Airpack B.V. - Air Compressor –

Integrated Methanol and Ammonia Plant

17735-COM Technical Operating and Maintenance Manual

01	12-09-2025	Issued for Information	M.C.	S.K.	J.J.
REV.	**DATE**	**DESCRIPTION**	**DRAWN**	**CHECKED**	**APPROVED**

LIST OF REVISED PAGES

Page \ Rev.	01	02	03	04	05	Page \ Rev.	06	07	08	09	10	Page \ Rev.	01	02	03	04	05	Page \ Rev.	01	02	03	04	05
1						**26**						**51**						**76**					
2						**27**						**52**						**77**					
3						**28**						**53**						**78**					
4						**29**						**54**						**79**					
5						**30**						**55**						**80**					
6						**31**						**56**						**81**					
7						**32**						**57**						**82**					
8						**33**						**58**						**83**					
9						**34**						**59**						**84**					
10						**35**						**60**						**85**					
11						**36**						**61**						**86**					
12						**37**						**62**						**87**					
13						**38**						**63**						**88**					
14						**39**						**64**						**89**					
15						**40**						**65**						**90**					
16						**41**						**66**						**91**					
17						**42**						**67**						**92**					
18						**43**						**68**						**ATTACHMENT**					
19						**44**						**69**						**1**					
20						**45**						**70**						**2**					
21						**46**						**71**						**3**					
22						**47**						**72**						**4**					
23						**48**						**73**						**5**					
24						**49**						**74**						**6**					
25						**50**						**75**						**7**					

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION A

GENERAL DATA

Customer	: Lavan Industry Development Company (LIDCO)
Contractor	: Nargan Company
Agent	: HSE Group
Purchase order number	: LIDCO-PO-NEC-278-6019
Equipment	: Instrument Air Package
Equipment tag number(s)	: K-020
Airpack reference	: 17735-COM
Serial no.	: T-2023-00799
Year built	: 2023
Quantity of packages	: 1
Compressor model	: TRZ 400
Compressor outlet capacity	: 35 Nm3/hr
Compressor suction pressure	: 9,5bar(a)
Compressor discharge pressure	: 30 bar(g)
Power supply motor LP	: 400V / 50Hz / 3ph.
Speed e-motor LP	: 1485 rpm
Manufacturer	: Airpack Nederland B.V. Phone: + 31 111 415 455 Fax : + 31 111 413 338 E-mail : airpack@airpack.nl

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION B

SAFETY PRECAUTIONS

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

The warranties agreed for this equipment are exclusive and all other warranties, whether express, oral, implied or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose, are hereby expressly disclaimed. Correction of nonconformities within the applicable warranty period set forth above provides the exclusive remedies with respect to the quality of or any defect in products or services delivered or performed hereunder. Notwithstanding anything else, the total liability, in the aggregate, of seller, its affiliates, and subcontractors, and their respective employees and agents shall be limited to the price paid by the purchaser to seller for the specific product/service giving rise to the claim. Under no circumstances shall seller, its affiliates, or subcontractors, or their respective employees or agents be liable for any consequential, incidental, indirect, special or punitive damages (whether for lost profits or revenue, work stoppage, downtime costs, lost business, or otherwise), even if advised of the possibility of such damages or if such damages are foreseeable.

This equipment is designed as per agreed specifications and recommendations of Airpack Nederland B.V and is delivered 'as is'. Technical recommendations waived by the buyer and their consequences are excluded from warranty. A warranty period has been agreed in the contract and is only valid as long as:

- The product is operated at agreed design considerations;
- The product is operated and maintained as described in the operating manual supplied by Airpack Nederland BV;
- The owner uses genuine Airpack Nederland BV parts and consumables.

The warranty is limited to defects resulting from faulty design, materials and workmanship only. Normal wear and tear, misuse and improper fitting are excluded from this warranty.

If, during any warranty period the user:

(a) makes any design change to the equipment without prior consent of Airpack Nederland BV or;

(b) uses replacement parts other than those supplied or approved in writing by Airpack Nederland BV; or

(c) carries out any repairs or replacements using unqualified staff;

This warranty shall, on the happening of any such event, immediately be rendered null and void.

All decisions relating to warranty work made by Airpack Nederland BV will be binding and final.

Please be aware that disregarding instructions in the operating manual, using non-genuine spare parts and making unauthorized modifications, may result in serious damage to the machine, your environment, and yourself!
All parts purchased that are claimed to be defective must be returned at the customer's risk and freight paid to Airpack headquarters.

This warranty does not cover consequential damages resulting from failure of parts or equipment or subsequent expenses or losses. This warranty is extended only to the first user of

the equipment purchased from Airpack Nederland BV and may not be transferred to any other person.

1 Basic operation and designation use of the machine/plant

1.1 The machine/plant has been built in accordance with state-of-the-art standard and the recognized safety rules. Nevertheless, its use may constitute a risk to life and limb of the user of third parties, or cause damage to the machine and to other material property.

1.2 The machine / plant must only be used in technically perfect condition in accordance with its designated use and the instructions set out in the operating manual, and only by safety-conscious persons who are fully aware of the risks involved in operating the machine/plant. Any functional disorders, especially those affecting the safety of the machine/plant, should therefore be rectified immediately.

1.3 The machine/plant is designed exclusively for the compression of the medium (air/gas) specified under "Technical data" of the operating instructions manual considered contrary to its designation use. The manufacturer/supplier cannot be held liable for any damage resulting from such use. The risk of such misuse lies entirely with the user. Operating the machine within the limits of its designation use also involves observing the instructions set out in the operating manual and complying with the inspection and maintenance directives.

2 Organizational measures

2.1 The operating instructions must always be at hand at the place of use of the machine/plant, e.g. by stowing them in the tool compartment or tool-box provided for such purpose.

2.2 In addition to the operating instructions, observe and instruct the user in all other generally applicable legal and other mandatory regulations relevant to accident prevention and environmental protection.

These compulsory regulations may also deal with the handling of hazardous substances, issuing and/or wearing of personal protective equipment.

2.3 The operating instructions must be supplemented by instructions covering the duties involved in supervising and notifying special organizational features, such as job organisation, working sequences or the personnel protective equipment.

2.4 Personnel entrusted with work on the machine must have read the operating instructions and in particular the chapter on safety before beginning work. Reading the instructions after work has begun is too late. This applies especially to persons working only occasionally on the machine, e.g. during maintenance.

2.5 Check at least from time to time whether the personnel is carrying out the work in compliance with the operating instructions and paying attention to risks and safety factors.

2.6 For reasons of security, long hair must be ties back or otherwise secured, garments must be close-fitting and no jewellery –such as rings- may be worn. Injury may result from being caught up in the machinery or form rings catching on moving parts.

2.7 Use protective equipment wherever required by the circumstances or by law.

2.8 Observe all safety instructions and warnings.

2.9 See to it that safety instructions and warnings attached to the machine are always complete and perfectly legible.

2.10 In event of safety-relevant modifications or changes in the behaviour of the machine/plant during operation, stop the machine / plant immediately and report the malfunction to the competent authority/person.

2.11 Never make any modifications, additions or conversions which might affect safety without the supplier approval. This also applies to the installation and adjustment of safety devices and valves as well as to welding work on pipe lines and receivers.

2.12 Spare parts must comply with the technical requirements specified by the manufacturer. Spare parts from original equipment manufacturers can be relied to do so.

2.13 Never modify the software of programmable control systems.

2.14 Hose pipes are subject to a quality check (pressure and visual examination) by the operator in appropriate intervals even if no safety-relevant defects have been detected.

2.15 Adhere to prescribed intervals or those specified in the operating instructions for routine checks and inspections.

2.16 For execution of maintenance work, tools and workshop equipment adapted to the task on hand are absolutely indispensable.

2.17 The personnel must be familiar with the location and operation of the fire exiting users.

2.18 Observe all fire-warning and fire-fighting procedures.

3 Selection and qualification of personnel – basic responsibilities

3.1 Any work on and with the machine/plant must be executed by reliable personnel only. Statutory minimum age limits must be observed.

3.2 Employ only trained or instructed staff and set out clearly the individual responsibilities of the personnel for operation, maintenance and repair.

3.3 Make sure that only authorised personnel works on or with the machine.

3.4 Define the machine operator's responsibilities given the operator the authority to refuse instructions by third parties that are contrary to safety.

3.5 Do not allow persons to be trained or instructed or persons taking part in a general training course to work on or with the machine / plant without being permanently supervised by an experienced person.

3.6 Work on the electrical system and equipment of the machine / plant must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with the electrical engineering rules and regulations.

3.7 Work on gas-fuelled equipment (gas consumers) may be carried out by specially trained personnel only.

4 Safety instructions governing specific operational phases

4.1 Standard operation

4.1.1 Avoid any operational mode that might be prejudicial to safety.

4.1.2 Take the necessary precautions to ensure the machine is used only when in a safe and reliable state. Operate the machine only if all protective and safety-oriented devices, such as removable safety devices, emergency shut-off equipment and sound-proofing elements are in place and fully functional.

4.1.3 Check the machine at least once per working shift for obvious damage and defects. Report any changes (incl. changes in the machine's working behavior) to the competent organization / person immediately. If necessary, stop the machine immediately and lock it.

4.1.4 In the event of malfunctions, stop the machine immediately and lock it. Have any defects rectified immediately.

4.1.5 During start up or setting the machine in motion, make sure that nobody is at risk.

4.2 Special work in conjunction with utilization of the machine and maintenance and repairs during operation; disposal of parts and consumables.

4.2.1 Observe the adjusting, maintenance and inspection activities and intervals set out in the operating instructions, including information on the replacement of parts and equipment. These activities may be executed by skilled personnel only.

4.2.2 Brief operating personnel before beginning special operations and maintenance work, and appoint a person to supervise the activities.

4.2.3 In any work concerning the operation, conversion or adjustment of the machine and its safety – oriented devices or any work relate to maintenance, inspection and repair, always observe that start-up and shut-down procedure set out in the operating instructions and the information on maintenance work.

4.2.4 Ensure that the machine area is adequately secured.

4.2.5 If the machine/plant is completely shut down for maintenance and repair work, it must be secured against inadvertent starting by
- locking the principal control elements and
- attaching a warning sign to the main switch

4.2.6 To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting tackle and secured. Use only suitable and technically perfect lifting gear and suspension systems with adequate lifting capacity. Never work or stand under suspended loads.

4.2.7 The fastening of loads and the instruction of crane operators should be entrusted to experienced persons only. The marshaller giving the instructions must be within sight or sound of the operator.

4.2.8 For carrying out overhead assembly work always use specially designed or otherwise safety-oriented ladders and working platforms. Never use machine parts as a climbing aid. Wear a safety harness when carrying out maintenance work at greater heights. Keep all handles, steps, handrails, platforms, landing and ladders free from dirt.

4.2.9 Clean the machine, especially connections and threaded unions, of any traces of oil, fuel or preservatives before carrying out maintenance / repair. Never use aggressive detergents. Use lint-free cleaning rags.

4.2.10 Before cleaning the machine with water, steam jet (high pressure cleaning) or detergents, cover or tape up all openings which – for safety and functional reasons- must be protected against water, steam or detergents penetration. Special care must be taken with electric motors and switch gear cabinets.

4.2.11 Ensure during cleaning of the machine that the temperature sensors of the fire warning and fire-fighting systems do not come into contact with hot cleaning against as this might activate the fire-fighting system of the plant.

4.2.12 After cleaning, remove all covers and tapes applied for that purpose.

4.2.13 After cleaning, examine all pipe lines for leaks, loose connections, chafe marks and damage. Any defects found must be rectified without delay.

4.2.14 Always tighten any screwed connections that have been loosened during maintenance and repair.

4.2.15 Any safety devices removed for maintenance or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.

4.2.16 Ensure that all consumables and replaced parts are disposed safely and with minimum environmental impact.

5 Warning of special dangers

5.1 Electric energy

5.1.1 Use only original fuses with the specified current rating. Switch off the machine immediately if trouble occurs in the electrical system.

5.1.2 Work on the electrical system or equipment may only be carried out by a skilled electrician himself or by specially instructed personnel under the control and supervision of such electrician and in accordance with the applicable electrical engineering rules.

5.1.3 If provided for in the regulations, the power supply to parts of machines an plants, on which inspection, maintenance and repair work is to be carried out must be cut off. Before starting any work, check the de-energized parts for presence of power and ground or short circuit them in addition to insulating adjacent live parts and elements.

5.1.4 The electrical equipment of machines is to be inspected and checked at regular intervals. Defects such as loose connections or scorched cables must be rectified immediately.

5.1.5 Necessary work on live parts and elements must be carried out only in the presence of a second person who can cut off the power supply in case of danger by actuating the emergency shut-off or main power switch. Secure working area with a red – and – white safety chain and a warning sign. Use insulated tools only.

5.2 Gas, dust, steam and smoke

5.2.1 Carry out welding, flame-cutting and grinding work on the machine/plant only if this has been expressly authorized, as there may be a risk of explosion and fire.

5.2.2 Before carrying out welding, flame-cutting and grinding operations, clean the machine/plants and its surroundings from dust and other inflammable substances and make sure that the premises are adequately ventilated (risk of explosion).

5.3 Pneumatic equipment

5.3.1 Work on pneumatic equipment may be carried out only by persons having special knowledge and experience in pneumatic systems.

5.3.2 Check all lines and screwed connections regularly for leaks and obvious damage. Repair damage immediately. Penetrating compressed nitrogen respectively gases and cause injury and fire.

5.3.3 Depressurize all systems sections and pressure pipes to be removed before carrying out any repair work.

5.3.4 Compressed nitrogen lines must be laid and fitted properly. Ensure that no connections are interchanged. The fittings, length and quality of the hoses must comply with the technical requirements.

5.4 Noise

5.4.1 During operation, all sound baffles must be closed.

5.4.2 Always wear the prescribed ear protector.

5.5 Oil, grease and other chemical substances

Observe the product-related safety regulations when handling oil, grease and other chemical substances.

6 Transport of machinery and equipment (changing placed of operation)

6.1 For loading only use lifting gear and tackle of sufficient capacity.

6.2 Appoint a competent marshaller to assist in the lifting operations.

6.3 Lift machinery and equipment properly with suitable lifting gear and only in accordance with the operating instructions (fixing points for lifting tackle, etc.).

6.4 Only use suitable means of transport of adequate carrying capacity.

6.5 Fasten the loads safely using the suitable fixing points.

6.6 For transport provide the machine with transport protection if necessary. Before putting the machine into operation please remove the transport protection properly.

6.7 Carefully refit and fasten all parts to be removed for transport purposes before re-commissioning the machine.

6.8 Cut off the external power supply of the machine even if only minor changes of place are envisaged. Properly re-connect the machine even if only minor changes of place commissioning.

