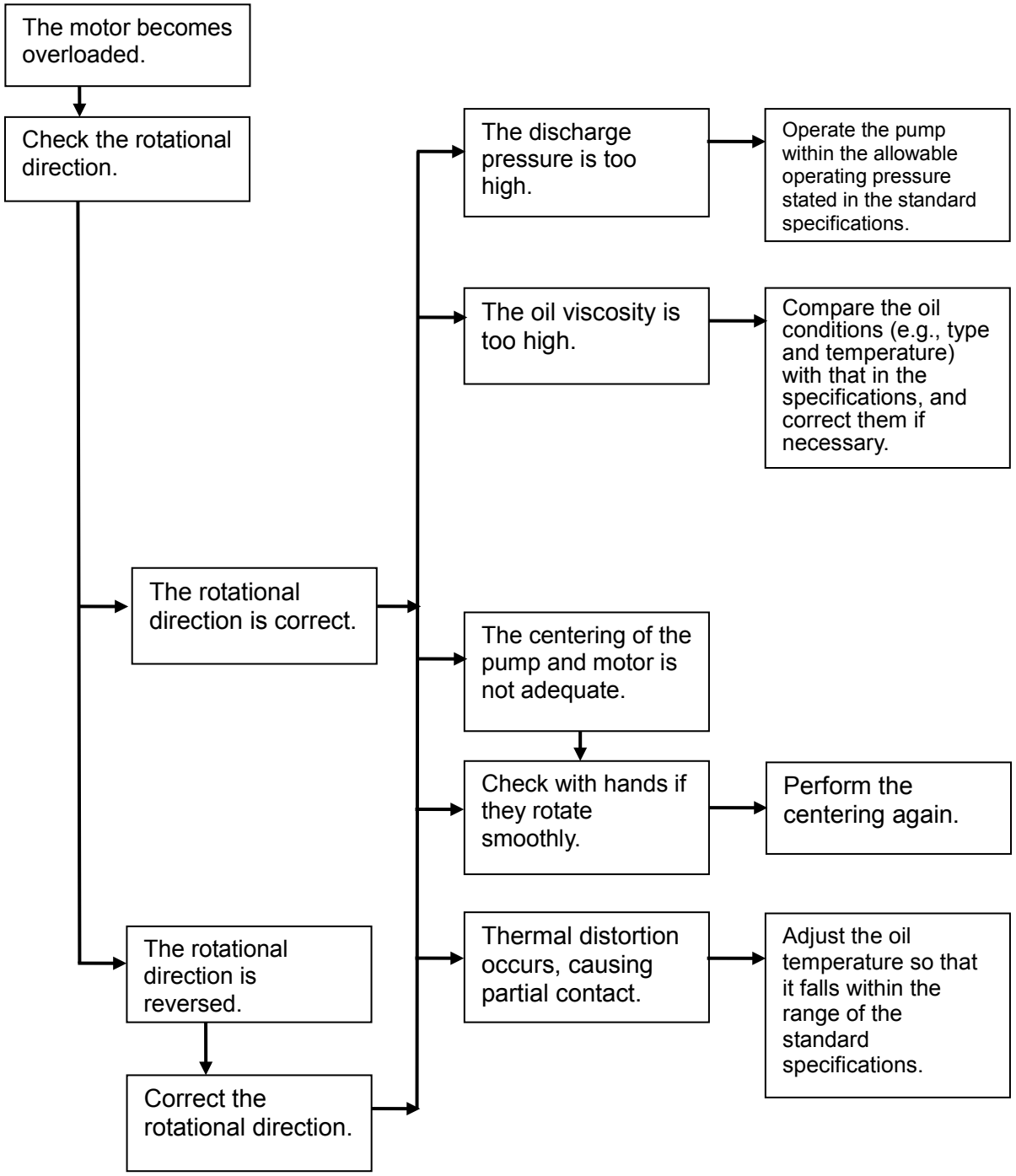
■ When hydraulic pressure does not rise



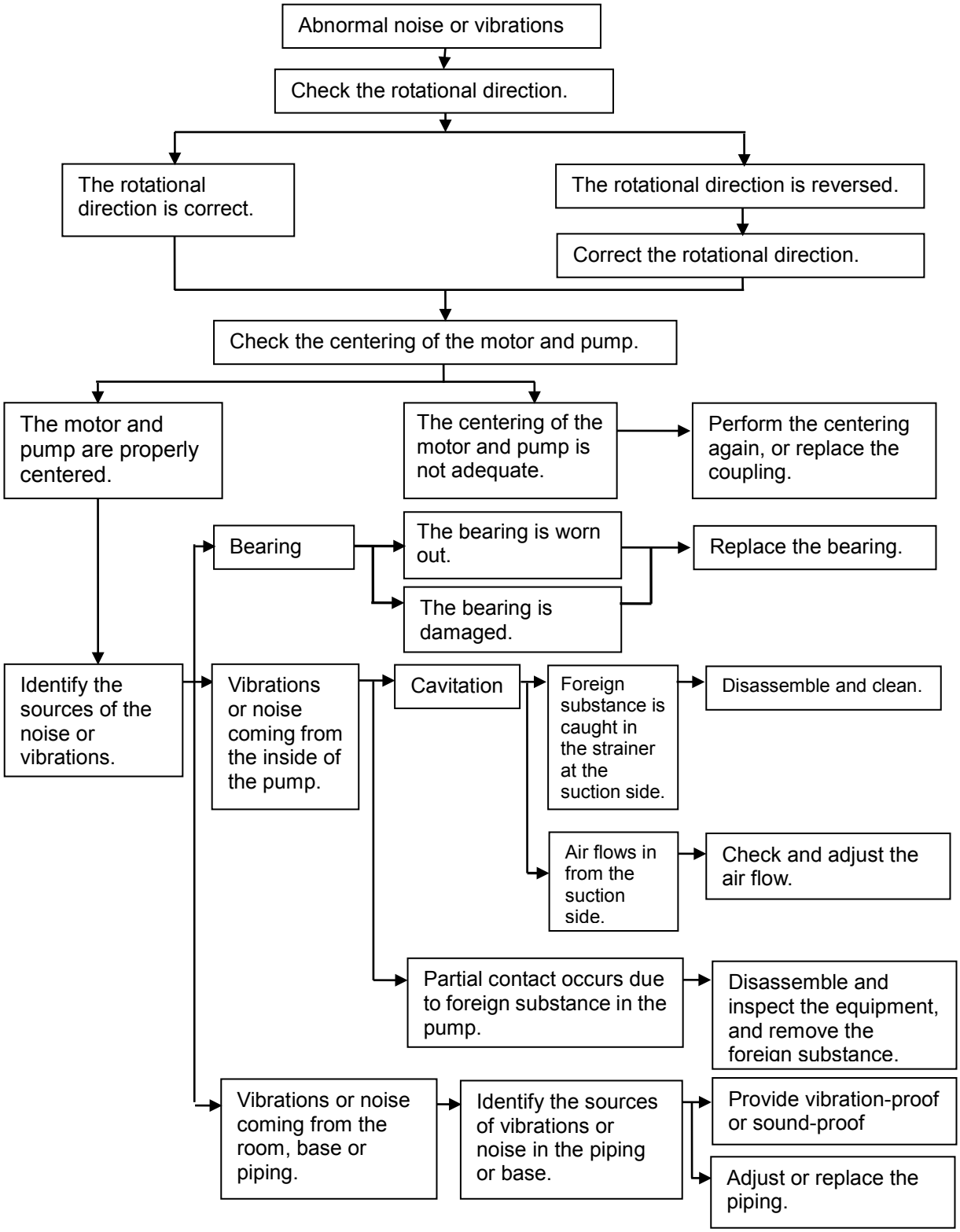
■ When oil drips from the seal



■ When the motor becomes overloaded

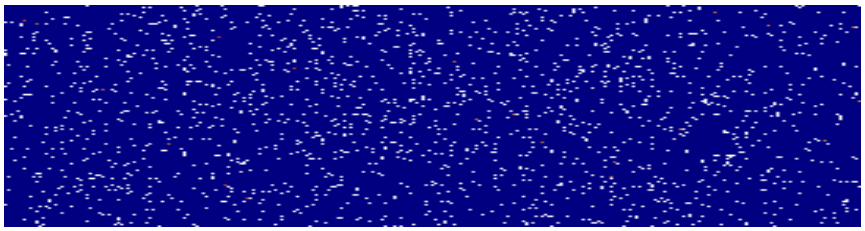


■ When abnormal noise or vibrations occur



Mayekawa Mfg. Co., Ltd.

3-14-15, Botan, Koto-ku, Tokyo, 135-8482 Japan
Tel : (81)3-3642-8181 (Main)
URL : http://www.mayekawa.co.jp



MAYEKAWA Europe MYCOM

MYCOM OIL PUMP (MP/FP SERIES) SPECIFICATION TABLE

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
1930 ZAVENTEM
BELGIUM

Tel. +32 (0)2 757 90 75
www.mayekawa.eu
info@mayekawa.eu

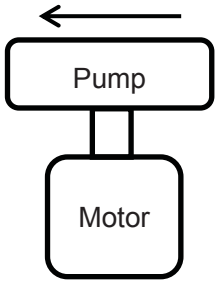
MYCOM Oil Pump Specification

MYCOM oil pump series

MP Series: M50P, M60P, M80P, M100P, M125P

FP Series: F50P, F60P

1 Standard specification

Model		M50P	M60P	M80P	M100P	M125P	F50P	F60P
Speed rpm	Maximum	1750*	1750	1750	1450	1150	1750*	1750
	Minimum	950	950	720	720	720	950	950
Flow direction**		Suction : right Discharge : left 						
Rotating direction （View from motor side）		CW			CCW			
Pressure barG	Design***	26	26	26	26	26	26	26
	Max. discharge	25	22	25	25	25	22	22
	Min. suction	-0.3						
	Relief valve*****	maximum set point 4 bar						
Temperature °C	Max. suction	80						
	Min. suction	10						
Oil	Viscosity	3～500 cSt						
	Oil strainer	>=#100 mesh (<=150 µm)						
O-ring		NBR (shaft seal: HNBR)						
Gasket		Compressed non-asbestos						
Bearing		Aluminum						
Shaft seal		Single****						

* Please consult compressor department in case it is over 1750rpm

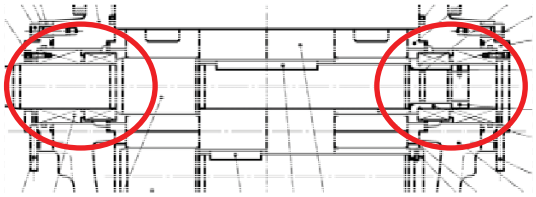
** Opposite flow direction is available with counter rotation gear sets

*** Casing design pressure, 30, 40 or 55 barG are available as an option for some pump sizes

**** Supplier is TANKEN. HNBR is used as standard O-ring material from 2011

***** Bypassable volume of oil by the relief valve is maximum 50% of its discharge capacity to protect the pump from oil temperature rise

2. Optional parts

parts	option
Oring*	HNBR: High temperature up to 130 °C CO_2 refrigeration low stage MITSUBISHI HNBR composition no. 25J6-80 VITON: High temperature up to 130 °C Process gas or Open system CO_2 (process application)
Gasket	GYLON: High pressure up to 30 barG Teflon based gasket for high pressure.
Bearing	White metal (WM): High temperature up to 130 °C Carbon (CA): (DISCONTINUED FROM 05/13) Low temperature min. -40 °C Carbon bearing is not recommended in high temperature, but practically, we use in high temperature because of low price. Carbon is not allowed to use for open system (process application), due to vulnerability to dust and particles.
Shaft seal	Twin: High pressure up to 30 barG. 2 x Single is used on both shaft ends to be balance axial force.  Bellows: European option (on request) High temperature M50P, M60P, M80P is available.(M60P seal is same as M80P)
Relief valve	Maximum set point 6 barG: Special (strong) spring No relief valve Maximum allowable delta Pressure is 20 barG.

* to check compatibility with gas and oil

3. Special specification

1) High temperature: up to 130 deg.C

	M50P	M60P	M80P	M100P	M125P	F50P	F60P
Oring	STD* or Viton						
Gasket	STD						
Bearing	WM(CA**)	WM	WM(CA**)	WM		WM(CA**)	WM
Shaft seal	STD (or Bellows)				STD	STD (or Bellows)	
Design pressure	26 barG						

* NBR is allowed to use for casing even high temperature (max. 100deg.C).

** CA DISCONTINUED FROM 05/13)

2) High pressure : up to 30 barG

	M50PH*	M60P	M80PH	M100PH**	M125P	F50P	F60P
Oring	STD or Viton	N.A.	STD or Viton		N.A.	N.A.	N.A.
Gasket	Gylon		Gylon				
Bearing	Aluminum		Aluminum	WM			
Shaft seal	Twin***		Twin***				
Design pressure	30 barG		30 barG				

* Maximum speed is 1750 rpm (4 Pole)

** Bellows is not allowable to use at high pressure

3) High temperature and pressure

	M50PH*	M60P	M80PH	M100PH**	M125P	F50P	F60P
Oring	STD or Viton	N.A.	STD or Viton		N.A.	N.A.	N.A.
Gasket	Gylon		Gylon				
Bearing	WM		WM				
Shaft seal	Twin		Twin				
Design pressure	30 barG		30 barG				

*M50PS model is available with 55 Bar G design (CCW)
**M100PJ model is available with 40 Bar G design

4) CO_2 refrigeration

	M50PH	M60P	M80PH	M100PH	M125P	F50P	F60P
Oring	HNBR	N.A.	HNBR		N.A.	N.A.	N.A.
Gasket	Gylon		Gylon				
Bearing	STD		STD				
Shaft seal	Twin		Twin				
Design pressure	30 barG		30 barG				
Relief valve	Max. Pd +6		Max. Pd +6				

MAYEKAWA Europe MYCOM

SOLENOID VALVE

TYPE OIL RETURN BLOCK

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
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BELGIUM

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MAYEKAWA MYCOM European Division

VALVE SPECIFICATION SHEET

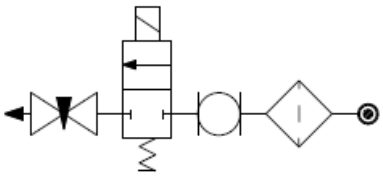
MAYEKAWA code	Description
SLV-ME-…V-..Hz-..B-RET-BLOCK	2/2 SOLENOID VALVE BLOCK, Normally Closed, AC
SLV-ME-24V-DC-..B-RET-BLOCK	2/2 SOLENOID VALVE BLOCK, Normally Closed, DC

GENERAL:

Construction:	1 valve 2/2 normally closed, 1 filter, 1 sight glass and 1 needle valve
Maximum allowable pressure:	40 bar
Response time:	5-25 msec
Lifetime coil:	30.000 hrs
Lifetime valve, expected:	500.000 cycles, dependent upon service

CONSTRUCTION:

Schematic overview

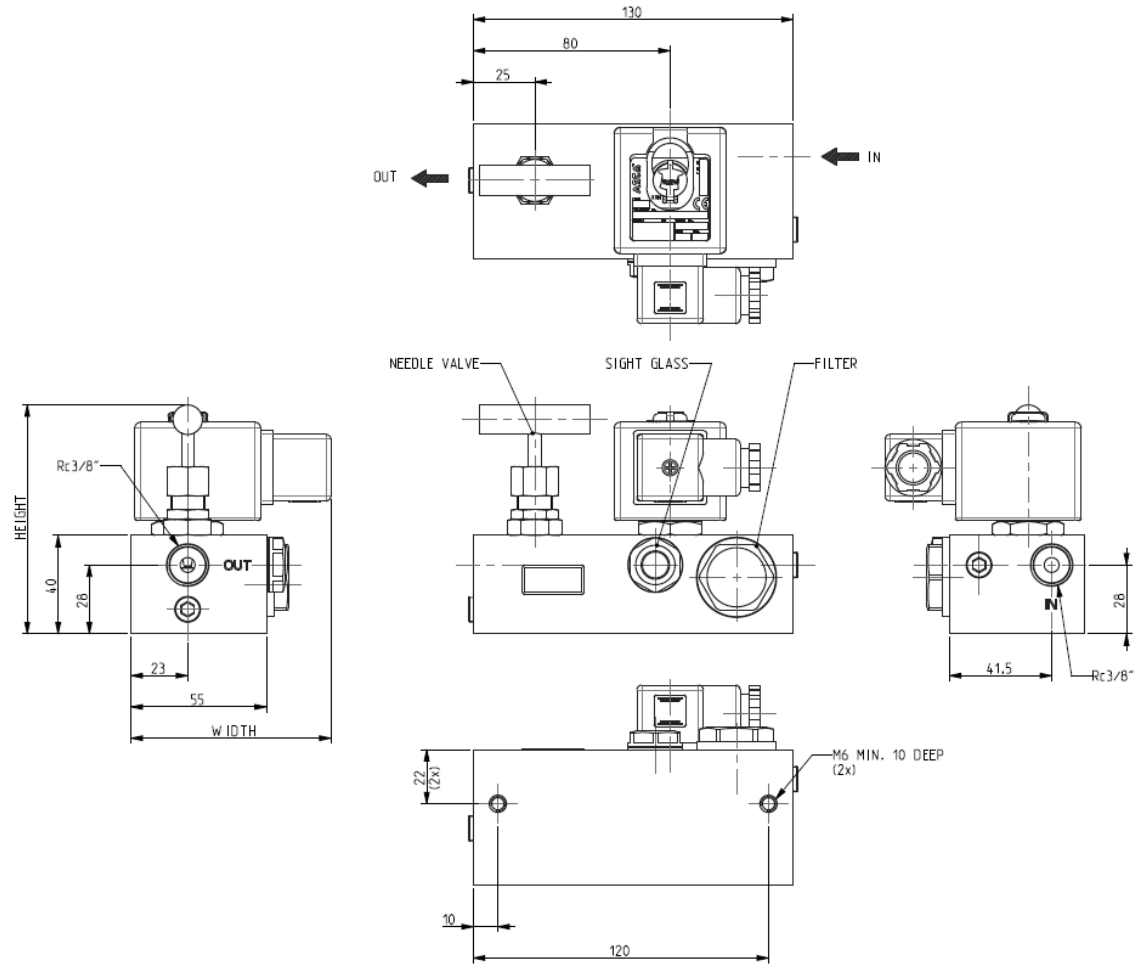


Body:	Aluminum, anodized
Core tube:	Stainless steel, AISI type 304
Core and plugnut:	Stainless steel, AISI type 430F
Springs:	Stainless steel, AISI type 302 Schematic
Seat:	Stainless steel, AISI type 303
Sealing:	PTFE
Disc:	PTFE
Shading coil:	Aluminium (AC only)
Sight glass:	Aluminium (HNBR O-ring sealing)
Filter:	Stainless steel; filtration 80µm
Coil insulation class:	F (155°C)
Power consumption:	AC (20bar) = 10.5W, DC (20bar) = 23.0W, AC (35bar) = 15.4W, DC (30bar) = 16.8W
Enclosure:	Fully encapsulated solenoid, IP-65
Electrical connection:	Spade plug connector with red led.
Pipe connections:	Rc 3/8”

Fluids	Temperature ranges
Light oil / NH3 / Freon	-25 to +130°C

Ambient temperature ranges
-25 to +75°C

DIMENSIONS:


130
80
25
OUT
IN
NEEDLE VALVE
SIGHT GLASS
FILTER
Rc3/8"
HEIGHT
40
26
OUT
23
55
WIDTH
IN
28
41,5
Rc3/8"
M6 MIN. 10 DEEP
(2x)
22
(2x)
10
120

MAYEKAWA Europe MYCOM

GASKET

TYPE MLGRA

Mayekawa Europe NV/SA
LEUVENSESTEENWEG 605
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BELGIUM

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info@mayekawa.eu

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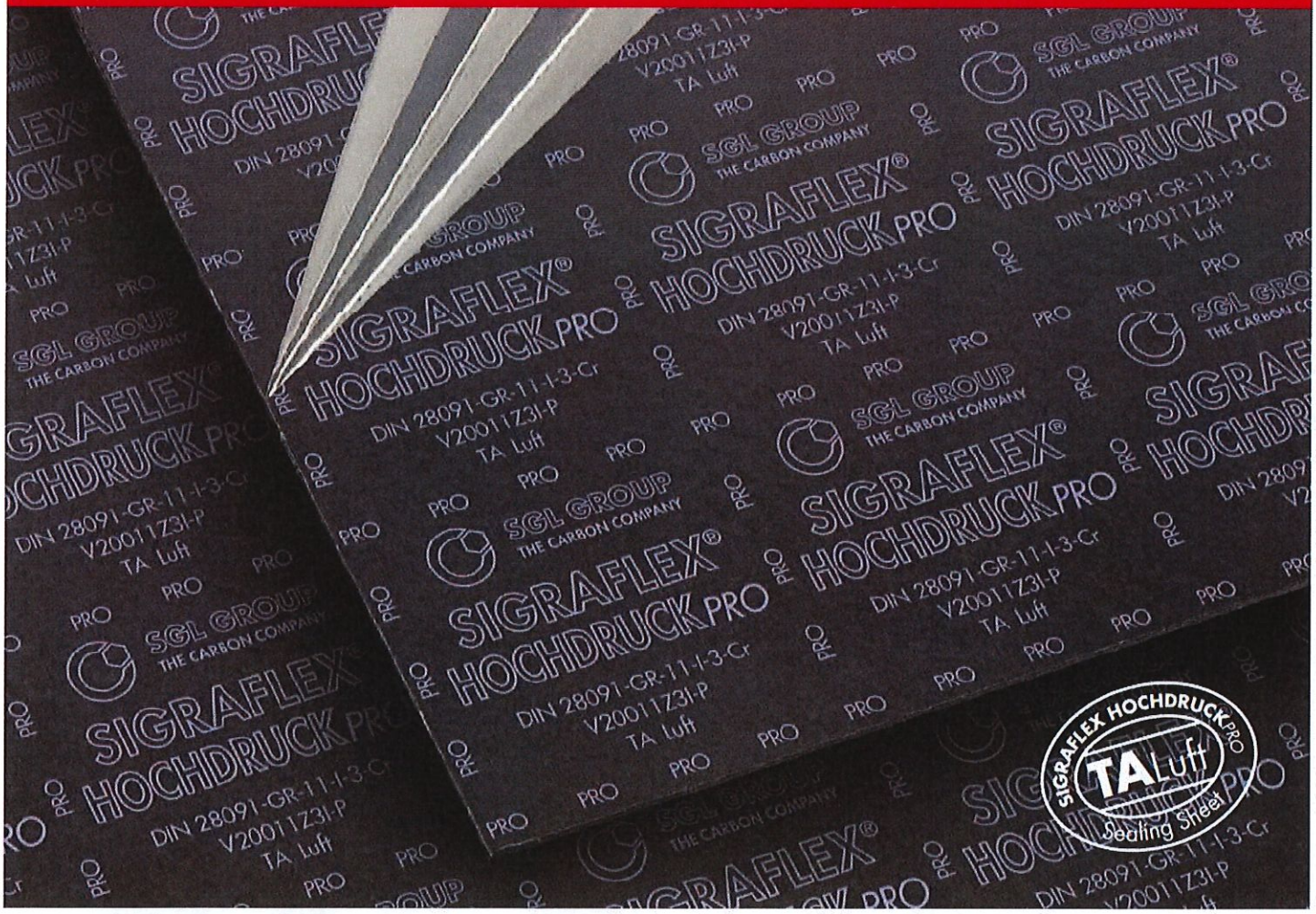
TA Luft-Compliant Sealing Sheet Made from Natural Graphite with High-Integrity Stainless Steel Foil Reinforcement for Extreme Conditions

Expanded Graphite



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SGL GROUP
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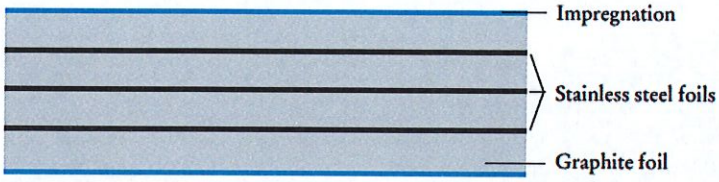
SIGRAFLEX® HOCHDRUCK *PRO*

Our Contribution to Environmental Protection

SIGRAFLEX® HOCHDRUCK *PRO*
is a multilayer high-strength graphite sealing sheet comprising 0.5 mm thick layers of high-purity graphite foil and 0.05 mm thick stainless steel foils. Depending on the sheet thickness required, several layers of graphite and stainless steel foil are joined together in a patented adhesive-free process. As a result, the sheets have outstanding mechanical properties. The sealing sheet is impregnated to reduce leakage and improve handling.
SIGRAFLEX HOCHDRUCK *PRO* allows end users in the process industry to cover almost their entire gasket application range with a reliable and safe product.



Cross-section

Applications

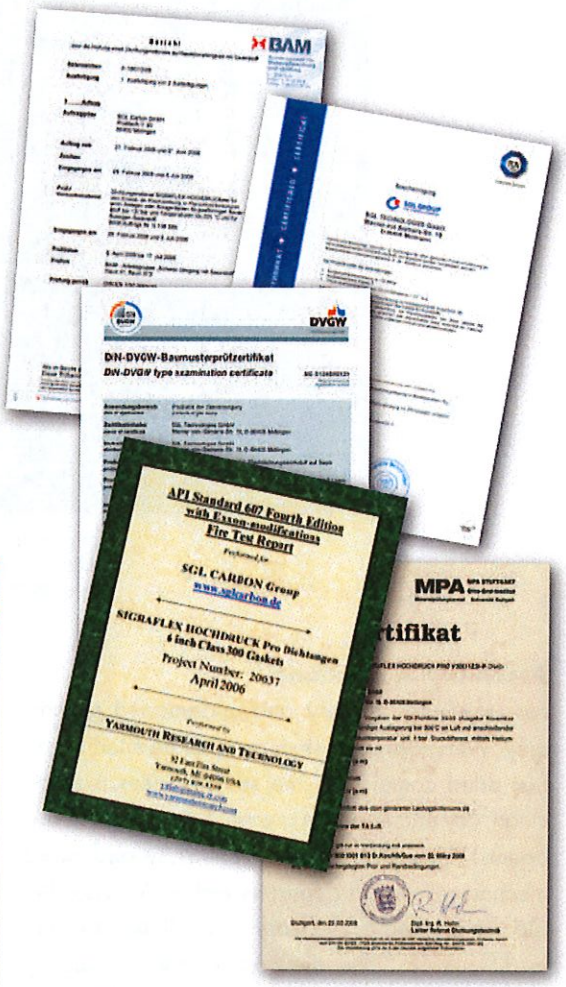
- For difficult and mechanically highly stressed sealed joints (in tongue-and-groove and special-dimension flanges, process equipment, heat exchangers); also suitable for all common pipework and vessel flange designs
- Recommended for one-piece gaskets up to 1500 mm outside diameter; for diameters over 1500 mm as two-layer structures with segmented sections and staggered joints, for instance
- For high internal pressures of up to 250 bar
- For corrosive media
- Suitable for a broad range of temperatures from –250 °C to approx. 550 °C under consideration of the chemical resistance; for applications at more than 450 °C, users should request our advice
- Gaskets for the chemical, petrochemical and nuclear industry as well as refineries
- Steam pipework and boilers in power stations
- Heat transfer oil and heating facilities
- Inspection glasses, pumps, fittings
- Existing plants

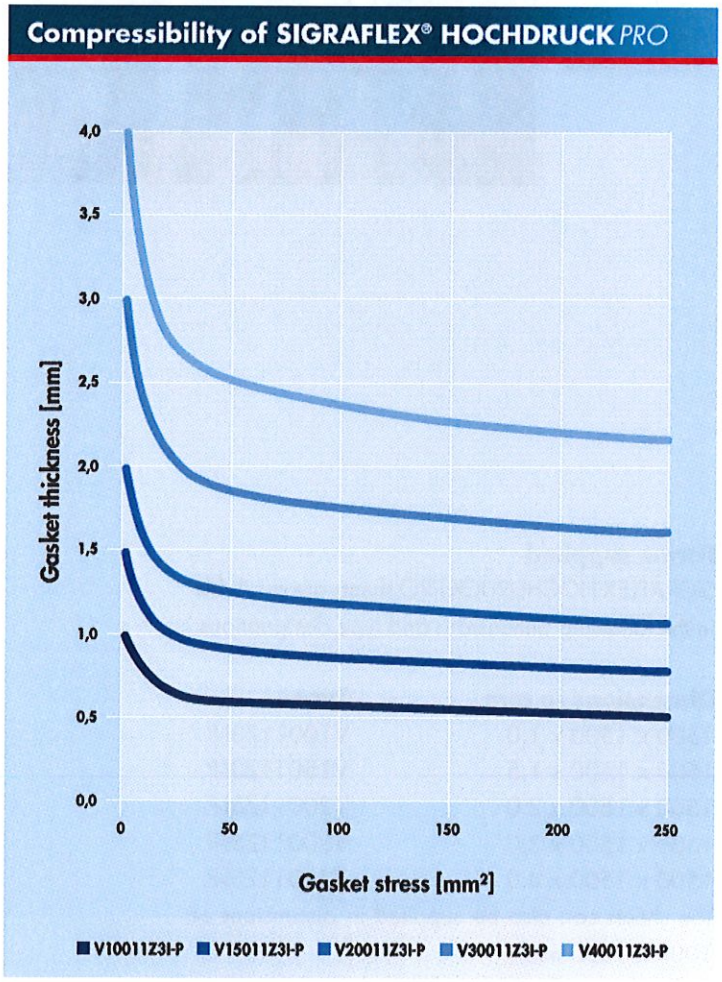
Properties

- Reduction in fugitive emissions due to very high leak-tightness
- Complies with the TA Luft leakage requirements for all sheet thicknesses
- Very high maximum permissible gasket stress
- High operational reliability and excellent oxidation resistance
- High blow-out resistance and very high mechanical strength
- Very high fault tolerance during assembly and operation
- Good chemical resistance
- Long-term stability of compressibility and recovery, even under fluctuating temperatures
- Good scratch resistance; antistick finish due to special impregnation
- No measurable cold or warm flow characteristics up to the maximum permissible gasket stress
- No aging or embrittlement, owing to the absence of adhesives or binders
- Ease of processing
- Asbestos-free, no associated health risks

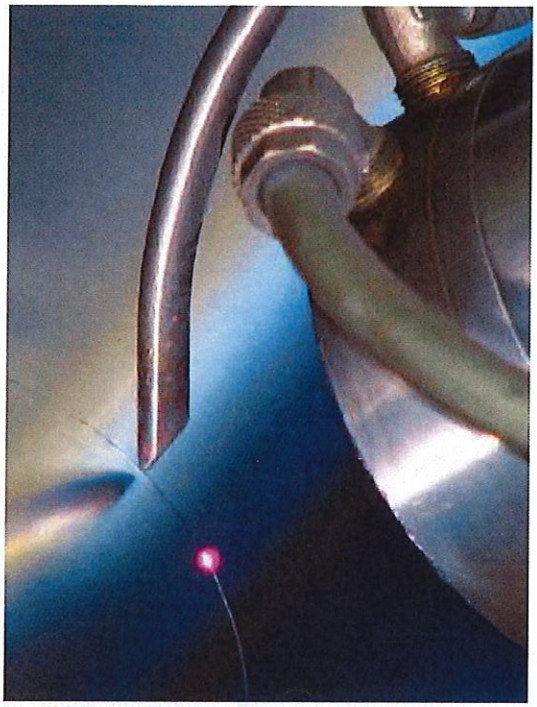
Approvals

- TA Luft (VDI 2440/VDI 2200) for all thicknesses
- Fire safety according to API 607
- Blow-out resistance (TÜV at 2.5 times the nominal pressure)
- BAM oxygen
- DVGW (DIN 3535-6)





Compressibility of SIGRAFLEX HOCHDRUCK PRO depending on gasket thickness and gasket stress under service conditions



Our patented, overlap-free laser welding process allows sheets of up to 1500 mm width without leakage channels

Assembly instructions

For assembly, use dry and undamaged gaskets only. Wet graphite gaskets must not be fitted unless first dried completely. The sealing faces must be clean, dry and free from grease. Do not use release agents! Position the gasket centrically and avoid mechanical stresses during assembly. An assembly aid can be used if necessary. To facilitate assembly in difficult positions, the gasket may be fixed by using a commercially available adhesive. However, the adhesive should be applied sparingly at a few points only.

Align the flanges as plane-parallel as possible. First hand-tighten the bolts and then tighten the bolts in a crosswise order to about 50% of the maximum torque value, in the second stage to about 80% and to the full value in the third stage. All bolts must be tightened to the specified bolt load, so the torque must be checked repeatedly. Our detailed assembly instructions are available on request.

Forms supplied

SIGRAFLEX HOCHDRUCK *PRO* sheets are available in the following dimensions and type designations:

Dimensions in mm	Types
1500 x 1500 x 1.0	V10011Z3I-P
1500 x 1500 x 1.5	V15011Z3I-P
1500 x 1500 x 2.0	V20011Z3I-P
1500 x 1500 x 3.0	V30011Z3I-P
1500 x 1500 x 4.0	V40011Z3I-P

The sheets can also be supplied in dimensions of 1000 x 1000 mm.

Material data of SIGRAFLEX® HOCHDRUCK *PRO*

Material type			V10011Z3I-P	V15011Z3I-P	V20011Z3I-P	V30011Z3I-P	V40011Z3I-P
Thickness		mm	1.0	1.5	2.0	3.0	4.0
Dimensions		m	1.5 x 1.5 / 1.0 x 1.0				
Bulk density of graphite		g/cm³	1.1				
Ash content of graphite (DIN 51903)		%	≤ 0.15				
Total chloride content		ppm	≤ 10				
Reinforcing steel foil details			Flat stainless steel foil				
ASTM material number			316 (L)				
Thickness		mm	0.05				
Number of foils			1	2	3	5	7
Residual stress (DIN 52913) $\sigma_{D\ 16\ h,\ 300°C,\ 50\ N/mm^2}$		N/mm²	≥ 48				
Gasket factors (DIN E 2505/DIN 28090-1)							
Gasket width b_D = 20 mm							
at an internal pressure of							
$\sigma_{VU/0.1}$	10 bar	N/mm²	10	10	10	10	11
	16 bar	N/mm²	10	10	12	13	14
	25 bar	N/mm²	10	12	14	15	17
	40 bar	N/mm²	12	14	16	18	20
m			1.3	1.3	1.3	1.3	1.3
σ_{VO}		N/mm²	305	290	270	240	200
$\sigma_{BO\ at\ 300°C}$		N/mm²	250	230	210	180	160
Gasket factors according to DIN EN 13555			see www.gasketdata.org				
Compression factors (DIN 28090-2)							
Compressibility	ε_{KSW}	%	30 – 40				
Recovery at 20 °C	ε_{KRW}	%	4 – 6				
Hot creep	ε_{WSW}	%	< 3				
Recovery at 300 °C	ε_{WRW}	%	3 – 5				
Young's modulus at 20 N/mm² (DIN 28090-1)		N/mm²	750				
ASTM	"m" factor		2.5				
	"y" factor	psi	2000				
Compressibility	ASTM F36	%	30 – 40				
Recovery		%	20 – 30				
The gasket factor conversion formulas as per AD Merkblatt B7 are as follows:			$k_0 \cdot K_D = \sigma_{VU} \cdot b_D$ $k_1 = m \cdot b_D$				

Definitions

$\sigma_{VU/0.1}$ Minimum gasket assembly stress needed to comply with leakage class L 0.1 (according to DIN 28090-1)
Recommended gasket assembly stress: ≥ 20 N/mm² up to σ_{BO}

σ_{BU} Minimum gasket assembly stress in service, where σ_{BU} is the product of internal pressure p and gasket factor m for test and in service ($\sigma_{BU} = p \cdot m$)

σ_{VO} Maximum permissible gasket stress at 20 °C

$\sigma_{BO,\ 300°C}$ Maximum permissible gasket stress in service

m σ_{BU}/p_i

"m" factor Similar to m, but defined according to ASTM, hence different value

"y" factor Minimum gasket stress in psi

k_0 In mm, factor for gasket assembly stress

k_1 In mm, factor for gasket stress in service

K_0 In N/mm², max. gasket stress-bearing capacity under assembly conditions

ε_{KSW} Compression set under a gasket stress of 35 N/mm²

ε_{KRW} Gasket recovery after reduction in gasket stress from 35 N/mm² to 1 N/mm²

ε_{WSW} Gasket creep compression under a gasket stress of 50 N/mm² at 300 °C after 16 h

ε_{WRW} Recovery after reduction in gasket stress from 50 N/mm² to 1 N/mm²

The percentage changes in thickness of ε_{KSW}, ε_{KRW}, ε_{WSW} and ε_{WRW} are relative to the initial thickness.

Product overview

Product		Characteristics	Recommended applications
SIGRAFLEX® FOIL F.....C/Z/APX	▲	Flexible, continuous	–250 °C to approx. 550 °C; for compressed packings, spiral-wound and kammprofile gaskets
SIGRAFLEX® STANDARD L.....CI	■	Unreinforced, impregnated	Raised-face flanges; enamel or glass flanges; highly corrosive media
SIGRAFLEX® ECONOMY V.....C4	■ ▲	Reinforced with bonded s/s** foil	Pumps; fittings; gas supply; waste gas pipelines
SIGRAFLEX® UNIVERSAL V.....C2I	■	Reinforced with tanged s/s** foil, impregnated	Pipework and vessels in the petro-/chemical industries and in power stations
SIGRAFLEX® UNIVERSAL *PRO* V.....C2I-P TA Luft	■	Reinforced with tanged s/s** foil, impregnated	For TA Luft* applications; for pipework and vessels in the petro-/chemical industries and in power stations
SIGRAFLEX® SELECT V16010C3I TA Luft	●	High-integrity s/s** foil reinforcement, impregnated	For TA Luft* applications; raised-face flanges; pipework in the chemical and petrochemical industries
SIGRAFLEX® HOCHDRUCK V.....Z3I	■	High-integrity multilayer laminate, impregnated	Universal sealing sheet, also for solving sealing problems in pipework, process equipment, tongue-and-groove flanges and non-standard joints in the petro-/chemical industries and in power stations
SIGRAFLEX® HOCHDRUCK *PRO* V.....Z3I-P TA Luft	■	High-integrity multilayer laminate, impregnated	Universal sealing sheet for TA Luft* applications, also for solving sealing problems in pipework, process equipment, tongue-and-groove flanges and non-standard joints in the petro-/chemical industries and in power stations
SIGRAFLEX® MF V.....Z2MF TA Luft	●	High-integrity laminate made of graphite, s/s** and PTFE	Maximum requirements for sealability (TA Luft*), safety, chemical resistance and process hygiene; sealed joints in the chemical and petrochemical, pharmaceutical and food industries
SIGRAFLEX® EMAIL V.....Z3E	■	High-integrity s/s** foil reinforcement	PTFE-envelope gaskets in enameled pipework, vessels, stub connections, etc.
SIGRAFLEX® HEXAGON V.....C8P TA Luft	■	s/s** foil with honeycomb pattern, without glue, impregnated	High requirements for sealability (TA Luft*), for pipework and vessels in the petro-/chemical industries and in power stations

Forms supplied: ▲ roll or tape ■ sheet material ● gasket with inner eyelet, for applications requiring TA Luft approval
*TA Luft: German Clean Air Act ** s/s: stainless steel

® registered trademark of SGL Group companies

01 2011/0 4NÄ Printed in Germany

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should therefore not be construed as guaranteeing specific properties of the products described or their suitability for a particular application. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our "General Conditions of Sale".

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SGL GROUP
THE CARBON COMPANY

SGL CARBON GmbH

Safety Data Sheet

according to Regulation (EC) No 1907/2006

SIGRAFLEX® HOCHDRUCK-PRO

Print date: 03.02.2017 Product code: OB_MEI2045002 Revision date: 10.01.2017

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

SIGRAFLEX® HOCHDRUCK-PRO

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture

Material for gaskets.

1.3. Details of the supplier of the safety data sheet

Company name:	SGL CARBON GmbH Location: Meitingen (GS)		
Street:	Werner-von-Siemens.Str. 18		
Place:	D-86405 Meitingen		
Telephone:	+49 (0)8271-83-0	Telefax:	+49 (0)8271-83-2466
Contact person:	Abteilung Arbeitssicherheit & Umweltschutz (EHS)	Telephone:	+49 (0) 8271-83-1512
e-mail:	MSDS_Meitingen@sglcarbon.de		
Internet:	http://www.sglgroup.com		
Responsible Department:	Abteilung Arbeitssicherheit & Umweltschutz (EHS)		

1.4. Emergency telephone number:

+49 (0) 08271-83-1200

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

2.2. Label elements

2.3. Other hazards

Cut wounds are possible by stainless steel foil.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Chemical characterization

Article based on expanded graphite, stainless steel foils and furan resin impregnation

SECTION 4: First aid measures

4.1. Description of first aid measures

General information

none

After inhalation

Provide fresh air.

After contact with skin

Gently wash with plenty of soap and water.

After contact with eyes

Rinse cautiously with water for several minutes.

After ingestion

Rinse mouth immediately and drink plenty of water.

4.3. Indication of any immediate medical attention and special treatment needed

none

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media

Foam. Carbon monoxide. Carbon dioxide (CO2). Extinguishing powder Water spray

Unsuitable extinguishing media

High power water jet.

5.2. Special hazards arising from the substance or mixture

In case of fire may be liberated: Carbon monoxide. Carbon dioxide (CO2). Sulphur dioxide (SO2)

A (Fires of solids, mainly organic nature, which normally burn down under glow forming.).

5.3. Advice for firefighters

In case of insufficient ventilation, wear suitable respiratory equipment.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid generation of dust.

Wear personal protection equipment (refer to section 8).

6.2. Environmental precautions

none

6.3. Methods and material for containment and cleaning up

Take up mechanically.

6.4. Reference to other sections

none

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling

none

Advice on protection against fire and explosion

Dust should be exhausted directly at the point of origin.

Further information on handling

none

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

none

Advice on storage compatibility

none

Further information on storage conditions

none

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.2. Exposure controls

Appropriate engineering controls

none

Protective and hygiene measures

none

Eye/face protection

none

Hand protection

Suitable gloves type: Chromate-free leather. Wear cotton undermitten if possible. literature infomation: 197

Skin protection

none

Respiratory protection

none

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state:	solid
Colour:	grey / black
Odour:	none

		Test method
pH-Value:	4,5 - 7	
Changes in the physical state		
Melting point:	1420 °C	(metal)
Initial boiling point and boiling range:	not applicable	
Sublimation point:	not applicable	
Softening point:	not applicable	
Flash point:	not applicable	
Flammability		
Solid:	Non-flammable.	
Explosive properties		
not explosive.		
Lower explosion limits:	not applicable	
Upper explosion limits:	not applicable	
Auto-ignition temperature		
Solid:	none	
Oxidizing properties		
none		
Vapour pressure:	not applicable	
Partition coefficient:	not applicable	
Viscosity / dynamic:	not applicable	

9.2. Other information

SECTION 10: Stability and reactivity

10.4. Conditions to avoid

none

10.5. Incompatible materials

none

10.6. Hazardous decomposition products

none

Further information

Temperatur higher than 250°C: Resin impregnation gets carbonized.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Toxicocinetics, metabolism and distribution

Based on existing data the substance does not fullfill the criteria of CMR-substances Cat. 1 and 2 according 67/548/EEC.

Acute toxicity

Graphite

Acute toxicity (oral): LD50: > 2000 mg/kg bw/day Method: Rat (OECD 423)

Acute toxicity (dermal): Not an irritant. Method: Rabbit (OECD 404)

Acute toxicity (inhalative): LD50: (4h) > 2000 mg/m³ Air. Method: Rat (OECD 403)

Carcinogenic/mutagenic/toxic effects for reproduction

Graphite

NOAEL: 813 mg/kg bw/day (Reproductive toxicity:)

Result: No signs of systemic toxicity were observed, no signs of any effects on development, reproduction, or fertility. NOAEL based on nominal food intake = 1000 mg/kg bw/day

SECTION 12: Ecological information

12.1. Toxicity

No data available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Advice on disposal

According to EAKV, allocation of waste identity numbers/waste descriptions must be carried out in a specific way for every industry and process.

Contaminated packaging

According to EAKV, allocation of waste identity numbers/waste descriptions must be carried out in a specific way for every industry and process.

SECTION 14: Transport information

Land transport (ADR/RID)

14.2. UN proper shipping name: No dangerous good in sense of these transport regulations.

Inland waterways transport (ADN)

14.2. UN proper shipping name: No dangerous good in sense of these transport regulations.

Marine transport (IMDG)

14.2. UN proper shipping name: No dangerous good in sense of these transport regulations.

Air transport (ICAO-TI/IATA-DGR)

14.2. UN proper shipping name: No dangerous good in sense of these transport regulations.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulatory information

Water contaminating class (D): - - not water contaminating

15.2. Chemical safety assessment

For this substance a chemical safety assessment has been carried out.

SECTION 16: Other information

Abbreviations and acronyms

"A - Alveolengängig; ADR - Accord européen relatif au transport international des marchandises Dangereuses par Route; bw - Body Weight; CAS - Chemical Abstract Service; CSR - Chemical Safety Report; DFG Deutsche Forschungsgemeinschaft; DIN - Deutsche Industrie Norm; DNEL - Derived No Effect Level; E - Einatembar; EAKV - Europäischer Abfallkatalog Verordnung; EC - Effective Concentration; EC - Effect Concentrationuropean Commission; EINECS - European Inventory of Existing Commercial Chemical Substances; ELINCS - European List of Notified Chemical Substances; EN - Europäische Norm; LC - Lethal Concentration; LD - Lethal Dosis; NOAEL - No Observed Adverse Effect Level; OECD - Organization for Economic Cooperation and Development; PBT - Persistent, Bioaccumulative and Toxic; RE - Repeated Exposure; REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals;" "RID - Règlement concernant le transport international ferroviaire de marchandises dangereuses; SE - Single Exposure; STOT - Specific Target Organ Toxicity; TA - Technische Anleitung; UN - United Nations; VCI - Verband der Chemischen Industrie; vPvB - Very Persistent and very Bioaccumulative; VwVwS - Verwaltungsvorschrift wassergefährdender Stoffe;"

Further Information

The above information describes exclusively the safety requirements of the product and is based on our present-day knowledge. The information is intended to give you advice about the safe handling of the product named in this safety data sheet, for storage, processing, transport and disposal. The information cannot be transferred to other products. In the case of mixing the product with other products or in the case of processing, the information on this safety data sheet is not necessarily valid for the new made-up material.

(The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.)

MAYEKAWA Europe MYCOM

FINE FILTER
TYPE FC317

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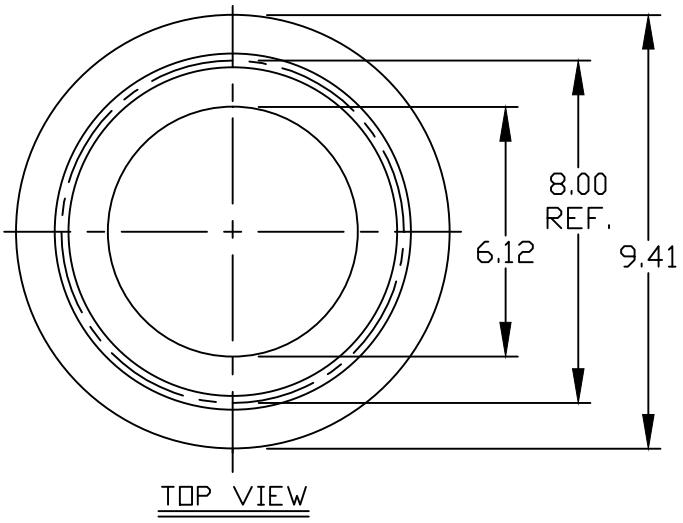
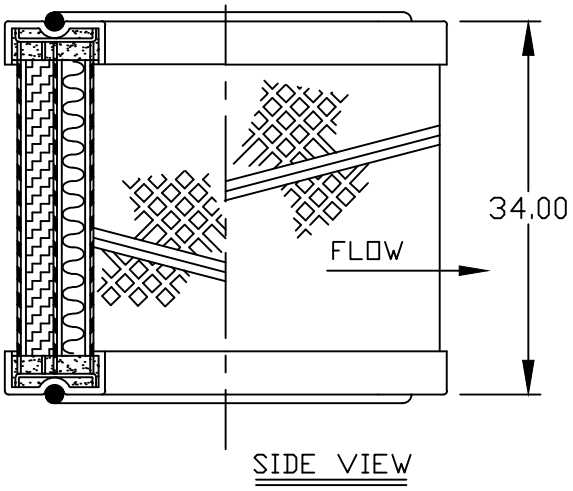


TOP VIEW



SIDE VIEW

35-40ft.lbs. TORQUE MAXIMUM

TECHNICAL DATA INFORMATION KR1100-046P			
BOX SIZE:	B125 (10.3 X 36 IN.) (262 X 914 MM)		
CASE QUANTITY:	1 PER BOX		
WEIGHT:	0.0 LBS.		
ELEMENT TYPE:	GAS/OIL SEPARATOR		
UNIT TYPE:	OPEN/CLOSED STEEL CAPS		
MEDIA TYPE:	FIBERGLASS/MICROGLASS		
SEAL TYPE:	NEOPRENE		
END SEAL:	EPOXY		
FLOW DIRECTION:	INSIDE/OUTSIDE		
MICRON RATING:	0.1µ		
UNIT:	**IN.**		**MM**
O.D. LARGEST:	9.41		239
BODY O.D. DIA:	9.41		239
INSIDE DIAMETER:	6.12		155
BODY HEIGHT:	34.00		864
DIA. HOLE ON RETAINER:	0.00		0.00
BOLT PATTERN:	**IN.**		**MM**
DIA. HOLES:	0.00		0.00
BCD HOLES:	0.00		0.00
QTY. OF HOLES:	0		
UNIT:	**FT²**		**M²**
SURFACE AREA:	16.81		1.56
CAPACITY @ 100 PSI:	**CFM**		**M³/H**
R22 FREON:	151.3		257.1
R717 AMMONIA:	319.4		542.7
NATURAL GAS:	327.8		557.0
UNIT:			
OPERATING TEMPETURE:	-35°F /300°F		
DELTA P:	1-2 PSI (0.069-0.14 bar)		
COLLAPSE PRESSURE:	45 PSI (3.10 bar)		
OPERATING PRESSURE:	100 PSI (6.98 bar)		
MAX. OPER. PRESSURE:	350 PSI (24.13 bar)		

KELTEC Technolab
2300 East Enterprise Parkway
Twinsburg, Ohio 44087

Rev. C

Part No. KR1100-046P

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OEM:

OEM No.

WEIGHT LBS. 00.00

DRAWN BY: J. TURNER

DATE: 11-18-03

Part No.
KR1100-046P

DOCUMENT NO	: SP21G115
REVISION	: 5
DATE	: 06.02.2024
PRODUCT	OIL FILTER (OFC)

OPERATING MANUAL

SELECTION

The suitable oil filter model shall be selected by means of the compressor selection program based on :
- compressor model
- rotation speed of compressor
- refrigerant (NH3, R134a, R404a, R507a, R22, etc.)
- evaporating temperature
- condensing temperature

For confirmation of selection please consult Mayekawa.

TECHNICAL DATA

All technical details are mentioned on the drawing.
If the drawing number and the revision refer to the serial n° of the vessel, please use the MDR (Manufacture Data Report) of this unit.

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BELGIUM

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INSTALLATION

The oil filter is to be integrated in the Mayekawa screw compressor packaged unit for oil filtration before the compressor.

Installation is done by Mayekawa in Mayekawa's assembly factory by qualified mechanics. In a few cases this can also be done by O.E.M.'s which are approved by Mayekawa. All components are to be supplied by Mayekawa, if not those are to be approved by Mayekawa.

The oil inlet is to be connected to the inlet nozzle*and the oil outlet to the outlet nozzle*; i.e. the oil flows from outside to inside the element. The oil filter is to be mounted between 2isolating stop valves in order to allow cleaning and changing of oil filter elements without having to depressurize the whole unit.

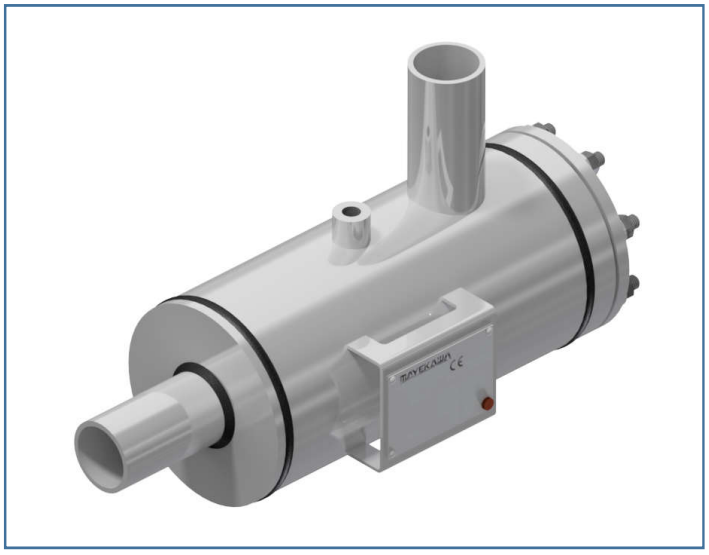
To avoid that the machine is to be stopped for servicing of oil filter element it is recommendable to install 2 oil filters in parallel so that 1 filter is always in stand-by. The stand-by filter has to take over the filtration of the oil in case that the oil filter in use needs service.

For bolt torque of flanged connections refer to ME-PRD-I-0153Bolt Tightening Instruction

*

For detailed nozzle indications refer to -the drawing, -part of the MDR.

Oil filter.



OPERATION

During commissioning of the equipment it is very important that correct functioning of the oil filter is checked.
The oil filter element should be checked after starting-up, or approx.2 hrs of operation, and if no abnormal dirt is found inside, and if pressure drop over the element remains below 0,5bar, it can successively every 3 months be inspected &/or cleaned by the qualified service representative.

It is very important that this measurement is done at stable operating condition and that all operating parameters of the compressor are registered such as:
- time of operation
- suction pressure
- suction temperature
- discharge pressure
- discharge temperature
- compressor load
- pressure drop over oil filter element
- oil temperature

During normal operation regular logging of data should be good praxis in order to obtain optimal operation of the equipment with longest lifetime

In case of abnormal oil cooling please follow Mayekawa's oil consumption troubleshooting guide which can be obtained on request

MAINTENANCE

Maintenance works should only be done by a Mayekawa qualified service representative. Before commencing disassembly and re-assembly service works on the unit, read carefully and understand the contents of the compressor manual, which explains the structure of and the work methods appropriate for the concerned compressor.

If any service work is performed which disregards the instructions given in the manual, there is a risk of accident.

Gasmasks must be available and be used in case that gas leakagemight occur.

For more details please refer to Mayekawa's procedure for servicing of oil filters.

REPEATING INSPECTIONS

As this vessels falls under vessel category requiring repeating inspections, it will be necessary to execute an internal vessel inspection every 5 years.

Rev.	Date	Change
5	**06.02.2024**	**Text removed**
4	02.10.2023	Fax removed
3	21.04.2022	Drawing added
2	12.05.2021	New presentation
1	06.10.2020	Note on Bolt Tightening Instruction added
0	30.11.1999	

DOCUMENT NO : SP21G112

REVISION : 26

DATE : 06.02.2024

PRODUCT HORIZONTAL OIL SEPARATOR (HS)

OPERATING MANUAL

SELECTION

The suitable oil separator model shall be selected by means of the Compressor selection program based on :

-compressor model
-rotation speed of compressor
-refrigerant (NH3, R134a, R404a, R507a, R22, etc.)
-evaporating temperature
-condensing temperature
-compressor load

The maximum compressor discharge gas and lubrication oil volumes determinate the suitable size of oil separator with relation to necessary quantity of fine filter cartridges and oil tank capacity.

For confirmation of selection please consult Mayekawa.

TECHNICAL DATA

All technical details are mentioned on the drawing.
If the drawing number and the revision refer to the serial n° of the vessel, please use the MDR (Manufacture Data Report) of this unit.

Mayekawa Europe NV/SA
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BELGIUM

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INSTALLATION

The oil separator is to be integrated in the Mayekawa screw compressor packaged unit as main component for primary-and secondary fine-oil separation, oil buffer tank for the oil lubrication system and base for the mounting of the screw compressor and its main drive electrical motor.
The gas outlet to the condenser is to be connected to the top outlet of the cyclonic oil separator.

Installation is done by Mayekawa in Mayekawa's assembly factory by qualified mechanics. In a few cases this can also be done by O.E.M.'s which are approved by Mayekawa. All components are to be supplied by Mayekawa, if not those are to be approved by Mayekawa.

Depending on the type of oil separator, the motor and the compressor are to be mounted on the chairs of the oil separator ora base frame around the vessel.
The gas outlet of the compressor is to be connected to the gas inlet nozzle*of the oil separator.
The gas outlet nozzle*of the oil separator is to be connected to the condenser of the system. Suitable support structures must be foreseen for this piping to prevent extra forces/moments and distortion on the oil separator vessel.
After the type oil separator a discharge check valve (non return valve) is to be installed to avoid that during standstill condensation of gas can be formed in the oil separator.
This condensation is possible if the ambient temperature is below the saturated pressure in the high pressure side of the system.

*
For detailed nozzle indications refer to-the drawing,-part of the MDR.

The oil which is separated from the gas will drop to the bottom of the oil separator.
In the first compartment of the oil separator, i.e. the primary separator which includes also the oil tank, the separated oil will drop into the oil tank.
In the second compartment of the oil separator, i.e. the fine separator, the separated oil will drop into the fine separator tank, where also the oil return to the low pressure side of the compressor is located.

The oil return circuit from the bottom of the fine separator tank is equipped with an isolating valve, a filter, a solenoid valve and an isolating valve at the compressor gas strainer inlet.
The isolating valves are needed for service purpose to isolate the components on the oil return line for service activities.

The solenoid valve on the oil return line is a normal closed valve(closed when not energized) and should always be closed during
standstill and during the first 5 to 10 minutes of operation in order to allow warming up of the oil separator so that no condensed refrigerant will be present in the oil separator tank which can otherwise deteriorate the lubrication oil condition of the machine.

The filter which is installed before the solenoid valve is to protect the orifices present in the solenoid valve against clogging by dirt which might be present in the system. The filter and solenoid valve should be mounted in the indicated flow direction in order to obtain correct functioning of the equipment.

During operation the surface temperature of the oil separator will be approx. 5 to 30°C lower than the compressor discharge gas temperature, so that a warning pictogram is sticked visible on the equipment to warn against hot surfaces.

Mayekawa recommends the equipment installator to foresee the necessary protections around the oil separator in case that surface temperatures are too high and if surface touching risk exists by installing suitable protection grids or heat insulation around the equipment.

In the primary oil tank of the oil separator or in the collector pipe mounted underneath the vessel in case of marine executions, an oil heater with performance of 2 KW is to be mounted onto the foreseen oil heater connection, in order to help the oil tank at20° to 40 °, depending on the type of oil applied, and to be approved by Mayekawa, during standstill of the machine.

The oil heater should be supplied by Mayekawa, if not it must be approved by Mayekawa. In special cases, another type of oil heater different size & capacities can be applied. The details are with indicated onto the component list and package. The detailed nozzle connections are indicated onto the drawing of the oil separator

The oil outlet connection at the bottom of the primary oil separator or the collection pipe for marine executions is to be connected to the oil cooler, oil filters and oil pump which are the other major components of the oil system.

The safety valve has to be mounted onto the safety valve
Connection of the oil separator. The safety valve must protect the vessel against overpressure. Connection size depends on the operating conditions and is to be confirmed by Mayekawa. The discharge from the device shall be vented into the low pressure side of the system. The oil tank on the primary oil separator has 2 oil level glasses which are required for oil level checking during oil charging and operation.

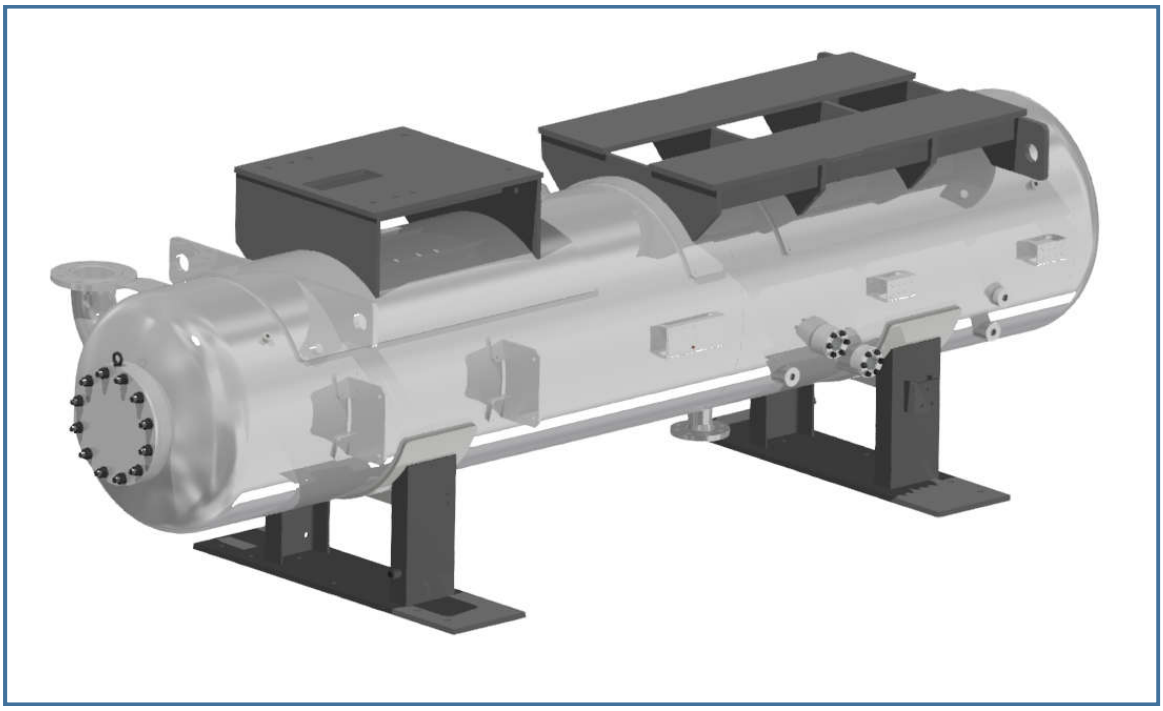
On special requests, extra equipment can be foreseen to verify the oil level. Details are then indicated onto the component list of thepackage & the detailed nozzle connections are indicated onto the drawing of the oilseparator.

For bolt torque of flanged connections refer to ME-PRD-I-0153 Bolt Tightening Instruction, see included in this manual.

Next table gives an indicative overview for the oil level of the used oil separator type.

	Maximum	**Normal**	**Minimum**	
	top top sight glass	center top sight glass	center bottom sight glass	
HS7633V	373	321	164	Liter

Standard horizontal oil separator with chairs



OPERATION

During commissioning of the equipment it is very important that correct functioning of the oil separator is checked.

Following points should be verified:

1) Check that there is sufficient time delay between the opening of the oil return(by means of solenoid valve) from the oil tank to the compressor and the compressor start to allow sufficient warming up of the cyclonic oil separator housing.

The return line to the compressor should not become too low in temperature as this indicates that condensed refrigerant is present in the oil line.

Expansion of the liquid through the float pot orifice will cool down strongly the circuit which can be sensed easily.

If applicable than time delay between start up of machine and opening of oil return should be increased.

It might also be necessary in case of outdoor mountings where the ambient temperatures are very low that the oil separator housing will not warm-up sufficient so that refrigerant condense formation cannot be avoided, in such case Mayekawa recommends to foresee heat tracing around the oil separator housing to keep the housing temperature above the saturated temperature in the system.

2) Check that the oil separator is working properly by controlling the oil tank level of the separator.

It is very important that this measurement is done at stable operating condition and that all operating parameters of the compressor are registered such as:

- time of operation
- suction pressure
- suction temperature
- discharge pressure
- discharge temperature
- compressor load
- oil level

During normal operation regular logging of data mentioned under 2) should be good praxis in order to obtain optimal operation of the equipment with longest lifetime

In case of abnormal oil consumption please follow Mayekawa’s oil consumption troubleshooting guide which can be obtained on request

MAINTENANCE

Maintenance works should only be done by a Mayekawa qualified service representative. Before commencing disassembly and re-assembly service works on the unit, read carefully and understand the contents of the compressor manual, which explains the structure of and the work methods appropriate for the concerned compressor.

If any service work is performed which disregards the instructions given in the manual, there is a risk of accident.

Gasmasks must be available and be used in case that gas leakage might occur.

REPEATING INSPECTIONS

As this vessels falls under vessel category requiring repeating inspections, it will be necessary to execute an internal vessel inspection every 5 years.

Rev	Date	Change
26	**06/02/2024**	**Text removed**
25	02/10/2023	Fax removed
24	12/05/2022	Text adjusted
23	04/05/2022	Picture added
22	12/05/2021	Adjustment Layout
21	12/05/2021	Adjustment Layout
20	04/05/2020	Note about Torque tables added
19	20/12/2019	Adjustment table
18	28/06/2019	Oil level table update
17	18/10/2018	Oil level table update
16	24/07/2018	Oil level table update
15	11/04/2018	Oil level table update
14	06/12/2017	Oil level table update
13	04/10/2017	Oil level table update
12	04/08/2017	Oil level table update
11	15/06/2017	Oil level table update
10	06/04/2017	Oil level table update
9	27/02/2017	Oil level table update
8	23/11/2016	Oil level table update
7	28.10.2016	Oil level table update
6	08.04.2016	Oil level table update
5	12.08.2015	Oil level table update
4	31.07.2015	Oil level table update
3	02.06.2015	Oil level table update
2	25.07.2013	Oil level table update
1	04.02.2013	Oil level table update
0	20.01.2010	Introduction document

DOCUMENT NO : SP21G113

REVISION :5

DATE : 06.02.2024

PRODUCT SUCTION GAS STRAINER (SSD)

OPERATING MANUAL

SELECTION

The suitable suction gas strainer model shall be selected by means of the compressor selection program based on :
- compressor model
- rotation speed of compressor
- refrigerant (NH3, R134a, R404a, R507a, R22, etc.)
- evaporating temperature
- condensing temperature

For confirmation of selection please consult Mayekawa.

TECHNICAL DATA

All technical details are mentioned on the drawing.
If the drawing number and the revision refer to the serial n° of the vessel, please use the MDR (Manufacture Data Report) of this unit.

INSTALLATION

The suction gas strainer is to be integrated in the Mayekawa screw compressor packaged unit for suction gas filtration before the compressor.

Installation is done by Mayekawa in Mayekawa's assembly factory by qualified mechanics. In a few cases this can also be done by O.E.M.'s which are approved by Mayekawa. All components are to be supplied by Mayekawa, if not those are to be approved by Mayekawa.

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The gas inlet of the installation is to be connected to the gas inlet nozzle*of the suction strainer. Suitable support structures must be foreseen for this piping to prevent extra forces/moments on the vessel, which is mounted on the compressor suction, and compressor.

The suction gas strainer is to be mounted with the gas outlet nozzle*on top of the compressor gas inlet.

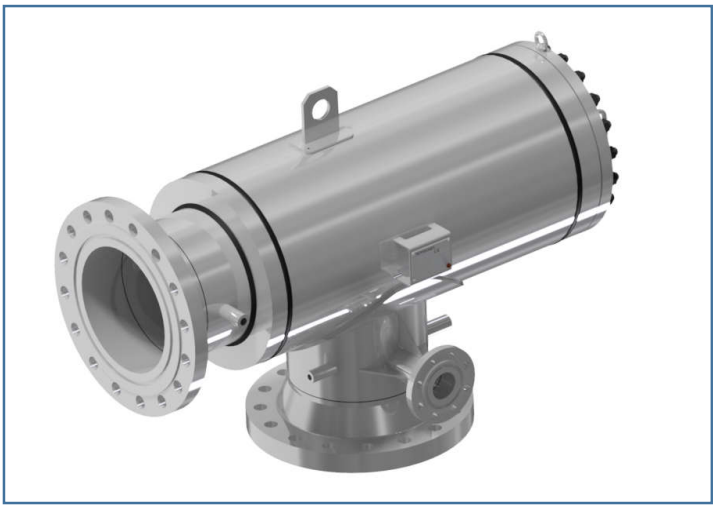
Between suction gas strainer and compressor a suction duo-check valve is sandwiched in order to isolate the low pressure part of the plant from the high pressure part and to avoid counterrotation of the compressor during stopping.

Connecting of the suction gas strainer to the plant can only be done by qualified persons under supervision of the installator.

Oil return connection nozzles as foreseen on the suction filter must be equipped with the necessary valves.
The temperature and pressure measuring devices are to be mounted on the suitable nozzles by Mayekawa/ Mayekawa's customer authorized personnel following code of good praxis.
The start up gas bypass return can be connected to the nozzle*if applicable depending on the application.

For bolt torque of flanged connections refer to ME-PRD-I-0153Bolt Tightening Instruction
*
For detailed nozzle indications refer to -the drawing, -part of the MDR.

Suction strainer



OPERATION

During commissioning of the equipment it is very important that correct functioning of the suction gas strainer is checked. The suction strainer element should be checked after starting-up, or approx.500 hrs of operation, and if no abnormal dirt is found, it can successively be yearly inspected &/or cleaned by the qualified service representative.
It is very important that this measurement is done at stable operating condition and that all operating parameters of the compressor are registered such as:
- time of operation
- suction pressure
- suction temperature
- discharge pressure
- discharge temperature
- Compressor load.