6.9 For re-commissioning only proceed in accordance with the operating instructions.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION C

Main Components (Start-up, Shutdown, Commissioning, Pre-commissioning)

1 Compressor
2 Motor
3 Inter / after cooler

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION C-1

Main Components (Start-up, Shutdown, Commissioning, Pre-commissioning)
COMPRESSOR

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

WARNING!

Risk of fatality posed by premature reactivation.

➢ Prior to reactivation, make sure that personnel are no longer in the danger zone.

9. Check the system prior to recommissioning and make sure that all the safety equipment is installed and functional.

Note on compressing dangerous gases

Explosion with risk of fatality to personnel!

➢ **Purge** compressor blocks for flammable gases or vapours **prior to opening and prior to start-up after opening** to prevent explosive gas/air or vapour/air mixtures from forming.

C-4.6 Operational disruptions

In this section, the possible causes of faults and troubleshooting are described. If faults occur with increasing frequency, adjust the maintenance intervals according to actual loads.

In the event of faults which cannot be resolved using the following notes, contact the manufacturer (see the contact data at the start of the operating instructions).

What to do in the event of faults

Local safety regulations apply in all cases to the operation of the machine, irrespective of the instructions below.

Safety shutdown

Prior to commencing work on troubleshooting, installation, servicing or repair

• Render the **machine currentless** (shut down at the main switch)

• **and,** in the case of work on pressurised parts, also render the system **depressurised.**

• For machines **in areas at risk of explosion**, the compressor block and gas-carrying pipes must be **purged prior to work** (see section 5).

We strongly recommend **a lockable in situ interrupter**, which prevents unintentional machine reactivation in the event of repairs or troubleshooting

C-4.6.1 Safety

Personnel

• Some work must only be performed by specially qualified specialist personnel or exclusively by the manufacturer, which is specifically emphasised in the description of the individual faults.

• Work on the electrical system must strictly only be performed by electrical specialists.

Personal protective equipment

Wear protective equipment for all fault work:

• Safety shoes

• Eye protection

DANGER!

Emergence of explosive gas/air mixtures

Development of explosive gas/air mixtures or vapour/air mixtures when opening and before starting up after opening due to air contact!

May lead to explosion with risk of fatality to personnel.

- Purge compressor blocks for flammable gas or vapours prior to opening and prior to start-up after opening to prevent explosive gas/air or vapour/air mixtures from forming.

Explosions

Explosions!

The introduction of ignition sources, such as sparks, naked flames and hot surfaces may lead to explosions in areas at risk of explosion.

- Prior to commencing work, obtain a work permit in writing.
- Only use tools which are approved for use in areas at risk of explosion.
- Only perform troubleshooting work free of potentially explosive atmospheres.

WARNING!

Unexpected start-up

Risk of injury posed by unexpected compressor block/unit start-up!

Unexpected start-up of the compressor block/unit may lead to injuries.

- Prior to activating the compressor block/unit, ensure that no persons are endangered (especially from a remote start-up release from a control room).

Uncontrolled start-up

Uncontrolled start-up of the machine!

Injuries to personnel.

- Install a lockable in situ interrupter, which prevents unintentional machine reactivation in the event of repairs or troubleshooting.

In the case of assembly work for servicing, repair or fault resolution, please note the specifications of the relevant assembly instructions of the accessory components. They are located in a separate folder "Accessory instructions".

In all other respects, we refer you to the relevant accident prevention regulations of the respective employer's liability insurance associations.

C-4.6.2 What to do in the event of operational disruptions

As a rule:

1. In the event of faults posing an immediate danger to personnel or property, trigger the emergency-off function of the machine immediately.

2. Determine the cause of the fault.

3. Immediately notify the superior at the location of use about the fault.

4. If troubleshooting necessitates working in the danger zone, switch the machine off and secure it against reactivation.

5. Have the fault resolved by authorised specialist personnel or, if authorisation for resolution is provided in the fault table, resolve it yourself.

C-4.6.3 Faults / troubleshooting

Q: Qualified technical staff

T: Trained personnel

E: Electrical specialist

The qualification of personnel to which the above abbreviations refer is described in section 2 "Safety".

Occurrence / fault	Possible cause	Troubleshooting	Resolved by
Falling pressure or low volume flow	Suction filter soiled	Clean filter insert, replace after lengthy operation	I
	Pipelines or valves leaking	Search and seal leak points with leak-detecting spray	I
	Suction/pressure valves are leaking	Remove valves and check; replace if necessary	Q
	Valve lifting mechanism not working	Remove valve lifting mechanism; check for smooth running; lubricate with PFPE lubricant, or replace diaphragm	Q
	Piston rings worn	Replace piston rings	Q

Occurrence / fault		Possible cause	Troubleshooting	Resolved by
Oil pressure too low		insufficient oil in the crankcase	Top up oil	I
		Excessively thin oil in the crankcase	Oil does not conform to manufacturer recommendations (technical data); replace oil and replace with an appropriate one	I
		Oil screen / oil filter blocked	Clean or replace oil screen / oil filter	I
		Enlarged bearing play (connecting rod, crankshaft)	Set oil pressure higher with regulating screw	I
Compressor block becomes hot (Higher gas discharge temperature is normal)	General	Pressure valves are leaking	Remove valves and check; replace if necessary	Q
		Piston rings are worn	Replace piston rings	Q
	Air-cooled compressor blocks	Blower V-belt tension too low or V-belts are defective	Re-tighten V-belt; replace if necessary	I
		Protective grating in front of blower dirty	Clean protective grating	I
		Inadequate ventilation	Ensure decent cooling air supply	I
		incorrect rotation direction	Ensure that the cooling air from the fan is blowing in the direction of the compressor block	I
	Water-cooled compressor blocks	Strainer in cooling water supply pipe blocked	Clean strainers	I
		Thermostatic valve misaligned or defective	Check thermostatic valve; replace if necessary	Q
		Insufficient pressure in the cooling water supply pipe	Ensure higher pressure: At least 1.5 to 2 bar	I

Occurrence / fault	Possible cause	Troubleshooting	Resolved by
	Excessive cooling water temperature	Ensure lower temperature or higher flow rate; if necessary, connect compressor block and cooler separately.	Q
	Deposits in the cooling water spaces of the compressor block	Detach and clean compressor block	Q
Compressor block starts up with difficulty	Start-up relief not working	Check relief device	Q
	Non-return valve leaking	Detach and clean non-return valve	Q
Motor protection switches off due to overloading	Compressor block running against excessively high pressure: • pressure pipe throttled • Pressure switch set too high • Excessive pressure in suction pipe	Check pressure ratios	Q
	Line voltage too low	Check voltage directly on the motor or switching device	E
	Drive unit bearing or crosshead seized up (Compressor disc only rotates with difficulty)	Check components; replace if necessary	Q
	Jamming of piston rings due to excess temperatures (Compressor disc only rotates with difficulty)	Check components; replace if necessary	Q
Compressor block runs unevenly	V-belt loosened	Re-tensioning V-belt	I

Table 6-1: Fault table

If a fault occurs with the compressor block which is not described here, please refer to customer services at Mehrer Compression GmbH. The contact data is presented in section 7 "Maintenance".

C-4.6.4 Commissioning following operational disruption resolution

Once the operational disruption has been resolved, take the following steps:

1. Check firm fitting of previously released screw connections and secure if necessary.

2. Ensure the proper functioning of all previously removed covers and protective equipment.

3. Remove tools and work materials from out of the work area.

4. Clean the machine/work area and, if necessary, remove discharged substances (liquids, processing material, etc.) and dispose of them in an environmentally friendly manner.

5. Ensure the correct installation of all the machine's safety equipment and that it is working properly.

6. Machines for the compression of **dangerous gases** must be purged prior to reactivation **in accordance with section 5 "Purging".**

Note on compressing dangerous gases

Explosion with risk of fatality to personnel!

- **Purge** compressor blocks for flammable gases or vapours **prior to opening and prior to start-up after opening** to prevent explosive gas/air or vapour/air mixtures from forming.

7. Put the machine back into operation in accordance with the notes in the section "Commissioning".

Premature reactivation

Risk of fatality posed by premature reactivation of the machine!

- Prior to the reactivation of the machine, ensure that people are no longer in the danger zone / are no longer performing work in the danger zone.

C-4.7 Safety

Important

The safety information and notes in section 2 "Safety", the safety notes in this section and the warning notes immediately after the action steps must be read and understood.

Personnel

• Provided nothing else is indicated, the maintenance work described here can be performed by the service personnel of the operator.

• Inspections, wear checks and work on the pressurised and/or gascarrying components with which the compressor block must be opened must only be performed by qualified specialist personnel as described in section 2. The maintenance and installation instructions, as well as all safety and accident prevention regulations should be observed in this regard.

Personal protective equipment

• Safety shoes

• Protective gloves

Pressurised components

Unexpected pressure equalisation when opening pressurised components!

Injuries due to flinging around or the unexpected discharge of pressurised gases.

- Prior to maintenance or repair work, take the machine out of service completely, depressurise it and secure it against reactivation.
- Only allow wear checks and work on pressurised components of the machine to be performed by qualified specialist personnel.

Faulty maintenance

Incorrectly performed maintenance work!

Improper maintenance work may cause injuries.

- Comply with stipulated maintenance intervals.
- Ensure to correctly re-install removed components.
- Pay attention to stipulated tightening torques when installing components.

Securing against reactivation

Unauthorised reactivation of the machine

Unauthorised machine reactivation during maintenance and repair work could lead to injuries to maintenance personnel.

- Prior to maintenance or repair work, switch off the machine on the main switch and secure it against reactivation.

Hot surfaces and operating resources

Hot surfaces and operating resources due to operation!

During operation, machine parts and operating resources reach high temperatures. Contact with machine parts or operating resources may cause burns.

- Prior to starting work, check temperature of surfaces or operating resources; if necessary, wait for them to cool down.
- Wear protective gloves if working on hot surfaces is necessary.

Incorrect spare parts and accessories

Incorrect spare parts and accessories!

Compressor block components are subject to considerable stress. Spare parts not approved by Mehrer Compression GmbH may be unable to withstand this type of stress. Failing non-approved components may cause serious injuries.

- Use only spare parts approved by Mehrer Compression GmbH.

Overhead installation work

Machine parts used as climbing aids for overhead installation work.

Injuries due to falling from height in the event of overhead installation work where machine parts are used as climbing aids.

- Do not use machine parts as climbing aids.
- Use safety-compliant climbing aids and work platforms.
- For maintenance work at great heights, wear fall protection devices.
- Keep handles, steps, rails, platforms and ladders free of dirt, snow and ice.

Environmental protection

Dispose of materials, machine parts and accumulated work materials properly in accordance with local rules and regulations. (See also section 2 "Safety" – "Environmental protection")

C-4.7.1 Special notes regarding dangerous gases and operation in areas at risk of explosion

DANGER!

Explosive atmosphere

Potentially explosive atmospheres!

Death or serious injury due to explosion.

- No open flames; no fire, open ignition source, or smoking!
- Unauthorised access denied!
- Stay in areas at risk of explosion only as long as is necessary for performing your work.
- Keep mobile phones switched off!
- Immediately leave the danger zone in the event of a gas alarm.
- Comply with the emergency plan drawn up by the owner.

Explosion due to discharging gases

Risk of explosion when opening process gas-conveying components of the compressor block.

When opening process gas-carrying components of the compressor block, residual quantities of the process gas are discharged. They may create an explosive atmosphere.

- Prior to commencing with maintenance and repair work, process-gas-carrying components must be purged to displace the process gas.
- Check adequate purging.
- Only have work on the compressor block performed by qualified specialists.

C-4.8 Maintenance preparations

Prior to commencing maintenance work, depressurisation must be performed. Compressor blocks for the compression of dangerous gases must also be purged.

C-4.8.1 Depressurising compressor block

Prior to commencing with maintenance work on the compressor block, pressure must be released. Appropriate valves for blocking and relieving the compressor block in the overall system in which the compressor block is installed must be arranged on site.

System state

Component	State	Reference
Main switch	OFF and secured against reactivation	Overall system operating instructions
Compressor block	Pressurised	-

Personal protective equipment

- Safety shoes
- Eye protection

Repressurisation

Repressurisation inside the compressor block after depressurisation has been performed!

Risk of injury posed by pressurised components.

- Keep shut-off valves of the gas supply pipes shut during maintenance work.
- Keep ball valves in open position for pressure relief during maintenance work.

C-4.8.2 Purging the compressor block

Prior to commencing maintenance work the crank drive and the gas-carrying area of the compressor block must be purged (inerted) with purging gas.

The purging process must be performed for every compressor block individually.

System state

Component	State	Reference
Main switch	OFF and secured against reactivation	Overall system operating instructions
Compressor block	Depressurised	**7.2.1**

The action steps for the purging process are described in section 5.

C-4.9 Maintenance plan

The sections that follow describe the maintenance work that will ensure that the system operates in an optimum way and free of faults.

Maintenance intervals

The intervals specified in the maintenance plan are recommendations which are influenced by the operating conditions (suction and final pressure), as well as the gas to be compressed (purity, humidity [humid, dry with dew point up to "bone dry"]).

The maintenance plan specifies the maintenance intervals for the first 8,000 operating hours. After this point, the inspections are to be conducted in line with experience gained thus far regarding spare part wear.

Recommended first inspection

After **2,000 operating hours**, the first inspection of the compressor block should take place. The level of wear of the individual assemblies (valves, pistons, oil and gas gland) and the general condition of the compressor block is assessed.

Adapting maintenance intervals

If increased wear is identified during the regular inspections, then the maintenance intervals should be adapted appropriately to the actual incidence of wear in consultation with the manufacturer.

Personnel

The definitions of personnel qualifications are described in section 2 of these operating instructions.

Symbol	Meaning
TP	Trained person
QP	Qualified specialist personnel with special training
E	Electrical specialist
I	Approved inspection body / for the inspection of competent personnel as per national regulations

Other symbols

Symbol	Meaning
MD	(**M**ehrer **D**ocumentation) Reference to description in the supplier documentation of the components in the "Accessories instructions" folder

In the event of questions regarding maintenance work and intervals, contact the manufacturer; see the contact data for customer services at the start of this section.

	Actions required after operating hours:		**Reference**	**Daily**	**50 to 500**	**2,000**	**every 4,000**	**every 8,000**	**every 32,000**	**every 40,000**
	Latest due after months:							**every 12**		**every 60**
Qualification	**Component**	**Taks**								
TP	Operating parameters	Checking	**Section 6**	*		*		*		
TP	Compressor block	Check for noises and running behaviour		*		*		*		
TP	Compressor block	Drain condensate	**7.3.1**	*		*		*		
TP	Oil	Check fill level and condition	**7.3.2**	*		*		*		
QP	Oil	Change	**7.3.3**			*		*		
QP	Oil filter	Change	**7.3.3**			*		*		
QP	Control unit, valve control unit	Checking				*	*	*		
QP	Suction valve lifting	Lubrication				*		*		
QP	Suction and pressure valves **) / ***)	Inspection				*		*		
QP	Valve chambers	Inspection for deposits				*		*		
QP	Piston	Check ring grooves							*	
QP	Piston and guide rings **) / ***)	Inspection				*		*		
QP	Piston rod	Inspection							*	

	Actions required after operating hours:		**Reference**	**Daily**	**500 to 500**	**2,000**	**every 4,000**	**every 8,000**	**every 32,000**	**every 40,000**
	Latest due after months:							**every 12**		**every 60**
Qualification	**Component**	**Taks**								
QP	Gas gland *) / **)	Inspection				*		*		
QP	Non-return valve purging gas outlet / leakage gas, yoke	Checking						*		
QP	Non-return valve for leakage gas return to suction side	Checking						*		
QP	Cylinder liner	Inspection								*
QP	Cylinder and Cylinder head	Check cooling water chambers and clean if necessary								*
QP	Oil gland *) / **)	Inspection						*		
QP	Crankcase	Remove covers and check bearings visually						*		
QP	Screw connections of piston	Change screws								*
QP	All bearings	Check visually								*
QP	Crosshead	Inspection and change bolts								*
QP	Oil pump	Check								*
QP	Oil pressure regulator	Functional test								*
QP	Screw connections	Re-tightening	**7.3.4**			*		*		*

	Actions required after operating hours:		Reference	Daily	500 to 500	2,000	every 4,000	every 8,000	every 32,000	every 40,000
	Latest due after months:							every 12		every 60
Qualification	**Component**	**Taks**								
QP	V-belt (if installed)	Re-tightening			*	*	*			
QP	V-belt (if installed)	Check; re-tighten or replace if necessary				*	*			
QP	Coupling (if installed)	Check wear				*		*		

*) If increased wear is detectable during the inspection, the maintenance intervals are to be shortened.

**) If the components are heavily worn, they must be replaced.

C-4.9.1 Drain condensate

System state

Component	State	Reference
Main switch	**ON**	Overall system operating instructions
Compressor block	Pressurised	-

Condensate may accumulate in the yoke if there are humid gases.

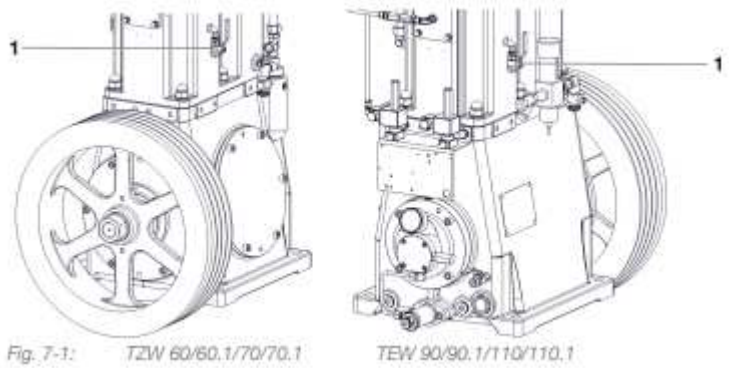


Fig. 7-1: TZW 60/60.1/70/70.1 TEW 90/90.1/110/110.1

Pos.	Component
1	Condensate drain cock

The following steps are to be performed for the condensate drain:

1. Keep the collection tank under the ball valve.

2. Open the condensate drain cock [1].

3. Wait until no more condensate discharges.

4. Shut the condensate drain cock [1]. 5. Condensate is drained.

C-4.9.2 Check oil level and condition

System state

Component	State	Reference
Main switch	OFF	Overall system operating instructions
Compressor block	Pressurised	-

Perform this check while the machine is shutdown.

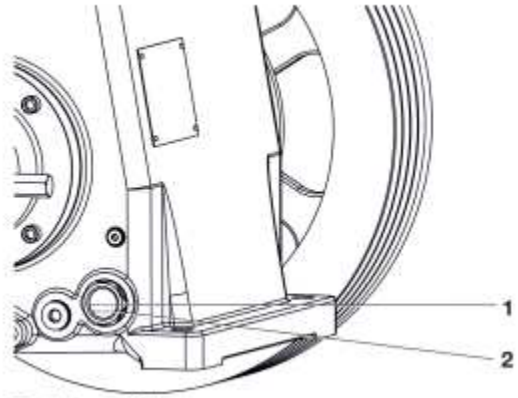


Fig. 7-2: Oil level

Pos.	Component
1	**Maximum**
2	**Minimum**

Oil level

Visual inspection of fill level (check in oil inspection glass):

Maximum: Oil inspection glass centre level

Minimum: Oil inspection glass quarter level

ATTENTION!

Incorrect oil level!

An excess or lack of oil may cause severe damage to the compressor block.

➢ Check oil level as per the maintenance plan.

Condition

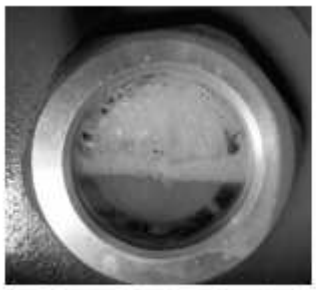


Fig. 7-3: Condition: Example of condensate in oil

In the event of changes to the condition of the oil, the lubricating properties of the oil no longer exist.

The condition of the oil is checked and read from the oil inspection glass.

Occurrence	Possible cause	Measures
Milky, cloudy oil, foaming	Cooling water discharge temperature too low	Check process, oil change (section 7.3.3, p.7-16), clean drive unit, clean yoke chamber, clean valve nests, if possible: purge compressor with nitrogen to dry it (inertisation)
	Oversaturated gas	
	Steam trap not working	

C-4.9.3 Oil change

System state

Component	State	Reference
Main switch	OFF and secured against reactivation	Overall system operating instructions
Compressor block	Depressurised	**7.2.1**

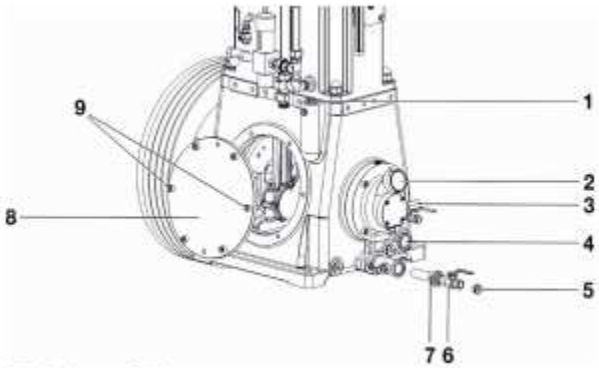


Fig. 7-4: Oil change

Pos.	Component
1 **2** **3**	Oil filler port Oil pressure manometer Pressure regulator
4	Oil inspection glass
5 **6**	Oil drain cock Oil drain screw
7	Filter insert
8	Crank drive side cover
9	Screws

The following steps are to be performed for the oil change:

1. Take the compressor block out of service and make all preparations, as described in the section "Maintenance preparations".

2. Detach the screws [9] on crank drive side cover [8] and remove crank drive side cover [8]

3. Place a collection tank under the oil drain screw [5] / oil drain cock [6] or connect a hose and discharge into a collection tank.

4. Open the oil drain screw [5].

5. Open the oil drain cock [6].

6. Wait until the oil has fully drained from the crank drive.

7. If necessary, clean the crank drive interior with a lint-free cloth.

8. Detach the filter insert together with the oil drain cock [7], check it for dirt and clean it if necessary.

9. Attach filter insert [7] and oil drain cock [6].

10. Shut the oil drain cock [6].

11. Dispose of used filter elements and used oil in in an environmentally friendly manner in accordance with the respective local rules and regulations that apply.

12. Mount the oil drain screw [5] and crank drive side cover [8] and tighten the screws [9] as per the torque tables in the appendix.

13. Open oil filler port [1] and top up with the oil and oil quantity specified in the sections "Technical data" and "Operating parameters".

ATTENTION!

Unsuitable lubricants!

Serious damage to the compressor block due to use of unsuitable lubricants.

- Only use lubricant in accordance with the specifications in the "Technical data" in the appendix to these instructions.

Incorrect oil quantity!

An excess or lack of oil may cause severe damage to the compressor block.

- Only top up oil quantity in accordance with the specifications in the "Technical data" in the appendix to these instructions.

14. The fill level height of the oil should be in the middle of the oil inspection glass [4].

15. Check oil pressure after machine has reached its operating temperature; readjust, if necessary.

Oil pressure	Value	
Min. permissible oil pressure	**0.4**	bar gauge
Max. permissible oil pressure	**1**	bar gauge

C-4.9.4 Re-tighten cylinder / valve covers, pressure flange, screws

System state

Component	State	Reference
Main switch	OFF and secured against reactivation	Overall system operating instructions
Compressor block	Depressurised	**7.2.1**

The following steps are to be taken for retightening screws:

1. Ensure the compressor block is switched off and depressurised.

2. Use a suitable torque wrench to retighten the screws of the cylinder head, the suction and pressure valves and the flange connections of the gas inlet/outlet according to torque tables in the "Appendix" section.

3. Screws are attached.

C-4.10 Measures after maintenance is finished

Once maintenance is finished, but before the recommissioning of the compressor block, the following steps are to be taken:

1. Ensure the firm fitting of the screw connections.

2. Clean the machine/work area and, if necessary, remove discharged substances (liquids, processing material, etc.) and dispose of them in an environmentally friendly manner.

3. Remove tools and work materials from out of the work area.

4. Ensure the proper functioning of all previously removed covers and protective equipment.

5. In the case of compressor blocks that are **installed in areas at risk of explosion or which compress dangerous gases**, the gas-carrying area and the crank drive must be purged before reactivation **in accordance with section 5 "Purging".**

Risk of explosion

Risk of explosion with risk of fatality to personnel!

- **Purge** compressor blocks for dangerous gases or vapours **prior to opening and prior to start-up** after opening to prevent explosive gas/air or vapour/air mixtures from forming.

6. Put the machine back into operation in accordance with the notes in the section "Commissioning".

Premature reactivation

Risk of fatality posed by premature reactivation of the machine!

- Prior to the reactivation of the machine, ensure that people are no longer in the danger zone / are no longer performing work in the danger zone.

7. After a successful test run and commissioning as per section 5, the compressor block can be approved for operation.

C-5. Decommissioning and disposal

Once the service life is over, the machine must be taken out of service, dismantled and disposed of in an environmentally friendly manner.

C-5.1 Safety

Personnel

• Decommissioning and disassembly may only be performed by qualified specialist personnel.

• Work on electrical components must only be performed by electrical specialists.

Pressurised components

Risk of injury when opening pressurised components!

Opening pressurised components may cause injuries from sudden pressure equalisation. Potential hazards include being forcefully pushed away or suddenly discharged pressurised gas.

- Prior to commencing disassembly work, switch off the system in which the compressor block is integrated at the main switch and secure it against reactivation.
- Prior to commencing with disassembly work, place the compressor block and the pressurised components into a depressurised state and ensure it is in such a state.
- Only have work on the compressor block performed by qualified specialists.

Hot surfaces and operating resources

Touching of hot surfaces or contact with hot operating resources!

During operation, machine parts and operating resources reach high temperatures. Contact with machine parts or operating resources may cause burns.

- Prior to starting work, check temperature of surfaces or operating resources; if necessary, wait for them to cool down.
- Wear protective gloves if working on hot surfaces is necessary.

Falling parts

Falling parts during disassembly!

Some compressor block components are very heavy. When their fixings are loosened, they may fall down and cause serious physical injuries.

- Prior to the screw connections loosening, secure components against falling down.

C-5.1.1 Special notes on dangerous gases

Discharging dangerous gases

Risk of explosion when opening the process gas-conveying components!

When opening process gas-conveying components, residual quantities of the process gas are discharged. They may create an explosive atmosphere.

- Prior to commencing disassembly work, render components carrying process gas inert using purging gas to displace the process gas.
- Check for sufficient inert rendering.
- Only have work on the compressor system performed by qualified specialist personnel.

C-5.2 Decommissioning

Keep to the following steps for safe decommissioning:

1. Switch off the compressor block via the control system of the overall system and secure it against reactivation.

2. Place the compressor block in a depressurised condition and check this condition.

3. In the case of compressor blocks that are **installed in areas at risk of explosion or which compress dangerous gases**, the gas-carrying area and the crank drive must be purged before disassembly **in accordance with section 5 "Purging".**

Risk of explosion

Risk of explosion with risk of fatality to personnel!

- Purge compressor blocks for dangerous gases or vapours prior to opening to prevent explosive gas/air or vapour/air mixtures from forming.

4. Disconnect all process and supply media from their interfaces to the compressor system.

• Process gas

• Control air (compressed air)

• Purging gas

5. Disconnect energy supplies physically and discharge stored residual energy.

• Electrical power supply

6. Remove auxiliary and operating resources and dispose of them in an environmentally friendly manner.

• Oil

• Cooling fluid (for water-cooled compressor blocks)

7. Disassemble the compressor block taking account of applicable local work safety and environmental protection regulations.

8. Clean components properly in order to remove residues from auxiliary and operating resources or the process medium.

C-5.3 Disposal

ATTENTION!

Environmental damage due to incorrect disposal!

Electrical scrap, electronic components, lubricants and other auxiliary materials are subject to special waste handling and must only be disposed of by approved specialist operations in accordance with applicable statutory regulations.

C-5.3.1 Auxiliary/operating resources

Auxiliary and operating resources must be disposed of in accordance with the applicable statutory regulations.

C-5.3.2 Components, assemblies and individual parts

Sort the components, assemblies and individual parts into material groups for disposal.

- Metallic scrap
- Electrical scrap
- Plastics

Dispose of the material groups in accordance with applicable statutory regulations.

Your local municipal authorities or specialist disposal operations will provide information on environmentally friendly disposal.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION C-2

Main Components (Start-up, Shutdown, Commissioning, Pre-commissioning)
MOTOR

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Performing the test run
1. Switch the separately driven fan motor on and off briefly.
2. Compare the direction of rotation of the separately driven fan with the specified direction of rotation. The direction of rotation of the separately driven fan is indicated with an arrow on the fan cover specifying the direction of rotation or with a terminal designation on the rating plate of the separately driven fan.
Depending on the version, the fan impeller is visible through the air inlet opening in the fan cover on the separately driven fan motor.
3. If the direction of rotation is wrong, then interchange two line cables in the separately driven fan motor terminal box.