During normal operation regular logging of data should be good praxis in order to obtain optimal operation of the equipment with longest lifetime.

MAINTENANCE

Maintenance works should only be done by a Mayekawa qualified service representative. Before commencing disassembly and re-assembly service works on the unit, read carefully and understand the contents of the compressor manual, which explains the structure of and the work methods appropriate for the concerned compressor.

If any service work is performed which disregards the instructions given in the manual, there is a risk of accident.
Gasmasks must be available and be used in case that gas leakage might occur.

REPEATING INSPECTIONS

As this vessel falls under vessel category requiring repeating inspections, it will be necessary to execute an internal vessel inspection every 5 years.

Rev.	Date	Change
5	**06.02.2024**	**Text removed**
4	02.10.2023	Fax removed
3	21.04.2022	Picture added
2	12.05.2021	New presentation
1	06.10.2020	Note on Bolt Tightening Instruction added
0	30.11.1999	Introduction

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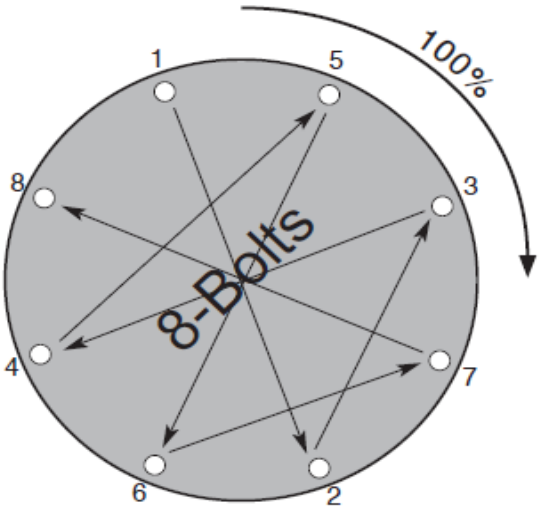
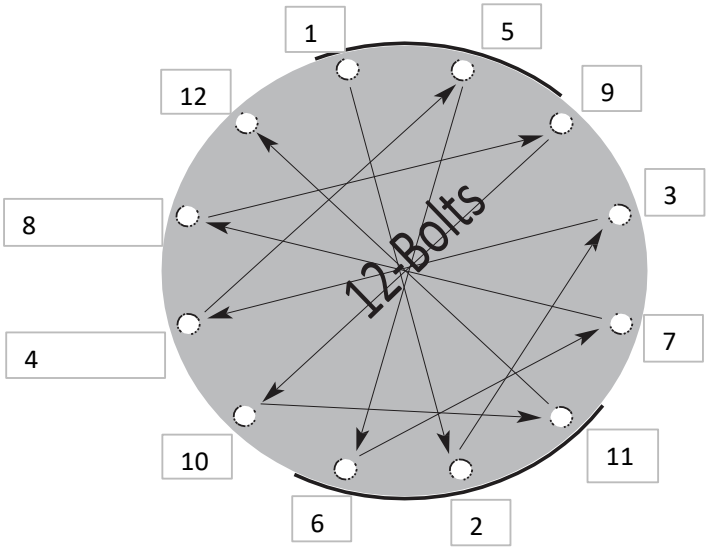
BOLT TIGHTENING INSTRUCTION: SCREW UNITS

1. The use of suitable lubricants (grease) on the stud threads and nut bearing faces is advised.

2. Tightening torque and pattern using a calibrated torque wrench (In four stages):

1st torque stage	25% of final torque value following numbered pattern
2nd torque stage	50% of final torque value following numbered pattern
3rd torque stage	75% of final torque value following numbered pattern
Final torque stage	Final torque value in clockwise pattern from #1 position





3. Mechanics are responsible for the torquing of all bolts on a unit (not fitters or welders).
4. Each torqued bolt must be marked with two black line (using black marker).
5. Design and chose the bolting so that a minimum of three threads is exposed after tightening.
6. During inspection, check that there is a least one turn of fully formed thread coming of the nut.

TORQUE VALUES

FLANGES (PN25)				
			Torque (Nm)	
DN	Bolt q'ty	Bolt size	Premium	SSTC
15	4x	M12	30	30
20	4x	M12	60	60
25	4x	M12	75	75
32	4x	M16	110	110
40	4x	M16	110	110
50	4x	M16	130	130
65	8x	M16	100	100
80	8x	M16	100	100
100	8x	M20	200	200
125	8x	M24	290	290
150	8x	M24	320	320
200	12x	M24	350	350

FLANGES (PN40)				
			Torque (Nm)	
DN	Bolt q'ty	Bolt size	Premium	SSTC
15	4x	M12	30	30
20	4x	M12	60	60
25	4x	M12	75	75
32	4x	M16	110	110
40	4x	M16	110	110
50	4x	M16	130	130
65	8x	M16	100	100
80	8x	M16	100	100
100	8x	M20	200	200
125	8x	M24	290	290
150	8x	M24	320	320
200	12x	M27	370	370

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TORQUE VALUES

FLANGES (PN63)				
		Torque (Nm)		
DN	Bolt q'ty	Bolt size	Premium	SSTC
15	4x	M12	30	30
20	4x	M16	80	80
25	4x	M16	80	80
32	4x	M20	90	90
40	4x	M20	110	110
50	4x	M20	130	130
65	8x	M20	110	110
80	8x	M20	120	120
100	8x	M24	280	280
125	8x	M27	350	350
150	8x	M30	400	400
200	12x	M33	450	450

FLANGES (PN100)				
		Torque (Nm)		
DN	Bolt q'ty	Bolt size	Premium	SSTC
15	4x	M12	30	30
20	4x	M16	80	80
25	4x	M16	80	80
32	4x	M20	90	90
40	4x	M20	110	110
50				
65				
80				
100				
125				
150				
200				

SUCTION STRAINER					
			Torque (Nm)		
TYPE	Bolt q'ty	Bolt size	Premium	SSTC	Gasket
SSD150	8x	M12	**60**	**60**	127x115x2
SSD200	12x	M12	48	48	170x150x2
SSD250	12x	M12	48	48	203x183x2
SSD250 (J)	12x	M16		80	203x183x2
SSD350	12x	M16	80	80	255x235x2
SSD450	20x	M20	120	120	381x369x2

OIL SEPARATOR (FINE FILTER COVER)				
TYPE	Bolt q'ty	Bolt size	Torque (Nm)	
380x280	12x	M20	320	320
380x280	16x	M20	320	320
Old HS	22x	M20	370	370

FINE FILTER	
TYPE	Torque (Nm)
Horizontal	27-34
Vertical	16

OIL FILTERS			
			Torque (Nm)
TYPE	Bolt q'ty	Bolt size	FN14-150N
OF50	8x	M12	50

DISCHARGE ELBOW				
TYPE	Bolt q'ty	Bolt size	Premium	SSTC
3"	8x	M20	260	260
4"	8x	M20	280	280
5"	8x	M20	300	300
8"	12x	M24	350	350

OS SIGHTGLASS			
TYPE	Bolt q'ty	Bolt size	Torque (Nm)
Horizontal OS	6x	M10	35
Vertical OS	8x	M10	35

OIL PUMP				
			Torque (Nm)	
TYPE	Bolt q'ty	Bolt size	Premium	SSTC
M50	8x	M16	80	80
M60	8x	M16	80	80
M80	8x	M20	260	260

MAYEKAWA MYCOM

TORQUE VALUES

TORQUE VALUES: PISTON UNITS

Part No.	Part Name	Material	Quantity			Bolt Type	Tightening Torque (Nm)
			4M	6M	8M		
10	Hexagon head bolt, main bearing head	SCM435	16			M16xL75-10.9	120
307	Hexagon socket head cap screw, blow-by gas plate	SCM435	10			M8xL15-12.9	40
16	Hexagon socket head cap screw, oil filter	SCM435	2			M12xL50-12.9	80
60	Hexagon socket head cap screw, oil pump	SCM435	8			M12xL50-12.9	80
119-2	Hexagon head bolt, magnet	SCM435	1			M8xL15-10.9	----
25	Hexagon head bolt, bearing head	SCM435	10			M16xL65-10.9	120
41-3	Hexagon socket set screw, shower flushing sleeve	SCM435	2			M6xL8	----
28	Hexagon head bolt, shaft seal cover	SCM435	8			M12xL75-10.9	80
48	Hexagon head bolt, hand hold cover	SCM435	32			M16xL75-10.9	120
73-5	Hexagon head bolt, valve plate	SCM435	6	9	12	M16xL45-10.9	120
112	Hexagon head bolt, discharge valve seat	SCM435	12	18	24	M10xL40-10.9	60
52	Hexagon head bolt, head cover	SCM435	44	66	88	M16xL115-10.9	120
54	Hexagon head bolt, head jacket cover	SUS304	28	42	56	M10xL35-SUS/ Water cooling head cover specification	----
78	Hexagon head bolt, connecting rod	SCM435	8	12	16	M12xL80	60
149	Hexagon head bolt, unloader cover	SCM435	8	12	16	M18xL35-10.9	40
163	Hexagon head bolt, suction filter cover	SCM435	6	12	12	M16xL55-10.9	120
170L	Hexagon head bolt (No.1), discharge manifold	SCM435	---	3	---	M16xL200-10.9	120
170M	Hexagon head bolt (No.2), discharge manifold	SCM435	8	10	20	M16xL170-10.9	120
170S	Hexagon head bolt (No.3), discharge manifold	SCM435	4	4	4	M16xL120-10.9	120
170C	Hexagon socket head cap screw (No.4), discharge manifold	SCM435	---	1	---	M16xL55-12.9	120
166	Hexagon head bolt, oil sight glass	SCM435	4			M16xL20-10.9	15
4	Hexagon socket head cap screw, mechlock	----	10			M12	80

STYRENE PARK OFFSITE

Document Title:

Installation, Operation & Maintenance (Manual)

R0	09-03-2025	IFA	K.BASAMI	J.BEIGLOO	A.GHOLIZADEH
Rev.	**Issued Date**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**

REVISION RECORD SHEET

Page	Revisions								Page	Revisions						
	R0	R1	R2	R3	R4	R5	R6			R0	R1	R2	R3	R4	R5	R6
1	X								41	X						
2	X								42	X						
3	X								43	X						
4	X								44	X						
5	X								45	X						
6	X								46	X						
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32	X								72	X						
33	X								73	X						
34	X								74	X						
35	X								75	X						
36	X								76	X						
37	X								77	X						
38	X								…	X						
39	X								93	X						
40	X								94	X						

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1. INTRODUCTION

These instructions have been prepared to facilitate the erection, installation and maintenance of equipment supplied by DTT and offer customers best procurement conditions and delivery time of detail and spare parts requested.

The equipment assembly and erection operation procedures within this document shall be handled by qualified personnel with experience in the field of air-cooler erection in full compliance with API 661.

Erection and commissioning shall be carried out in strict conformity with the instructions of this manual. Any problems regarding the implementation of these instructions shall be filed and reported to DTT in writing (via email or fax) after sale service spec manual, which will answer as soon as possible.

DTT's responsibility cannot be engaged when the clauses of this document are not met, furthermore should any issue arise, please contact DTT.

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Fax: (98) 21 44922494

Email: sales@damafin.com

DETAIL/SPARE PARTS PROCUREMENT

SPARE PARTS AND SERVICE DEPARTMENT

For procurement of detail and spare parts, please contact DTT Sale Service Department. When ordering, please specify the following information:

DTT job No. (for example: 21105, 23153, 26102…).

DTT serial No. which is stamped on the tube bundle unit nameplate.

Item No. (for example: E601, 172 A01, etc.).

Description and reference No. of part.

MARKING SYSTEM

To facilitate the picking of parts, they are marked in the following pattern:

- 1st group: 3 Number Characters >> DTT's job number (DTT’s job number for this project is 1158)

- 2nd group: 1 Letter following a 2-Digit Number >> DTT's item number (DTT’s Item Code: A, B, C, … following DTT’s Bank Number:01, 02, 03, …)

- 3rd group: Numbering Code for Document (for common parts such as steel structure part number, see general part list)

- 4th group: 2 Number Characters >> Representing Document Series Number

Example: steel structure part of item: Drawing no.: 1158-A01-1100-00

Marking: Column: CL-1 or 1111-00

Note: some of identical parts for all items are not marked, such as

- Tie Rod
- Butt Straps
- Special Washer

2. THERMAL DATASHEET

STYRENE PARK OFFSITE

Document Title:

Air Cooler Thermal Data Sheet

Rev.	Issued Date	DESCRIPTION	PREPARED	CHECKED	APPROVED
R1	1-JUL-2024	IFA	H.Torshizi	H.Torshizi	B.Sheikhbeigi
R0	22-JUN-2024	IFA	H.Torshizi	H.Torshizi	B.Sheikhbeigi

REVISION RECORD SHEET

Page	Revisions								Page	Revisions						
	R0	R1	R2	R3	R4	R5	R6			R0	R1	R2	R3	R4	R5	R6
1	X	X							41							
2	X	X							42							
3	X	X							43							
4	X								44							
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39									79							
40									80							

API 661 Air-Cooled Heat Exchanger - Specification Sheet

Based on GEA Btt-Batignolles Technologies Thermiques FRANCE

Damafin Thermal Technology Co.

Job No.		Item No.	Air Cooler
Page	Page 1 of 2	By	
Date	June 30, 2024	Revision	R1
Proposal No.	02612N	Contract No.	
Inquiry No.		Order No.	
		No. of Item	2

Manufacturer		Damafin Thermal Technology Co.	Heat exchanged	(kW)	257.
Model no.			Surface/Item-Finned tube	(m2)	1579.2
Customer		ENER Teknoloji	Bare tube	(m2)	68.101
Plant location			MTD, Eff.	(Deg. C)	6.8
Service			Transfer rate-Finned	(W/m2-K)	25.561
Type draft		FORCED	Bare tube, service	(W/m2-K)	592.73
Bay size (WxL)	(m)	2.65 x 6.4	Bare tube, clean	(W/m2-K)	679.13
No. of bays/Items		1			

Basic design data

Pressure design code		ASME VIII div 1 + API 661	Structural code		UBC 97
Tube bundle code stamped		No.	Flammable service		Yes.
Heating coil code stamped		No.	Lethal/toxic service		No.

Performance Data - Tube Side

Fluid name		Propane			In		Out
Total fluid entering	(kg/hr)	3015.5	Total flow rate (Liq/Vap)	(kg/hr)	0.0000 / 3015.5	3015.5 /	0.0000
Dew/bubble point	(Deg. C)	/	Water/Steam	(kg/hr)	0.0000 / 0.0000	0.0000 /	0.0000
	(Deg. C)		Noncondensables	(kg/hr)	0.0000		0.0000
Latent heat	(kJ/kg)		Molecular Wt. (Vap/Non-cond)		/		/
Inlet pressure	(bar)	19.800	Density (Liq/Vap)	(kg/m3)	435.84 / 40.275	435.93 /	46.071
Pressure drop (All/Calc)	(bar)	0.100 / 0.018	Specific heat (Liq/Vap)	(kJ/kg-C)	3.6067 / 2.2738	3.6049 /	2.3920
Velocity (Allow/Calc)	(m/s)	/ 0.85	Thermal cond. (Liq/Vap)	(W/m-C)	0.0764 / 0.0253	0.0764 /	0.0238
Inside fouling resistance (m2-K/W)		0.000170	Viscosity (Liq/Vap)	(cP)	0.0730 / 0.0106	0.0730 /	0.0103
		In / Out					
Temperature	(Deg. C)	73.50 / 56.32					

Performance Data - Air Side

Air inlet temperature	(Deg. C)	48.00	Face velocity	(m/s)	3.15
Air flow rate/item	(m3/s)	45.529	Minimum design ambient temp	(Deg. C)	5.00
Mass velocity	(kg/s-m2)		Altitude	(m)	20.000
Air outlet temperature	(Deg. C)	52.28	Static pressure	(Pa)	102.95
Air flow rate/fan	(m3/s)	26.879			

Design, Material, and Construction

Design pressure	(barG)	22 + F.V	**Heating Coil**		NO.
Test pressure	(barG)		No. of tubes		
Design temperature	(Deg. C)	120.00	Tube outside diameter	(mm)	
Min. design metal temp.	(Deg. C)		Tube material		
Tube bundle			Fin material and type		
Size (WxL)	(m)	2.5 X 6.4	Fin thickness	(mm)	
No./Bay		1	ASME Code, Sec. VIII, Div. 1		
Number of tube rows		4	Heating fluid		
Bundles in parallel		1	Heating fluid flow rate	(kg/hr)	
Bundles in series			Temperature (In/Out)	(Deg. C)	/
Structure mounting		Grade	Inlet pressure	(bar)	
Pipe rack beams			Pressure drop (All/Calc)	(kPa)	/
Ladders, walkways, platforms			Design temperature	(Deg. C)	
Structure surface prep.			Design pressure	(bar)	
Header surface prep.			Inlet/Outlet nozzle		/
Louver		NO.	**Header**		
Material			Type		Plug
Action control			Material		SA-516 Gr70(N)
Action type			Corrosion Allowance	(mm)	3
			No. of passes		4
			Tube / Tubesheet		Strength weld

API 661 Air-Cooled Heat Exchanger - Specification Sheet

Damafin Thermal Technology Co.

Based on GEA Btt-Batignolles Technologies Thermiques FRANCE

Job No.		Item No.	Air Cooler
Page	Page 2 of 2	By	
Date	June 30, 2024	Revision	R1
Proposal No.	02612N	Contract No.	
Inquiry No.		Order No.	

Design, Material, and Construction (continued)

Header (continued)					
Slope / Split	1% on last pass / No				
Plug material	SA 350 LF2 CL.1				
Gasket material	Soft Iron				
Nozzle	No.	Size, (in)	Rating/Facing		
Inlet	1	4	#300		
Outlet	1	2	#300		
Vent					
Drain					
Chemical Cleaning					
Min. Wall Thk.					
Tube					
Material	SA-334 6				
Tube outside diameter	(mm)	25.400			
Min wall thickness	(mm)	1.651			

No./Bundle		140	
Length	(m)	6.096	
Pitch	(mm)	69.850	
Layout		Triangular	
Fin			
Type		Extruded	
Material		Aluminum	
Thickness (Base / Tip)	(mm)	1 / 0.24	
Selection temp.	(C)		
Outside diameter	(mm)	57.150	
Fin density	(fin/meter)	433.1	
ASME Code, Sec. VIII, Div. 1			
Customer Specifications			

Mechanical Equipment

Fan		
Manufacturer	Axial Fans Int Srl (or equivalent)	
No./Bay	2	
RPM	(Revs/min.)	
Diameter	(ft)	7
No. of blades		
Angle	(degrees)	
Pitch adjustment	100% Manual	
Blade material	Aluminium	
Hub material	Manufacturer Standard	
@design temp	(kW)	
@min. ambient temp		
Tip speed		
Driver		
Type	Electrical	
Manufacturer	OME ELECTRIC OR AVL	
No./Bay		
Driver (1)	(kW)	7.5

RPM		1500	
Service factor			
Enclosure		Exec / IP55	
Voltage		400	
Phase		3	
Cycle		50	
Fan noise level	(dB)	max 85	
Speed Reducer			
Type		V- belt	
Manufacturer			
No./Bay		2	
Service factor			
Speed ratio			
Support			
Vib. switch		YES	
Enclosure			

Controls - Air Side

Air recirculation		Louvers	
Degree control of outlet process temp.		Positioner	
(Max. Cooling),+/-	/	Signal air pressure (bar)	
Action on control signal failure		From	To
Fan pitch		From	To
Louvers		Supply air pressure (bar)	
Actuator air supply		From	To
Fan		From	To

Shipping

Plot area (WxL)	(m)	2.65 x 6.4	Total weight, Dry / Wet	(Kg) (Based On HTRI)	11,800 / 12,300
Bundle weight	(kg)		Shipping	(kg)	
Bay	(kg)				

1) STD. nominated power.

3. INSTALLATION AND ERECTION

3.1 DESCRIPTIONS

The following documents should be consulted before undertaking erection:
- This Instruction Manual
- Outline Drawing
- Supporting Steel Structure Erection Diagram
- Fan Drive Machinery Diagram
- Service Walkway Assembly and Installation Diagram
- Parts and Hardware Lists

Erection Sequence:
1 - Anchoring Verification
- Verification of Pieces
- Pipe Rack Level

2 - Main Steel Structure
- Civil Engineering Level
- Assembling

3 - Fan Hoods
- Fan Plenum
- Fan Ring

4 - Fan & Drive
- Bearings
- Speed Reducer (Belt & Pulley)
- Fans
- Motors

5 - Bundles
- Lifting

6 - Louvers
- Assembly
- Adjustment

7 - Finishing
- Guard
- Ladder and Walkway
- Sealing Strips

3.2 ASSEMBLY PROCEDURE OF A FORCED DRAFT AIR-COOLER

Pre-Assembling on the Ground in Modular or Semi-Modular Way

Lifting of The Pre-Assembled Tube Bundle onto The Rack or Platform:
Stage 1 - Front View of a Forced Draft Air-Cooler Unit. (Figure 3-1)

A Column
B Bracing
C Beam
D Tube Bundle
E Louver
F Plenum
G Fan Ring
H Fan Guard
I Support Mechanism

Stage 2 - 3D View of Assembled Steel Structure (Figure 3-2)

Stage 3 - including:
1- Assembly Operation of the Fan Ring and Plenums on the Ground
2- Assembly Operation of the Plenums and Structures (Figure 3-4)

Stage 4 - Assembling the Mechanisms on the Ground on Temporary Irons to be supplied by Company in charge of Assembly Operation (Figure 3-5)

Stage 5 - Fastening of the Mechanisms under the Fan Ring and Plenums of the uneven Modules (Figure 3-6)
The mechanisms of the even units will be lifted onto the platforms to be installed there after the modules and units are lifted. The fans can be installed also on the uneven modules.

Stage 6 - Lifting of the Tube bundles and Louvers (Figure 3-7)

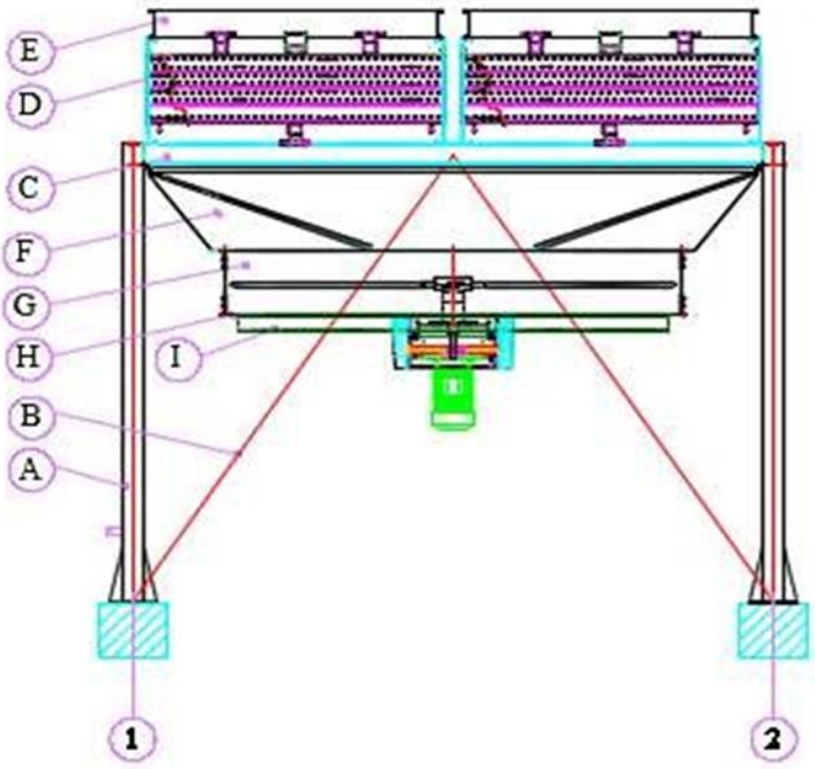


Figure 3-1

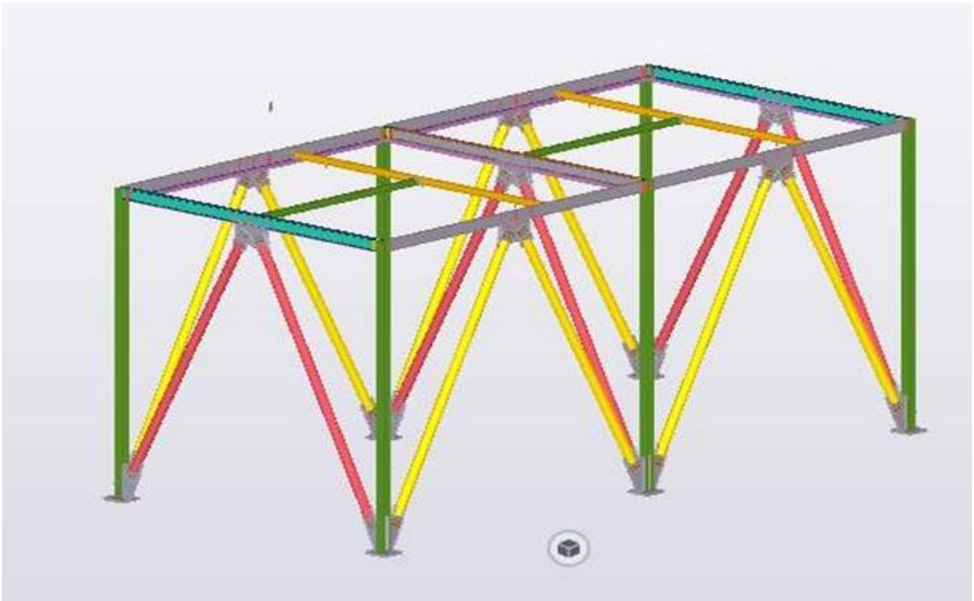


Figure 3-2

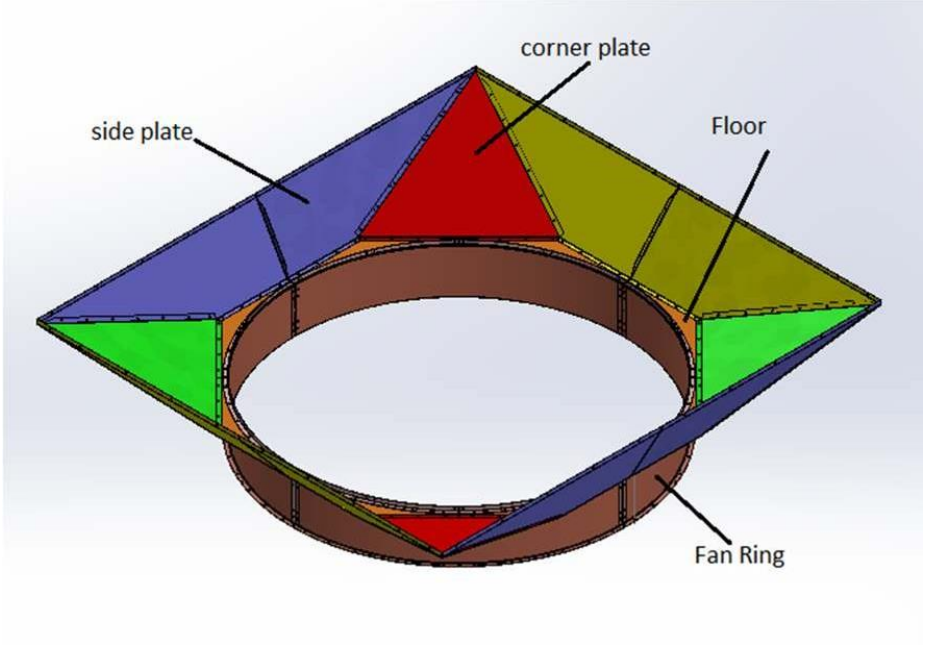


Figure 3-3

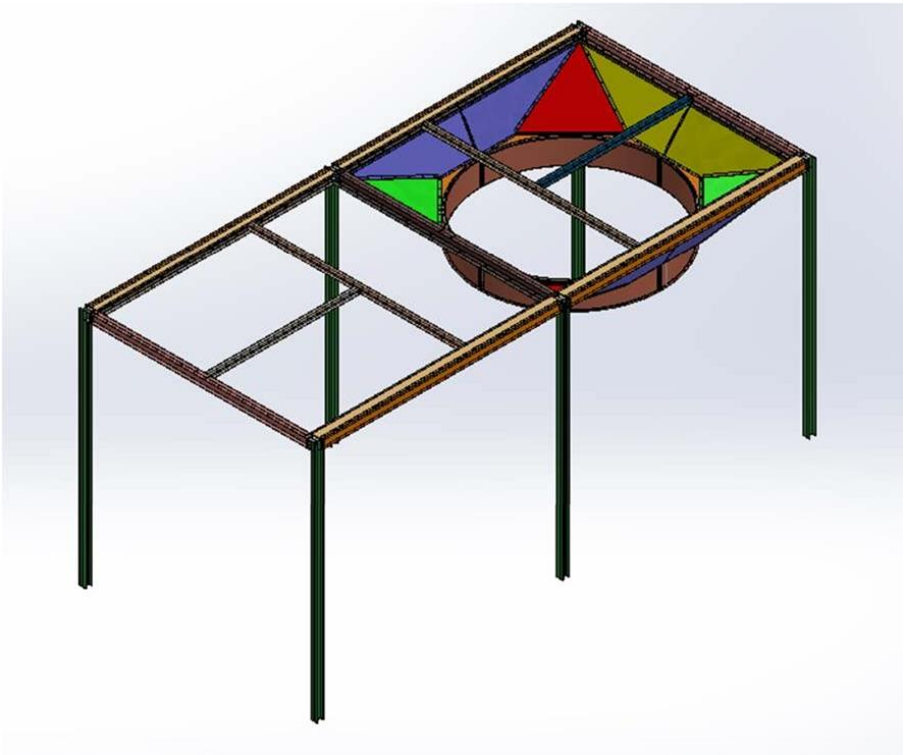


Figure 3-4

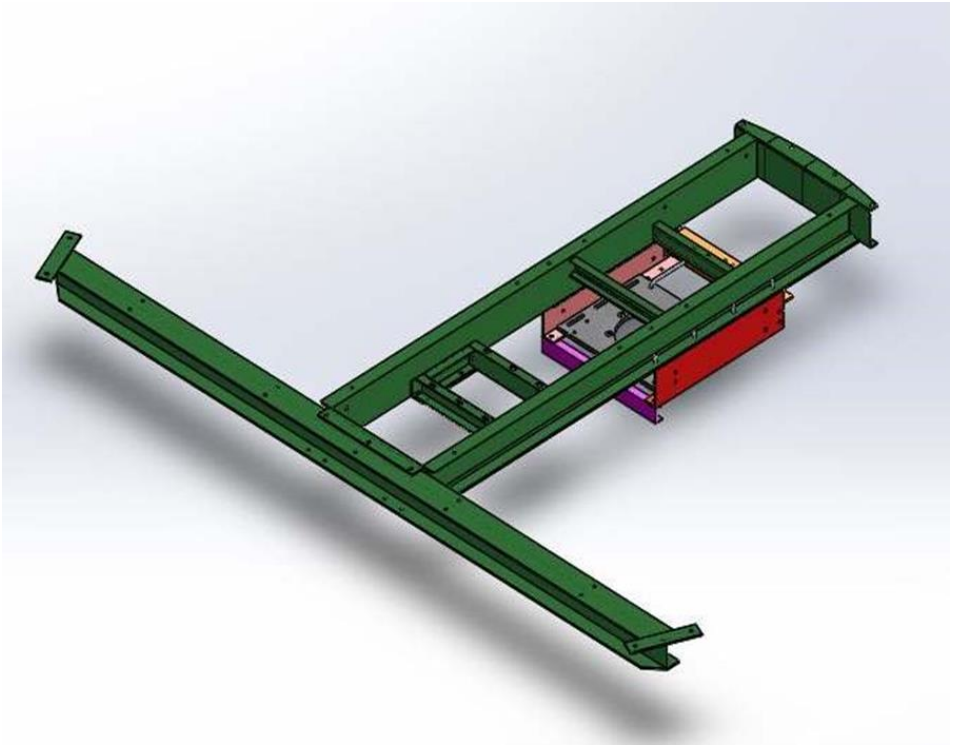


Figure 3-5

Figure 3-6

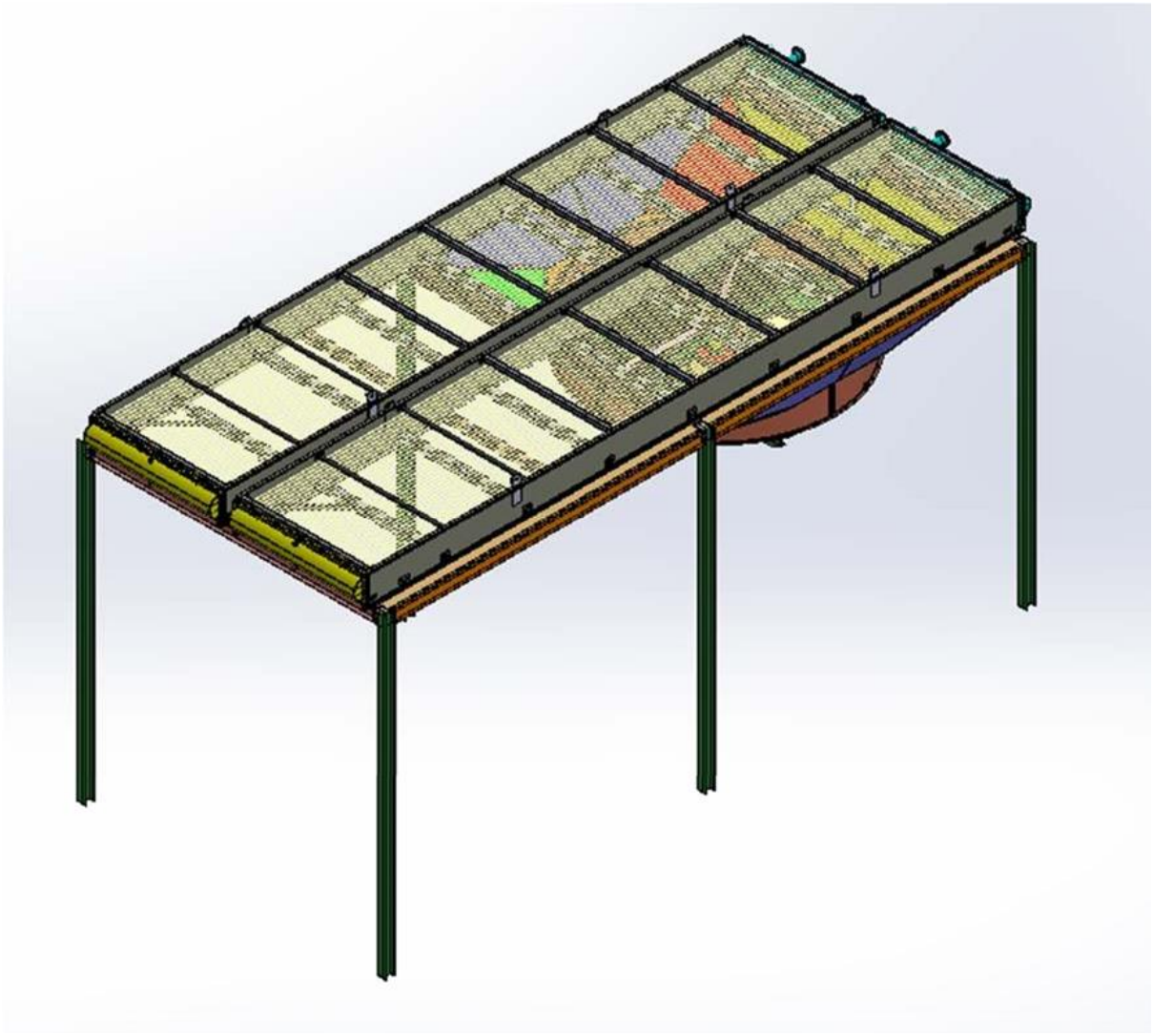


Figure 3-7

3-3 ANCHORING VERIFICATION

The foundations or supports (pipe rack) are to be supplied by the purchaser. They are to be in compliance with the dimensions shown on the DTT drawings as approved by the purchaser.

a) Foundation Case

The top surface of foundation footings/slabs shall be leveled within maximum tolerance of +0mm/-30mm from the elevation as specified by DTT. Anchor bolts must be arranged according to the purchaser (see limit of supply on drawings).

b) Substructure Case

The top surface of substructure which will be used as seating plan for items of equipment, as well as the holes drilled in it for bolts, must exactly comply with the dimensions shown on the DTT drawings approved by the purchaser.

The bolts to secure DTT items of equipment to the substructure top members are supplied by either DTT or the purchaser (see limit of supply on drawing).

IMPORTANT NOTE!

The erector must prior to undertaking erection work ensure that the substructure top surface is true leveled and flat, and they shall provide any shims required to obtain a true level seating plan.

3-4 MAIN STEEL STRUCTURE AND WALKWAY ASSEMBLY

The pieces of steel structure will be uncrated, picked out and verified with marks and quantities in regards to part lists.

The columns should be erected, if necessary, with shims under base plates so as to have their top flanges exactly at the elevation shown on DTT erection diagram. The cross beams, if any, as well as front and rear bracing members should be fitted then bolted. Finally, tighten the nuts of hook anchor bolts when bars have been previously embedded in concrete footings or place and grout the fishtail anchor bolts into concrete footing recesses.

For more information see “Steel Structure Drawing for Air Cooled Heat Exchanger (All Items)”.

WALKWAY ASSEMBLY

Consult DTT outline drawing, Platform installation diagram(s) and part list.

A. Bolt walkway frame brackets to the main steel structure columns or, in some cases, to the tube bundle frame members.

B. Bolt the walkway stringers onto walkway brackets or supports.

C. Place and secure the flooring sections using hardware or screws supplied for that purpose.

NOTE! When flooring consists of dropped-tear or checked/serrated steel plates, they are sometimes shop welded onto walkway supporting structure.

D. Install and secure ladders, after fitting the safety cages, if provided.

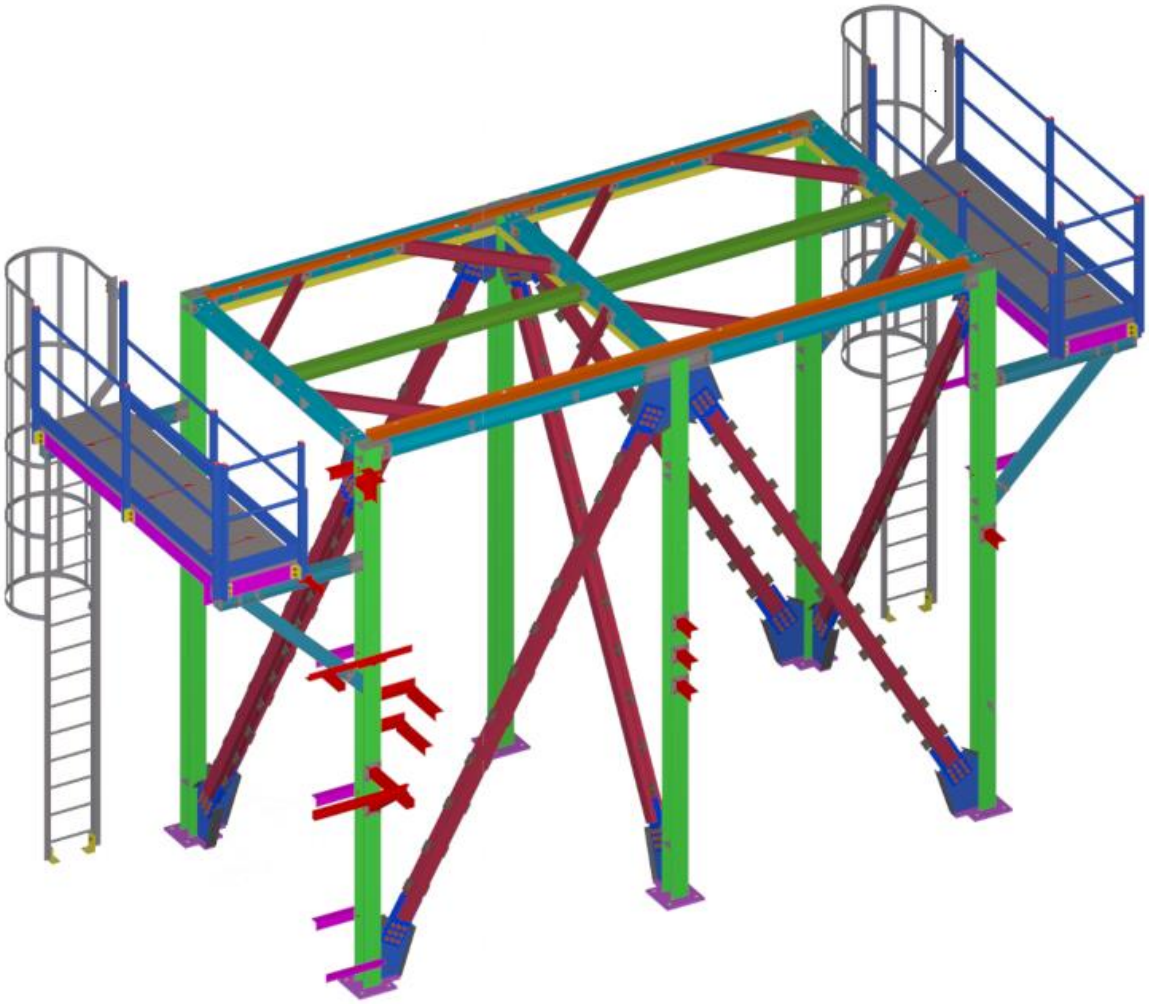
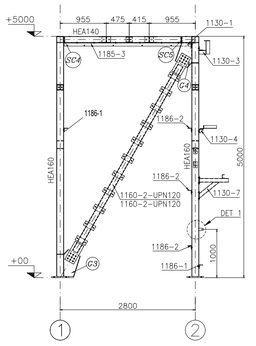


Figure 3-8 Steel Structure of Air Cooler
For Reference See “Steel Structure Drawing”
Document No.: EI027-DMF-VD-ST-DWG-013



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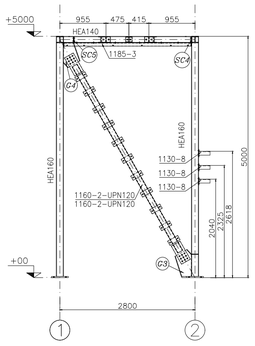

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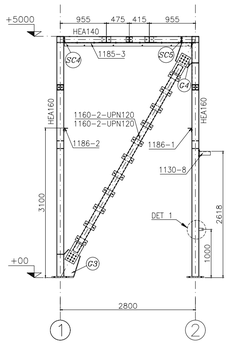

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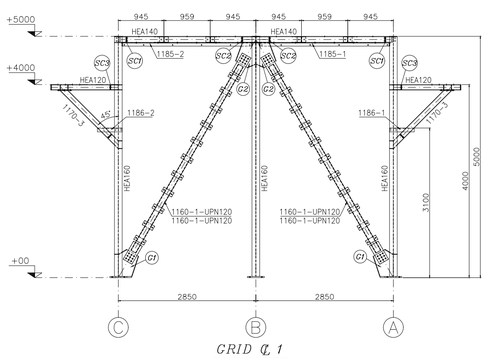

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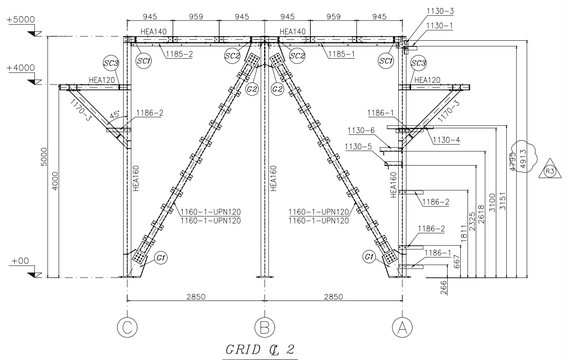

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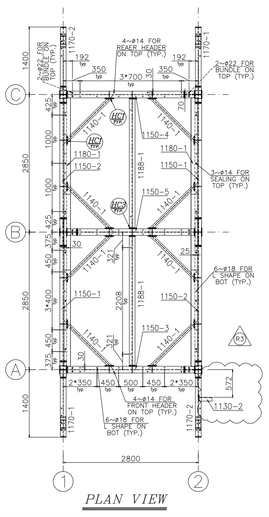
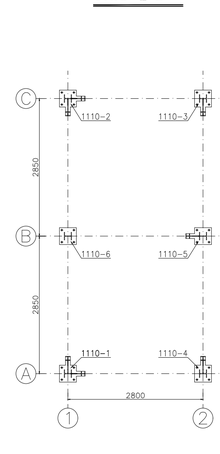
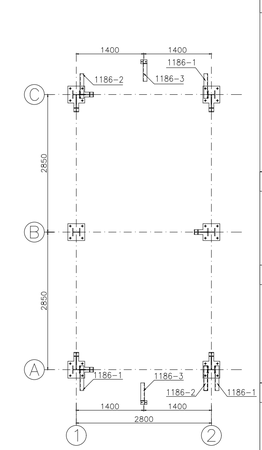


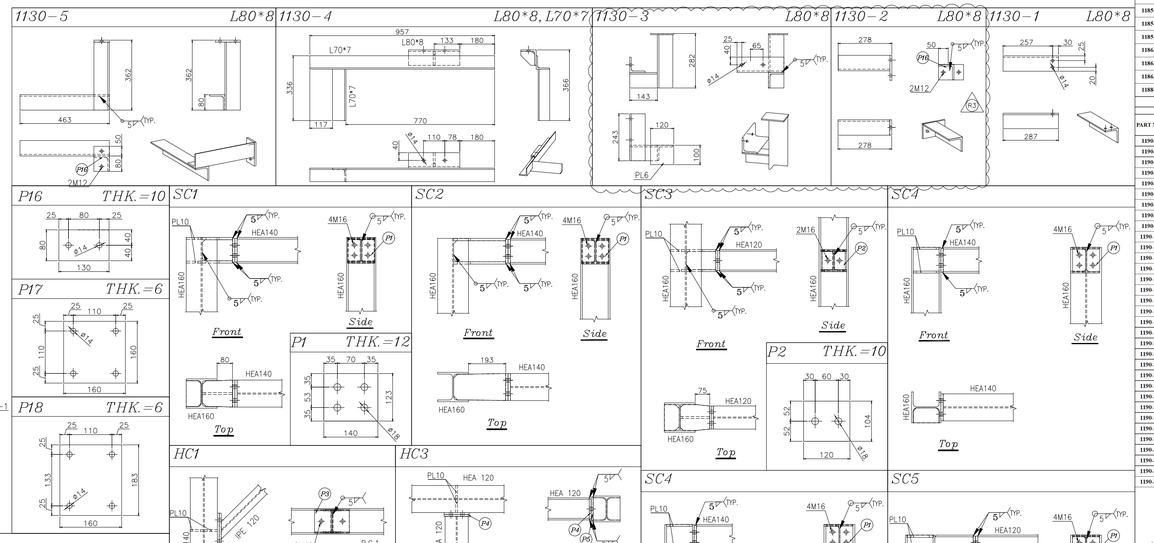
PLAN VIEW

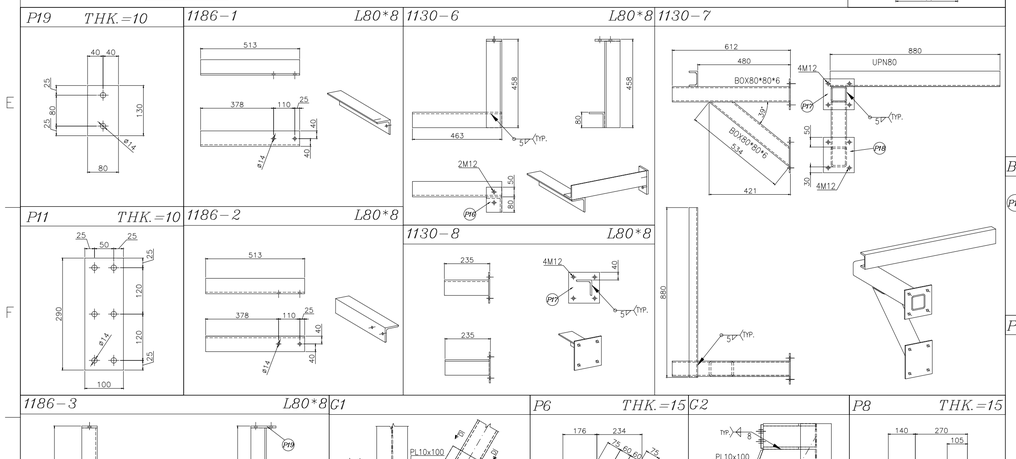


Base Plate Plan



Cable Try Support Plan





TOTAL UNITS =2

PART LIST FOR 1 UNIT

PART NO.	DESCRIPTION	PROFILE	DIMENTION DIA (mm)	LENGTH (mm)	WIDTH (mm)	THK (mm)	MATERIAL	QTY.	UNIT WEIGHT (kg)	TOTAL WEIGHT (kg)	REV.
1110-1	COLUMN ASS.	HEA160		5000	-	-	ST-37(PAINTED.)	1	247.3	247.3	
1110-2	COLUMN ASS.	HEA160		5000	-	-	ST-37(PAINTED.)	1	246.8	246.8	
1110-3	COLUMN ASS.	HEA160		5000	-	-	ST-37(PAINTED.)	1	251.8	251.8	
1110-4	COLUMN ASS.	HEA160		5000	-	-	ST-37(PAINTED.)	1	249.8	249.8	
1110-5	COLUMN ASS.	HEA160		5000	-	-	ST-37(PAINTED.)	1	271.4	271.4	
1110-6	COLUMN ASS.	HEA160		5000	-	-	ST-37(PAINTED.)	1	269.6	269.6	
1130-1	PIPE SUPPORT ASS.	L80*8		257	-	-	ST-37(PAINTED.)	1	2.8	2.8	
1130-2	PIPE SUPPORT ASS.	L80*8		278	-	-	ST-37(PAINTED.)	1	3.4	3.4	
1130-3	PIPE SUPPORT ASS.	L80*8		282	223	-	ST-37(PAINTED.)	1	6.9	6.9	
1130-4	PIPE SUPPORT ASS.	L80*8 , L70*7		957	336	-	ST-37(PAINTED.)	1	11.9	11.9	
1130-5	PIPE SUPPORT ASS.	L80*8		463	362	-	ST-37(PAINTED.)	1	8.7	8.7	
1130-6	PIPE SUPPORT ASS.	L80*8		463	458	-	ST-37(PAINTED.)	1	9.6	9.6	
1130-7	PIPE SUPPORT ASS.	BOX80*80*8, UPN80		800	612	-	ST-37(PAINTED.)	1	25.2	25.2	
1130-8	PIPE SUPPORT ASS.	L80*8		235	-	-	ST-37(PAINTED.)	4	3.4	13.6	
1140-1	HORIZENTAL BRACING ASS.	IPE120		1358	-	-	ST-37(PAINTED.)	8	16.4	131.2	
1150-1	BEAM ASS.	HEA140		2393	-	-	ST-37(PAINTED.)	2	67.5	135	
1150-2	BEAM ASS.	HEA140		2393	-	-	ST-37(PAINTED.)	2	67.5	135	
1150-3	BEAM ASS.	HEA140		2437	-	-	ST-37(PAINTED.)	1	71.1	71.1	
1150-4	BEAM ASS.	HEA140		2437	-	-	ST-37(PAINTED.)	1	71.1	71.1	
1150-5	BEAM ASS.	HEA140		2437	-	-	ST-37(PAINTED.)	1	75.8	75.8	
1160-1	BRACING ASS.	UPN120		4934	-	-	ST-37(PAINTED.)	8	97.2	777.6	
1160-2	BRACING ASS.	UPN120		4914	-	-	ST-37(PAINTED.)	6	96.9	581.4	
1170-1	WALKWAY SUPPORT ASS.	HEA120		1235	-	-	ST-37(PAINTED.)	2	27.9	55.8	
1170-2	WALKWAY SUPPORT ASS.	HEA120		1235	-	-	ST-37(PAINTED.)	2	27.9	55.8	
1170-3	WALKWAY SUPPORT ASS.	IPE120		1439	-	-	ST-37(PAINTED.)	4	17.5	70	
1180-1	SEALING ASS.	PLATE		5570	182	2	ST-37(PAINTED.)	2	15.7	31.4	
1185-1	L SHAPE PLENUM	L70*7		2670	-	-	ST-37(PAINTED.)	2	19.7	39.4	
1185-2	L SHAPE PLENUM	L70*7		2670	-	-	ST-37(PAINTED.)	2	19.7	39.4	
1185-3	L SHAPE PLENUM	L70*7		2628	-	-	ST-37(PAINTED.)	4	19.4	77.6	
1186-1	CABLE TRY SUPPORT ASS.	L80*8		513	-	-	ST-37(PAINTED.)	3	5	15	
1186-1	CABLE TRY SUPPORT ASS.	L80*8		513	-	-	ST-37(PAINTED.)	4	5	20	
1186-1	CABLE TRY SUPPORT ASS.	L80*8		980	446	-	ST-37(PAINTED.)	2	13.7	27.4	
1188-1	TIE ROD BEAM ASS.	HEA120		2690	-	-	ST-37(PAINTED.)	2	55.2	110.4	
							TOTAL WEIGHT (kg)			4139.2	

LIST OF BOLTS & NUTS & WASHERS FOR 1 UNIT

PART NO.	DESCRIPTION	PROFILE	DIMENTION DIA (mm)	LENGTH (mm)	WIDTH (mm)	THK (mm)	MATERIAL	QTY.	UNIT WEIGHT (kg)	TOTAL WEIGHT (kg)	REV.
1190-1		-	M16	50	-	-	DIN 933-8.8 (DACROMET.)	56	-	-	
1190-2	for BEAM ASS.	-	M16	-	-	-	DIN 934-8 (DACROMET.)	56	-	-	
1190-3		-	A17	-	-	-	DIN 125A-ST (DACROMET.)	112	-	-	
1190-4		-	M20	70	-	-	DIN 933-8.8 (DACROMET.)	126	-	-	
1190-5		-	M20	-	-	-	DIN 934-8 (DACROMET.)	126	-	-	
1190-6	for BRACING ASS.	-	A21	-	-	-	DIN 125A-ST (DACROMET.)	252	-	-	
1190-7		-	M16	45	-	-	DIN 933-8.8 (DACROMET.)	154	-	-	
1190-8		-	M16	-	-	-	DIN 934-8 (DACROMET.)	154	-	-	
1190-9		-	A17	-	-	-	DIN 125A-ST (DACROMET.)	308	-	-	
1190-10	for HORIZENTAL BRACING ASS.	-	M16	45	-	-	DIN 933-8.8 (DACROMET.)	32	-	-	
1190-11		-	M16	-	-	-	DIN 934-8 (DACROMET.)	32	-	-	
1190-12		-	A17	-	-	-	DIN 125A-ST (DACROMET.)	64	-	-	
1190-13	for WALKWAY SUPPORT ASS.	-	M16	45	-	-	DIN 933-8.8 (DACROMET.)	8	-	-	
1190-14		-	M16	-	-	-	DIN 934-8 (DACROMET.)	8	-	-	
1190-15		-	A17	-	-	-	DIN 125A-ST (DACROMET.)	16	-	-	
1190-16		-	M12	40	-	-	DIN 933-8.8 (DACROMET.)	40	-	-	
1190-17		-	M12	-	-	-	DIN 934-8 (DACROMET.)	40	-	-	
1190-18		-	A13	-	-	-	DIN 125A-ST (DACROMET.)	80	-	-	
1190-19	for TIE ROD BEAM ASS.	-	M16	45	-	-	DIN 933-8.8 (DACROMET.)	8	-	-	
1190-20		-	M16	-	-	-	DIN 934-8 (DACROMET.)	8	-	-	
1190-21		-	A17	-	-	-	DIN 125A-ST (DACROMET.)	16	-	-	
1190-22	for PIPE SUPPORT ASS.	-	M12	40	-	-	DIN 933-8.8 (DACROMET.)	36	-	-	
1190-23		-	M12	-	-	-	DIN 934-8 (DACROMET.)	36	-	-	
1190-24		-	A13	-	-	-	DIN 125A-ST (DACROMET.)	72	-	-	
1190-25	for CABLE TRY SUPPORT ASS.	-	M12	40	-	-	DIN 933-8.8 (DACROMET.)	18	-	-	
1190-26		-	M12	-	-	-	DIN 934-8 (DACROMET.)	18	-	-	
1190-27		-	A13	-	-	-	DIN 125A-ST (DACROMET.)	36	-	-	
1190-28	for L SHAPE PLENUM ASS.	-	M16	45	-	-	DIN 933-8.8 (DACROMET.)	48	-	-	
1190-29		-	M16	-	-	-	DIN 934-8 (DACROMET.)	48	-	-	
1190-30		-	A17	-	-	-	DIN 125A-ST (DACROMET.)	96	-	-	
1190-31	for SEALINGASS.	-	M12	30	-	-	DIN 933-8.8 (DACROMET.)	12	-	-	
1190-32		-	M12	-	-	-	DIN 934-8 (DACROMET.)	12	-	-	
1190-33		-	A13	-	-	-	DIN 125A-ST (DACROMET.)	24	-	-	

NOTES:

1- ALL DIMENSIONS ARE IN MILLIMETER .

2-ALL PARTS SHALL PAINTED ACCORDING TO EI027-DMF-VD-QC-PRO-024

3- BOLTS & NUTS & WASHERS SHALL BE DACROMET IN ACCORDANCE WITH ASTM - A153 OR EN ISO 1461

4- WELD: CONTINUOUS WELD.
MIN. HEIGHT OF FILLET WELD =0.7 x MIN. THK.
< MAX. THK. , IF MAX.THK.< 7mm
≤ MAX. THK.-1.5 , IF MAX.THK.> 7mm

TOLERANCES						
THE FOLLOWING VALUES ARE APPLICABLE TO THE DIMENSIONS THAT ARE NOT PROVIDED WITH TOLERANCES ON DRAWING						
NOMINAL DIMENSIONS PER MILLIMETER STEPS		0 200	201 800	801 2000	2001 5000	5001 & +
TOLERANCES	±	2	3	5	6	7
TOLERANCE ON CENTER DISTANCES ± 1.5						
THE TOLERANCES SHOWN HERE ARE NOT CUMULATIVE						

General Arrangement Drawing	1158-A01-1000-00 / EI027-DMF-VD-ME-DWG-003
Bundle Frame Drawing	1158-A01-2400-00 / EI027-DMF-VD-ME-DWG-007
Plenum Drawing	1158-A01-5110-00 / EI027-DMF-VD-ME-DWG-011
Header Walkway Drawing	1158-A01-1200-00 / EI027-DMF-VD-ST-DWG-014
Ladder Drawing	1158-A01-1520-00 / EI027-DMF-VD-ST-DWG-015

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY	APPROVED BY	FINAL APPROVED BY
R3	12/30/2024	ISSUED FOR APPROVAL	J.M.	J.B.L	J.B.L	A.GHZ
R2	12/28/2024	ISSUED FOR APPROVAL	J.M.	J.B.L	J.B.L	A.GHZ
R1	11/13/2024	ISSUED FOR APPROVAL	J.M.	J.B.L	J.B.L	A.GHZ
R0	09/01/2024	ISSUED FOR APPROVAL	J.M.	J.B.L	J.B.L	A.GHZ

CLIENT:

CONTRACTOR:

PROJECT :
AIR COOLER FOR
Toase-ehe Park Sanati Gohar Ofogh Petrochemical Co.
Steel Structure Drawing
1158-A01-1100-00

DWG. NO.	EI027-DMF-VD-ST-DWG-013	
SCALE : NTS	SIZE : A1	REV. : R3

Damafin thermal technology
Factory : Km 14 special Karaj road

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3-5 FAN HOOD

3-5-1 Fan Ring Assembly

- On the floor, position the 4 quarter sections of fan ring.

- Connect the 4 quarter sections together, using the fixing plates with provided bolts and nuts. (See Fan Ring Drawing)

See Figure 3-9

3-5-2 Plenum Assembly on the Assembled Fan Ring

- Place the 4 quarter sections of floor plate (octagonal plates) on the corresponding side of the assembled fan ring.

- The octagonal plates junction shall be positioned at a 45-degree angle relative to the junction of fan ring sections.

- Install the angle brackets, superimposing them over the quarter floor. Link the angle brackets, quarter floor and ring with the hardware.

- Position the fan hood side sheets (trapezoid plates) to rest over the quarter floor plates. Link them to each other with the inside clamps. Maintain the side sheets at the ends using support parts (wooden blocks).

NOTE! The side sheets are symmetrical.

- Position the corner sheets (triangular plates) to rest over the quarter floor and link with the quarter floor and side sheets. (**WARNING! The corner sheet butt plates are located outside the fan hood**). The corner sheets are symmetrical.

The ring is locked after installation of the blades and adjustment of a correct clearance on the blade tip.

The butt plates enable the ring to be widened.

For storage purpose (according to the fan hood geometry) it is possible to stack 3-4 completely assembled plenums.

The screws are fitted with 2 washers, the nuts are located inside the plenum.

Fit the motors, the bearings, the fan pulleys and hub and accessories onto the machinery mount and assemble the unit according to the space requirement drawing(s).

See Figure 3-10 & 3-11

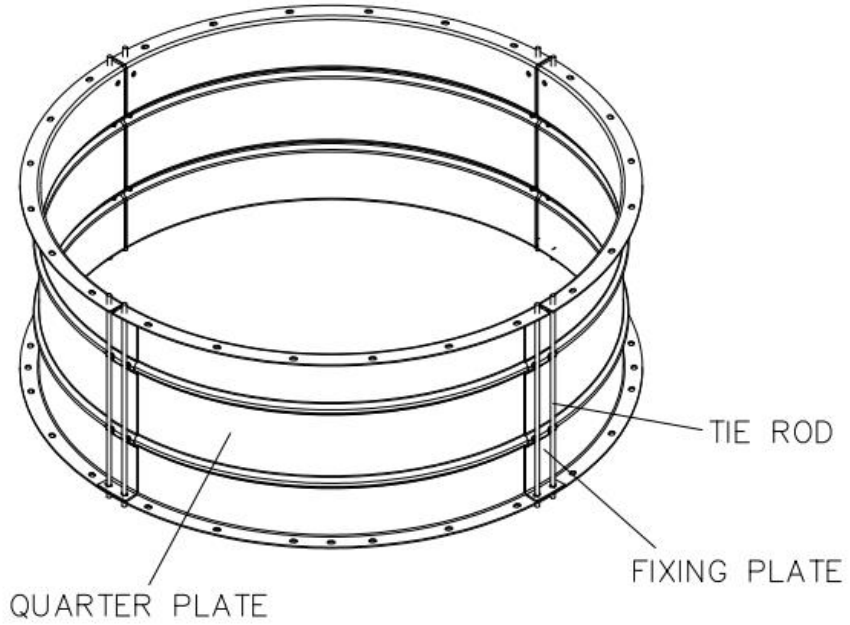
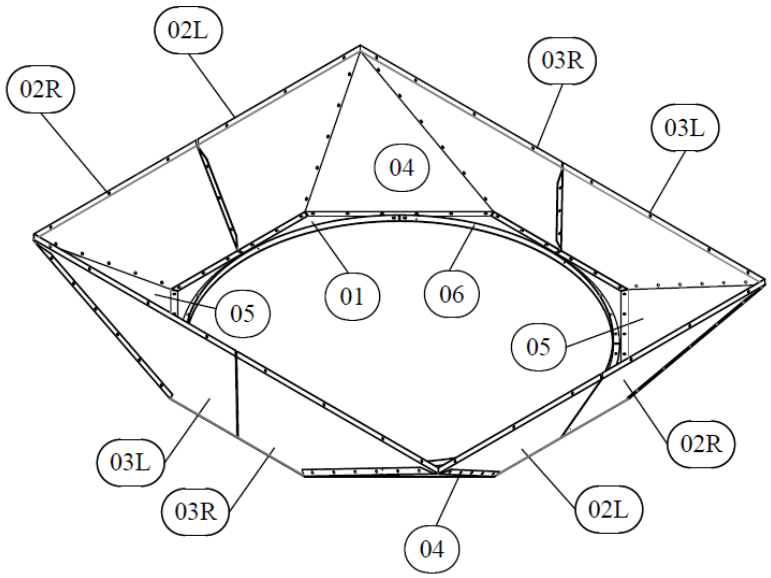


Figure 3-9 Assembled Fan Ring (All Items)



PART NO.	DESCRIPTION
01	Floor Plate (Octagonal Plate)
02R/02L/03R/03L	Side Plate (Trapezoid Plate)
04/05	Corner Plate (Triangular Plate)

Figure 3-10 Double Section Side Plate Plenum (All Items)

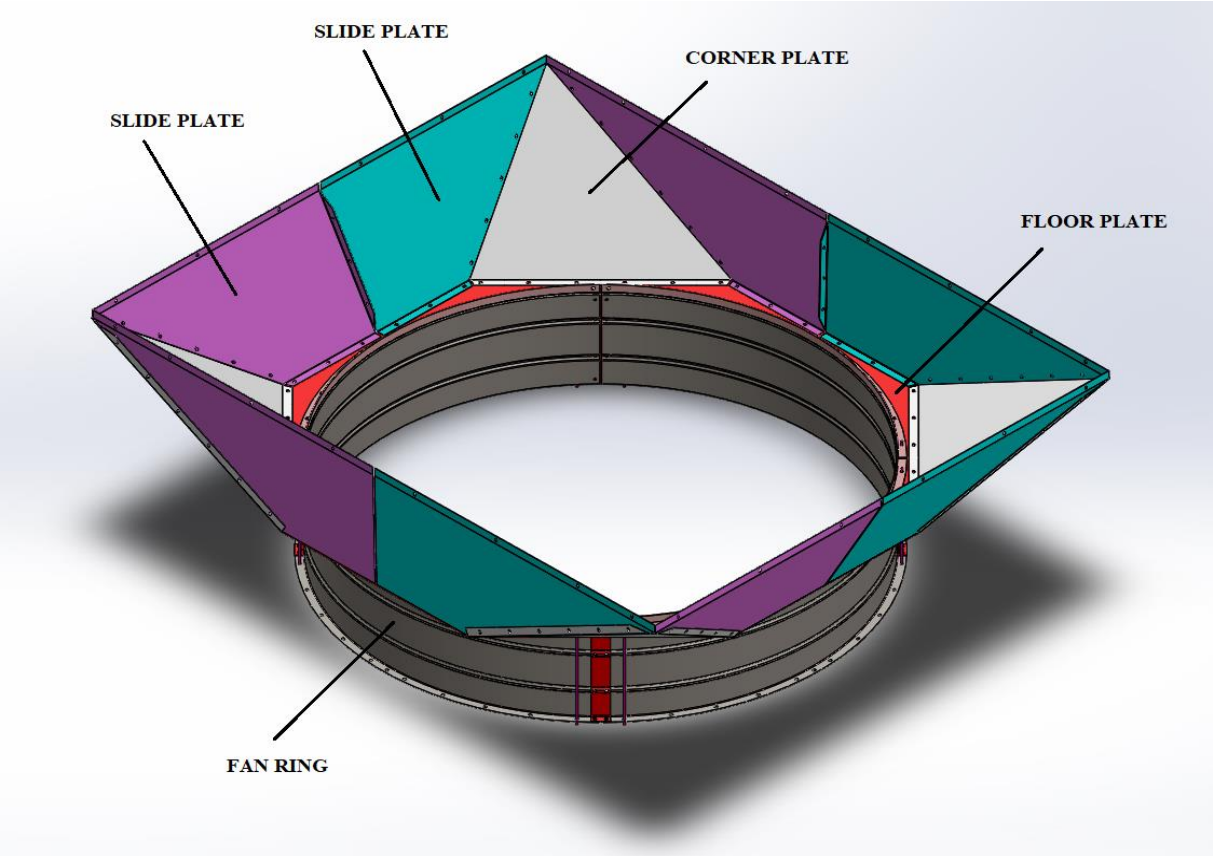


Figure 3-11 Assembled Fan Hood (Plenum + Fan Ring)

3-6 INSTALLATION OF FORCED DRAFT FAN BELT ARRANGMENT

3-6-1 INSTALLATION STEPS

A. Mechanism support, fan ring and plenum are to be assembled on the floor before being lifted and installed on the structure under the bundle frame. (See Figure 3-12)

B. The mechanism support shall be horizontally level by means of tie beams. (See Figure 3-13)

C. After step B, the screws connecting different sections of plenum together and also the screws connecting plenum to fan ring shall be completely tightened.

D. Install complete fan shaft assembly (Shaft+Bearing Blocks) on the mechanism support, but don't tighten the bolts. (See Figure 3-14)

Note! The fan shaft comes pre-assembled to the site.

E. Center the fan shaft with regard to the fan ring and make sure of its vertical alignment. After that, tighten the bolts connecting fan shaft to the mechanism support.

F. Install the driven pulley on the fan shaft.

G. Equip the motor with its motor support plate, the driver pulley and the motor support frame. (See Figure 3-15)

H. Hoist the motor assembly (electric motor + motor plate + motor support frame) and bolt it to mechanism support.

I. Slide the fan propeller hub to let it rest on shaft shoulder. Tighten hub securing bolts, then install the fan blades at angle setting required on project's thermal or fan datasheets. (See Figure 3-16)

(Refer to fan manufacturer's instructions attached in section 5.)

WARNING! Set the fan ring inside diameter to obtain 6-10 mm or 8-15 mm tip clearance for reinforced resin or aluminum blades respectively.