Note
Use these operating instructions for motors with separately driven fans.

C-2.6.1.7 Setpoint values for monitoring the bearing temperature

Prior to commissioning
If the motor is equipped with bearing thermometers, set the temperature value for disconnection on the monitoring equipment before the first motor run.

Table 7- 1 Set values for monitoring the bearing temperatures before commissioning

Set value	Temperature
Alarm	115 °C
Shutting down	120 °C

Normal operation

Determine the maximum operating temperature of the bearings $T_{operation}$ taking into account the temperature, bearing load and influences of the plant on the motor in °C. Set the values for shutdown and warning corresponding to the operating temperature T_{op}.

Table 7- 2 Set values for monitoring the bearing temperatures

Set value	Temperature
Alarm	$T_{operation}$ + 5 K ≤ 115 °C
Shutting down	$T_{operation}$ + 10 K ≤ 120 °C

C-2.6.2 Switching on

Measures for start-up
After installation or inspections, the following measures are recommended for normal startup of the motors:
• Start the motor without a load. To do this, close the circuit breaker and do not switch the motor off prematurely. Switching the motor off again while it is starting up and still running at slow speed should be kept to a bare minimum, for example for checking the direction of rotation or for checking in general. Allow the motor to run to a standstill before switching it back on again.

• Check mechanical operation for noise or vibration at the bearings or end shields.
• If the motor is not running smoothly or is emitting abnormal noises, switch it off, and determine the cause of the fault as it runs down.
• If mechanical operation improves immediately after the motor is switched off, then the cause is magnetic or electrical, e.g. voltage imbalance, magnetic imbalance. If mechanical operation does not improve immediately after switching the motor off, then the cause is mechanical, e.g. an imbalance in the electrical motors or in the driven machine, inadequate alignment of the machine set, operation of the motor with the system resonating (system = motor + base frame + foundations etc.).
• If the motor runs perfectly in terms of its mechanical operation, switch on any cooling devices present and continue to monitor the motor for a while as it idles.
• If it runs perfectly, connect a load. Check that it runs smoothly.
Read off and document the values for voltage, current, and power.
Where possible, read off corresponding values for the driven machine and document them as well.
• Monitor the bearing temperature, winding temperature, etc. until the system reaches a steady state. Document these, provided this is possible with existing measuring instruments.

NOTICE
Damage of the motor
The motor may get damaged if the vibration values are not strictly complied with.
• In operation, maintain vibration values in accordance with DIN ISO 10816-3.

Test run
After installation or inspection, carry out a test run:
1. Start up the motor without a load. To do this, close the circuit breaker and do not switch off prematurely. Check whether it is running smoothly.
Switching the motor off again while it is starting up and still running at slow speed should be kept to a bare minimum, for example for checking the direction of rotation or for checking in general.
Allow the motor to run down before switching it on again.
2. If the motor is running smoothly and evenly, switch on the cooling equipment.
Continue to observe the motor for a while in no-load operation.
3. If it runs perfectly, connect a load.

NOTICE
Thermal overload of motors connected directly to the line supply In addition to the load torque, the ramp-up (accelerating) time is essentially influenced by the moment of inertia to be accelerated. While ramping up when connected to the line supply, the inrush (starting) current is a multiple of the rated current. This can result in thermal overload. This can damage the motor.
As a consequence, when ramping up, observe the following:
• Monitor the ramp-up time and number of consecutive starts.
• Comply with the limit values and/or ramp-up conditions specified in the catalog or the order documentation.

4. During the test run, check and document the following:
– Check whether it is running smoothly.

– Document the voltage, current and power values. As far as possible, document the corresponding values of the driven machine.
– If this is possible using the available measuring equipment, check the bearing and stator winding temperatures until they have reached steady-state values.
– Check the motor for noise or vibrations on the bearings or bearing shields as it runs.
5. In case of uneven running or abnormal noise, switch off the motor. As the motor runs down, identify the cause.
– If the mechanical operation improves immediately after the motor is switched off, then the cause is magnetic or electrical.
– If the mechanical running does not improve immediately after switching the motor off, then the cause is mechanical.
- Imbalance of the electrical motor or the driven machine
- The machine set has not been adequately aligned
- The motor is being operated at the system resonance point. System = motor, base frame, foundation, ...

NOTICE
Serious damage to the motor
If the vibration values in operation are not maintained in accordance with DIN ISO 10816-3, then the motor may get damaged.
• During operation, observe the vibration values in accordance with DIN ISO 10816-3.

C-2.7 Operation

Observe the following when carrying out any work on the motor:
• Comply with the general safety instructions (Page 11).
• Comply with the applicable national and sector-specific regulations.
• When using the motor within the European Union, comply with the specifications laid down in EN 50110-1 regarding safe operation of electrical equipment.

C-2.7.1 Safety instructions for operation

Hazardous voltages at the motor
Electrical motors have hazardous voltage levels. Contact with these can result in death, serious injury or material damage.
Operating the motor on a line supply system with a non-grounded neutral point is only permissible for short periods of time that occur rarely, e.g. the time leading to a fault being eliminated. Cable ground fault EN / IEC 60034-1.

Risk of injury due to rotating parts
Rotating parts are dangerous. Touch protection against rotating parts is no longer guaranteed if covers are removed. Touching rotating parts can result in death, serious injury or material damage.
• Carefully ensure that all of the covers are closed while operational.
• First switch off and disconnect the motor if you must remove covers. Carefully comply with the "5 safety rules".
• Only remove the covers when the rotating parts have come to a complete standstill.

Danger as a result of stationary parts under voltage (live parts)
Live parts represent a hazard. Touch protection against active (live) parts is no longer guaranteed if covers are removed. The minimum air and creepage distances may be fallen below (violated) when coming close to active parts. Touching or coming close can result in death, serious injury or material damage.
• Carefully ensure that all of the covers are closed while operational.
• First switch off and disconnect the motor if you must remove covers. Carefully comply with the "5 safety rules".
• When the motor is in operation, the terminal boxes must remain closed at all times. Terminal boxes may be opened only when the motor is stopped and in a no-voltage condition.

Faults in operation
Any changes with respect to the normal condition can indicate that the motor is not functioning correctly.
• Higher power consumption, temperatures or vibration levels.
• Unusual noise or smells.
• Monitoring devices respond.
These changes can cause faults which can result in eventual or immediate death, serious injury or material damage.
• Immediately inform the service personnel.
• If you are in doubt, immediately switch off the motor, carefully observing the system specific safety conditions.

Corrosion damage as a result of condensation
Humidity can condense inside the motor if the motor and/or ambient temperatures fluctuate, for intermittent operation or load fluctuations. Condensation can accumulate. Moisture can have a negative impact on the winding insulation or result in damage, such as corrosion.
• Ensure that any condensation can freely flow away.
• If available, remove the screw plugs to drain the water depending on the ambient and operating conditions.
• If available, reinsert the screw plugs.
If the motor is equipped with drain plugs, then the water can drain away by itself.

Risk of burn injuries as a result of hot surfaces
Individual motor parts can become hot in operation. Burns can result when coming into contact with these parts.
• Never touch motor parts during operation.
• Allow the motor to cool down before starting work.
• Check the temperature of parts before touching them. If required, wear suitable protective equipment.

Hazardous substances
Chemical substances required for the setup, operation and maintenance of motors can present a health risk. Poisoning, skin damage, cauterization of the respiratory tract, and other health damage may result.
• Read the information in these operating instructions and the product information supplied by the manufacturer.

• Observe the relevant safety regulations and wear the personal protective equipment specified. Substances that can be easily ignited and are flammable Chemical substances required for the setup, operation and maintenance of motors may be flammable. Burns and other damage to health and material may result.
• Read the information in these operating instructions and the product information supplied by the manufacturer.
• Observe the relevant safety regulations and wear the personal protective equipment specified.

Damage to the motor or premature bearing failure
The bearings can be damaged if the following is not observed.
• It is absolutely crucial that you maintain the permissible vibration values according to ISO 10816-3 to avoid damage to the motor or even its destruction.
• Under all circumstances maintain the minimum radial load of cylindrical rolling bearings of 50 % corresponding to what is specified in the catalog.
• Take the appropriate measures to reduce bearing currents. Comply with the information in Chapter "Converter operation".

Overheating as a result of the anti-condensation heating
If the anti-condensation heating is operated while the motor is operational, this can increase the temperatures inside the motor and cause material damage.
• Install an interlock circuit that switches off the anti-condensation heating once the main motor is switched on.
• Only switch on the anti-condensation heating after the motor has been switched off. Comply with the data stamped on the plate of the anti-condensation heating, if available.

C-2.7.1.1 Safety instructions relating to ventilation and cooling

C-2.7.1.1.1 Safety instructions for forced ventilation (option)

Forced ventilation (optional): Type of cooling IC 416 in accordance with EN / IEC 60034-6

WARNING
Risk of burning
Operating the motor without a separately driven fan results in overheating. This may result in death, personal injury and material damage.
• Never commission the motor without a separately driven fan.

C-2.7.1.1.2 Safety instructions when operating motors with fan

CAUTION
Risk of injury when touching the fan
There is a risk of injury at motors equipped with a fan cover (e.g. on motors in the textile industry), as the fan is not completely touch protected.
• Do not touch the rotating fan.
• Do not put your fingers into the larger air discharge openings.
• Prevent manual intervention by using suitable measures, e.g. appropriate housings or a protective grating.

C-2.7.1.1.3 Motors with fan for the textile industry

In order to guarantee an essentially unobstructed flow of cooling air containing fluff, remains of materials or similar dirt, motors used in the textile industry have a larger air discharge cross-section between the edge of the cover and the cooling ribs of the motor frame. These motors have a warning sticker on the fan cover.

C-2.7.2 Switching on the motor

1. If at all possible, run the motor without load and check that it is running smoothly.
2. If it runs perfectly, connect a load.

NOTICE
Thermal overload of motors connected directly to the line supply
In addition to the load torque, the ramp-up (accelerating) time is essentially influenced by the moment of inertia to be accelerated. While ramping up when connected to the line supply, the inrush (starting) current is a multiple of the rated current. This can result in thermal overload. This can damage the motor.
As a consequence, when ramping up, observe the following:
• Monitor the ramp-up time and number of consecutive starts.
• Comply with the limit values and/or ramp-up conditions specified in the catalog or the order documentation.

3. If this is possible using the available measuring equipment, check the bearing and stator winding temperatures.

C-2.7.3 Deactivating

Commission any devices provided for protection against condensation after switching off the motor. Do not immediately switch off the separately driven (external) fan after switching off the motor. First wait for the motor to cool down. This will prevent the accumulation of residual heat.

C-2.7.4 Switching on again after an emergency switching-off

• Check the motor before recommissioning the driven machine after an Emergency Off.
• Eliminate all the causes that have led to the emergency off

C-2.7.5 Stoppage

The stoppage is a shutdown for a period of time, during which the motor is stopped but remains at the location of use. Under normal ambient conditions, e.g. the stationary motor not exposed to any vibration, no increased level of corrosion, the following measures are required.

Longer non-operational periods
• For longer non-operational periods (> 1 month), either operate the motor or at least turn the rotor regularly, approximately once per month.
• If attached, remove the rotor shipping brace before you turn the rotor.
• Carefully comply with the information in Section "Switching on" before switching on to recommission the motor.

NOTICE
Restricted motor function
If not used for longer periods of time, material damage or complete motor failure can occur. If the motor is out of service for a period of more than 12 months, then environmental effects can damage the motor.
• Apply suitable corrosion protection, preservation, packaging and drying measures.

Switching on the anti-condensation heating, if available
Only switch on the anti-condensation heating after the motor has been switched off. Comply with the data stamped on the plate of the anti-condensation heating, if available.

Taking the motor out of service
Detailed information on how to take the motor out of service is provided in Chapter "Preparing for use".

Lubricating before recommissioning
NOTICE
Dry running bearings
Bearings can be damaged if they do not have sufficient grease.
• Re-grease the bearings if they have been out of service for more than one year.
The shaft must rotate so that the grease can be distributed in the bearings. Follow the instructions on the lubricant plate.
• "More information can be found in Chapter Rolling bearings".

C-2.7.5.1 Avoidance of damage to rolling bearings during stoppages

Extended stoppages at the identical or almost identical resting position of the rotor in the rolling bearings can result in damage, such as brinelling or corrosion.
• During stoppages, regularly start up the motor for a brief period once a month. As a minimum, turn the rotor several times. If you have uncoupled the motor from the driven machine and secured the rotor with a rotor shipping brace, then remove this before turning the rotor over or starting up the motor.
Make sure that the resting position of the rotor after the rotor has been turned over is different from its previous position. Use the fitted key or the coupling halves as reference markers.
• When recommissioning, carefully comply with the information in Chapter "Commissioning".

C-2.7.5.2 Decommissioning the motor

• Record the decommissioning steps. This log will be useful upon recommissioning.
• If the motor is going to be out of service for longer than six months, then take the necessary measures for preservation and storage. Otherwise, the motor could be damaged as a result of not being operated.

C-2.7.5.3 Re-commissioning the motor

When you re-commission the motor, proceed as follows:
• Study the record made when the motor was decommissioned, and reverse the measures that were taken for conservation and storage.
• Perform the measures listed in Chapter "Commissioning".

C-2.7.6 Faults

C-2.7.6.1 Inspection in the event of faults

Natural disasters or unusual operating conditions, such as overloading or short circuit, are faults that overload the motor electrically or mechanically.
Immediately perform an inspection after such faults. Correct the cause of the fault as described in the respective remedial measures section. Repair any damage to the motor.

C-2.7.6.2 Electrical faults

Note
If you are operating the motor with a converter, the operating instructions of the converter must also be observed if electrical faults occur.

Table 8- 1 Electrical faults

↓ Motor fails to start								
	↓ Motor accelerates sluggishly							
		↓ Rumbling noise during startup						
			↓ Rumbling noise during operation					
				↓ High temperature rise during no-load operation				
					↓ High temperature rise with load			
						↓ High temperature rise of individual winding sections		
							Possible causes of faults	**Remedial measures**
X	X		X		X		Overload	Reduce the load.
X							Interrupted phase in the supply cable	Check the switches and cables.
	X	X	X		X		Interrupted phase in the feeder cable after switching on	Check the switches and cables.
	X						Mains voltage too low, frequency too high	Check the power supply conditions.
				X			Mains voltage too high, frequency too low	Check the power supply conditions.
X	X	X	X			X	Stator winding incorrectly connected	Check the winding connection in the terminal box.
	X	X	X			X	Winding short circuit or phase short circuit in stator winding	Determine the winding resistances and insulation resistances. Carry out repair work **after consultation with the manufacturer.**
					X		Incorrect direction of rotation	Check the connection.