J. Unscrew the grease nipples from the fan shaft bearings to screw them into the lubrication block fitted on the side of the motor supporting frame (See Figure 3-17). Then connect copper (or stainless steel) lubricating lines between the two shaft bearings and the block using the fittings provided for this purpose.

K. Then install the belt of the fan drive systems.

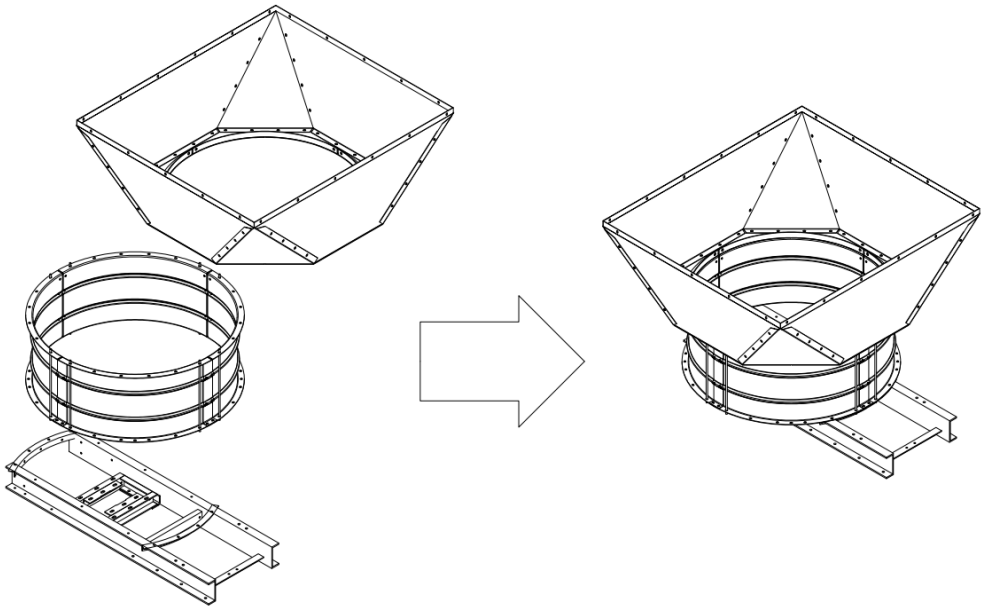


Figure 3-12 Assembly of Mechanism Support, Fan Ring & Plenum on the Floor

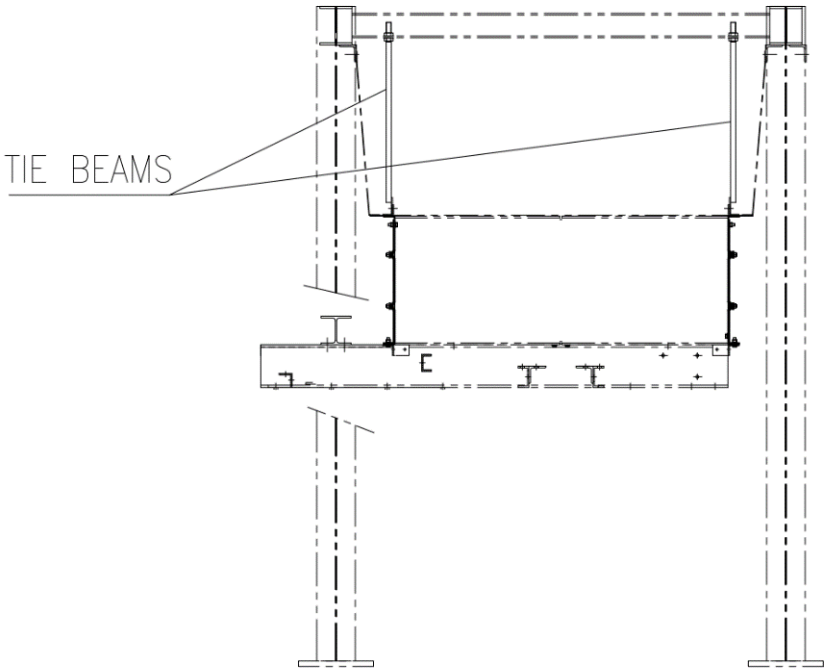


Figure 3-13 Connecting Support Mechanism + Fan Ring + Plenum
to Structure and Leveling by Tie Beams

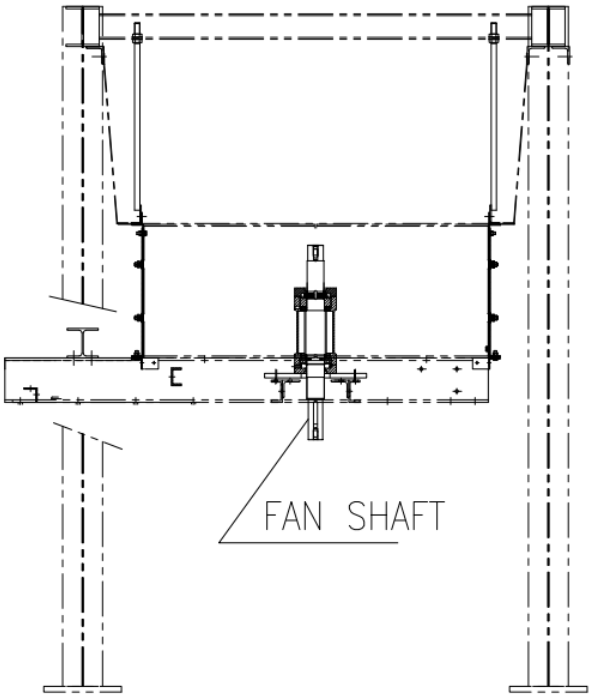


Figure 3-14 Installation of Fan Shaft on Mechanism Support

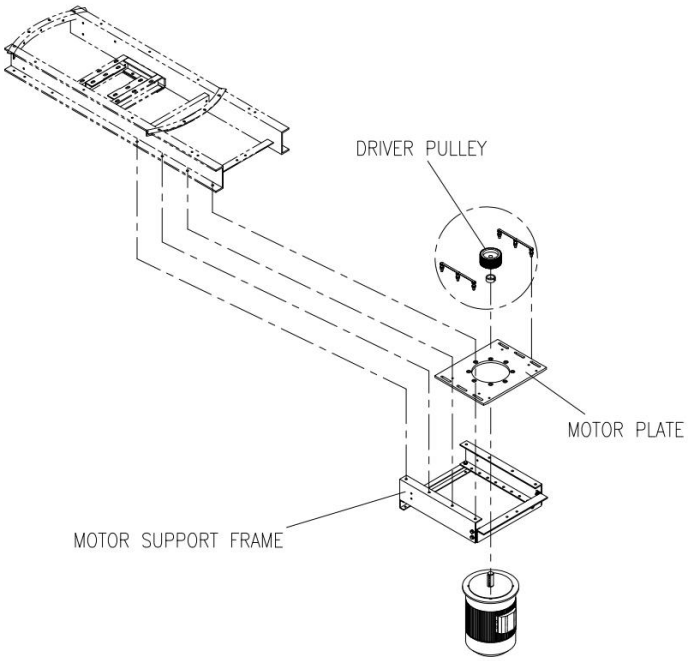


Figure 3-15 Motor Installation on Mechanism Support

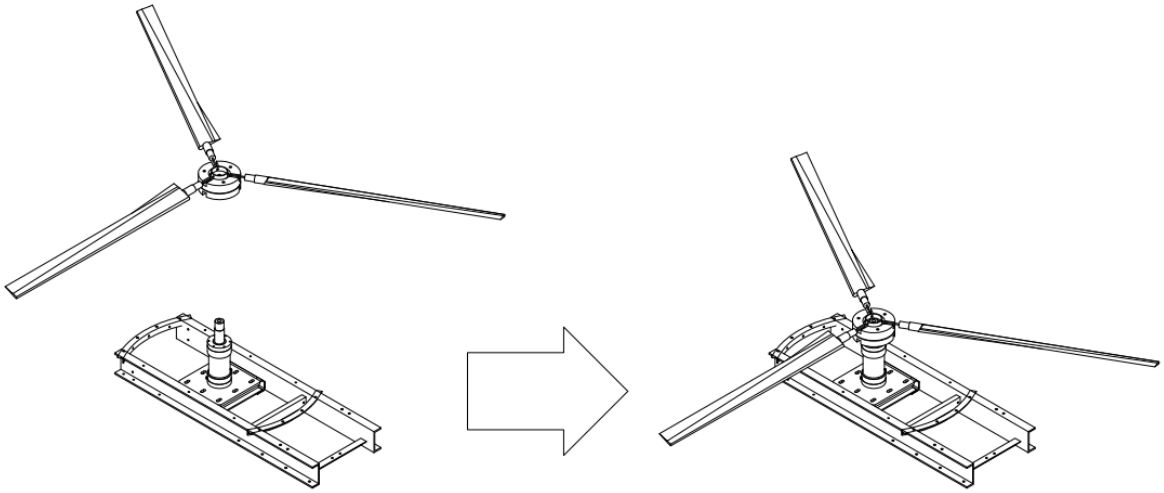


Figure 3-16 Fan Blade Assembly on Shaft Shoulder

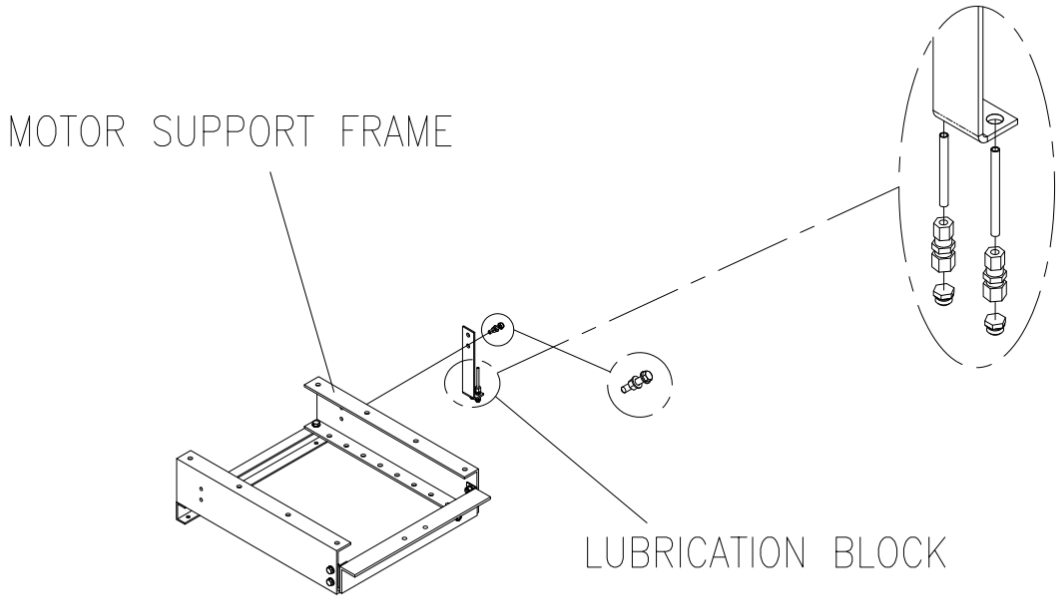


Figure 3-17 Lubrication Block Location

3-7 BELT DRIVE INSTALLATION

a. Paying special attention to the Machinery Diagram, make sure that motor baseplate is properly resting on the supporting slide members.

b. Align the driven pulley on the driving pulley. Both pulleys must be within one horizontal plane (see instruction on the following page).

c. After locking the pulley mounting hub bolts, check alignment again and correct if needed.

d. Loosen the motor securing bolt and slide the motor towards the fan shaft. Place the belts (see instructions on the following page) and tension them by means of the tensioning screws.

e. Turn fan propellers by hand to ensure that they operate freely and there are no obstacles to their starting up. Switch on the motors for an instant to check that the direction of rotation and blade positions are compatible. The leading edge is the thicker edge, which must be downwards. For reverse rotation, the motor supply phases should be reversed.

f. Check the motor power required, which must comply with the data (see the following page). Should power requirements not comply with specifications, adjust the blade angle accordingly.

g. Finally, install the belt guards.

3-7-1 PULLEY ALIGNMENT DIAGRAM

Align the driven pulley on the driving pulley. Both pulleys must be within one horizontal plane. After locking the pulley mounting hub bolts, check alignment again and correct if needed. (See figure 3-18)

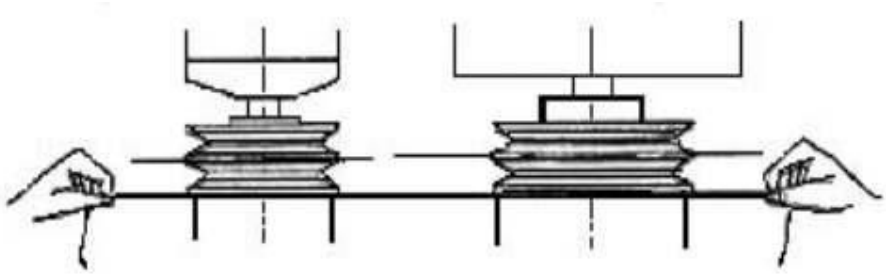


Figure 3-18 Pulley Alignment

3-7-2 INSTALLATION OF BELTS

Belts must be installed without induced forces. Some severe stresses would be placed upon belts if they are forced over the sheave flanges. It can seriously damage the cover fabric and the high quality, low stretch tension members.

3-7-3 BELT TENSIONING

The load C is to be applied at the right angle at the center of the belt span (See Figure 3-19). The drive must be tensioned until the calculated deflection F_a is obtained.

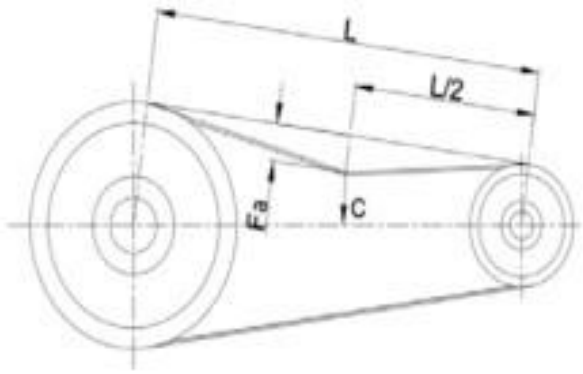


Figure 3-19 Belt Tensioning Load

For a first tension (new belts), take into account C for new belts. See Table 3-1 to check the values required to proceed with the following tensioning procedure:
Place gauge with load hook “A” in the center of the belt span with slider “B” overhanging to next the belt in set as illustrated. (See Figure 3-20)
Apply appropriate load (see Table 3-1) to belt section. At this load upper end of slider “B” should just come into contact with top of next belt in set for deflection F_a.

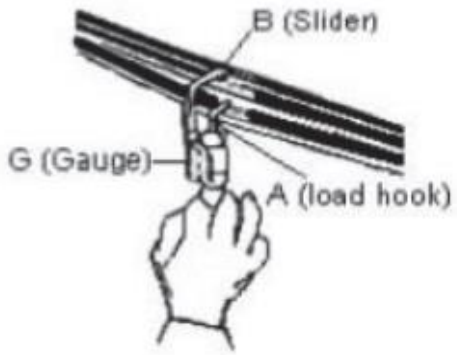


Figure 3-20 Belt Tensioning Procedure

Table 3-1

Item No.	BELT TYPE	TEST LOAD (N)	DEFLECTION (mm)
AIR COOLER	V-Belt Profile: NARROW (SPA)	New: 69 Used: 60	New: 11.6 Used: 11.6

3-7-4 CHECKING THE BELT DRIVES

a. Check the free rotation of fan by turning the fan propeller manually.

b. Check that whether belts are properly tensioned.

c. Switch on the motors for an instant to check if the direction of rotation is consistent with the blade angle and to ensure that there is no excessive vibration and overheating. Also record power requirements (measure current, power, etc.) and check if they comply with specifications.

d. After 5 to 10 hours in operation, take up the belt tension as required.

Procedure to Adjust Electric Fan Drive Motor Current Absorbed with Unit Being Shut-Down

NOTATION

$P = Absorbed\ Fan\ Power\ (kW) - Refer\ to\ Fan\ Datasheet$

$U = Line\ Voltage$

$I = Absorbed\ Current, Measured\ at\ Site\ while\ Fan\ Working$

$I_s = Calculated\ Absorbed\ Current$

$I_r = Absorbed\ Current, Corrected\ for\ Different\ Fan\ Blade\ Pitch\ Angle$

$E_m = Motor\ Efficiency$

$E_d = Drive\ Efficiency$

$PF = Power\ Factor$

$K = Correction\ Factor\ for\ Fan\ Blade\ Pitch\ Angle$

$T_c = Deliver\ Air\ temperature$

$T_a = Fan\ Outlet\ Air\ Temperature, Measure\ at\ Site$

CALCULATING ABSORBED CURRENT UNDER OPERATING CONDITION

- ***Item No.:*** **Air Cooler(@ Min. Temperature)**

- Fan Data
  P (Fan Absorbed Power) = 4.5 kW
  E_d (Drive Efficiency) = 95 % (V- Belt)
- Motor Data
  E_m (Motor Efficiency) = 90.4 %
  PF (Power factor) = 0.84

$$I_s = \frac{1000 \times P}{\sqrt{3} \times U \times PF \times E_d \times E_m}$$

$$I_s = \frac{1000 \times 4.5}{\sqrt{3} \times 400 \times 0.84 \times 0.95 \times 0.904} = 9.2\ A$$

CORRECTING CALCULATED ABSORBED CURRENT FOR FAN PITCH ANGLE

$$I_r = I_s \times K$$

$$K = \frac{273 + T_c}{273 + T_a}$$

For a forced draft unit, T_c equals the inlet air temperature (the lesser of the two specified on fan datasheet). If "I" measured during operation is different from I_r, adjust fan blade pitch so as to achieve I_r.

WARNING!

The "I" measured during operation shall never be exceeding the rated current specified on motor nameplate. If this happens, please inform DTT.

3-8 TUBE-BUNDLE INSTALLATION

When lifting a very large unit, it is recommended to use a 4-leg sling arrangement of sufficient length and place cross-bars between the lifting lugs to prevent any warp to tube-bundle frame (refer to figure 3-21).

Very large tube bundles are supplied by DTT equipped with cross bars between the lifting lugs. When bundles are delivered uncrated two by two, only the upper tube-bundle is equipped with cross bars (those are to be removed for handling the second tube-bundle).

Finally, remove transport temporary clips from tube-bundle frame and protective material from fin-tube layers as well as the cross bars.

IMPORTANT NOTE!

To avoid any damage to fin-tubes, refer to recommendations on diagram.
When the items are equipped with heating bundle, it is necessary to fix them under tube-bundle units; using special hardware components itemized in DTT part lists before lifting them on steel structure.

VERIFICATION OF BUNDLE INSTALLATION

Check that bolts connecting the <u>sliding header</u> to the side frame are removed after installation to allowe the free expansion of the tubes during operation.

Check that the protection material had been removed and do not get in the way of air flow. If required check that the sealing sheets are set between the bundle of the same bay to avoid the bypass of cooling air.

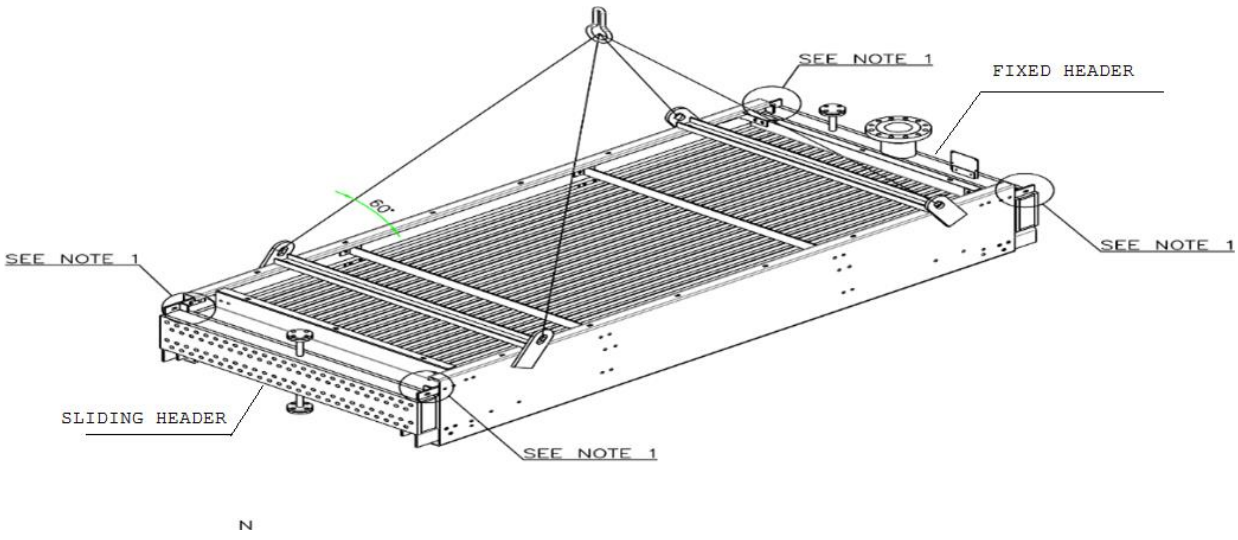


Figure 3-21

Note 1: Bolts which are used for fixing header to side frame should be locked during transportation. But make sure to remove these bolts on the <u>sliding header</u> side to allow free expansion of tubes during operation.

Ref : ECA201

ÉLINGUE CÂBLE 2 BRINS BOUCLES COSSÉES MANCHONNÉES ALU

Conforme à la norme EN 13414-1

CROCHETS À LINGUET (Réf. ECA201) / CROCHETS À VERROUILLAGE AUTOMATIQUE (Réf. ECA202)

Ref : ACCOL

Ref : ACCVO

Désignation	Ø câble mm	CMU en kg 0°<β≤45° 0°<α≤90° Facteur 1,4	CMU en kg 46°<β≤60° 91°<α≤120° Facteur 1	Dimensions maille A x B x Ø d mm	Passage crochets ECA201	Passage crochets ECA202	Longueur / Poids mini réalisable m	Longueur / Poids mini réalisable kg (ECA201)	Longueur / Poids mini réalisable kg (ECA202)	Poids du m + kg
08	8	950	700	120 x 70 x 16	34	33	1	2,10	2,64	0,462
10	10	1 500	1 050	135 x 75 x 18	34	33	1	2,74	3,28	0,722
12	12	2 120	1 550	150 x 90 x 20	40	43	2	5,00	5,82	1,040
14	14	3 000	2 120	150 x 90 x 22	41	47	2	7,50	9,36	1,416
16	16	3 850	2 700	170 x 95 x 25	41	47	2	10,44	12,30	1,848
18	18	4 800	3 400	170 x 95 x 25	52	61	2	12,50	15,60	2,340
20	20	6 000	4 350	200 x 120 x 28	52	61	2	15,60	18,70	2,888
22	22	7 200	5 200	200 x 120 x 30	52	61	2	18,30	21,40	3,494
24	24	8 800	6 300	250 x 150 x 36	60	78	2	25,20	34,20	4,158
26	26	10 000	7 200	250 x 150 x 38	60	78	2	28,60	37,60	4,880
28	28	11 800	8 400	250 x 150 x 38	80	90	3	43,60	49,80	5,660
32	32	15 000	11 400	300 x 200 x 45	80	90	3	57,60	63,80	7,394
36	36	19 000	14 000	300 x 200 x 50	90	102	3	79,00	85,00	9,358

Acier galvanisé - CMU établie sur base âme textile (possiblité âme métallique pour gamme CMU supérieure : nous consulter).

Ref : ECA202

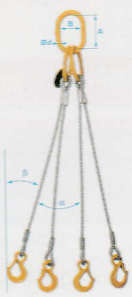
Ref : ECA301

Ref : ECA302

Autres élingues câbles disponibles : ÉLINGUE CÂBLE 3 BRIN - BOUCLES COSSÉES MANCHONNÉES ALU - Conforme à la norme EN 13414-1

CROCHETS À LINGUET (Réf. ECA301) / CROCHETS À VERROUILLAGE AUTOMATIQUE (Réf. ECA302) ..... *Nous consulter*

Ref : ECA401



ÉLINGUE CÂBLE 4 BRINS BOUCLES COSSÉES MANCHONNÉES ALU

Conforme à la norme EN 13414-1

CROCHETS À LINGUET (Réf. ECA401) / CROCHETS À VERROUILLAGE AUTOMATIQUE (Réf. ECA402)

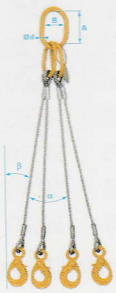
Ref : ACCOL

Ref : ACCVO

Désignation	Ø câble mm	CMU en kg 0°<β≤45° 0°<α≤90° Facteur 1,4	CMU en kg 46°<β≤60° 91°<α≤120° Facteur 1	Dimensions maille A x B x Ø d mm	Passage crochets ECA301	Passage crochets ECA302	Longueur / Poids mini réalisable m	Longueur / Poids mini réalisable kg (ECA301)	Longueur / Poids mini réalisable kg (ECA302)	Poids du m + kg
08	8	1 500	1 050	120 x 70 x 16	34	33	2	4,70	5,80	0,924
10	10	2 250	1 600	135 x 75 x 18	34	33	2	6,60	7,70	1,444
12	12	3 300	2 300	150 x 90 x 22	40	43	2	10,30	11,90	2,080
14	14	4 350	3 150	150 x 90 x 22	41	47	2	15,30	19,00	2,832
16	16	5 650	4 200	170 x 95 x 25	41	47	2	18,30	22,00	3,696
18	18	7 200	5 200	200 x 120 x 28	52	61	2	25,60	31,80	4,680
20	20	9 000	6 500	200 x 120 x 30	52	61	2	29,40	35,60	5,776
22	22	11 000	7 800	250 x 150 x 36	52	61	3	44,00	50,20	6,988
24	24	13 500	9 400	250 x 150 x 36	60	78	3	54,10	72,10	8,316
26	26	15 000	11 000	250 x 150 x 38	60	78	3	62,60	80,60	9,760
28	28	18 000	12 500	280 x 170 x 44	80	90	3	84,10	96,50	11,320
32	32	23 500	16 500	300 x 200 x 45	80	90	3	100,70	113,10	14,790
36	36	29 000	21 000	300 x 200 x 50	90	102	3	135,00	147,00	18,720

Acier galvanisé - CMU établie sur base âme textile (possiblité âme métallique pour gamme CMU supérieure : nous consulter).

Ref : ECA402



Pour vos commandes et questions techniques, contactez votre conseiller commercial : cliquez ici

MANILLE LYRE HAUTE RÉSISTANCE CE RÉF 5210 et 5211

Réf. Catalogue page 77

Pour définir vos **manilles** indiquer : la **RÉFÉRENCE** et le **CODE**

Acier allié traité haute résistance
Coefficient d'utilisation 1/5
Couleur de l'axe non contractuelle

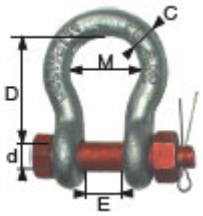
Réf 5210 : axe à oeil

réf 5210 : MANILLE LYRE " AXE À OEIL "

CODE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
CMU en kg	500	750	1000	1500	2000	3250	4750	6500	8500	9500	12000	13500	17000	25000	35000	55000	85000
C en mm	7	8	10	12	13	17	20	23	26	29	33	35	38	45	50	65	75
D en mm	29	31	37	41	46	60	71	83	95	108	119	132	147	178	197	254	330
E en mm	12	13	17	18	21	26	30	38	44	49	54	57	62	74	83	105	127
M en mm	20	21	25	28	32	42	50	57	66	74	80	89	98	126	138	185	-
d en mm	8	10	11	12	16	19	23	25	29	34	36	38	40	50	57	70	80
poids en kg	0,07	0,09	0,14	0,17	0,33	0,62	1,07	1,64	2,28	3,36	4,30	6,14	7,80	14,9	20,6	41	59

Acier allié traité haute résistance
Coefficient d'utilisation 1/5
Couleur de l'axe non contractuelle

Réf 5211 : axe boulonné



réf 5211 : MANILLE LYRE " AXE BOULONNÉ "

CODE	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
CMU en kg	750	1000	1500	2000	3250	4750	6500	8500	9500	12000	13500	17000	25000	35000	55000	85000	120000
C en mm	9	10	11	13,5	16	19	22	25	28	32	35	38	45	50	65	75	90
D en mm	32	36,5	43	51	64	76	83	95	108	115	133	146	178	197	254	330	381
E en mm	13,5	17	18,5	22	27	31	36	43	47	51	57	60	74	83	105	127	146
M en mm	21	26	29	32	43	51	58	68	75	83	92	99	126	138	185	190	238
d en mm	10	11	12	16	19	22	25	28	32	35	38	42	50	57	70	80	95
poids en kg	0,13	0,17	0,25	0,44	0,79	1,26	1,88	2,78	3,87	5,26	6,94	8,79	14,99	20,65	41,05	62,24	110

Alloy Master Links

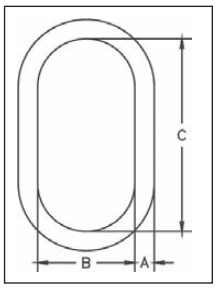
"QT" QUENCHED & TEMPERED | QUIC-CHECK® | Crosby 8/10™

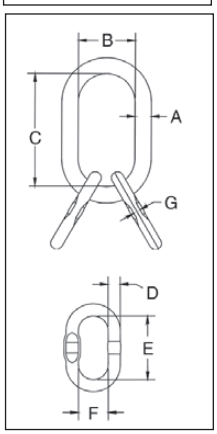
A-342

Ratings below are for use with chain slings fabricated in accordance with ASME B30.9. For other applications, see page 159.

- Alloy Steel – Quenched and Tempered.
- Individually Proof Tested with certification. (See page 159 for Proof Test values.)
- Proof Tested with 60% inside width special fixtures sized to prevent localized point loading per ASTM A-952. Reference page 269.
- Meets or exceeds all requirements of ASME B30.26 including identification, ductility, design factor, proof load and temperature requirements. Importantly, these links meet other critical performance requirements including fatigue life, impact properties and material traceability, not addressed by ASME B30.26.
- Forgings have a Product Identification Code (PIC) for material traceability, along with the size, the name Crosby and USA in raised lettering.
- Selected sizes designated with "W" in the size column have enlarged inside dimensions to allow additional room for sling hardware and crane hook.
- Incorporates patented **QUIC-CHECK®** deformation indicators.

A-345





A-342 Alloy Master Links

Size (in.)	Size (mm)	A-342 Stock No.	Weight Each (lbs.)	Chain Size (in.)	Chain Size (mm)	Single Leg WLL Based on Grade 80 Chain (lbs.)*	Single Leg WLL Based on Grade 100 Chain (lbs.)*	Double Leg WLL Based on Grade 80 Chain 60° Sling Angle (lbs.)*	Double Leg WLL Based on Grade 100 Chain 60° Sling Angle (lbs.)*	Dimensions (in.) A	B	C	Deformation Indicator
1/2W	13W	1014266	1.3	1/4	7	3500	4300	6100	7400	.62	2.80	5.00	3.50
				5/16	8	4500	5700	-	-				
5/8	16	1014280	1.5	5/16	8	4500	5700	7800	-	.62	3.00	6.00	3.50
3/4W	19W	1014285	2.0	5/16	8	4500	5700	-	9900	.73	3.20	6.00	4.00
				3/8	10	7100	8800	12300	-				
7/8W	22W	1014319	3.3	3/8	10	7100	8800	12300	15200	.88	3.75	6.38	4.50
				1/2	13	12000	15000	-	-				
1W	26W	1014331	6.1	1/2	13	12000	15000	20800	26000	1.10	4.30	7.50	5.50
				5/8	16	18100	22600	-	-				
1-1/4W	32W	1014348	12.0	5/8	16	18100	22600	31300	39100	1.33	5.50	9.50	7.00
				3/4	20	28300	35300	-	-				
1-1/2W	38W	1014365	18.6	3/4	20	28300	35300	49000	61100	1.61	5.90	10.50	7.50
				7/8	22	34200	42700	-	-				
1-3/4	44	1014388	25.2	7/8	22	-	-	59200	74000	1.75	6.00	12.00	7.50
				1	26	47700	59700	-	-				
2	51	1014404	37.0	1	26	-	-	82600	103400	2.00	7.00	14.00	9.00
				1-1/4	32	72300	90400	-	-				
2-1/4	57	1014422	54.1	1-1/4	32	-	-	125200	-	2.25	8.00	16.00	10.00
2-1/2	63	1014468	68.5	1-1/4	32	72300	90400	125200	156600	2.5	8.38	16.00	11.00

* Chain slings require that the Minimum Ultimate Load be 4 times the Working Load Limit. Refer to page 159 to determine products actual Ultimate Load. Proof Test Load equals or exceeds the requirement of ASTM A952(8.1) and ASME B30.9-1.4 for the chain size and number of legs. See chart on page 234 for other sling angles.

A-345 Master Link Assembly with Engineered Flat for Use with S-1325A coupler link

Size (in.)	Size (mm)	A-345 Stock No.	Weight Each (lbs.)	Chain Size (in.)	Chain Size (mm)	Three and Four Leg Sling WLL Based on Grade 80 Chain 60° Sling Angle (lbs.)*	Three and Four Leg Sling WLL Based on Grade 100 Chain 60° Sling Angle (lbs.)*	Dimensions (in.) A	B	C	D	E	F	G	Deformation Indicator	Engineered Flat for S-1325 (in.) — (mm)
3/4W	19W	1014739	3.5	1/4	7	9100	11200	.73	3.20	6.00	.56	3.35	1.77	.30	4.00	1/4"-5/16", 7-8mm
7/8W	22W	1014742	4.8	5/16	8	11700	14800	.88	3.75	6.38	.56	3.35	1.77	.30	4.50	-
1W	26W	1014766	9.3	3/8	10	18400	22900	1.10	4.30	7.50	.75	3.94	2.36	.33	5.50	3/8", 10mm
1-1/4W	32W	1014779	15.8	1/2	13	31200	39000	1.33	5.50	9.50	1.00	6.30	3.54	.51	7.00	1/2", 13mm
1-1/2W	38W	1014807	34.1	5/8	16	47000	58700	1.61	5.90	10.50	1.25	7.09	3.94	.65	7.50	5/8", 16mm
1-3/4	44	1014810	46.7	3/4	20	73500	91700	1.75	6.00	12.00	1.50	6.00	4.00	-	7.50	No Flat
2-1/4	57	1014845	97	7/8	22	88900	110900	2.25	8.00	16.00	1.88	8.00	5.50	-	10.00	No Flat
				1	26	123900	155100	2.25	8.00	16.00	1.88	8.00	5.50	-	10.00	No Flat
3-1/4	83	1014986	255	1-1/4	32	187800	234900	3.25	10.00	20.00	2.50	11.25	8.00	-	13.50	No Flat

* Chain slings require that the Minimum Ultimate Load be 4 times the Working Load Limit. Refer to page 159 to determine products actual Ultimate Load. Proof Test Load equals or exceeds the requirement of ASTM A952(8.1) and ASME B30.9-1.4 for the chain size and number of legs. **See chart on page 234 for other sling angles.**

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3-9 FAN & MECHANISM GAURDS

After complete installation of fan and belt drive system, assemble the guards for each item as shown on diagrams below.

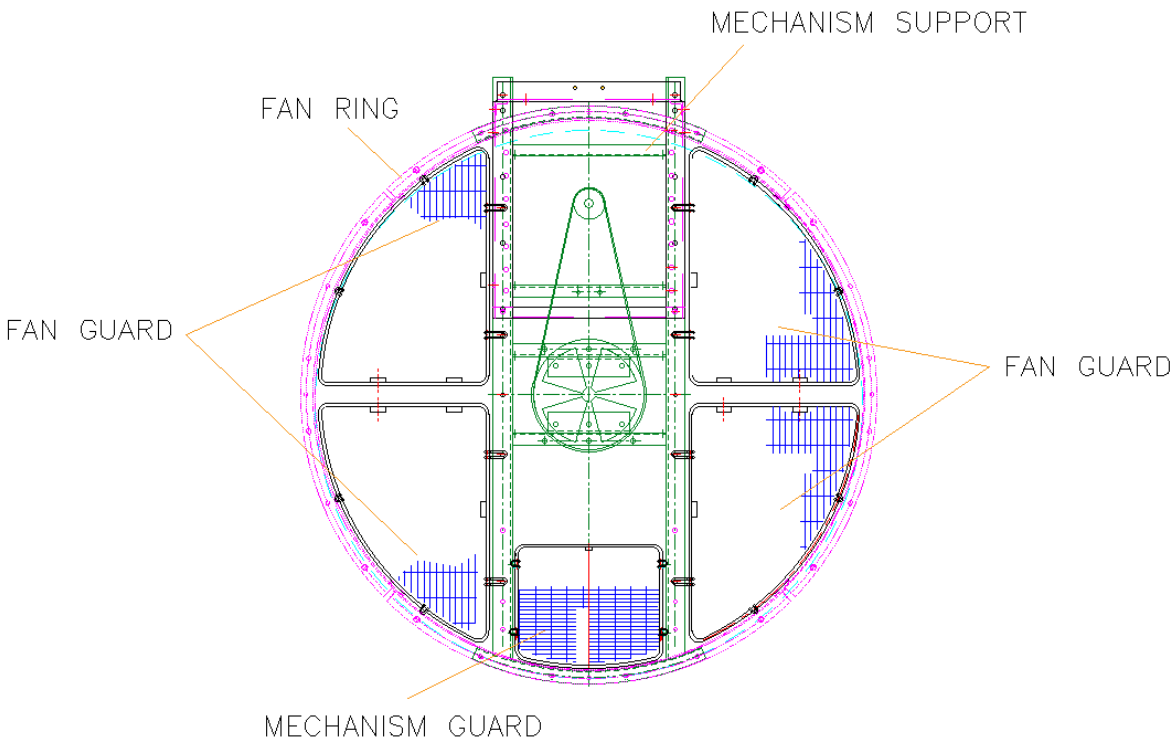


Figure 3-22
For Reference See “Fan Drive Assembly Drawing For Air Cooled Heat Exchangers ”
Document No.: EI027-DMF-VD-ME-DWG-008

3-10 EQUIPOTENTIAL INTERCONNECTION OF METALLIC MASSES

Subsequently to complete assembling of all parts and for safety reasons the equipotential interconnection of metallic masses must be ensured.

For this purpose, all headers and hoods, as well as the 2 columns in the middle of each row, are fitted with an earthing lug (see General Arrangement Drawing). The fitter will have to connect these earthing lugs through some 35 mm2 section stranded copper wire.

The connections of all further bolted metal parts shall be ensured through weld seams or spots protected by paint or varnish compatible with the basic protection coating (see General Arrangement Drawing).

3-11 CLOSURE SHEETS

When several bundles are fitted under a common fan hood it is necessary to equip those with sealing sheets to avoid the "By-pass" of the air.

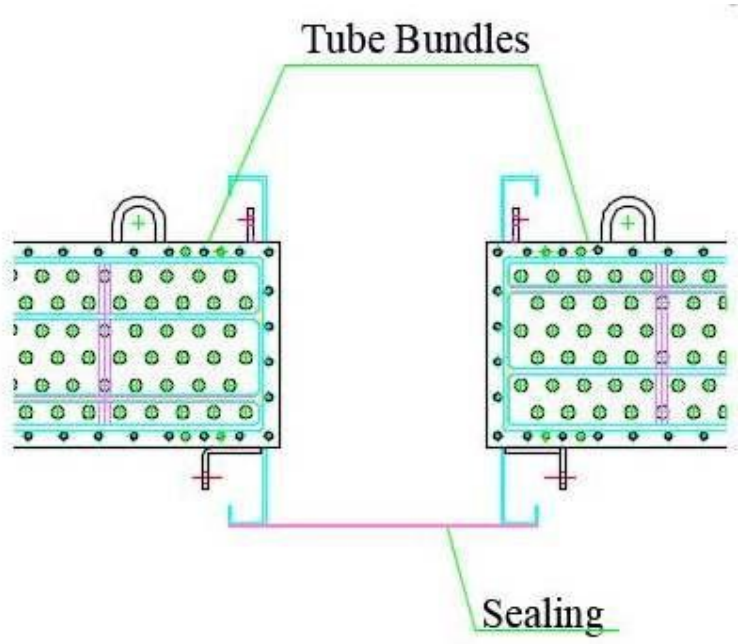


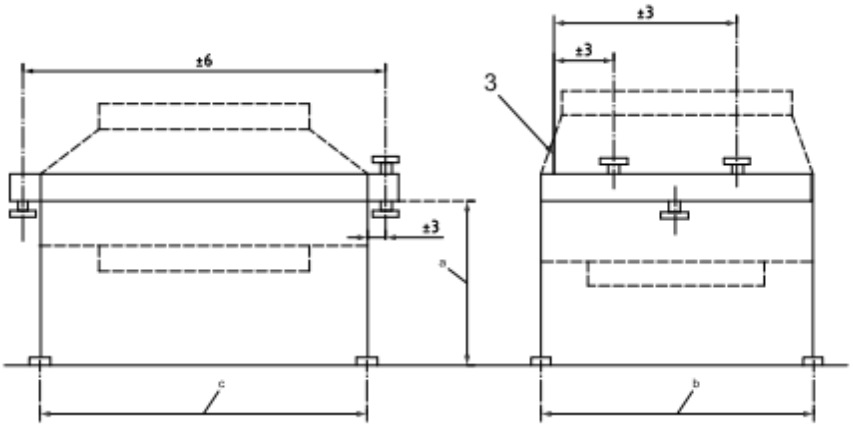
Figure 3-23
For Reference See “General Arrangement Drawing For Air Cooled Heat Exchangers (All Items)”

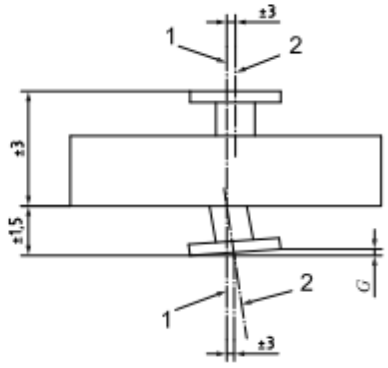
3-12 STANDARD TOLERANCES

3-12-1 Standard Tolerances for The Dimensions of Air-Cooler Tube Bundles

The standard tolerances for assembly dimensions of air-cooler tube-bundles are shown below. Tolerances apply to both forced-draft and induced-draft units.

Tolerances in millimeters (in.)





Key

1 centerline header
2 centerline nozzle
3 reference line
G out-of-plane tolerance, as given below:

Nominal nozzle size DN (NPS)	Maximum out-of-plane tolerance *G* mm (in.)
50 to 100 (2 to 4)	1.6 ($^{1}/_{16}$)
150 to 300 (6 to 12)	2.4 ($^{3}/_{32}$)
> 300 (> 12)	4.8 ($^{3}/_{16}$)
stacked, all	0.8 ($^{1}/_{32}$)

a $^{+1}_{-2}$ per meter.

b ±1 per meter.

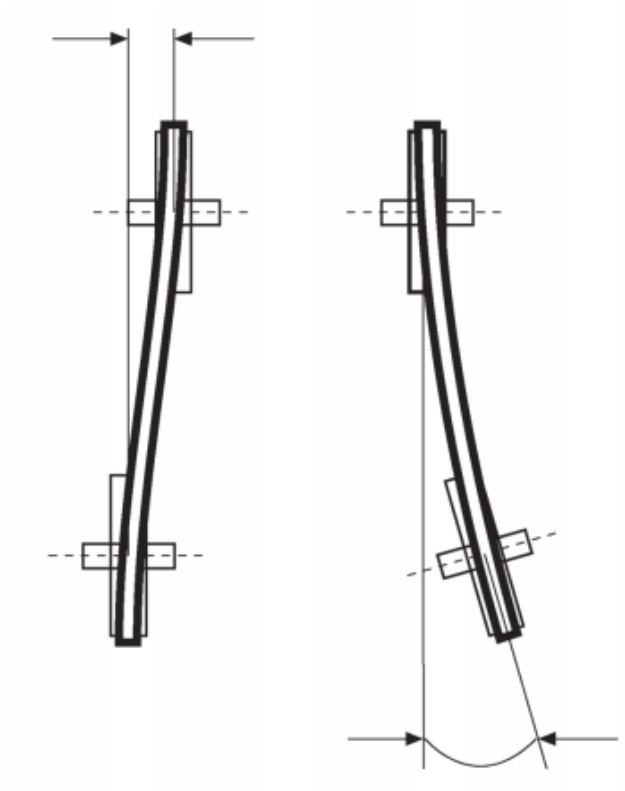
c ±3 (W_p to 3 m; $^{+1}_{-2}$ for each additional meter).

3-12-2 Standard Tolerances for Shaft and Pulley Alignment

Offset and Angular Tolerances are as per figure below:

Axial displacement and angular errors shall be limited as far as possible.

The axial displacement (left) should not exceed 0,5% of the distance between centers.



The angular error (right) should not exceed 0,25°.

4. MAINTENANCE AND OPERATRION

4-1 PROCEDURE FOR INTRODUCTION OF THE PROCESS FLUID

1. During starting up process it is advisable to limit the thermal shock to the tube-bundle and also to avoid a brutal cooling during periods of low ambient temperature and low heat load.

2. It is advisable to take certain special precautions when starting up units intended to release heat from process fluids with the following properties:

   High viscosity fluids; fluids whose pour point is above the ambient air temperature

   In many cases where fluids with these properties are circulating in air-coolers, the units are equipped with one or more of the following systems, aimed at eliminating such problems in starting and during operation: Manually or automatically controlled louvers, steam-coils and auto-variable pitch fan propellers.

   Start-up problems are much reduced with units thus equipped. Before introducing the process fluid, close the louvers, start to circulate steam through the coils and switch off the fans.

   Progressively increase the fluid flow until the normal rate is reached. Then gradually open the louvers, shut off the steam inlet and start the AV fans. Watch carefully the temperature of the output fluid during all this period and, if there is a risk of excessive cooling, run the heating steam.

   For the units without louvers nor steam-coil, the process fluid should be introduced rapidly in order to avoid excessive cooling of the initial charge of fluid in contact with the cold tubes. It is advisable, however, to avoid any fluid pressure surge.

3. In order to release heat from a process fluid having a low viscosity and a very low pour point, the starting procedure will be somewhat simplified. First of all, start up the fans, then admit the process fluid, initially with a low rate of flow, but gradually increase it to the required value.

4-2 REMEDYING LEAKAGE OBSERVED IN TUBE-BUNDLE TEST

Check that assembly bolting is screwed and locked.

Every tube-bundle unit has been subjected to a hydrostatic pressure test in manufacturer's shop. Nevertheless, in order to check that it has not been damaged during transport or erection, it is advisable to subject the tube-bundle and the associated piping, circulating pumps, etc. to further hydraulic proof test, before starting up the plant.

The tube-bundle units will be delivered perfectly leakproof after being subjected to tightness test. However, should any leak be found (which may occur where tube-bundle units have been stored for a period of time) proceed as follows:

A. LEAKAGE AT TUBE SHEET HOLE EXPANDED TUBE JOINT

- Remove cover plates of header.
- Roll in the tube a little further
- Replace the cover plates after changing the gaskets
- Re-pressurize to check the tightness. Repeat this procedure if seal is not perfect.

B. LEAKAGE RESULTING FROM CRACK IN A FAULTY TUBE

In such case, both ends of the faulty tube must be blocked. Proceed as follows:

Remove the cover plates of header

Cut through the faulty tube at one end, a few millimeters from the tube sheet before the start of the finned section of the tube, using an inner tube cutter. - This is a must to prevent the tube acting as a tie-rod between the two box headers.

Using the special mandrel provided by the manufacturer, insert a taper plug into each end of the leaky tube.

Gently hammer in the taper plugs.

Replace the cover plates and new gaskets.

4-3 THE AIR-COOLER SHUTS DOWN UNEXPECTEDLY

In this occasion following steps shall be regarded:

1. Motor power supply line shall be checked.
2. If electrical power line has been disconnected by the vibration switch, check the vibration switch to ensure that it works in proper condition, otherwise, the other vibration possibilities in system shall be checked.
3. Power transmission system included pulleys, belts and fans also inside surface of fan rings shall be checked. Moreover, the bolted connections of motor to motor-support as well as housing to housing-support shall be visually checked in order to distinguishing any vibration.
4. Proper operation of pulleys, belts, motor bearings and housing bearings shall be checked while motor is running.

   Note! Before starting the motor, following steps must be taken:

   - **Rotate the fan by hands in order to ensure that the fan blades have no clash with inside surface of fan ring.**
   - **Start the fan for a moment (ON/OFF) to check if any abnormal vibrations exist.**
5. Any fault in components operation that mentioned above shall be maintained (please contact the producer if required).

4-4 PRE-COMMISSIONING

Document title: Shop run-in test procedure

Checking the tip gap between the end of the blade and the fan ring in accordance with API 661 requirements (Using a ruler).

Fan testing of the machinery by rotation test (Clockwise).

Control of the fan speed according to the specifications of the fan (Using an achy meter).

Record of the absorbed intensity and voltage measurement (using an ammeter).

Power of items plus ambient condition shall be recorded.

Checking of the structure and mechanism vibrations in conformity with the applicable code or the fan supplier´s requirements. Using a vibro-meter and filling up the vibration table (QF-23 as shown at next page).

Point of vibration measuring shall be min 3 points (are shown below), each point related to one direction. For each measuring item, RMS and peak to peak shall be recorded.

Structural members shall be designed to minimize vibration, the maximum amplitude of vibration over the design fan-speed range shall be 0.15mm (0.006 inch) from peak to peak, as measured on primary structural members and machinery mountings (acc. to 7.3.2.1 API 661).

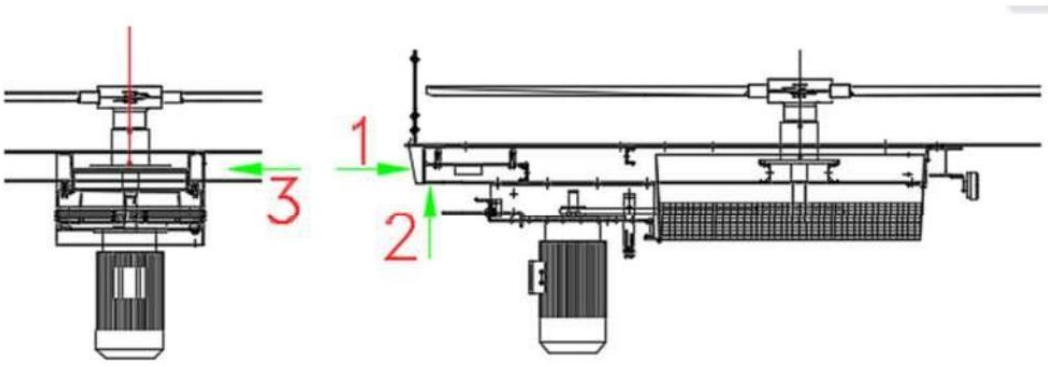
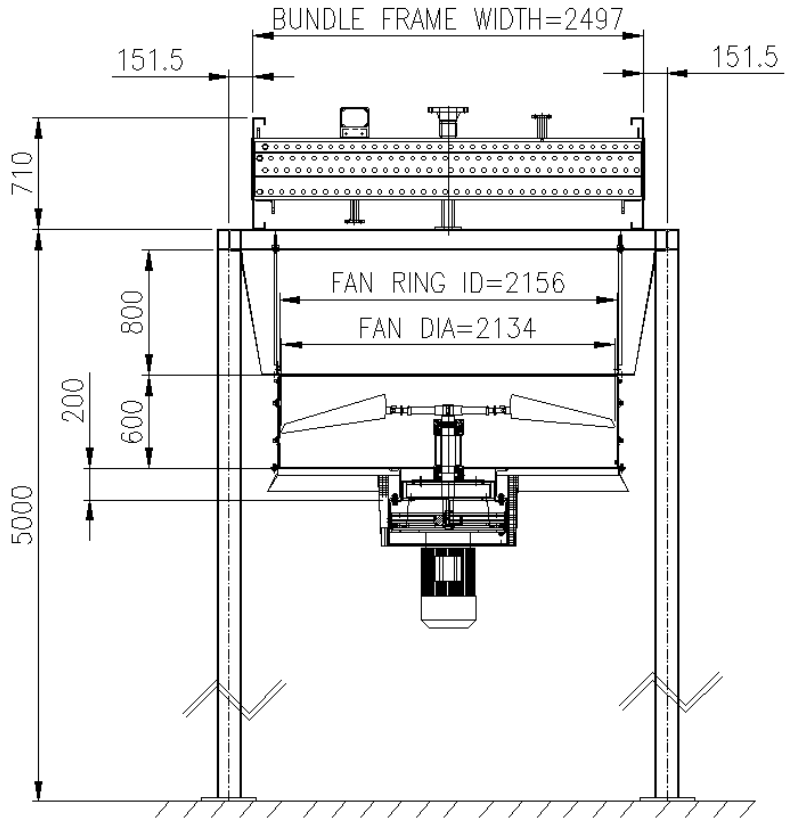


Figure 4-1 Test for Motor and Fan Vibration

Damafin thermal technology	**VIBRATION RECORD RUN-IN TEST**
Report No.:	
Project Name/DTT Job No.:	CONCEPTUAL, BASIC and DETAIL DESIGN ENGINEERING OF STYRENE PARK OFFSITE / 1158
Reference Doc. Name/No.:	
Item No.:	Air Cooler

Sketch:



Measure Point	1	2	3	RPM	
Displacement Speed (mm/s)				Motor	
Displacement (µm)				Fan	

DESCRIPTION:

Vendor	PMC	TPA	OWNER
Name:	Name:	Name:	Name:
Date:	Date:	Date:	Date:
Sign:	Sign:	Sign:	Sign:

4-5 PROCEDURE FOR FIN TUBES MAINTENANCE (Instructions for tube cleaning)

4-5-1 INTERIOR CLEANING OF FIN-TUBES

The methods used for the cleaning of the inside of air-cooler tubes are the same as for conventional shell-and-tube heat-exchangers;

1. Mechanical Cleaning

This method consists of drills or wire brushes fitted to long rods which are rotated by a compressed air motor. This method is normally completed with a water rinse or a blowing out. It is not an advised method for the removal of tarry deposits.

2. Chemical Cleaning

This method consists of circulating a hot chemical solution through the tubes. Such solutions contain inhibitors against tube wall corrosion.

It is recommended to contact a specialist and to supply him with a sample of the fouling deposit, in order to choose the most appropriate chemical solution. Each tube-bundle has to be fitted with inlet and outlet pipe fittings (1 1/2" to 3") to facilitate the passage of the solution. A circulating pump and a topping-up tank should also be available.

This method is becoming more popular in process plants because it reduces downtime and avoids disassembling the unit. It offers no advantage at all with blocked tubes.

3. High-Pressure Hushing Equipment

The use of these units (or "Hydro Jets") has become widespread in the U.S. and Europe during recent years. The tube cleaning can be accomplished by means of a portable HP pump. Generally speaking, such pumps have a capacity of 25 GPM with discharge pressures as high as 62 MPa. The sprinkler head is fitted at the end of a long tube, similar to that used for mechanical cleaning, and it is introduced into each tube individually. The best pressure is found by trial and error. Generally speaking, the softer the deposit, the lower water pressure needs to be. For example, an amine heat-exchanger can be cleaned with a water pressure of around 14 MPa. A scale deposit left by carbonated water requires a higher pressure ranging about 41 to 62 MPa. Here again, it should be emphasized that this is not suitable for blocked tubes. Those have to be mechanically cleaned.

4-5-2 OUTSIDE CLEANING OF FIN-TUBES (General)

The fouling of the extended heat-transfer or fin surfaces depends on the location of the unit, the kind of process, the ground conditions, foliage or other environmental factors, such as presence of other factories in the area.

The most common types of fouling are as follows:

A. Dirt or Dust

It accumulates over fins and between fins.

Sometimes, it collects as a fine powder and after being wetted, it forms a crusty deposit. Or alternatively, with oil, it can produce a mixture having the consistency of putty.

B. Lint, Popular Seeds, Down of Cotton Wool, etc.

C. Insects

D. Mixtures of Dust with Oil and Corrosive Substances

Generally speaking, only the two or three lower fin-tube rows will be found to be fouled. This indicates that the cleaning should be undertaken from the top downwards with the fan at standstill and shut-off valves closed. A preliminary examination should first be made to determine which type of cleaning would be best.

I. Air Nozzle

An air jet from a nozzle under a pressure of 0.22 MPa should normally remove dust powder and dry insects. One should ensure that the air jet is always within the plane of the fins to avoid bending them over. The nozzle usually consists of a 1-inch dia. pipe and 10-inch long, flattened at the end to from a tip about 1 1/4" across. The air is supplied via a hose, a control valve and a pressure gage.

II. Water Nozzle

A cold water-jet under a pressure of 0.22 MPa normally allows the removal of agglomerated dust and other impurities.

A fire hose with a 1" round-nosed jet should be satisfactory. As above, the jet should always he within the fin plane, to avoid bending them over.

III. Hot Water or Steam Jet

If the consistency of the fouling is such as to resist both the cold water and the air jet, an atomized spray of hot water or steam should be sufficient to clean the fins.

The steam nozzle can be made in the same manner as the air nozzle. How water can be obtained by means of a proportioning/mixing device fitted at the inlet of the steam nozzle.

IV. Chemical Cleaning

Normally, in 75% of cases, methods A, B and C will be sufficient to clean the fins. Nevertheless, there are times when the composition of the fouling is either chemical or organic. It is then necessary to consult a specialized chemical cleaning firm. With regard to chemical cleaning, great care must be taken. The cleaning fluid should be consistent with the fin material. The chemical cleaning specialist is familiar with these problems and is capable of supplying the proper cleaning solution.

4-6 PROTECTION OF TUBE-BUNDLE UNITS

4-6-1 EXTERNAL PROTECTION OF TUBE-BUNDLE UNITS

Where the unit is not equipped with control louvers, a canvas or plastic cover should be laid all over the top side of the tube-bundle to prevent the fins from becoming fouled by sand or dust deposits due to wind and/or natural air draft.

Where the unit is equipped with control louvers, the blades should be kept in closed position.

4-6-2 INTERNAL PROTECTION OF TUBE-BUNDLE UNIT

All of the inlet and outlet nozzle and connections should be shut off with blind flanges, one of which per tube-bundle on the side should be fitted with a valve, pressure gauge and blocking plug.

Then connect a nitrogen supply line to the blind flange with valve. Loosen the bolts at one of the inlet nozzle blind flanges to let air escape. Inject gas into tube-bundle so as to effective nitrogen flushing for about 10 minutes and thus to expel all of the air out of the unit.

Finally, re-tighten the inlet nozzle blind flange bolts and let nitrogen pressure build up to 300-500 Pascals so as to get tube-bundle pressurized.

Disconnect the nitrogen line and screw in the blocking plug to avoid any pressure drop in case of valve leak.

4-7 MACHINERY COMPONENTS

First, all drive motors should be taken down to be stored indoors. Then, every month, turn motor shafts by hand to distribute lubricant all over bearing parts.

DRIVE BELTS

General Storage Conditions

The physical properties of correctly stored belts will not change over a period of many years. In poor storage conditions and with incorrect handling, rubber products are, however, subject to changes in their physical properties. These changes can for example, be caused by effects of oxygen, ozone, extreme temperature, light, moisture and solvents.

The storage area should be dried, dust-free and reasonably well ventilated. Belts must not be stored close to chemicals, solvents, fuels, lubricants and acid.

Storage Temperature

The storage temperature should be between +59˚ F (+15˚ C) and +77˚ F (25˚ C). Normally, lower temperatures are not detrimental to Belts. However, since they become very stiff at low temperatures, they should be warmed to a temperature of approximately +68˚ F (20˚ C) before fitting to avoid ruptures and cracks.

Radiators and their supply lines should be guarded. The distance between a radiator and the stored Belts must be at least three feet.

Storage Lighting Conditions

Belts should be protected against light, especially direct sunlight and high ultra violet content (ozone formation) such as naked fluorescent tubes. Illumination utilizing conventional light bulbs is advisable.

Where possible, windows should be painted a red or orange protective paint. Under no circumstances should blue be used.

Ozone

In order to counteract the harmful effects of ozone, warehouses should not contain any ozone producing appliances, for example fluorescent lights, mercury vapor lights or high voltage electrical equipment. Combustion gases and vapors which may lead to the formation of ozone by photo chemical processes must be avoided or eliminated.

Moisture

Damp store rooms are unsuitable. Care must be taken to ensure that condensation does not occur. The most favorable relative air humidity is below 65%.

Storage Position

Because stresses can prompt both permanent deformation and the formation of cracks, care must be taken to ensure that Belts are stored without stress, i.e., without tension, pressure or any other form of deformation.

If Belts are stored horizontally and stacked upon each other, it is recommended that the stack height does not exceed 12 inches to avoid deformation. If to save space, belts are hung, the diameter of the cylinder on which the belts rest should be at least ten times the height of the belt section.

Cleaning

Contaminated belts can be cleaned using a 10:1 glycerin-spirit mixture. Benzene, benzol, and turpentine amongst others must not be used.

In addition, sharp edged objects, wire brushes, emery paper, etc. must not be used under any circumstances. Such action will seriously damage the belts.

PULLEY

Thoroughly clean all the pulley grooves, then coat spray anti-rust compound all over the groove sides.

FAN and DRIVE SHAFT

Clean all machined or exposed surfaces, then coat spray anti-rust compound all over.

BALL/ROLLER BEARING

Every month, turn the fan propelled and shafting by hand to distribute grease evenly all over the bearing parts. Then, every three months, inject grease to prevent any blocking of the lubrication lines possibly due to grease hardening.

Whenever the fan propeller and shafting have been turned, it is a must to secure them at standstill.

FAN UNIT

Fixed Blade Propeller: no particular care is required for bladesSelf-Adjustable Pitch Angle Blade Propeller: every month operate pneumatic control system to actuate blade control linkage so as to prevent hub internals from sticking.

FAN PITCH CONTROL SYSTEM

The pneumatic control system should be supplied with nitrogen and not with air, which even with a very low moisture content, can be detrimental to servo-actuators and controllers.

NOTE!
For protection of equipment, when not operated for long periods of time, the grease used must be a long-time non oxidizing preservation grease.

4-8 FAN SHAFT BEARINGS LUBRICATION

A. 1st FILLING

Fan Shaft Upper Bearing

Fan Shaft Lower Bearing

Bearing Block Grease Capability: Around 0.5 kg

The lubrication lines must be filled with lubricant as well, which requires loosening line fittings at bearing housing. Then, using a grease gun, inject lubricant at the lubrication block nipples so that grease will flow out of the other end of line. Now loosen bearing housing fittings and inject again so that grease flows out at the bearings.

B. PROCEDURE PRIOR TO STARTING-UP

Check that fan shaft bearings for grease packing are correct, and make up lubricant if required. Check that greasing for mechanical equipment is correct, and make up lubricant if required. See supplier's instructions.

C. LUBRICATION OF FAN SHAFT BEARINGS

Lube each 20,000 hours with Athesia EP2 or equivalent. (See Table 4-1)

4-9 LUBRICATION OF FAN DRIVE ELECTRIC MOTORS

Motor bearings are packed with grease before leaving manufacturer's factory. When changing over to a new grade/brand of lubricant, it is necessary to take down the bearing, remove the old grease and clean thoroughly before repackaging with new grease.

WARNING!An excess of grease will be detrimental to bearing life.FITTING OF FAN SHAFT BEARING

Lubrication for Forced Draft Units

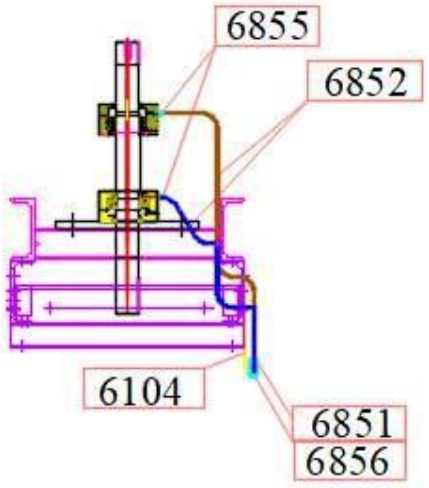


Figure 4-2 Fan Shaft Bearin Block

6851: Union Female Connector (1/8” NPT-8 mm (Tube))

6852: Tube (OD=8 mm, ID=6 mm)

6855: Union Male Connector (1/4” NPT-8 mm (TUBE))

6856: Grease Nipple (1/8” NPT)

6104: Lubrication Piping Support

LUBRICATION SCHEDULE (DS21-6701-01)

Table 4-1

	Equipment	Bearing type	Lubrication Method	Oil Reservoir	Lubricant	Recommended Brand			Initial Charge (1 Set)		Maintenance Frequency			Annual Consumption (for 4 Sets)
						Shell	Total	Domestic Brands	Quantity	Break-in Period	Inspection	Replace	Refill	
1	FAN BEARING	BEARING: (set)	INJECTION	-	GREASE	See below table			0.5 kg	20000 h	-	-	0.5	2 kg

Lubricant chart. (Standard)
SHELL ALVANIA G2 OR G3
TOTAL MULTIS 2 OR 3
ایرانول لیما EP2 یا EP3
بهران یاقوت EP2 یا EP3
نفت پارس، پارس لیتیوم (ماهان سابق) EP2 یا EP3

Note! All of these lubricant types are recommended based on related temperature range.