C-2.7.6.3 Mechanical faults

Table 8- 2 Mechanical faults

↓ Grinding noise				
	↓ Radial vibrations			
		↓ Axial vibrations		
			Possible causes of faults	**Remedial measures**
X			Rotating parts grind	Establish the cause and realign the parts.
	X		Rotor or coupling not balanced.	Disconnect the rotor or coupling and rebalance.
				If the motor has two shaft ends, and a transmission element is only fitted to one end, secure the fitted key at the other end to prevent it from being thrown out. If the rotor has balance type "H" (standard type), the fitted key must be cut back to roughly half of its length.
	X		Rotor out of round, shaft bent	Consult the manufacturing plant.
	X	X	Poor alignment	Align the machine set; check the coupling. (1)
	X		Coupled machine not balanced	Rebalance the coupled machine.
		X	Shocks from coupled machine	Investigate the coupled machine.
	X	X	Uneven running of gear unit	Fix the gearing.
	X	X	Resonance of the overall system comprising motor and foundation	Stabilize the foundation following consultation.
	X	X	Changes in foundation	Establish the cause of the changes and eliminate them if necessary; realign the motor.

(1) Take any changes into account when warming up the motor.

C-2.7.6.4 Rolling bearing faults

Damage to rolling bearings can be difficult to detect in some cases. If in doubt, replace the roling bearings. Use other bearings only after consultation with Airpack BV.

Table 8- 3 Rolling bearing faults

↓ Bearing overheats				
	↓ Bearing "whistles"			
		↓ Bearing "knocks"		
			Possible causes of faults	**Remedial measures**
X			High coupling pressure	Align the motor more accurately.
X			Belt tension too high	Reduce the drive belt tension.
X			Bearing contaminated	Clean or replace the bearing. Check the seals.
X			High ambient temperature	Use a suitable high-temperature grease.
X	X		Insufficient lubrication	Grease the bearings as instructed.
X	X		Bearing canted	Contact the service center.
X	X		Insufficient bearing play	Contact the service center.
		X	Excessive bearing play	Contact the service center.
X	X		Bearing corroded	Replace the bearing. Check the seals.
X			Too much grease in bearing	Remove surplus grease.
X			Wrong grease in the bearing	Use the correct grease.
		X	Friction marks on raceway	Replace the bearing.
		X	Brinelling or scoring	Replace the bearing. Avoid any vibration at standstill

C-2.8 Maintenance

Through careful and regular maintenance, inspections, and overhauls you can detect faults at an early stage and resolve them. This means that you can avoid consequential damage. Operating conditions and characteristics can vary widely. For this reason, only general maintenance intervals can be specified here. Maintenance intervals should therefore be scheduled to suit the local conditions (dirt, starting frequency, load, etc.). Observe the following when carrying out any work on the motor:

- Comply with the general safety instructions.
- Comply with the applicable national and sector-specific regulations.
- When using the motor within the European Union, comply with the specifications laid down in EN 50110-1 regarding safe operation of electrical equipment.

Note
Please contact Airpack, if you require support with service, maintenance or repair.

C-2.8.1 Preparation and notes

Touch up any damaged paintwork
If the paint is damaged, it must be repaired in order to protect the unit against corrosion.

Note
Paint system
Contact Airpack before you repair any damage to paint. They will provide you with more information about the correct paint system and methods of repairing paint damage.

C-2.8.2 Inspection and maintenance

C-2.8.2.1 Safety instructions for inspection and maintenance

Danger as a result of stationary parts under voltage (live parts) Live parts represent a hazard. Touch protection against active (live) parts is no longer guaranteed if covers are removed. The minimum air and creepage distances may be fallen below (violated) when coming close to active parts. Touching or coming close can result in death, serious injury or material damage.
• Take the motor out of operation.
• Switch off the motor and ensure that it is in a no-voltage condition. Carefully comply with the "5 safety rules"
• Only open the terminal box when the motor is stationary and in a no voltage condition.

Risk of injury due to rotating parts
Rotating parts are dangerous. Touch protection against rotating parts is no longer guaranteed if covers are removed. Touching rotating parts can result in death, serious injury or material damage.
• Before carrying out any repair work on the motor, take it out of operation, and carefully lock it out so that it cannot be switched on again.
• Only remove the covers when the rotating parts have come to a complete standstill.

Risk of burn injuries due to hot surfaces
In operation, the temperature of individual motor parts can increase - and only decrease slowly after switching off. You can burn yourself if you touch hot surfaces.
• Allow the motor to cool before starting any maintenance and service work on the motor.
• Check the temperature of parts before touching them. If required, wear suitable protective equipment.

Danger when cleaning using compressed air
When cleaning parts of the motor using compressed air, loose parts or particles of dirt can be flung around and cause injury.

• Installed suitable extraction measures.
• Wear personal protective equipment, such as protective glasses, gloves, overall.
• Ensure that personnel not involved in the work are not in the danger area.

Damage if the motor is not maintained
The motor can be damaged if it is not appropriately maintained. This can cause faults which can result in eventual or immediate death, serious injury or material damage.
• Maintain the motor at the specified maintenance intervals.

Damage from foreign bodies in the motor
Foreign bodies such as dirt, tools or loose components can be left by accident inside the motor after maintenance is performed. These can cause short circuits, reduce the performance of the cooling system or increase noise in operation. They can also damage the motor.
• Ensure that no foreign bodies are left in or on the motor.
• Securely attach all loose parts once you have completed the work.
• Carefully remove any dirt.

C-2.8.2.2 Inspections in the event of faults

Natural disasters or unusual operating conditions, such as overloading or short circuit, are faults that overload the motor electrically or mechanically.
Immediately perform an inspection after such faults.

Note
Inspection specifications
• Carefully comply with the relubrication intervals for rolling bearings that deviate from the inspection intervals.
• When servicing a three-phase motor, it is generally not necessary to dismantle it. The motor only has to be dismantled if the bearings are to be replaced.

C-2.8.2.3 First inspection after installation or repair

Perform the following checks after approximately 500 operating hours or at the latest six months after commissioning:

Table 9- 1 Checks after assembly or repair

Check	When the motor is running	At standstill
The electrical parameters are maintained.	X	
The permissible bearing and winding temperatures are not exceeded (Page 76).	X	
The smooth running characteristics and motor running noise have not deteriorated.	X	
The foundation has no cracks or indentations. (*)	X	X

(*) You can perform these checks while the motor is running or at a standstill.

Additional tests may also be required according to the system-specific conditions.

NOTICE
Motor damage When carrying out the inspection, if you detect any impermissible deviations from the normal state, you must rectify them immediately. They may otherwise cause damage to the motor.

C-2.8.2.4 General inspection

Check that the installation conditions are observed. We recommend that the following checks are performed after approx. 16 000 operating hours or at the latest after two years:

Table 9- 2 Checks that have to be performed during the general inspection

Checking	When the motor is running	At standstill
The electrical parameters are maintained	X	
The permissible bearing temperatures are not exceeded	X	
The smooth running characteristics and motor running noise have not deteriorated	X	
The foundation has no cracks or indentations. (*)	X	X
The motor is aligned within the permissible tolerance ranges		X
All the fixing bolts/screws for the mechanical and electrical connections have been securely tightened		X
All the potential connections, grounding connections and shield supports are correctly seated and properly bonded		X
The winding insulation resistances are sufficiently high		X
Any bearing insulation is fitted as shown on the plates and labels		X
The CABLES and insulating parts and components are in good condition and there is no evidence of discoloring		X

(*) You can perform these checks while the motor is at standstill or, if required, while running.

NOTICE
Motor damage
When carrying out the inspection, if you detect any impermissible deviations from the normal state, you must rectify them immediately. They may otherwise cause damage to the motor.

C-2.8.2.5 Assessing the rolling bearings

To assess the rolling bearings, it is generally not necessary to dismantle the motors. The motor only has to be dismantled if the bearings are to be replaced. The state of a rolling bearing can be assessed by analyzing the bearing vibration. The measured values provide an indication and can be assessed by specialists. In this case, please contact Airpack.

C-2.8.2.6 Maintenance intervals

Please note the following in order to identify faults at an early stage, rectify them and avoid follow-on damage:
• Maintain the motor regularly and carefully.
• Inspect the motor.
• Motors must be allocated a revision/inspection number after inspection.

NOTICE
Motor failure
Material damage can occur if the motor develops faults or is overloaded.
• Immediately inspect the motor if faults occur.
• An immediate inspection is especially necessary, if the three-phase motor is excessively stressed, either electrically or mechanically (e.g. overload or short-circuit).

The motors are equipped with permanently lubricated rolling bearings. The motor may be equipped with a regreasing device.

CAUTION
Skin irritations and eye inflammations
Many greases can cause skin irritations and eye inflammations.
• Follow all safety instructions of the manufacturer.

Measures, intervals and deadlines
Measures after operating period intervals or deadlines have elapsed:
Operating situations and characteristics can vary widely. For this reason, only general maintenance intervals are specified here. Maintenance intervals should therefore be scheduled to suit the local conditions (dirt, starting frequency, load, etc.).

Table 9- 3 Operating period intervals

Measures	Operating period intervals	Intervals
Initial inspection	After 500 operating hours	After 1/2 year at the latest
Relubrication (optional)	See the lubricant plate	
Clean	Depending on the degree of pollution	
Main inspection	Approximately every 16000 operating hours	After two years at the latest
Drain condensate	Depending on the climatic conditions	

C-2.8.2.7 Re-greasing

For motors with regreasing system, relubrication intervals, grease quantity and grease grade are provided on the lubricant plate. Additional data can be taken from the main motor rating plate.
Grade of grease for standard motors UNIREX N3 - ESSO.
Below are the list of approved greases that can be used:

Table 9- 4 Approved rolling bearing greases for vertical and horizontal types of construction

Manufacturer	Grease type
Shell	Shell Gadus S2 V100 3
ExxonMobil/Esso	Unirex N3
ExxonMobil/Esso	Mobilgrease XHP 103

Note
It is not permissible to mix different types of grease. If an alternative grease is being used, make sure that the old grease has been cleaned from all grease chambers and grease paths (bearing covers, bearing, grease pipe and grease nipple).

Prolonged storage periods reduce the useful lifetime of the bearing grease. Check the condition of the grease if the equipment has been in storage for more than 12 months. If the grease is found to have lost oil content or to be contaminated, the motor must be immediately relubricated before commissioning. For information on permanently-greased bearings, please refer to the section titled Rolling bearings .

Procedure
To relubricate the rolling bearings, proceed as follows:
1. Clean the grease nipples at the drive end and non-drive end.
2. Press-in the specified grease and amount of grease according to the data stamped on the lubrication plate.
– Please observe the information on the rating and lubricant plates.
– Regreasing should be carried out when the motor is running (max. 3600 rpm).
The bearing temperature can rise significantly at first, and then drops to the normal value again when the excess grease is displaced out of the bearing.

WARNING
Rotor can fall out
If the motor is in a vertical position, the rotor can fall out while work is being performed on the locating bearing. This can result in death, serious injury or material damage.
Support or relieve the rotor when carrying out work with the motor in a vertical position.

C-2.8.2.8 Cleaning

Cleaning the grease ducts and spent grease chambers
The spent grease collects outside each bearing in the spent grease chamber of the outer bearing cap. When replacing bearings, remove the spent grease.
Dismantle the bearing cartridges to replace the grease in the lubrication duct.

Cleaning the cooling air ducts
Regularly clean the cooling air ducts through which the ambient air flows.
The frequency of the cleaning intervals depends on the local degree of fouling.
Damage to the motor when cleaning with compressed air or water jets
• Do not direct compressed air or water jets in the direction of the shaft outlet or motor openings.
• Avoid direct impact of compressed air and water jets on sealing elements of the motor.

C-2.8.2.9 Cleaning the fan cover of motors for the textile industry

Regularly remove fluff balls, fabric remnants, and similar types of contamination from the fan cover of motors for the textile industry (particularly at the air passage opening between the fan cover and cooling fins of the motor enclosure) to ensure that the cooling air can flow without obstruction.

C-2.8.2.10 Drain condensate

If there are condensation drain holes present, open these at regular intervals, depending on climatic conditions.

WARNING
Hazardous voltage
The winding can be damaged if objects are introduced into the condensation holes (optional). This can lead to death, serious injury or material damage.
Note the following to maintain the degree of protection:
• Switch off the motor so that it is in a no-voltage condition before you open the condensation drain holes.
• Close the condensation drain holes, e.g. using T-plugs, before commissioning the motor.

NOTICE
Reduction of the degree of protection
If condensation drain holes are not closed, then this can result in material damage to the motor. In order to maintain the degree of protection, after the condensation has been drained, you must close all of the drain holes.

C-2.8.2.11 Insulation resistance and polarization index

Measuring the insulation resistance and polarization index (PI) provides information on the condition of the motor. It is therefore important to check the insulation resistance and the polarization index at the following times:
• Before starting up a motor for the first time
• After an extended period in storage or downtime
• Within the scope of maintenance work
The following information is provided regarding the state of the winding insulation:
• Is the winding head insulation conductively contaminated?
• Has the winding insulation absorbed moisture?
As such, you can determine whether the motor needs commissioning or any necessary measures such as cleaning and/or drying the winding:
• Can the motor be put into operation?
• Must the windings be cleaned or dried?
Detailed information on testing and the limit values can be found here:
Checking the insulation resistance

C-2.8.2.12 Servicing the separately driven fan

WARNING
Injury caused by rotating parts or live (under voltage) parts Live electrical parts are dangerous. Contact with them can cause death, serious injury or material damage.
• Before carrying out any maintenance work on the separately driven fan, disconnect it from the mains, particularly before opening the terminal box.
• Make sure that the device cannot be switched back on.

Servicing the separately driven fan
However, dirt and dust deposits on the impeller and the motor, particularly in the gap between the impeller and the inlet nozzle can impair its function.
• Remove the dirt and dust deposits regularly; the intervals depend on how dirty the surrounding area is.
• Make sure that the impeller is cleaned evenly, as irregular deposits can lead to an imbalance.
• The full air flow can only be achieved when air can freely flow through the impeller.
• There must be a clearance of at least 1 x air intake diameter in the axial direction.
• A uniform gap must be maintained between the impeller and the air intake assembly.

Servicing the separately driven fan motor
• Perform an occasional visual inspection of the separately driven fan motor and check it electrically and mechanically every time the rolling bearings are replaced.
• Replace the permanently lubricated rolling bearing on the separately driven fan motor after 40000 operating hours or five years at the latest.