4-10 UTILITY CONSUMPTION

Table 4

No.	Item No.	Power/Motor (kW)	QTY.	Total Consumption (kW)
1	AIR COOLER	7.5	4	30
		TOTAL		**30**

4-11 BOLT AND PLUG TORQUE

BOLT TORQUE

Size	8.8				10.9			
	ضریب اصطکاکی 0.1		ضریب اصطکاکی 0.14		ضریب اصطکاکی 0.1		ضریب اصطکاکی 0.14	
	PV[N.M]	MA[N]	PV[N.M]	MA[N]	PV[N.M]	MA[N]	PV[N.M]	MA[N]
M8	20	17900	25	16500	28	25100	35	23200
M10	40	28400	49	26200	56	40000	69	36900
M12	69	41500	86	38300	98	58500	120	54000
M14	110	56500	135	52500	155	80000	190	74000
M16	170	78500	210	73000	240	110000	295	102000
M18	235	95000	290	88000	330	134000	405	124000
M20	330	122000	410	114000	465	172000	580	160000
M22	445	152000	550	141000	620	214000	780	199000
M24	570	176000	710	164000	800	248000	1000	230000

PLUG TORQUE

Stainless steel Plugs	90 mkg
Carbon Steel Plugs	80 mkg

5. APPENDICES

(Datasheet of Components and Sub-Supliers Manual)

5.1 Axial Fan Datasheet

STYRENE PARK OFFSITE

Document Title:

Axial Fan Data Sheet

Rev.	Issued Date	DESCRIPTION	PREPARED	CHECKED	APPROVED
R2	18-08-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R1	06-08-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R0	22-06-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh

REVISION RECORD SHEET

Page Page	Revisions								Page	Revisions						
	R0	R1	R2	R3	R4	R5	R6			R0	R1	R2	R3	R4	R5	R6
1	X	X	X						41							
2	X	X	X						42							
3	X	X							43							
4	X	X	X						44							
5	X	X							45							
6	X	X	X						46							
7	X	X							47							
8	X	X							48							
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AXIAL FAN DATA SHEET (PROJECT 1158) Qty = 4				
BASIC DATA				
1	Item No.		Air Cooler	
2	Quantity	Manual Adjustable Pitch	100%	
		Automatic Adjustable Pitch	-	
3	Positioner		NO	
4	BEARING BLOCK		YES	
5	Blade Material	Aluminum (ASTM,B-179)	YES	
		Fiber glass	NO	
6	Type of Air cooler/ Inlet		FORCED / CONICAL L/D=0.05	
7	Fan Diameter		7/ 2134	(ft /mm)
8	Fan Ring Diameter		2156	(mm)
9	Fan Ring Height		600	(mm)
10	Altitude		20	(m)
11	Relative Humidity		65	(%)
12	Temperature inlet /outlet		48 /52.28	(° C)
13	Actual flow		26.879	(m3/s)
14	Actual static pressure		102.95	(Pa)
15	Fan RPM		382	(rpm)
16	Tip speed		42.7	(m/s)
17	Motor power rating		7.5	(KW)
18	Noise level (at one meter)		85	(db)
19	Min Temperature		5	° C

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Customer Name	Job Reference
Job Name	
Item Number	Date 8/6/2024

CHARACTERISTICS

Required Volume	26.87	m³/sec	Required Static Pressure	102.95	Pa
Pressure recovery	0.00	Pa	Fan static pressure	102.95	Pa
Velocity pressure	28.98	Pa	Total pressure	131.93	Pa
Air Temperature	48.0	°C	Site Elevation	20.0	m
Inlet Air Humidity (%)	65.0		Inlet Air Density	1.068	kg/m³
Fan diameter	2134	mm	Fan ring diameter	2156	mm
Blade Airfoil	24L	ALU	Rotor hub type	B3	
Speed	382.0	RPM	Blade Tip Speed	42.68	m/sec
N° blades	4		Blade Operating Freq. +/-5%	722	cpm
Static efficiency	61.4	%	Total efficiency	78.7	%
Blade pitch angle	8.5	(°)	Rotor shaft power	4.5	kW
Min. Ambient Temperature	5.0	°C	Rotor shaft power @ 5.0 °C	5.3	kW
			Rotor shaft power @ API point	6.0	kW
Pressure Margin (%)	65 [1] / 95 [2]		Volume Margin (%)	28 [1]	
Tip Clearance/D	0.005		Inlet	Conical L/D=0.05	
Diffuser angle (°)			Diffuser:Length/D		
Inlet Obstacle a/A			Inlet Obstacle x/D		
Outlet Obstacle a/A			Outlet Obstacle x/D		
Installation Type	Forced		Aerod axial force	472	N
Rotor total weight	52	kg			
Rotor inertia PD²	35	kg x m²			
Max residual unbalance	13.1	N			
Blade Failure Load	3847	N			
2 Blades Failure Load	5441	N			
Xs Static deflection	55	mm	Xr Running deflection	43	mm

[1] according to API [2] at Design Pitch Angle

NOISE CHARACTERISTICS

Tolerance on sound values +/- 2 dB(A)

PWL (± 2)	SPL @	Inlet / outlet (± 2)	Side (± 2)
86 dB(A)	1.0 m From Fan	78 dB(A)	65.8 dB(A)

Octave [Hz]	31.5	63	125	250	500	1000	2000	4000	8000

ROTOR MODEL 2134- 4-24L/B3T PAC

All data must be approved by Cofimco Fantastic.NET 2008.2.2

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Customer Name	Job Reference
Job Name	
Item Number	Date 8/6/2024

PWL [dB]	89.0	91.0	91.0	87.0	84.0	81.0	73.0	69.0	65.0
Inlet/Outlet SPL [dB]	81.0	83.0	83.0	79.0	76.0	73.0	65.0	61.0	57.0
Side SPL [dB]	68.8	70.8	70.8	66.8	63.8	60.8	52.8	48.8	44.8
Tolerance +/-	5.0	5.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0

ROTOR MODEL 2134- 4-24L/B3T PAC

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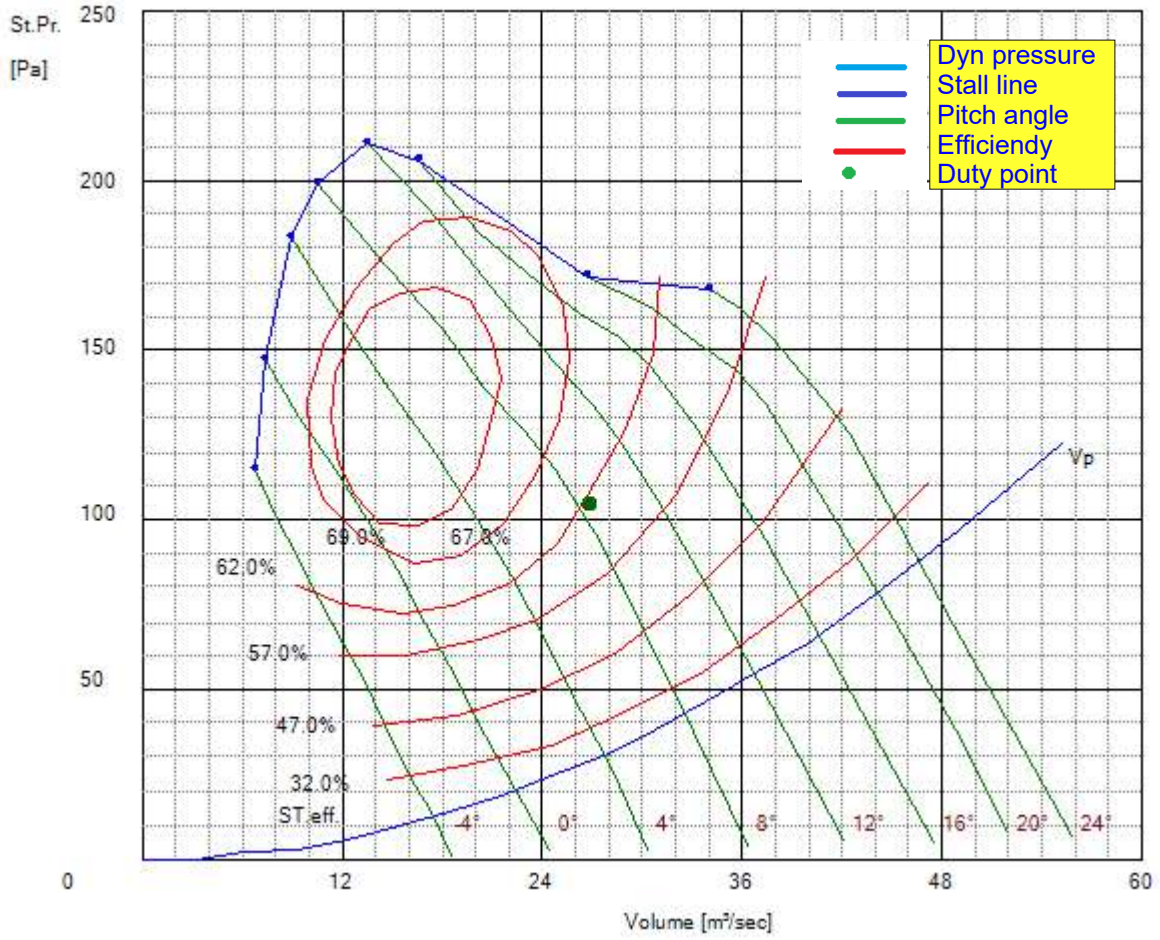
Customer Name	Job Reference
Job Name	
Item Number	Date 8/6/2024

STATIC PRESSURE vs VOLUME CURVE



Inlet Air Density 1.068 kg/m³
382 RPM = 42.68 m/sec
Pressure recovery 0.00 Pa
Rotor shaft power 4.5 kW
PWL (± 2) 86 dB(A)

ROTOR MODEL 2134- 4-24L/B3T	PAC
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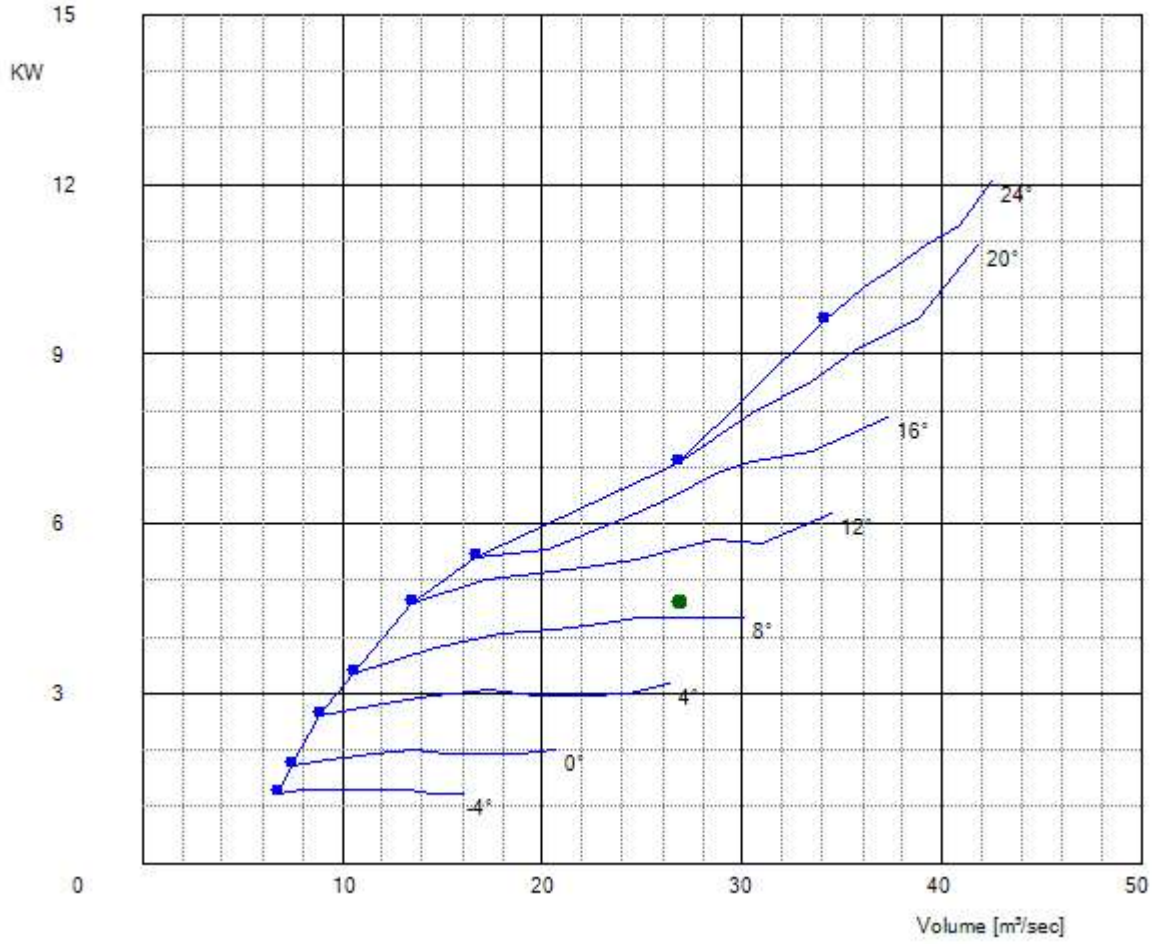
Customer Name	Job Reference
Job Name	
Item Number	Date 8/6/2024

FAN POWER vs VOLUME CURVE



Inlet Air Density 1.068 kg/m³
382 RPM = 42.68 m/sec
Pressure recovery 0.00 Pa
Rotor shaft power 4.5 kW

ROTOR MODEL 2134- 4-24L/B3T	PAC
All data must be approved by Cofimco	Fantastic.NET 2008.2.2

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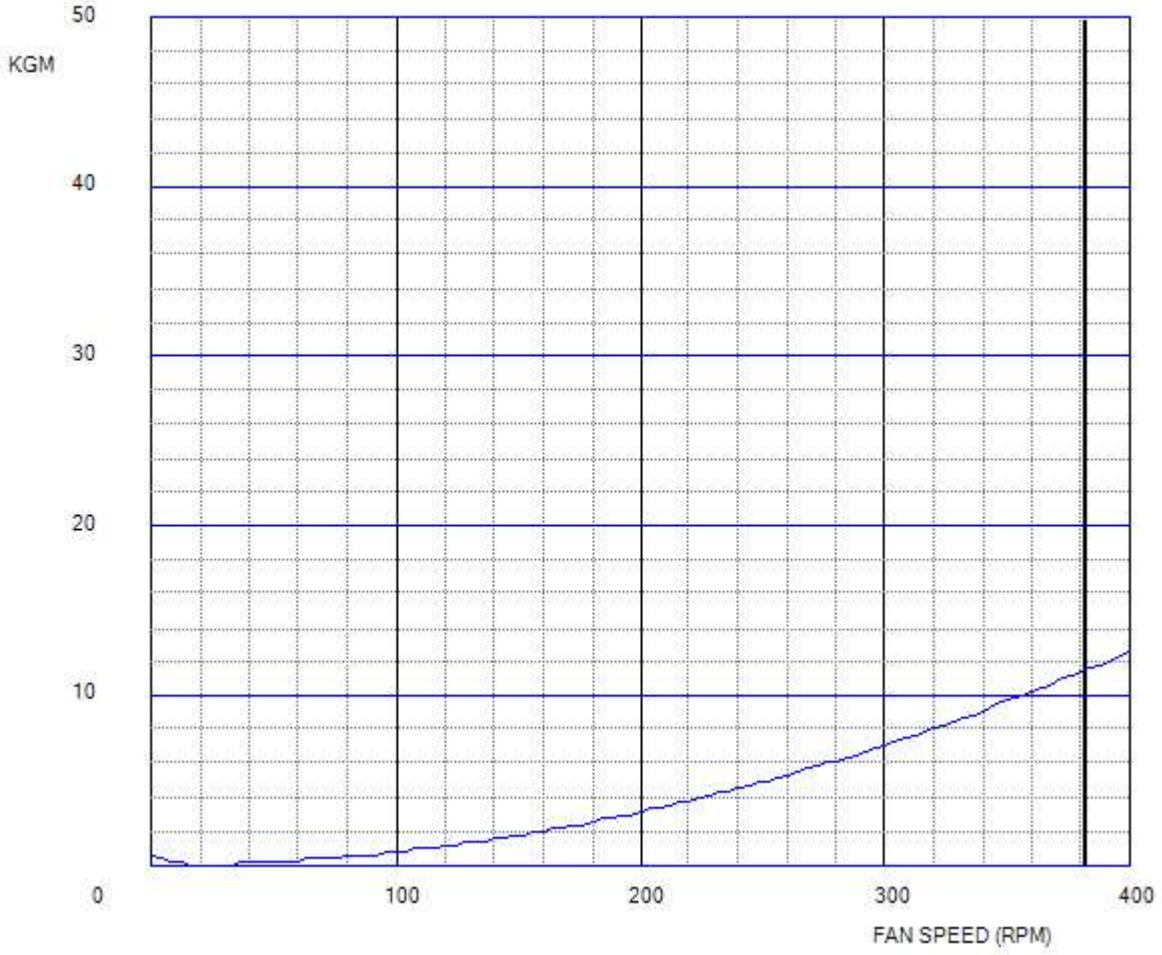
Customer Name	Job Reference
Job Name	
Item Number	Date 8/6/2024

TORQUE CURVE



Rotor shaft power 4.5 kW
RPM = 382.0
Torque @ 382.0 rpm = 11.5 kgm

ROTOR MODEL 2134- 4-24L/B3T PAC

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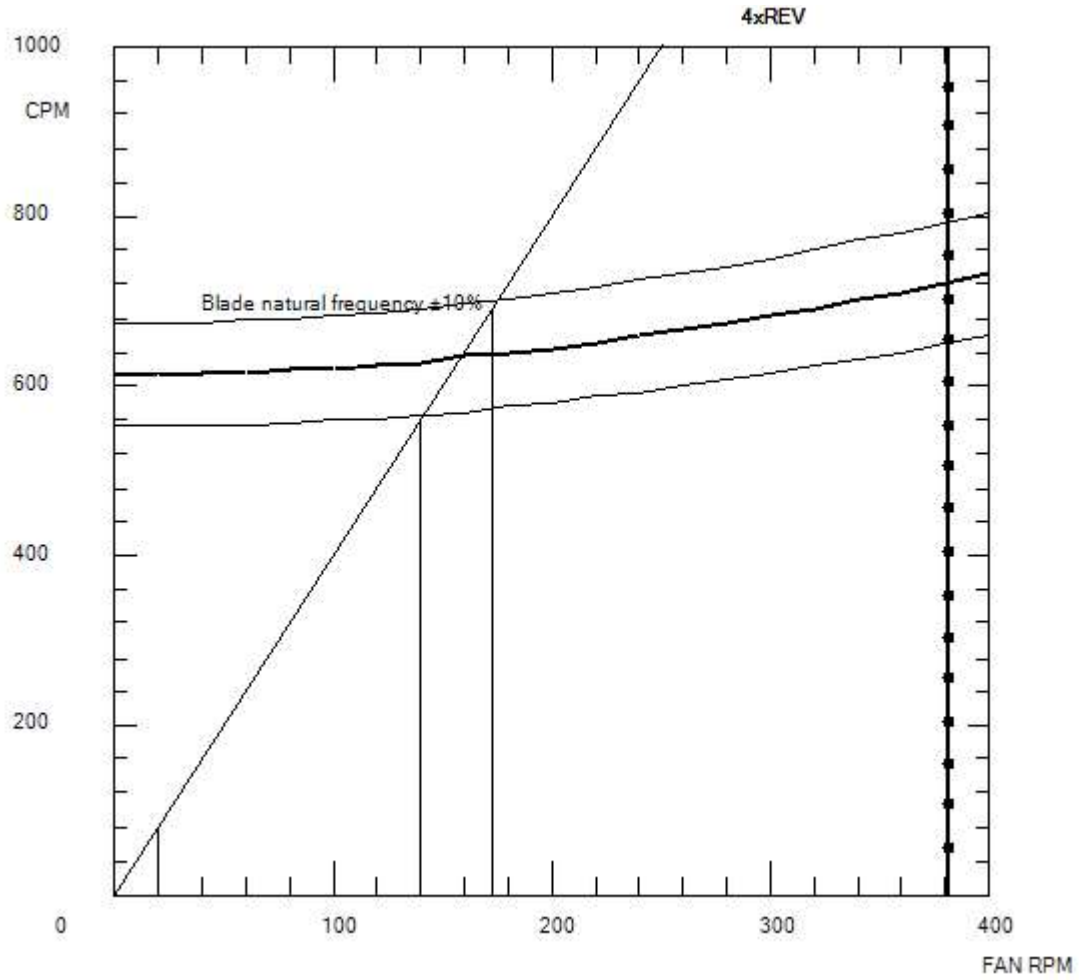
Customer Name	Job Reference
Job Name	
Item Number	Date 8/6/2024

CAMPBELL DIAGRAM



N° blades 4

382 RPM = 42.68 m/sec

ROTOR MODEL 2134- 4-24L/B3T	PAC
All data must be approved by Cofimco	Fantastic.NET 2008.2.2

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Customer Name	Job Reference
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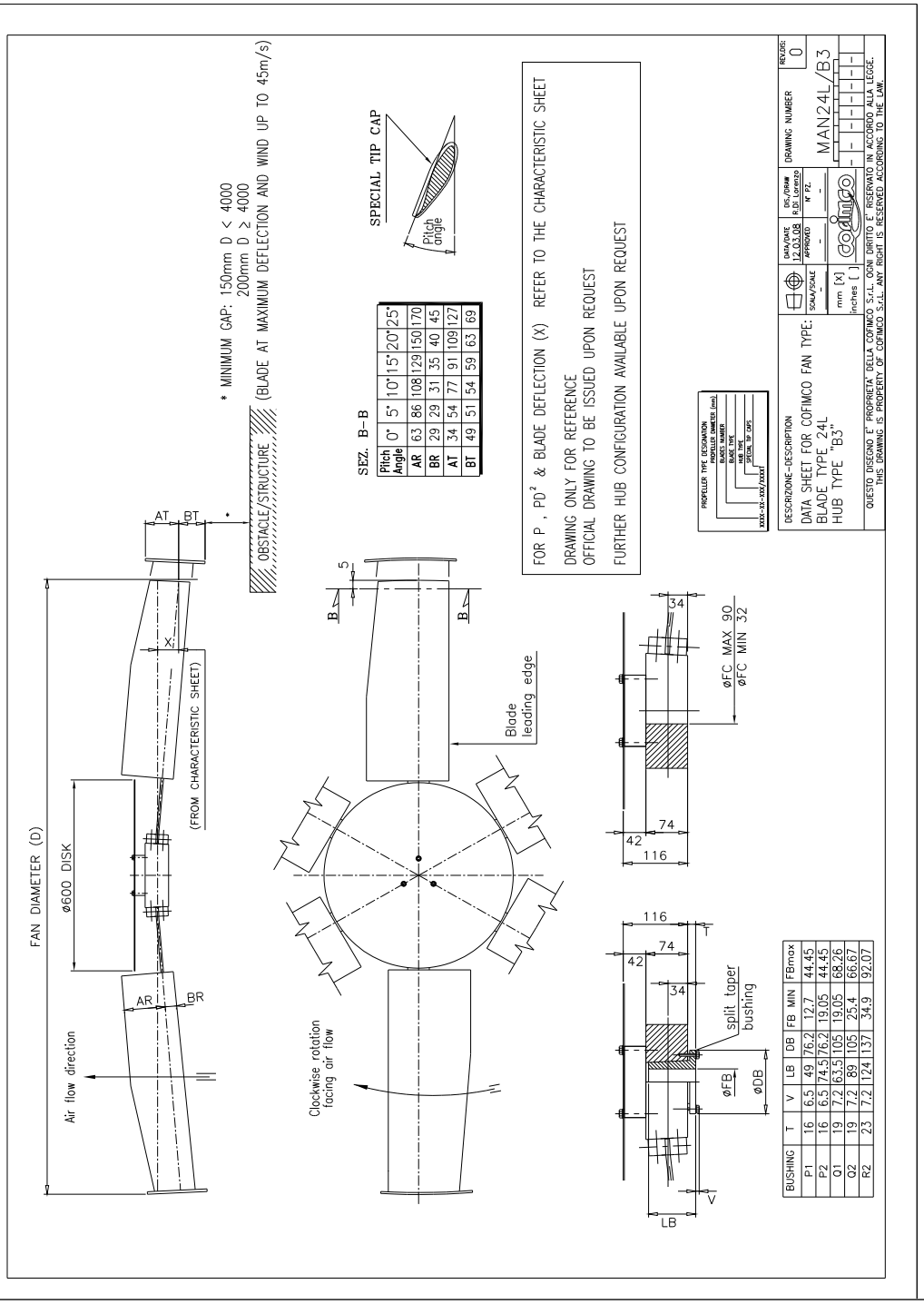

Pitch Angle	0°	5°	10°	15°	20°	25°
AR	63	86	108	129	150	170
BR	29	29	31	35	40	45
AT	34	54	77	91	109	127
BT	49	51	54	59	63	69

BUSHING	T	V	LB	DB	FB MIN	FBmax
P1	16	6.5	49	76.2	12.7	44.45
P2	16	6.5	74.5	76.2	19.05	44.45
Q1	19	7.2	63.5	105	19.05	68.26
Q2	19	7.2	89	105	25.4	66.67
R2	23	7.2	124	137	34.9	92.07

ROTOR MODEL 2134- 4-24L/B3T	PAC
All data must be approved by Cofimco	Fantastic.NET 2008.2.2

5.2 Electric Motor Datasheet

STYRENE PARK OFFSITE

Document Title:

Electrical Motor Data Sheet

Rev.	Issued Date	DESCRIPTION	PREPARED	CHECKED	APPROVED
R4	24-11-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R3	06-11-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R2	06-10-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R1	11-08-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R0	22-06-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh

REVISION RECORD SHEET

Page Page	Revisions								Page	Revisions						
	R0	R1	R2	R3	R4	R5	R6			R0	R1	R2	R3	R4	R5	R6
1	X	X	X	X	X				41							
2	X	X	X	X	X				42							
3	X	X	X	X	X				43							
4		X	X						44							
5		X	X						45							
6		X	X						46							
7		X	X						47							
8		X	X						48							
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MOTOR BASIC DATA (1158)		
INSTALLATION SITE		
QUANTITY/ Tag number		4/ RU0001A-M-02, RU0001A-M-03, RU0001B-M-02, RU0001B-M-03
BRAND-MODEL		Marathon- E3ABL
RATED POWER		7.5 kw
SUPPLY VOLTS		400±5%
FREQUENCY		50±2%
NUMBER OF POLE		4
WINDING CONNECTIONS/ROTATION		Delta
COUPLING TYPE		V-Belt(Belt & Pulley)
NOMIAL SPEED		1500 rpm
DUTY CATEGORY		S1
INVERTER DUTY		YES
ALTITUDE		20 m
AMBIENT TEMPRATURE MIN/MAX		5/48 C
RELATIVE HUMIDITY (RH)		65%
STARTING METHOD		2-DOL /2-VFD
CABLE GLAND SUPLIED		YES
DIRECTION OR ROTATION		Both
ISULATION CLASS/TEMP. RISE		F/B
COOLING		(IC 411)
AREA CLASSIFICATION		Ex db IIB T4
WINDING TEMPERATURE . DETECTORS (PTC RELAY)		N.A
ANTI-CONDANATION HEATER (SPACE HEATER)		N.A
MOUNTING (TYPE OF INSTALATION)		IMV3
PROTECTION DEGREE FOR MOTOR/FOR TERMINAL BOX		IP55//IP55
ROTOR CAGE MATERIAL (AL)		CAST IRON
PAINT SYSTEM		STANDARD COLOR-RAL (5015)
CABLE TYPE AND SIZE (FEEDER CABLE BY CLIENT)	MAIN	18~21 mm
	HEATER	N.A
	PTC	N.A
THERED (GLAND) ENTRY	MAIN	2XM32
	HEATER	N.A
	PTC	N.A
EARTH TERMINALS		IN & EXT
MAX NOISE LEVEL (AT ONE METER)		< 85
LIFTING DEVICE		YES
DRAIN PLUGS		NO
NO OF PHASE		3
IE (EFFICIENCY CLASS)		IE=3
PF (COS &)		0.84
TYPE TEST		NO
MOTOR SUITABLE FOR VCDS (Y/N)		NO
CURVE & OUTLINE & COMPLETE CATALOUGE (Y/N)		YES

marathon® Motors

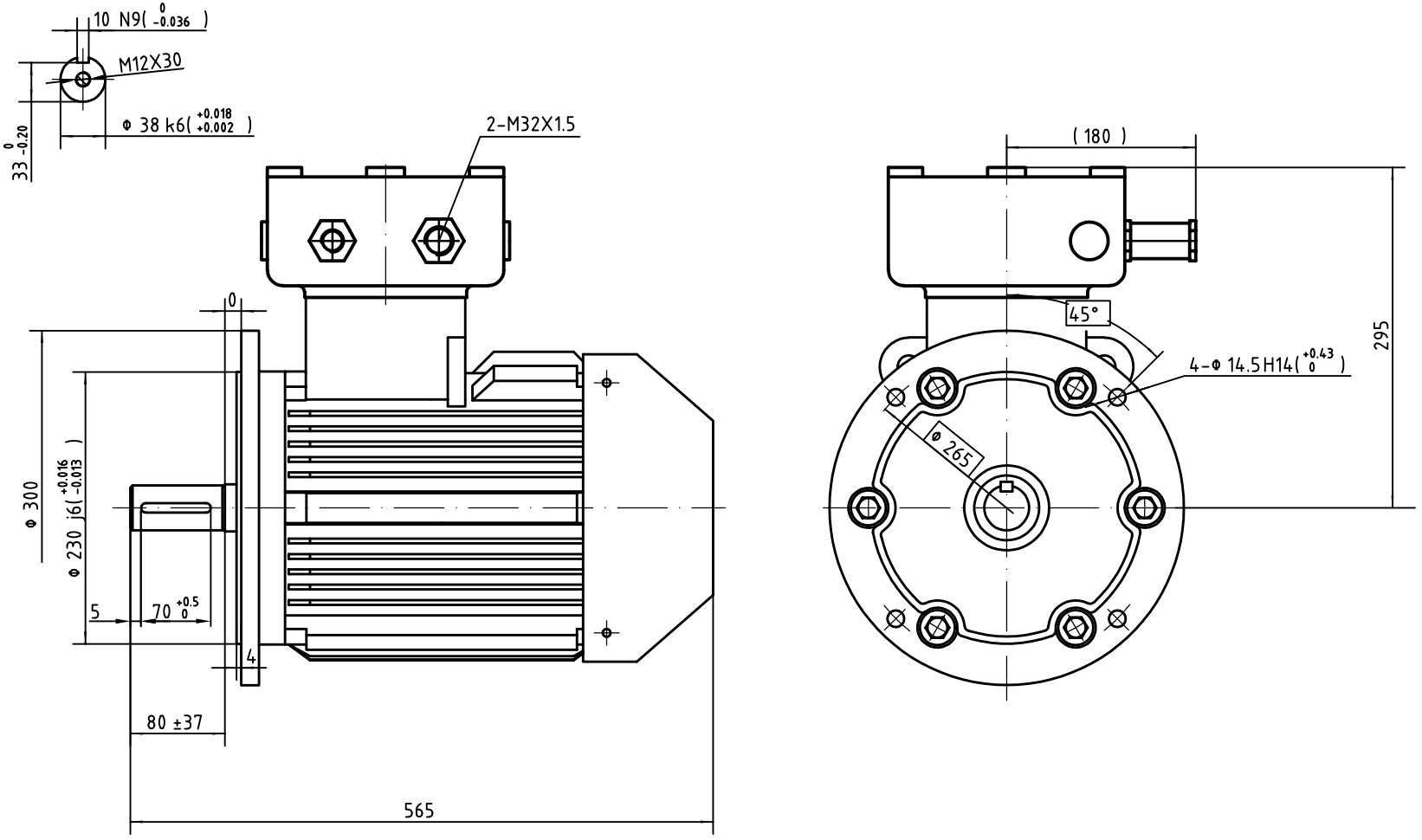
Squirrel Cage Induction Motor Data Sheet

Accreditation (National)	IEC 60079
Hazardous Classification	Ex db IIB T4
Series Model Type	E3ABL
Frame Size	132M
Rated Output Power	7.5 kW
Rated Speed	1465 r/min
Number of Poles	4 Pole
Number of Phases	3 Phase
Voltage	400 V
Frequency	50 Hz
Duty Cycle	S1
Service Factor	1.00
Operating Altitude	1000 masl
Insulation Class	F (155°C)
Temperature Rise	80K (B class)
Ambient Temperature	-15°C ~ 50°C
Method of Cooling	IC411 (TEFC - Totally Enclosed Fan Cooled)
Degree of Protection (Ingress Level)	IP55
Material of Construction	Cast Iron
Connection	△/Y
Full Load Current [I_N]	14.43
Locked Rotor Current [I_L / I_N]	7.50
Full Load Torque [T_N]	48.89 Nm
Locked Rotor Torque [T_L / T_N]	2.0
Breakdown Torque [T_B / T_N]	2.3
Efficiency Class	**IE3**

Load	**100% load**	**75% load**	**50% load**
Efficiency	90.4%	90.3%	89.7%
Power Factor (cos φ)	0.84	0.79	0.69

Bearing Configuration (DE / NDE)	Ball Bearing / Ball Bearing
Bearing Series Type	**DE:** 6208-2Z/C3 **NDE:** 6208-2Z/C3
Bearing Lubrication Type	Grease - ESSO UNIREX N2
Vibration	1.6 mm/sec
Moment of inertia (kg.m²)	0.0488
Direction of Rotation	CW or CCW
Sound Pressure Level	75 dB(A)
Final Colour	RAL 5010
Paint Specification	2 Pack Epoxy
Mounting Options	B5 /V3
Terminal Box Position	Top Terminal Box

This DataSheet has been issued for standard motor execution.
Technical data and the execution are subject to change without prior notice.