C-2.8.3 Corrective maintenance

Observe the following when carrying out any work on the motor:
• Comply with the general safety instructions (Page 11).
• Comply with the applicable national and sector-specific regulations.
• When using the motor within the European Union, comply with the specifications laid down in EN 50110-1 regarding safe operation of electrical equipment.
If the motor has to be transported, please observe the information and instructions in Chapter "Transport".
Note
Before commencing removal, you should mark how each of the fastening elements has been assigned, as well as how internal connections are arranged. This simplifies subsequent reassembly.

Avoid damaging the windings protruding out of the stator enclosure when assembling the end shield.
If possible, assemble the motor on and alignment plate. This ensures that the mounting feet surfaces are all on the same plane.

Sealing measures
1. Apply the necessary liquid sealant, e.g. Fluid-D, Hylomar, to the centering edge.
2. Check the terminal box seals, and if required, replace these.
3. Repair any damage to the paint, also to screws/bolts.
4. Take the necessary measures to ensure compliance with the applicable degree of protection.
5. Do not forget the foam rubber cover in the cable entry. Completely seal the holes, and ensure that cables do not come into contact with sharp edges.

C-2.8.3.1 Rolling bearings

Refer to the rating plate or the catalog for the designations of the bearings being used.

Bearing lifetime
Prolonged storage periods reduce the useful lifetime of the bearing grease. For permanently lubricated bearings, this reduces the bearing service life. We recommend that the grease is replaced after a storage time of 12 months. Replace greased bearings also in the case of closed bearings (suffix 2Z or 2 RS). After 4 years in storage, generally replace all rolling bearings and grease.

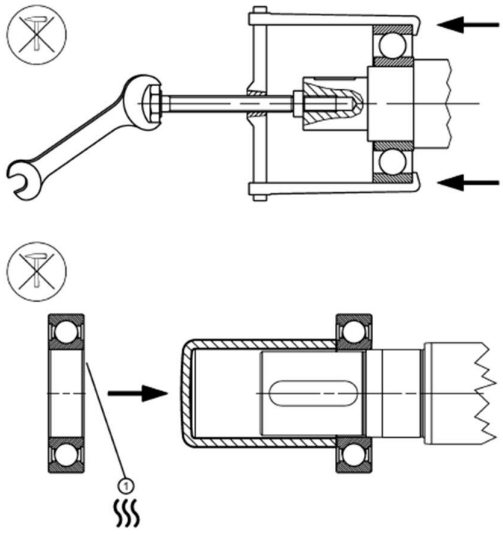
Replacing bearings
Recommended interval after which bearings are to be replaced under normal operating conditions:

Table 9- 5 Bearing replacement intervals

Ambient temperature	Principle of operation	Bearing replacement intervals
50 °C	Horizontal coupling operation	50,000 h
50 °C	With axial and radial forces	20,000 h

- Do not reuse bearings that have been removed.
- Remove the dirty spent grease from the bearing shield.
- Replace the existing grease with new grease.
- Replace the shaft seals when the bearings are replaced.
- Slightly grease the contact surfaces of the sealing lips.

Note
Special operating conditions
The operating hours are reduced, e.g.
- When motors are vertically mounted.
- High vibration and surge loads
- Frequent reversing operation
- Higher ambient temperatures.
- High speeds etc.



C-2.8.3.1.1 Bearing bushes

Protect the bearings against the ingress of dirt and moisture.
When fitting the bearing cartridges, observe the specified screw tightening torques

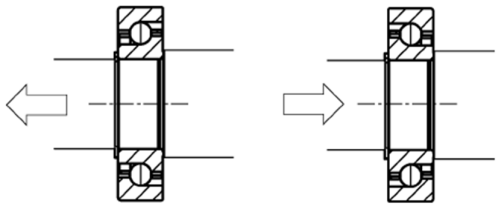
C-2.8.3.1.2 Installing bearings

Sealing the bearings
Note the following details:

• Shaft sealing rings are used to seal motors at the rotor shaft.
– For V rings, comply with the assembly dimension.
• Use the specified bearings.
• Ensure that the bearing sealing disks are in the correct position.
• Insert the elements for bearing preloading at the correct end.
• Fixed bearings can have a locking ring or bearing cover.
• Seal the bearing cap screws with the appropriate gaskets or with grease.
• Do not interchange the position of the bearing covers (DE and NDE or inner and outer).

Danger as a result of rotor falling out
If the motor is in a vertical position, the rotor can fall out while work is being performed on the locating bearing. This can result in death, serious injury or damage.
• Support or unload the rotor when carrying out work with the motor in a vertical position.

Installing rolling bearings
• Extreme caution and attention to cleanliness are vital when installing rolling bearings.
Observe the correct assembly sequence of the components.
• Attach all components with the specified tightening torques
• For individually mounted angular contact ball bearings, carefully comply with the installation position corresponding to the permissible direction of force.



• Angular contact ball bearings arranged in pairs must always be installed in strict compliance with the manufacturer's specifications.
• Always use angular contact ball bearings of the same type.

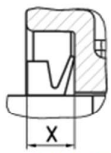
Note
For further information about mounting the rolling bearing, please refer to the catalog or the information provided by the rolling bearing manufacturer.

Procedure
1. Replace the damaged components.
2. Remove any dirt from the components. Remove any grease and the remains of sealant or liquid threadlocker.
3. Prepare the bearing seats:
– Lightly oil the inner ring seat.
– Grease the outer ring seat with a solid lubricant such as Altemp Q NB 50.
– Press the inner bearing cover onto the shaft.
4. Warm up the rolling bearing.
5. Push the inner ring of the warmed up rolling bearing onto the shaft. Avoid any blows that might damage the bearing.

6. Ensure that the rolling bearing is resting against the shaft shoulder or the 2nd bearing.
7. Fill the bearing to the top with the specified lubricating grease as stamped on the lubricant plate.
8. Warm up the grease slinger (if one is available), and push it onto the shaft.
9. Depending on the particular version, fix the bearing with a locking ring or shaft nut.
10. Support the rotor when installing the bearing housing or bearing end shield.
11. Use a suitable sealant when assembling.
12. Assemble the bearing shield or bearing housing together with the bearing shield.
13. Install the outer bearing cover (if one is available).
14. Install the sealing elements.

C-2.8.3.2 Mounting dimension "x"

Mounting dimension "x" of V rings

Shaft height	x mm	
71	4.5 ±0.6	Standard design  Special design 
80 ... 112	6 ±0.8	
132 ... 160	7 ±1	
180 ... 225	11 ±1	
250 ... 315	13.5 ±1.2	

• Extreme caution and attention to the correct positioning are vital during installation and assembly.
• Make sure the sealing surface is free of dirt and damage.
• Lightly grease the sealing lips.

C-2.8.3.3 Fan

NOTICE
Destruction of the fan
Material damage can occur by forcefully removing the fan from the shaft.
Take care not to damage the snapping mechanisms on fans that are equipped with these.

Plastic fan
• Correctly expose the breakout openings provided in the fan plate.
• Heat up the fans to a temperature of approximately 50° C around the area of the hub.
• Use a suitable tool to pull off the fan (puller).
• Locate the arms of the pulling tool in the breakout openings and slightly tension the pressure screw of the tool.
• For fans with snapping mechanisms, simultaneously release the two snap-in lugs of the fan from the annular shaft groove. Keep the snap-in lugs in this position.
• Uniformly withdraw the fan from the shaft by turning the pressure screw of the pulling tool.
• Do not apply any hammer blows to avoid damaging the rotor shaft, the fan and the bearings.
• Order the appropriate new parts if damaged.

Metal fan
• Shaft heights 71...90: Release the M5 set screw so that the fan can rotate freely on the shaft.
• Shaft height 100...315: Remove the locking ring.

• Use a suitable tool to pull off the fan (puller).
• Locate the arms of the pulling tool in the openings in the fan in the vicinity of the hub.
• Alternatively, place the pulling tool at the outer edge of the fan plate.
• Uniformly withdraw the fan from the shaft by turning the pressure screw of the pulling tool.
• Do not apply any hammer blows to avoid damaging the rotor shaft, the fan and the bearings.
• Order the appropriate new parts if damaged.

Canopy
Canopies with spacer bolts or with screwed mounting brackets Forcibly removing or separating can destroy the distance bolts, the connecting elements of the mounting bracket or the fan cover.
• Release the fixing screw on the outer surface of the canopy.
• Under no circumstances remove the spacer bolts or the mounting bracket – or forcibly separate them from one another or the cover.
Canopies with welded support brackets
• Release the fixing screws at the contact location (canopy foot - riveting nut) at the outer surface of the cover mesh.

C-2.8.3.4 Canopy, encoder under the canopy

• For screwed canopies, insert the fastening screws through the holes on the outer surface of the canopy. Tighten the fastening screws with a torque of 3 Nm ± 10 %.

C-2.8.3.5 Tightening torques

Note the information in Chapter "Tightening torques for screw and bolt connections

C-2.8.3.6 Screw lock washers

Nuts or bolts that are mounted together with locking, resilient and/or force-distributing elements (e.g., safety plates, spring-lock washers, etc.) must be refitted together with identical, fully functional elements.
Locking and sealing elements must always be replaced!

C-2.8.3.7 Links

• Replace any corroded screws.
• Take care not to damage the insulation of live parts.
• Document the position of any rating and supplementary plates that have been removed.
• Avoid damaging the centering edges.

C-2.8.3.8 Reassembly: Miscellaneous information

- Position all rating and supplementary plates as in the original state.
- Where relevant, fix electric cables.
- Check the tightening torques of all screws, as well as those of screws that have not been released.

C-2.8.3.9 Optional add-on units

Note
Further documents
Observe all of the other documents provided with this motor.
You can find additional operating instructions here:
Service & support

Mounting a brake

Table 9- 6 Assigning standard brakes for 1LE7 motors

Shaft height	Pole	Brake maker	Model	Brake size	Brake torque (Nm)	Tightening torque for the manual release lever (Nm)
71	2	EMCO	14.458	8	8	2.8
	4...8	Intorq	BFK458	6	5	
80	2	EMCO	14.458	10	16	4.8
	4...8	Intorq	BFK458	8	10	2.8
90	2	EMCO	14.458	12	32	4.8
	4...8	Intorq	BFK458	10	20	
100	2	EMCO	14.458	14	60	12
	4...8	Intorq	BFK458	12	40	4.8
112	4...8	Intorq	BFK458	14	60	12
132	2...8	EMCO	14.458	18	150	23
160	2...8	EMCO	14.458	20	260	
180	2...8	EMCO	14.458	23	315	
200	2...8	EMCO	14.458	25	400	40
225	2...8	EMCO	14.458	25	400	

C-2.8.3.10 O-ring seal

If O-ring seals are present, you should check that they are in perfect condition and that the Oring seals are properly seated in the grooves between the components. Replace damaged Oring seals.
O-ring seals can be present on the following components, for instance:

- Adapters, tapers
- Entries, glands
- Bearing seals
- End shield seals
- Terminal box sealing

C-2.8.3.11 Encoder

Note
Further documents
Observe all the manufacturer's documentations provided with the encoder.

C-2.8.3.12 Grounding brush

• Ensure that the micro-switch, if available with grounding brush unit, is connected to the drive interlock.
• Check the wearing status of the grounding brush regularly and replace it if necessary.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION C-3

Main Components (Start-up, Shutdown, Commissioning, Pre-commissioning)
INTER / AFTER COOLER

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of contents

C-3Inter, after and oil cooler

C-3.1 Introduction

C-3.1.1 General instructions

- These instructions describe how to handle the machine to ensure safe operation, optimum efficiency and long service life.
- Read this section before putting the machine into operation to ensure correct handling, operation and proper maintenance. The maintenance schedule is comprised of measures to keep the machine in good working condition.
- Keep instructions available for the operator and make sure that the machine is operated and maintenance is carried out in accordance with instructions. Record all operating data, maintenance performed, etc.
- Follow all relevant safety precautions.
- In all correspondence, mention the type and the serial number shown on the package nameplate.
- For all data not mentioned in the text, see the last page of this chapter, preventative maintenance chart and section A: General data.
- Airpack reserves the right to make changes at any time, without prior notice.

IMPORTANT:

- Never operate at higher pressure than the nominal one. The pressure can be found in section A: General Data.
- Never operate without the protectors of the moving parts in place.
- Never operate without safety devices. If dismantling any safety device for any reason, i.e. checking or repairing it, it is required that another be fitted before resuming operation.

NOTE:
Please note that the guarantee of our package is limited to an agreed length of time, however, serious damage appearing after the guarantee expires, which can be traced back to a mistake during manufacturing will be covered under the guarantee.

However, if 'non-genuine' spare parts are used in the package, lawfully, no personal damages or other damages can be accepted as any claim or guarantee. This statement applies during the guarantee period as well as after the guarantee has expired.

Replacement part orders
To avoid errors of interpretation, the following data must be indicated in any correspondence related to Airpack compressors as well as replacement part orders:

1. Airpack project reference no.
2. Package serial no.
3. Compressor model
4. Part number as stated in the spare parts list (for ordering replacement parts)

Airpack reserves the right to modify the technical specification without prior notice and waives all legal responsibilities with respect to such modifications.
Any supplementary data concerning maintenance of your compressor can be obtained directly from:

Airpack Netherlands
Groeneweegje 25
4301 RN Zierikzee
Phone: (31) (0) 111-415455
E-mail: airpack@airpack.nl
Webpage: www.airpack.nl

WARRANTY LIMITATIONS
Please note that our packages are guaranteed for a limited period of time. However, serious damage appearing after the guarantee has expired which can be traced back to a mistake during manufacturing will be covered under our guarantee.

If spare parts are not ordered directly from Airpack Netherlands B.V., or modifications/changes are made to the machine without prior consent from Airpack Netherlands B.V., the guarantee will expire immediately. The maintenance log book must be accurate and Airpack certified maintenance must be performed according to the schedule. If correct, regular maintenance is not performed, any warranty of the package & its parts will be null and void. Airpack cannot legally be held responsible for problems, defects, or damage that may result.

Please be aware that disregarding the WARRANTY LIMITATIONS, may result in serious damage to the machine, your environment, and yourself!

We Advise: Always order spare parts from Airpack Netherlands B.V. to ensure the safety & guarantee of your package.

C-3.1.1.1 Operational range

After cooler of this product line were developed in particular for application in the field of the industrial and maritime cooling. The present device is a high efficient After cooler on the principle of shell and tube, in compact and lightweight design. The apparatus of this product line can be adapted to different conditions of use by particular combination of material and components. The field of application include all possible uses of cooling, in particular turbines, compressors, refrigeration units, hydraulic plants, in the range of engines, gears etc. Service life of the devices is essentially influenced by proper maintenance and operation. For this reason, observe strictly these instructions.

C-3.1.1.2 Conservation

Under normal conditions are internal surfaces of the devices protected for a duration of 6 months. A post-preserving is necessary after 6 months. The preserving liquid and the note on safety can be provided by us. The used preservative is well compatible with all mineral lubricants. The removal of these substances can be done by using any known solvent (check material compatibility!). The devices should only be stored in closed rooms. Condensation through strong variation of temperature must be avoided.

C-3.1.1.3 Transportation

A damage of the device must be by all means avoided. The transportation of the unpacked device when using lifting systems has to be carried out with sufficient number of transportation straps set around the casing. Please note the dead weight of the device indicated on the current data sheet or the type plate.

C-3.1.1.4 Structural build-up

C-3.1.1.4.1 Tube bundle

The tube bundle is the core heat transfer element of the shell and tube water cooler. It consists of a series of seamless tubes, expanded or welded into tube sheets, and arranged in a parallel configuration to maximize heat exchange efficiency. The tubes are designed to withstand the operating pressure and temperature of the service fluids. The bundle can be removed for inspection, cleaning, or replacement as required during maintenance. Materials of construction are selected based on process compatibility, typically stainless steel or copper alloys for enhanced corrosion resistance.

C-3.1.1.4.2 Shell

The shell is the cylindrical pressure vessel that houses the tube bundle. It provides containment for the shell-side fluid and directs the flow across the tubes. The shell is fabricated from carbon steel or stainless steel, designed and tested in accordance with applicable pressure vessel codes. Flow distribution baffles are installed inside the shell to improve heat transfer performance and minimize dead zones. Drain and vent nozzles are provided to allow for safe operation and maintenance.

C-3.1.1.4.3 Bonnets

Bonnets, also referred to as heads or end covers, are installed at both ends of the shell to distribute the tube-side fluid. Depending on the design, bonnets may be fixed or removable to allow tube bundle extraction. They are typically designed with inlet and outlet nozzles, inspection openings, and provisions for venting and draining. Internal partitions may be incorporated to achieve the required number of tube passes. The bonnets are sealed to the shell with bolted connections and gaskets to ensure leak-tight operation.

C-3.1.1.4.4 Seals

Sealing elements are essential to maintain the integrity of the water cooler. Gaskets, O-rings, and packing materials are applied at critical flanged joints, tube sheets, and bonnet connections. All seals are selected for compatibility with the operating fluids, temperature, and pressure conditions. Proper installation and torqueing are required to prevent leakage. During operation, seals should be periodically inspected and replaced if signs of wear, deformation, or leakage are observed.

C-3.1.1.4.5 Accessories/spare parts

Accessories and spare parts can be taken from the spare part lists. Drawing and identification numbers of components which are necessary for ordering, are also listed there. Price lists for the spare parts and not listed accessories can be requested via our Spare parts department.

C-3.1.2 Service

C-3.1.2.1 Installation

The following items must be considered during the installation of the device:

- 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 parts have penetrated the device.
- Foreign bodies must 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.
- 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 built up.
- The assembly can be horizontal or vertical.
- Sufficient space should be available to ensure easy accessibility to all srcew connections. Take particular care for providing enough space for remove the tube bundle. You can take the necessary space dimensions for remove the tube bundle from the sketch. It is possible to remove the tube bundle from both sides of the device.
- The direction of flow is to be taken from the enclosed sketch and from the datasheet.
- Before startup, the device must be completely bled.
- Never weld or modify the cooler.
- In case of using the device as oil cooler before startup, clean/flush the oil circuit but not the lubricated points.
- Orifice plates must only be installed at the outlet side of the device.

C-3.1.2.2 Screw fasteners

To ensure a safe operation and a long service of fastening elements, the screw fastenings should be only torqued. The table below lists the torque figures for used screws. Through influence of various factors, the specified values may show a deviation which in individual cases require lower or higher values.

Connection shell/bonnet

Type	Screw/strength	Torque [Nm]
K12	M12 5.6	38
	M12 8.8	80
K20	M16 5.6	95
	M16 8.8	200
K25	M20 5.6	180
	M20 8.8	400

Connection / flanges

Screw/strength	Material of thread	Torque [Nm]
M12 5.6	Aluminum	30
	Red bronze	30
M16 5.6	Aluminum	75
	Red bronze	75
M24 5.6	Cast steel	100
	Cast steel	300

C-3.1.2.3 Starting up

At first the apparatus must be filled up with the intended medium, and then the entire system must be checked for leakage. For water-cooled devices use only clean water at the tube side. Before the actual starting up of the system, make sure that the cooling medium is circulated. Operating the device without flow of cooling medium is not permissible.

The use of additives in the cooling water has to be confirmed through Airpack B.V.

C-3.1.2.4 Operating instructions

During the operation, make sure by suitable means that pre-set parameters for which the devices are designed are kept.

C-3.1.2.5 Cooling water quality

To avoid any damage on the heat exchangers, and to provide and guaranty long term functionality of the equipment, the ingredients of the cooling water should not exceed the following values:

		CuNi	1.4404
Ammoniac	Less then	2 mg/l	n.a.
Chloride	Less then	20000 mg/l	150 mg/l
Iron	Less then	0,2 mg/l	0,2 mg/l
Free carbonic acid	Less then	10 mg/l	n.a.
Manganese	Less then	0,2 mg/l	0,2 mg/l
Nitrate	Less then	50 mg/l	n.a.
Oxygen	More then	2 mg/l	n.a.
Sulfate	Less then	2000 mg/l	300 mg/l
Sulfite	Less then	1 mg/l	1 mg/l
Free clorine	Less then	1 mg/l	1 mg/l
Suspended solids	Less then	20 ppm	20 ppm

Furthermore the cooling water has to have the following qualities.

pH-value		7-9	7-9
Max. size of dust particle		100 µm	100 µm

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D

Electrical and Instrumentation Equipment

1 Pressure Gauge
2 Pressure transmitter
3 Temperature Transmitter
4 Thermowell + Element
5 Temperature gauge
6 Pressure Safety Valve
7 Hand Ball Valve
8 Pressure Control Valve
9 Check Valve
10 Y-Strainer
11 Local Push Button Station

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-1

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
PRESSURE GAUGE

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-1 Pressure Gauge

D-1.1 Introduction

This device may only be used to display the pressure of media which are not highly viscous, do not crystallize, do not cause chemical reactions and which are compatible with the materials of the device under the specific measuring conditions (e.g. temperature, atmosphere, immunity of the material against the measured medium, etc.). The pressure of the medium must never exceed the full scale value of the pressure gauge. Any use other than that explicitly outlined in this instruction manual in not permitted.

This device may only be mounted, commissioned, operated, maintained, shut down and disposed of by qualified, specially trained staff.

D-1.2 Precautions

WARNING
Gases or liquids under high pressure pose a greater danger. Safety pressure gauges with blow-out devices (e.g. blow-out rear walls) should be used as a precaution in the event of leaks or bursting parts under pressure, to protect persons in front of the window of the pressure gauge from escaping medium or flying parts.

- The pressure of the medium must never exceed the full scale value of the pressure gauge.
- The pressure gauges may only be used in accordance with the temperature ranges specified.
- The pressure gauges must never be used as a part of an out-of-range safety system to protect against parameters exceeding permissible limit values (equipment parts with safety function).
- **WARNING**: pressure pulses can cause considerable shortening of the operating life of pressure gauges.

Overloads cause tension in the elastic measuring element which decreases its service life and deteriorates the measuring accuracy. You should always use a pressure gauge whose full scale value is greater than the maximum static pressure which makes the device less sensitive to overload and load changes.

NOTE: If for operational reasons, the range must be smaller than the maximum operating pressure, it is possible to install an overload protection device to protect the pressure gauge from damage. However, highly viscous or polluted media may have an adverse effect on the protection device or even make it ineffective.

D-1.3 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This pressure gauge meets the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC
- EMC Directive 89/336/EC

And also

- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-1.4 Maintenance

Using unsuitable spare parts and accessories may cause damage to the product. Use only genuine Airpack B.V. spare parts and accessories!

Pressure gauges are generally low-maintenance. Routine checks of the components and verification of accuracy should be performed. The general safety of a facility often depends on the reliability of indicators on the pressure gauges installed in the facility. Any pressure gauge that seems to be giving false readings must be removed immediately and tested. If the test proves it unreliable, it must be replaces with a new device. Any pressure gauge thought to have been exposed to abnormal conditions (fire, incorrect fluid, blow-out, etc.) may not be used!

Pressure gauges may only be repaired by the manufacturer. Prior to returning a pressure gauge to the manufacturer, you must completely remove the medium from the device, especially if the medium can be harmful (i.e. poisonous, caustic, flammable, etc.). When returning a device, it must be accompanied by a declaration that proper procedure has been followed and it does not pose any danger.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-2

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
PRESSURE TRANSMITTER

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-2 Pressure transmitter

D-2.1 Introduction

Your Pressure Transmitter was precisely calibrated at the factory before shipment. To ensure both safety and efficiency, please read this manual carefully before you operate the instrument.

This pressure transmitter is for measuring pressure and level. The manufacturer accepts no liability for damages resulting from incorrect use or use other than that designated.

The device has been designed to operate safely in accordance with current technical, safety and EU standards. If installed incorrectly or used for applications for which it is not intended, however, it is possible that application-related dangers may arise (e.g. product overflow due to incorrect installation or calibration). For this reason, the instrument must be installed, connected, operated and maintained according to the instructions in this manual: personnel must be authorized and suitably qualified to operate and maintain equipment. The manual must be read and understood, and the instructions followed. Modifications and repairs to the device are permissible only if they are expressly approved in the manual. Pay particular attention to the technical data on the nameplate.

Assembly, electrical connection, commissioning, and maintenance of this transmitter may only be done by authorized specialists. Qualified persons are experienced in the assembly, electrical connection, commissioning, and operation of the transmitter and hold the necessary qualifications to complete such work.

The device must be stored in a dry, clean area, protected against damage from impact.

D-2.2 Precautions

DANGER

To prevent possible explosions and to maintain explosion proof, dust-ignition proof protection, observe all applicable wiring practices. Plug unused conduit opening with the provided metal pipe plug, which engages a minimum of five full threads.

Explosions can result in death or serious injury.

- Do not remove the transmitter covers in explosive environments when the circuit is live.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.
- Before connecting a communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incentive filed wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

• Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals!

NOTE
Airpack recommends the use of transient/surge protection in installations prone to high levels of electrical transients and surges.

NOTE:
Make sure all electrical installation is in accordance with national and local code requirements.

- With high process temperatures, care must be taken not to burn yourself by touching the instrument or its casing.
- Never loosen the process connector nuts when the instrument is installed in a process. This can lead to a sudden, explosive release of process fluids.
- When draining condensate from the pressure detector section, take appropriate precautions to prevent the inhalation of harmful vapours and the contact of toxic process fluids with the skin or eyes.
- When removing the instrument from a hazardous process, avoid contact with the fluid and the interior of the meter.
- All installation shall comply with local installation requirements and the local electrical code.

D-2.3 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This pressure transmitter meets the statutory requirements of the following EC Directives:

• Pressure Equipment Directive 97/23/EC
• Low voltage Directive 73/23/EEC
• EMC Directive 89/336/EC

And also

- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-2.4 Maintenance

Wait 10 minutes after power is turned off, before opening covers.

Grounding is always required for the proper operation of transmitters. Follow the domestic electrical requirements as regulated in each country.

WARNING:

- Never loosen the process connector bolts when an instrument is installed in a process. The device is under pressure, and a loss of seal can result in a sudden and uncontrolled release of process fluid.
- When draining toxic process fluids that have condensed inside the pressure detector, take appropriate steps to prevent the contact of such fluids with the skin or eyes and the inhalation of vapours from these fluids.

DANGER

For non-intrinsically safe installations, to prevent a potential explosion in a division 1 hazardous area, de-energize transmitters before you remove threaded housing covers. Failure to comply with this warning could result in an explosion resulting in severe injury or death.

Care should be taken to prevent the build-up of drift dust or other material on the display glass and name plate. When performing maintenance, a soft and dry cloth should be used.

Parts replacement is generally limited to the electronics module assembly, housing assembly, sensor assembly, terminal block assembly, cover O-rings, and optional display. Replacements equipment or spare parts not approved by Airpack B.V. for use as spare parts could reduce the pressure retaining capabilities if the transmitter and may render the instrument dangerous.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-3

ELECTRICAL AND INSTRUMENTATION EQUIPMENT TEMPERATURE TRANSMITTER

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-3Temperature transmitter

D-3.1 Introduction

Before handling the temperature transmitter, it is absolutely imperative that users of this equipment read and observe the safety instructions mentioned in each section of the manual in order to ensure the protection and safety of operators, the transmitter itself and the system containing the transmitter. Airpack B.V. cannot be held liable for any damage or accidents due to actions or operation that does not adhere to the guidelines established in the manual, operation instructions, safety instructions, etc.

This device is a universal and configurable temperature field transmitter for resistance thermometers (RTD), thermocouples (TC) and resistance and voltage transmitters. The device is designed for installation in the field.

The manufacturer does not accept liability for damage caused by improper or non-designated use.

Among all factors, which may affect transmitter accuracy, environmental conditions are the most difficult to control. There are, however, ways of reducing the effects of temperature, humidity and vibration. Temperature fluctuation effects can be minimized by locating the transmitter in areas protected from extreme environmental changes.

In warm environments, the transmitter should be installed to avoid direct exposure to the sun. Installation close to lines and vessels subjected to high temperatures should also be avoided. For temperature measurements, sensors with cooling-neck can be used or the sensor can be mounted separated from the transmitter housing.

Use of sunshades or heat shields to protect the transmitter from external heat sources should be considered, if necessary.

Humidity is fatal to electronic circuits. In areas subjected to high relative humidity, the O-rings for the electronics cover must be correctly placed. Removal of the electronics cover in the field should be reduced to the minimum necessary because every time it is removed, the circuits are exposed to the humidity. The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed which leads to corrosion, since these parts cannot be protected by painting., code-approved sealing methods on conduit entering the transmitter should be employed. Contact Airpack B.V. for more information.

Measurement error can be decreased by connecting the sensor as close to the transmitter as possible and using proper wires (see Section II, Operation).

D-3.2 Precautions

CAUTION:
The products described in this document are NOT designed for nuclear-qualified applications. Using this product in applications that require nuclear-qualified hardware or products may cause inaccurate readings and will void the guarantee as it goes against the intended use.

WARNING:
Explosions may result in death or serious injury.