Note: Cable Gland not Included

DRAWING REVISION	REVISION BY	DATE
ECO	APPROVED BY	DATE
ECO DESCRIPTION		

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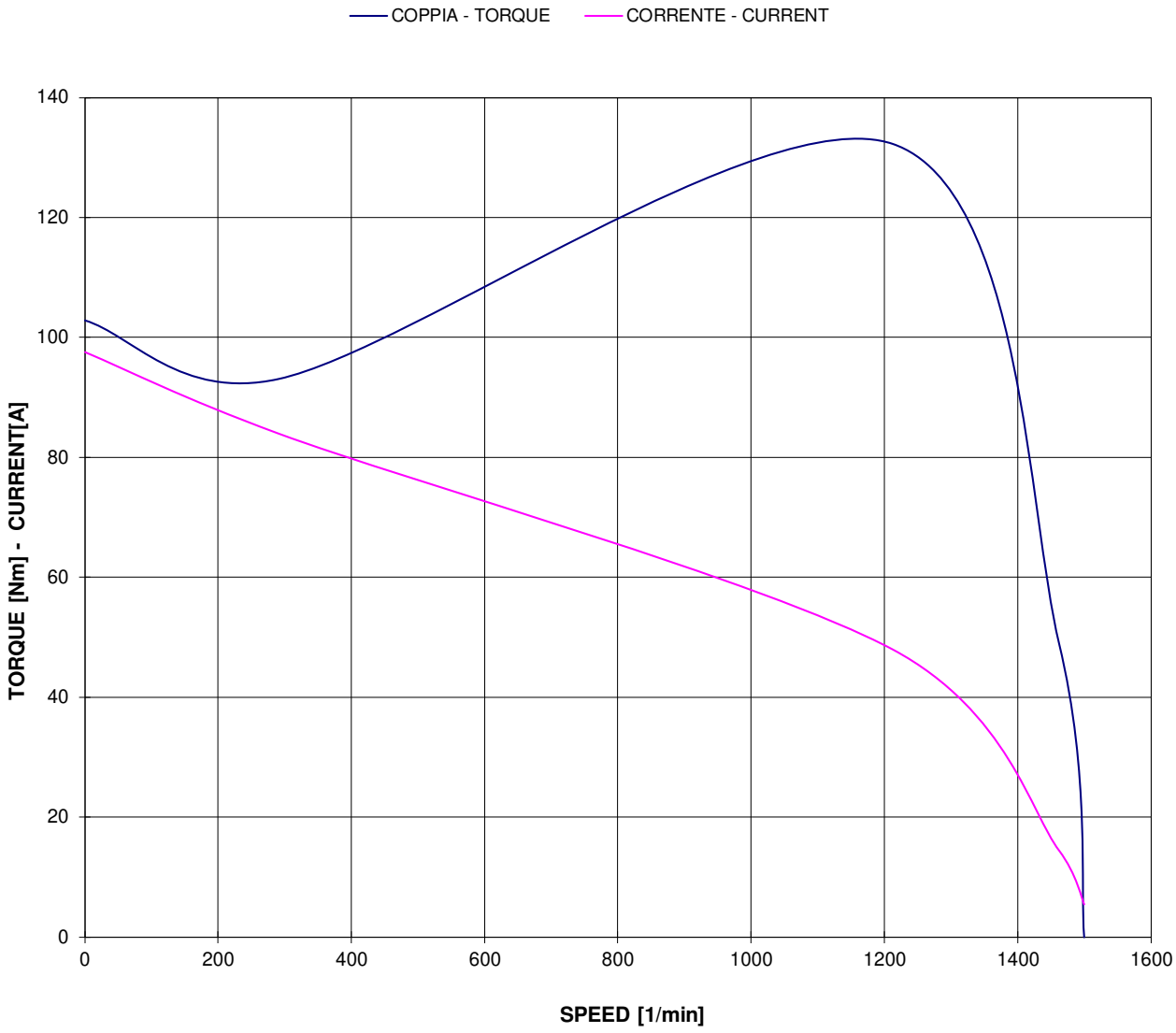
DRAWN BY	marathon™ Motors	
DATE		
APPROVED BY	DESCRIPTION	
DATE	E3ABL 132M B5	
REFERENCE	MATERIAL	PROCESS/FINISH
FIRST ANGLE PROJECTION	SIZE B / DRAWING NUMBER	SHEET

marathon Motors

TORQUE/CURRENT-SPEED DIAGRAM

Motore / Motor	**E3ABL 132M 4**	
Potenza nominale / Rated power	7.50	kW
Poli / Pole	4	
Tensione - Frequenza / Voltage - Frequency	400 - 50	V - Hz
Corrente / Rated current	14.43	A
Velocità / Speed	1462	rpm
Coppia / Torque	48.99	Nm

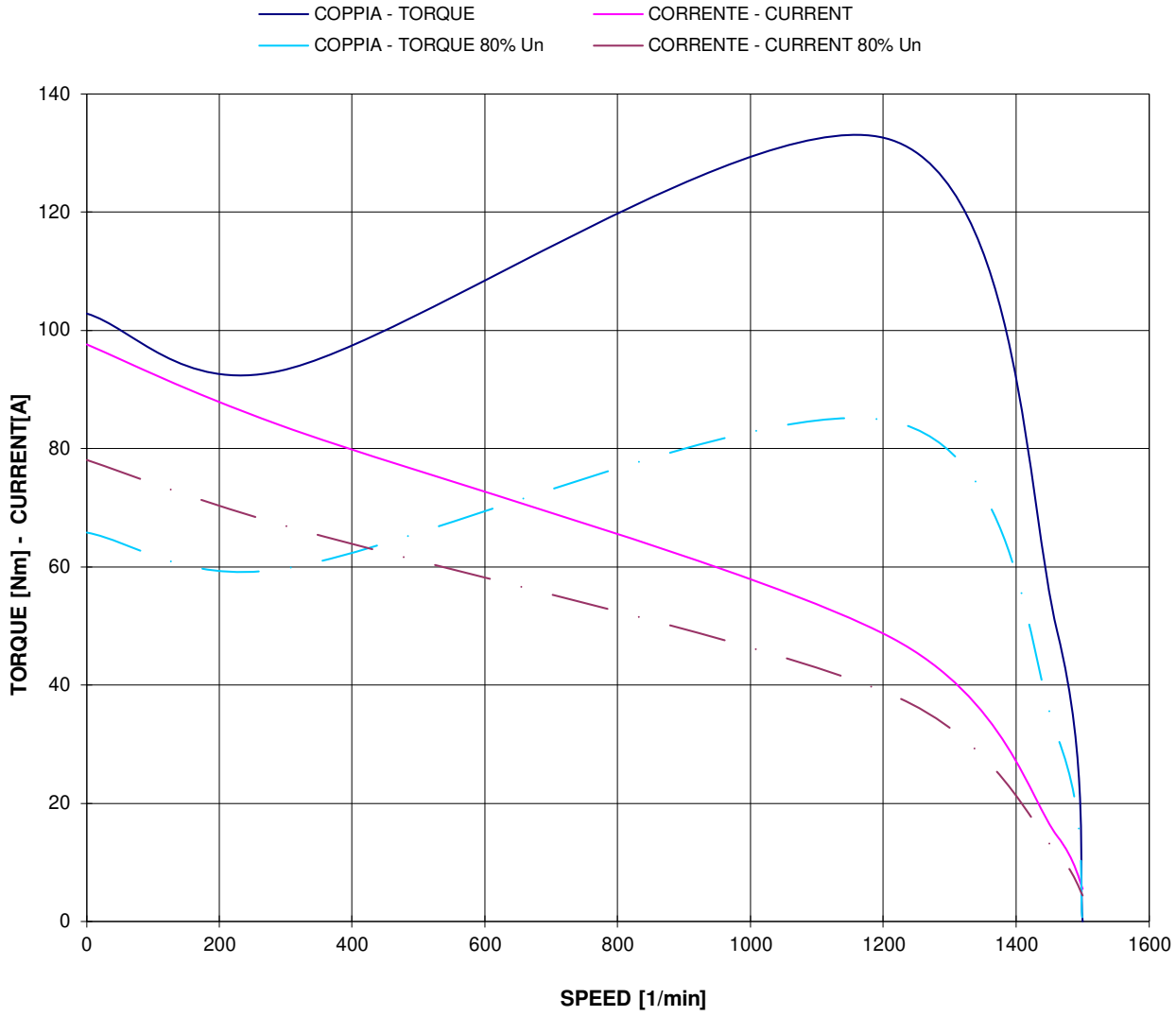


Data obtained by calculation method

marathon Motors

TORQUE/CURRENT-SPEED DIAGRAM (Reduced voltage)

Motore / Motor	**E3ABL 132M 4**	
Potenza nominale / Rated power	7.50	kW
Poli / Pole	4	
Tensione - Frequenza / Voltage - Frequency	400 - 50	V - Hz
Corrente / Rated current	14.43	A
Velocità / Speed	1462	rpm
Coppia / Torque	48.99	Nm

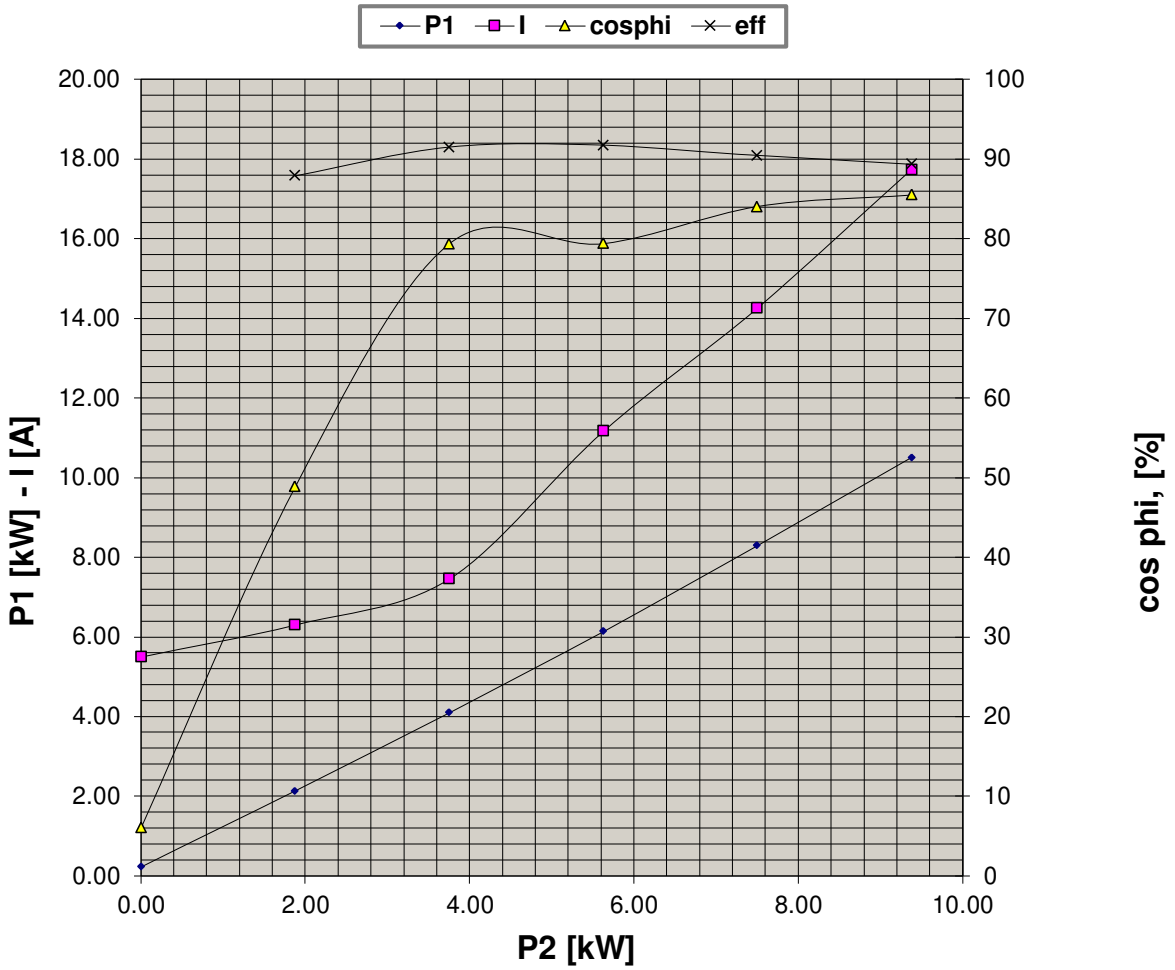


Data obtained by calculation method

marathon Motors

PERFORMANCE CURVES

Motore / Motor	**E3ABL 132M 4**	
Potenza nominale / Rated power	7.50	kW
Poli / Pole	4	
Tensione - Frequenza / Voltage - Frequency	400 - 50	V - Hz
Corrente / Rated current	14.43	A
Velocità / Speed	1462	rpm
Coppia / Torque	48.99	Nm

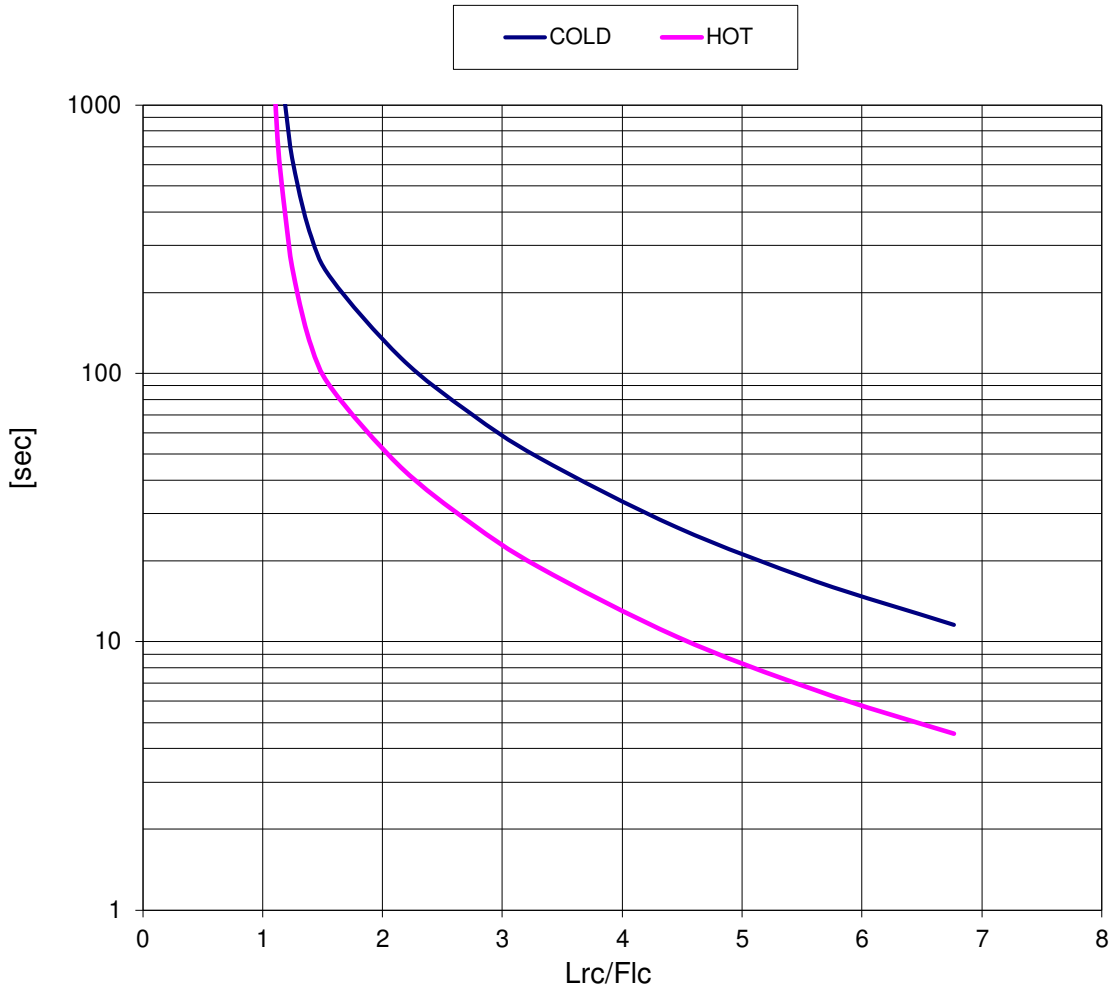


Data obtained by calculation method

marathon Motors

THERMAL WITHSTAND CURVE

Cliente / Customer	0	
Impianto / Plant	-	
ITEM	**-**	
Numero d'offerta / Offer Number	2024	
	-	
Motore / Motor	**E3ABL 132M 4**	
Potenza nominale / Rated power	7.50	kW
Poli / Pole	4	
Tensione - Frequenza / Voltage - Frequency	400 - 50	V - Hz
Corrente / Rated current	14.43	A
Velocità / Speed	1462	rpm
Coppia / Torque	48.99	Nm

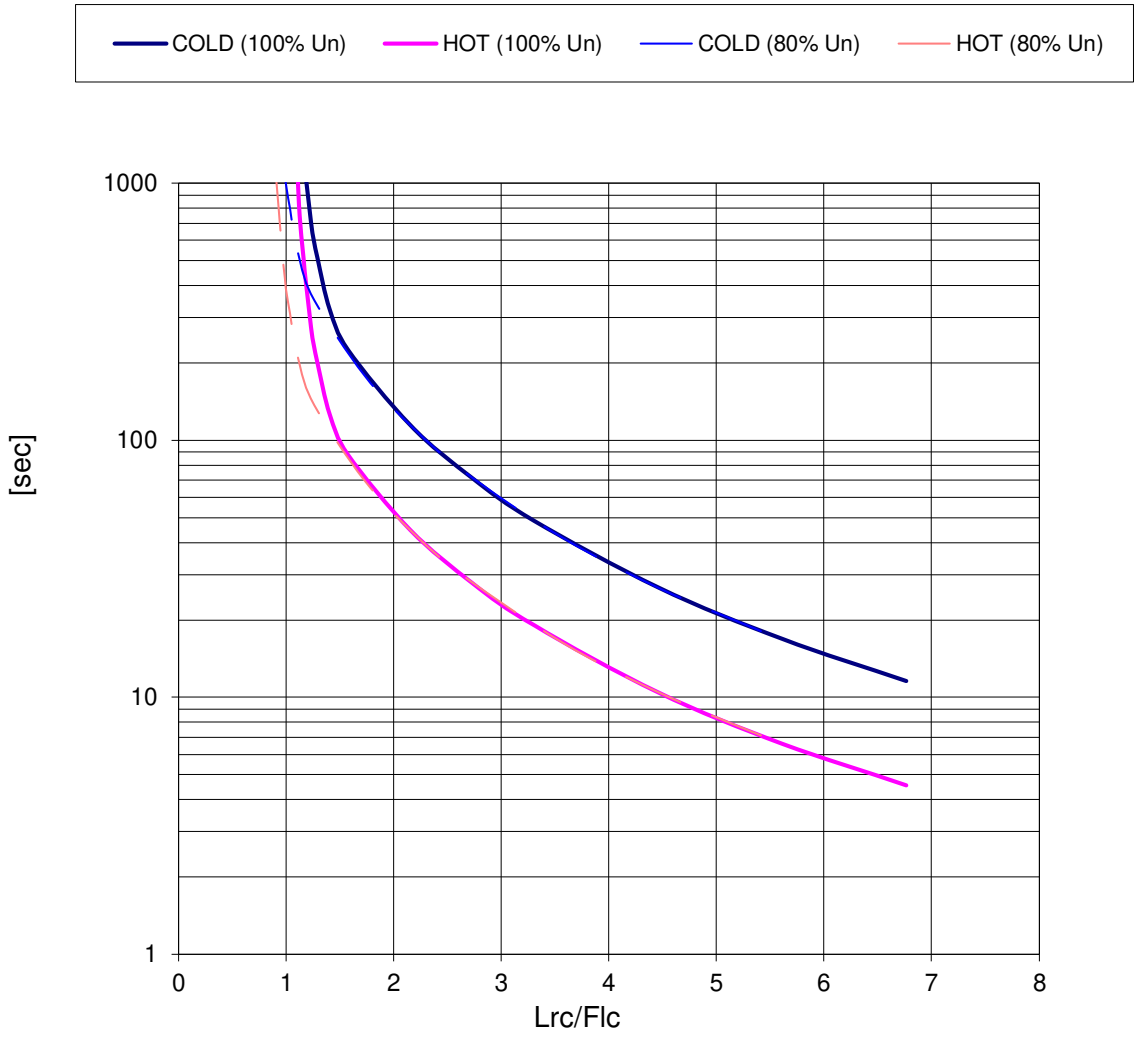


Data obtained by calculation method

marathon® Motors

THERMAL WITHSTAND CURVE (Reduced voltage)

Motore / Motor	**E3ABL 132M 4**	
Potenza nominale / Rated power	7.50	kW
Poli / Pole	4	
Tensione - Frequenza / Voltage - Frequency	400 - 50	V - Hz
Corrente / Rated current	14.43	A
Velocità / Speed	1462	rpm
Coppia / Torque	48.99	Nm



Data obtained by calculation method

5.3 Belt and Pulley Datasheet

STYRENE PARK OFFSITE

Document Title:

Belt & Pulley Data Sheet

Rev.	Issued Date	DESCRIPTION	PREPARED	CHECKED	APPROVED
R2	06-10-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R1	31-08-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R0	22-06-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh

REVISION RECORD SHEET

Page Page	Revisions								Page	Revisions						
	R0	R1	R2	R3	R4	R5	R6			R0	R1	R2	R3	R4	R5	R6
1	X	X	X						41							
2	X	X	X						42							
3	X	X	X						43							
4	X	X	X						44							
5			X						45							
6									46							
7									47							
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39									79							
40									80							

DATA SHEET FOR PULLEY BELT TRANSMISSION				
BASIC DATA FOR TRANSMISSIONS				
1	Customer items/DTT items	AIR COOLER		
2	Belt type	V-Belt		
3	Total quantity of belt			2Set
4	Motor power	(KW)		7.5
5	Motor frame size			-
6	Speed motor	(rpm)		1440
7	Speed fan	(rpm)		382
8	Speed ratio			3.76
9	Minimum service factor			1.4
10	Real service factor			1.8
11	Min. Max. Center Distance	(mm)		835 ±85
12	Center distance	(mm)		754.3
13	Belt width<QTY	(mm)		-- /2Set
14	Belt order info			CAPXPA2332
15	Belt drive life	(Hours)		V- belt estimated life~20000
16	Transmitted power	(kW)		13.75
17	Driver	QTY		2
		code		PBT106SPA2
		Pitch Dia	(mm)	106
		Pitch of Groove	(mm)	-
		Number of Grooves		2
		Width		-
		Bush no		1610
		Bore	(mm)	-
		Material/Weight		GG20 /-
18	Driven	QTY		2
		code		PBT400SPA2
		Pitch Dia	(mm)	400
		Pitch of Groove	(mm)	-
		Number of Grooves		2
		Width		-
		Bush no		2517
		Bore	(mm)	-
		Material/Weight		GG 20 /-
19	Deflection force	(N)		-
20	Deflection	(mm)		-
21	Maximum tension	(N)		561
22	Noise	dB(A)		85

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+39 02 89144 1
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info@sitspa.it - export@sitspa.it

INPUT DATA

Transmission type	2 Pulleys power transmission
Product family	NEXT®
Type	Narrow Raw Edge (XPZ,XPA,XPB,XPC)
Section	XPA

Power [kW]	7.50
Speed [RPM]	1440.0
Torque [Nm]	49.7
Required service factor	1.4

BELT

Code	CAPXPA2332
Length [mm]	2332.00
Number of belts / ribs [-]	2

RESULT

Resulting service factor	1.8
Transmissible power [kW]	13.75
Linear speed [m/s]	8.0
Center-to-center [mm]	754.3

PULLEYS

	Solid hub pulley code	Taper bushing code	External	Number of ribs	Pulley diameter [mm]	X [mm]	Y [mm]
Driver	PT106SPA2	PBT106SPA2	No	2	106.00	0	0
Driven	PT400SPA2	PBT400SPA2	No	2	400.00	754.26	0

	Transmission ratio	Speed [RPM]	Wrap angle [°]	Power [kW]	Torque [Nm]	Static shaft load [N]
Driver	--	1440.0	157.5	7.50	49.7	1693.3
Driven	0.26	381.6	202.5	7.50	187.7	1693.3

TENSIONING

Maximum tension [N]	561	**Minimum tension [N]**	432

		Vibration frequency method	
	Free segment length [mm]	**New belt frequency [Hz]**	**Run-in belt frequency [Hz]**
Driver-Driven	739.8	52 ± 2%	46 ± 2%

The calculation software is designed according to the latest specifications of mechanical transmissions and the high quality standards of our products. Please consider that similar products, not manufactured by SIT, or paired with pulleys not matching the international standards, could invalidate calculations and/or negatively affect performances. This software does not cover all possible belt drive conditions. It is responsibility of the belt drive system designer to ensure that SIT products are appropriate for the application. SIT declines all responsability and won't accept claims for errors or application problems caused by using this calculation software. This software specifications and calculation formulas are constantly being developed and SIT reserves the right to change them without notice.

06 October, 2024

MESSRS: Damafin Thermal Technology Co.
Iran - Tehran - 14th km of Tehran-Karaj special road –
Iran Khodro South Boulevard - Zamyad Street - No 4

Letter of conformity & Declaration of anti-static properties

Ref. order: PAE03029, 1158

Here enclosed we testify that the below mentioned belts:

Item code	Description	Quantity
CAPXPA2332	SIT NEXT® MC NARROW V-BELT Section XPA, Datum length Ld (mm) 2332	8

Are conform to Standards ISO 13050, and are antistatic according to ISO 9563 (Timing belts) and BS3790-1995, ISO 1813: 1998 (E) (V-Belts).

All belts have been inspected according SIT Spa ISO 9001 quality procedure.

Yours Faithfully,

Emiliano Dalla Nave
Sales Export Manager

SIT S.p.A.
Viale A.Volta, 2
20047 Cusago (MI)
ITALY
address

Tel. +39 02 89144.1
Fax +39 02 89144.291
www.sitspa.it
info@sitspa.it - export@sitspa.it
contacts

Via G. Carminati, 15
24012 Val Brembilla (BG)
Tel. 034598131
Fax 034599374
factory

5.4 Vibration Switch Datasheet

`

STYRENE PARK OFFSITE

Document Title:

Vibration Switch Data Sheet

Rev.	Issued Date	DESCRIPTION	PREPARED	CHECKED	APPROVED
R4	01-05-2025	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R3	02-11-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R2	06-10-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R1	17-09-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh
R0	22-06-2024	IFA	F.Aghaienezhad	J.Beigloo	A.Gholizadeh

REVISION RECORD SHEET

Page	Revisions								Page	Revisions						
Page	R0	R1	R2	R3	R4	R5	R6			R0	R1	R2	R3	R4	R5	R6
1	X	X	X	X	X				41							
2	X	X	X	X	X				42							
3	X	X	X	X	X				43							
4		X	X	X	X				44							
5		X	X	X	X				45							
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39									79							
40									80							

Vibration Switch Data sheet

Basic Data

1	PROJECT- Customer item		1158				
2	Quantity		4				
3	Tag No.		VS-RU0001A-01A VS-RU0001A-01B VS-RU0001B-01A VS-RU0001B-01B				
4	Area classification	IEC	Yes				
5		NEMA	Yes				
6	Enclosure		Exd				
7	Reset		Electric	NO	Manual	YES	
8	Switch contacts		SPDT	YES	DPDT	NO	
9	Protection		IP 65				
10	Zone - Gas group		2				
11	RANGE - SET POINT		(0- 5 g)				
12	Temperature class		IIB-T3				
13	Ambient temp. min/max		(5 To 48) ℃				
14	Humidity (RH) (%)		80%				
15	Altitude (m)		20				
16	Contact rating		24VDC, 1A				
17	Start-up delay		N.A				
18	MOUNTING		Yes				
19	Housing		CAST ALOMINIUM				
20	Thered size - TYPE		M20 @ 1.5				

Manufacturer Data

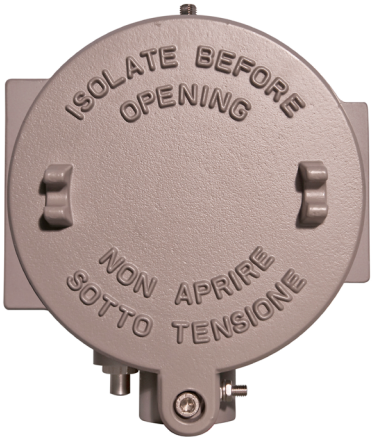
1	Manufacturer / Origin	SAMI/ WIKA/Italy			
2	Type - Model	VBS SPDT without M20*2.5			
3	Enclosure material	Cast aluminum painted			
4	Certification	According to 2014/34/EU ATEX Exd IIC T5			
5	Working	HORIZENTAL	Yes	VERTICAL	Yes
6	Wiring entry(type-size)	M20			
7	CABLE GLAND	M20*1.5			
8	RANGE	0-5g			
9	TEMP CLASS	T5			
10	Normal Operation Temp	(-20, 55) ℃			
11	Set point adjust	2g			
12	RESET	MANUAL			
13	PROTECTION	IP65			
14	Installation	With fixing base or bracket. The vibration sensitive axle is perpendicular or axial to the switch fixing base			
15					
16					
17					
18					
19					

Compact vibration switch, flameproof enclosure Ex D
Model VBS

for further approvals see page 4

Applications

- Monitor excess of vibrations in machinery equipments
- Safety-critical applications in chemical and petrochemical industries, oil and gas, power generation, including nuclear power plants, water/wastewater, mining
- Ventilation / Air conditioning
- Pumps & compressors, turbines
- Engines, motors & generators



Model VBS

Special features

- Robust switch enclosure from aluminium alloy
- Frequency sensitivity up to 60 Hz (< 3600 RPM)
- SPDT or DPDT contacts, up to AC 380 Vac, 15 A
- Calibration: up to 5 g with outer calibration screw

Description

The Vibration switches have been developed to protect the rotating equipments against increase in vibration due to operating anomalies or failures that could damage the entire machinery.
The high quality of the products and manufacturing in accordance with ISO 9001 ensure reliable monitoring of your machine. During the production phase the switches are 100% calibrated and tested.

The switches are of mechanical type. The robust switch enclosure from aluminium alloy can withstand the rough and corrosive operating conditions of the process industry.

To adjust the set point simply open the access cover plate. The access to the terminal block for the electrical connection is protected by a screw-on lid, which is secured with a screw-type lock against unauthorised intervention.
The vibration switches have a fequence sensitivity up to 60Hz and can be calibrated up to 5g acceleration directly in field.

Vibrations Switches contain a spring inside the body.
The excessive vibration, beyond a defined range, causes the movement of the spring, which consequently activates the switch through magnetic attraction.
The position of the magnet in relation to the spring can be changed to match the desired threshold value.
Disengaging the magnet from the spring will reset the Vibration Switch.

In order to ensure operation as flexible as possible, the Vibration switches are fitted with micro switches which enable the switching of an electrical load of up to AC 380V 15A directly.

Data sheets showing similar products and accessories:

Battery-operated signal converter; model FLC-406; see data sheet FL 20.08
Signal converter; model FLC-608; see data sheet FL 20.05
Flow meter; model FLC-2300; see data sheet FL 20.06

WIKA Part of your business

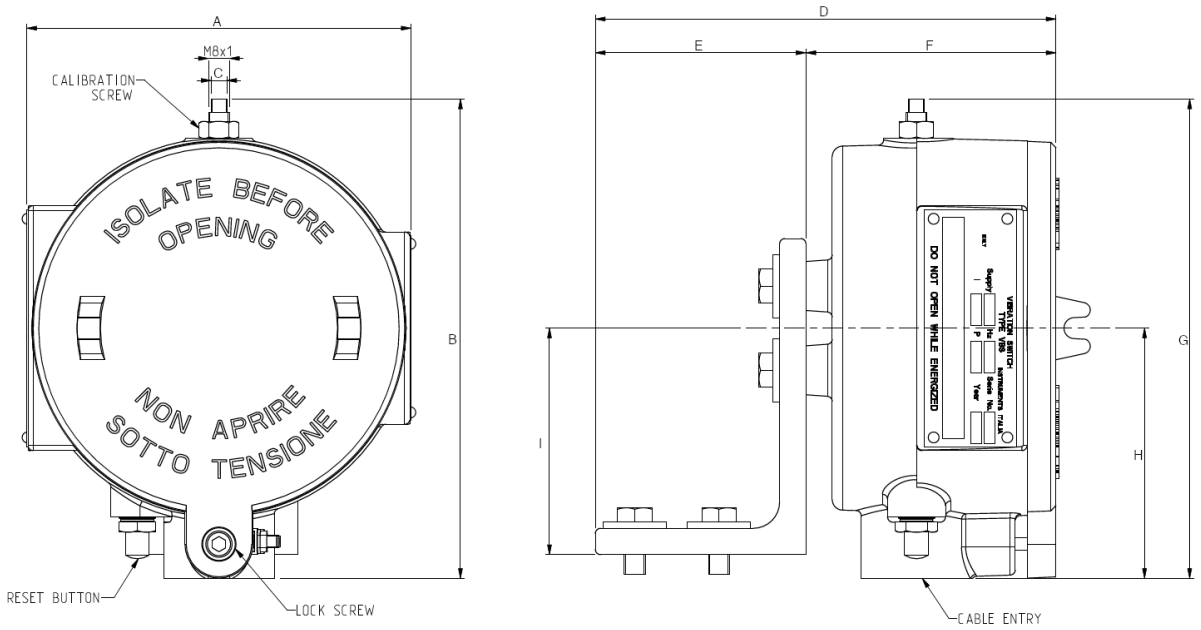
Specifications

Specifications	
Enclosure material	High resistance aluminium alloy. Max copper content: 1%
Ignition protection	CESI Flameproof, Ex d IIC T6 or T5 Gb
Switch enclosure	Epoxy resin coated and tamper-proof junction box and terminal box provided together with the equipment
Peak vibration range	5 g
Calibration	0 to 5g with outer calibration screw [1]
Frequency sensitivity	0 to 60 Hz (0 ÷ 3600 RPM)
Mechanical protection	IP 65 & CE mark
Working axes	2 Axis only (A-B see picture)
Ambient Temperature	■ -20°C +40°C for temperature class T6 ■ -20°C +55°C for temperature class T5
Capacity of contacts	■ SPDT 15A @ 0÷380 Vac ■ DPDT 10A @ 0÷250 Vac
Start-up delay	Optional reset coil required [2]
Reset	■ Local reset is provided as standard ■ Electrical Remote Reset can be supplied as optional
Weight	3 kg (including bracket and fixing screws)
Earth screws	Internal and external
Terminal box	Suitable for cable up to 2,5 mm^2
Installation	With fixing base or bracket. The vibration sensitive axle is perpendicular or axial to the switch fixing base
Label	Laser-engraved stainless steel nameplate fixed to the body, containing the following information: ■ Manufacturer name ■ Model ■ Serial Number ■ Range ■ Purchase Order number ■ Tag number
Reset coil	■ None ■ 115/120 Vac ■ 220/230 Vac ■ 24 Vdc
Electrical connection	■ M20 X 1,5 ■ ¾" NPT-F ■ 1/2" NPT-F
Switch contacts	■ SPDT ■ DPDT

[1] The vibration switches are provided with a standard pre-set factory set-point. The set-point of the instrument strongly depends on the intensity of the natural vibration produced by the equipment during the normal operation. The final calibration of the vibration switch must be done on field according to the peculiarity of machinery on which the device is installed. For this reasons, due to the huge variables that depend on the equipment and application, WIKA does not provide any customized set-point or any calibration certificate of the instrument.

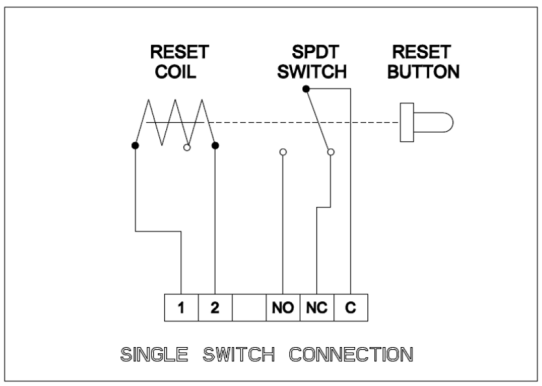
[2] Apply voltage to the reset coil to stop bounces for at least 20 seconds after the machine has started

Dimensions

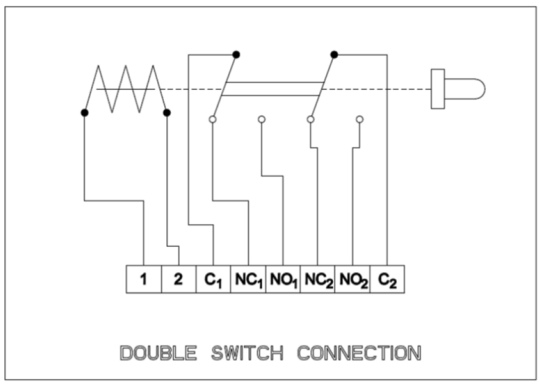


Dimensions in mm [in]								
A	B	C	D	E	F	G	H	I
146 [5.75]	182 [7.16]	6 [0.24]	175 [6.89]	80 [3.15]	95 [3.74]	182 [7.16]	95 [3.74]	86 [3.38]

Single Switch Connection Electrical Diagram



Double Switch Connection Electrical Diagram



Ordering Information

Item Number	Reset coil	Switch contacts	Electrical connections
81647076	24 VDC	DPDT	¾“ NPT-F + ½“ NPF-F adapter
81647079	24 VDC	DPDT	3/4" NPT-F direct
81647080	24 VDC	DPDT	M20x1,5 + Cable gland 11-18mm adapter
81647083	24 VDC	DPDT	M20x1,5 direct
81647077	24 VDC	SPDT	¾“ NPT-F + ½“ NPF-F adapter
81647078	24 VDC	SPDT	3/4" NPT-F direct
81647081	24 VDC	SPDT	M20x1,5 + Cable gland 11-18mm adapter
81647082	24 VDC	SPDT	M20x1,5 direct
81647168	110 VAC	DPDT	¾“ NPT-F + ½“ NPF-F adapter
81647165	110 VAC	DPDT	3/4" NPT-F direct
81647087	110 VAC	DPDT	M20x1,5 + Cable gland 11-18mm adapter
81647084	110 VAC	DPDT	M20x1,5 direct
81647167	110 VAC	SPDT	¾“ NPT-F + ½“ NPF-F adapter
81647166	110 VAC	SPDT	3/4" NPT-F direct
81647086	110 VAC	SPDT	M20x1,5 + Cable gland 11-18mm adapter
81647085	110 VAC	SPDT	M20x1,5 direct
81647170	220 VAC	DPDT	¾“ NPT-F + ½“ NPF-F adapter
81647173	220 VAC	DPDT	3/4" NPT-F direct
81647174	220 VAC	DPDT	M20x1,5 + Cable gland 11-18mm adapter
81647177	220 VAC	DPDT	M20x1,5 direct
81647171	220 VAC	SPDT	¾“ NPT-F + ½“ NPF-F adapter
81647172	220 VAC	SPDT	3/4" NPT-F direct
81647175	220 VAC	SPDT	M20x1,5 + Cable gland 11-18mm adapter
81647176	220 VAC	SPDT	M20x1,5 direct
81647072	Without	DPDT	¾“ NPT-F + ½“ NPF-F adapter
81647068	Without	DPDT	3/4" NPT-F direct
81647074	Without	DPDT	M20x1,5 + Cable gland 11-18mm adapter
81647071	Without	DPDT	M20x1,5 direct
81647073	Without	SPDT	¾“ NPT-F + ½“ NPF-F adapter
81647069	Without	SPDT	3/4" NPT-F direct
81647075	Without	SPDT	M20x1,5 + Cable gland 11-18mm adapter
81647070	Without	SPDT	M20x1,5 direct

Approvals

Logo	Description	Country
CE	**- EU Declaration of conformity** **- RoHS directive** **- ATEX directive** **- II 2G**	European Union

Approvals and certificates, see website

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