- Do not remove the instrument cover in explosive atmospheres when the circuit is live.
- Before connecting a field communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incentive field wiring practices.
- Both transmitter covers must be fully engaged to meet explosion-proof requirements.
- Electrical shock could cause death or serious injury. If the sensor is installed in a high-voltage environment and a fault or installation error occurs, high voltage may be present on transmitter leads and terminals.
- Use extreme caution when making contact with the leads and terminal.
  Process leaks could result in death or serious injury:
- Install and tighten thermowells or sensors before applying pressure or process leakage may result.
- Do not remove the thermowells while in operation. Removing them may cause process fluid leaks.

D-3.3 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This temperature transmitter meets the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC

- EMC Directive 89/336/EC

And also
- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-3.4 Maintenance

The transmitter has no moving parts and requires a minimum amount of scheduled maintenance. The transmitter features a modular design for easy maintenance. If a malfunction is suspected, check for an external cause before performing the diagnostics.

In general, it is recommended that the end user do not try to repair printed circuit boards. Instead he should have spare circuit boards, which may be ordered from Airpack B.V.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-4

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
THERMOWELL

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-4 Thermowell

D-4.1 General

Thermowells are used to protect temperature sensors from the process conditions. Furthermore, thermowells enable the removal of the temperature sensor without having to shut down the process; and they guard against damage to either the environment or to personnel, which might be caused by escaping process media.

The thermowell has been designed and built solely for the intended use described here, and may only be used accordingly.

The technical specifications contained in these operating instructions must be observed. Should the thermowell be improperly handled or operated outside of its technical specifications, it has to be inspected immediately.

D-4.2 Safety

Before installation, commissioning and operation ensure that the appropriate thermowell has been selected in terms of measuring range, design and specific measuring conditions.

Before installation, commissioning and operation ensure that the thermowell material used is chemically resistant / neutral to the medium being measured and that it withstands the mechanical stresses from the process.

Non-observance can result in serious injury and/or damage to equipment.

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. Make sure that the thermowell is sufficiently earthed.

Residual media on dismounted thermowells can result in a risk to persons, the environment and the equipment. Take sufficient precautionary measures.

D-4.3 Mounting

During mounting (especially with ceramic thermowells) the thermowells should not be subjected to thermal shocks or mechanical impacts.

Insert the thermowell into the process adapter without forcing or damaging it. The thermowell must not be bent or altered in order to mount it.

The exception is the retrospective machining of the support ring in order that the thermowell is supported free of play within the nozzle ("interference fit"). The retrospective adjustment of a support ring with a loose fit is not permissible. In general, thermowells with a support ring are not recommended within ASME PTC 19.3 TW 2010 and are outside of the scope of the standard.

It is recommended to mount the temperature measuring instrument into the thermowell using a suitable sealing material to avoid, for example, humidity ingress.

In general, the tip of the thermowell should be placed in the middle third of the pipe, though the position may differ in special cases. It must be ensured that the measuring element (Pt100, thermocouple, bimetal, etc.) is completely exposed to the medium and is not shielded by the flange stubs. If, as a result of a small pipe diameter, this cannot be ensured, a pipe expansion can be inserted around the measuring point.

Flanged thermowells: The flange dimensions of the thermowell must match those of the mating flange on the process side. The seals used must be suitable for the process and the flange geometries (cross-check the project specification). The correct tightening torques and suitable tools (e.g. spanner) should be used for installation. For thermowells with a collar, make sure that it matches the inner diameter of the coupling and is supported by it. In the case of an interference collar, they should be adapted to the inner diameter of the coupling.

The insertion length and the diameter of the thermowell are dependent on the process conditions, especially on the flow rate of the measured medium.

D-4.4 Maintenance

Dismounting
Only disconnect thermowells once the system has been depressurized!

Risk of burns!
Let the instrument cool down sufficiently before dismounting it!

When dismounting it, there is a risk that dangerously hot pressure media may escape.

Residual media on dismounted thermowells can result in a risk to persons, the environment and equipment. Take sufficient precautionary measures.

In general, thermowells are maintenance-free.

We recommend a visual check of the thermowell for leaks and damages at regular intervals.
Make sure that the seal is in perfect condition!

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-5

ELECTRICAL AND INSTRUMENTATION EQUIPMENT TEMPERATURE GAUGE

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-5Temperature gauge

D-5.1 Precautions

Thermometers operating below 0°C (32°F) must have a perfectly tight case to prevent entrance of moisture. "Hermetically sealed" thermometers are closed off in a dry, warm atmosphere and need no maintenance. If "bayonet ring type thermometers" show for any reason sign of stickiness when indicating a low temperature they should be brought to a dry, warm location an allow them to dry out for 24 to 48 hours with an open case. Afterwards, close the cases carefully and reinstall them.

A temperature indicator should be installed in a vibration free area. The instrument might exhibit excessive wear on the bearing surfaces of the movement. If an installed gauge fails and exhibits these symptoms it is almost certain that the wrong type of instrument has been used for that particular application and it is essential that the manufacturer is consulted.

D-5.2 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This temperature gauge meets the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC
- EMC Directive 89/336/EC

And also
- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-5.3 Maintenance

The instruments need little or no maintenance. But be sure that the case is closed at all times, so that no moisture or dirt can enter the case. If the thermometer is used with a medium that may harden and build up, the thermometer should be occasionally the stem cleaned.

The function of the gauge does not require any special maintenance procedures but frequent checks must be made to ensure that the instrument is still working correctly and accurately. Any shift in temperature readings greater than twice the tolerance of the instrument must be investigated and the gauge immediately replaced if it is faulty.

The repair and recalibration of the instrument should be undertaken only by competent personnel who have at their disposal the necessary facilities.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-6

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
PRESSURE SAFETY VALVE (PSV)

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-6 Pressure Safety Valve

D-6.1 Introduction

A pressure safety valve is a safety instrument which opens above a pressure set point to relieve pressure. At each opening it is essentials to recalibrate this valve according to procedure mentioned in this manual below.

ATTENTION

The safety of lives and property can depend on the proper operation of the pressure relief valves. Consequently, the valves should be kept clean and should be periodically tested and reconditioned to make sure they function properly.

Pressure relief valves are precision instruments. Correct installation is essential for the safety of the facility, property, personnel, and public safety. Failure of a pressure relief valve can lead to catastrophic overpressure of equipment and/or the release of fluid under pressure. Fluids may be hazardous and all precautions should be taken to ensure safe disposal.

Valves are often on hand at the job site months before they are installed. Unless properly stored and protected, valve performance may be adversely affected.
Rough handling and dirt may damage or cause misalignment of the valve parts. It is recommended that the valves be left in their original shipping containers and that they be stored in a warehouse or at a minimum on a dry surface with a protective covering until they are used.

CAUTION

Pressure relief valves must be handled carefully and never subjected to sharp impact loads. They should not be struck, bumped or dropped. Rough handling after the pressure setting, deforms valve parts and adversely affects seat tightness and valve performance.

D-6.2 Precautions

WARNING

This product is a safety component intended for use in critical applications. The improper application, installation or maintenance of this product or the use of parts or components not manufactured by Airpack B.V. may result in malfunction or failure of this product. The advice of a qualified engineer should be sought prior to any use of this product.
Any installation, maintenance, adjustment, repair or test performed on this product must be done in accordance with the requirements of all applicable Codes and Standards.

- Make sure that the safety relief valve is isolated from the pressure source before it is removed.
- Stand clear and wear protective clothing when removing the safety relief valve to prevent exposure to any types of deposits or corrosive debris which may have been trapped inside the valve.
- Do not stand near the discharge side of a safety relief valve when testing the valve.
- Always install a safety valve vertically as the internal parts are designed to operate in that position.
- Avoid hammer blows to the valve.
- Eliminate stress on the valve body whenever possible.
- Be careful when checking a safety valve for visible leakage.

There is a risk of injury from sharp edges and burrs. For this reason all parts have to be handled with caution.
There is a risk of safety valves falling over. They always have to be secured adequately.

D-6.3 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This pressure safety valve meet the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC
- EMC Directive 89/336/EC

And also

- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

Design, marking, production and approval of this pressure equipment corresponds to the requirements of the following regulations (directives, codes, rules and standards):

Harmonized standards: Other regulations:

DIN EN ISO 4126-1	PED 97/23/EC	VdTUV SV 100	ASME-Code Sec. II	API RP 521
DIN EN ISO 4126-7	AD 2000-Merkblatt A2	TRD 110	ASME-Code Sec. VIII Div. 1	API Std. 526
DIN EN 12266-1	AD 2000-Merkblatt A4	TRD 421	ASME PTC 25	API Std. 527
DIN EN 12266-2	AD 2000-Merkblatt HPO	TRD 721	API RP 520	API RP 576

D-6.4 Maintenance

A visual inspection should be done when the valves are first removed from service. The presence of deposits or corrosion in the valve and in the piping should be recorded and valves should be cleaned to the extent possible prior to disassembly. Check the condition of external surfaces for any indication of corrosive atmospheric attack or evidence of mechanical damage.

External parts such as the valve body, bonnet and cap should be cleaned by immersion in a bath such as hot Oakite solution or equivalent. These external parts may be cleaned with wire brushing, provided the brush used does not damage or contaminate the base metals. Only clean stainless steel brushes should be used on stainless steel components. The internal parts such as the guide, disc holder, disc insert, nozzle ring and spindle should be cleaned by immersion in a commercial high alkaline detergent. Guiding surfaces on the disc holder and guide may be polished using a fine emery cloth. The bellows and other metal parts may be cleaned using acetone or alcohol, then rinsed with clean tap water and dried.

Check all valve parts for wear and corrosion. The valve seats on both the nozzle and disc insert must be examined to determine if they have been damaged. Most often, lapping the valve seats is all that is necessary to restore them to their original condition.
If the inspection shows that the valve seats are badly damaged, replacement will be necessary. When the time is a factor, it may be advantageous to replace damaged parts from spare parts stock, thereby permitting the replaced part to be checked and reworked at leisure. The valve spring should be inspected for evidence of cracking, pitting or deformation. The bearing surfaces on the guide and disc holder should be checked for residual product build up and any evidence of scoring. Inspection of valve components is important to ensure proper valve performance. Damaged valve parts must be repaired or replaced.

Before valve teardown is performed, a review of the previous maintenance records will assist in understanding past valve performance, settings, and maintenance requirements. A comprehensive maintenance records management system will allow proper stocking of commonly replaced items, such as gaskets and seals, and adequate stocking of major replacement parts, such as nozzles, discs, and springs. Maintenance records, when properly updated, can serve to identify the need for ordering spare parts when valve servicing shows that the useful life of a particular part has been reached. Re-matching details and installation of new parts should be recorded to aid future service activities.

After the valve is received and checked it is ready for shop inspection and repair. The valve should be carefully dismantled. If you are unfamiliar with this line of Airpack valves, carefully study the cross-sectional drawings to familiarize yourself with part terminology and location. Proper facilities should be available for segregating parts as the valve is dismantled. At each stage in the dismantling process all parts of the valve should be visually inspected for evidence of wear and corrosion. If parts are worn, replace them. See Appendix 1 for necessary tools.

WARNING
Pressure safety valve must be calibrated on set point yearly

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-7

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
BALL VALVE

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-7 Ball valve

D-7.1. Introduction

This valve gets its name from the ball that rotates to open and close the valve. Ball valves are used in situations where tight shut-off is required.

NOTE:
This valve is intended for a specific range of pressures, temperatures and other application specifications.
Applying different pressures and temperatures to the valve could result in damage to the valve, malfunction of the control valve, or loss of control of the process. Do not expose this product to service conditions or variables other than those for which the product was intended. If you are not sure what these conditions are you should contact Airpack for complete specifications and clarification. Provide the product serial number (shown on the nameplate) and all other pertinent information.

D-7.2. Precautions

WARNING:
INCORRECT OR IMPROPER USE OF THIS PRODUCT CAN CAUSE SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

WARNING
Devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

D-7.3. Certification

CE mark

This device is designed to meet state-of-the-art safety requirements, it has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This ball valve meets the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC
- EMC Directive 89/336/EC

And also

- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-7.4. Maintenance

ATTENTION: during maintenance- or repair work- the valve must be completely pressure released and discharged! Disconnect all pneumatic, hydraulic and electric tubes/lines and protect them against unintentional insertion process.

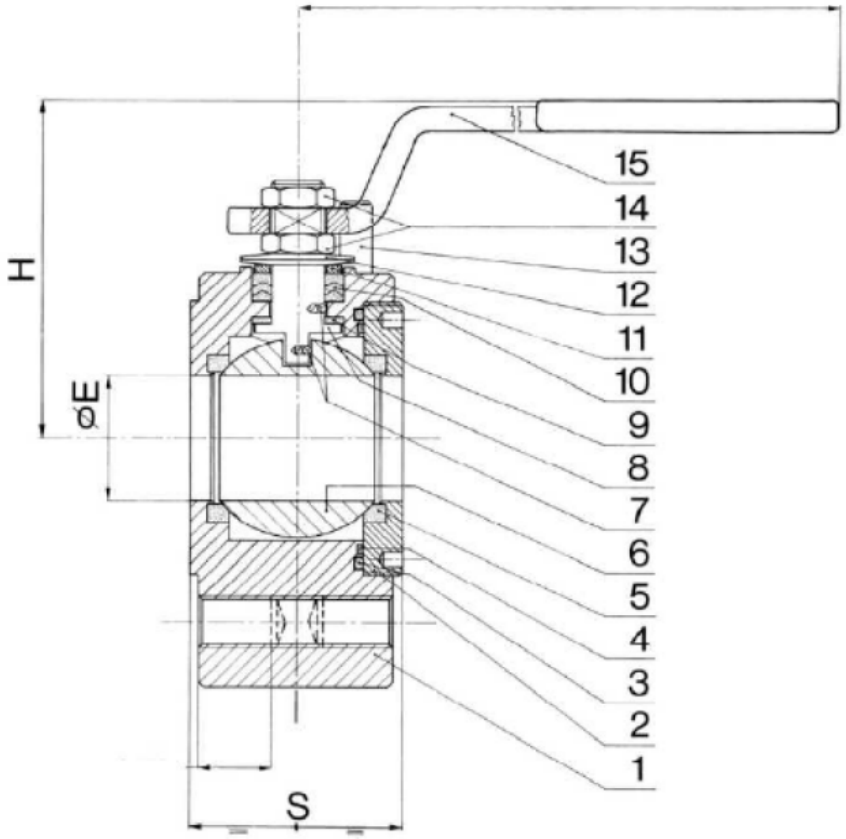
Provided that competent, trained personnel and the correct original spare parts are available, maintenance and revision of valve(s) can be carried out on site. The manufacturer's personnel are also available upon request.

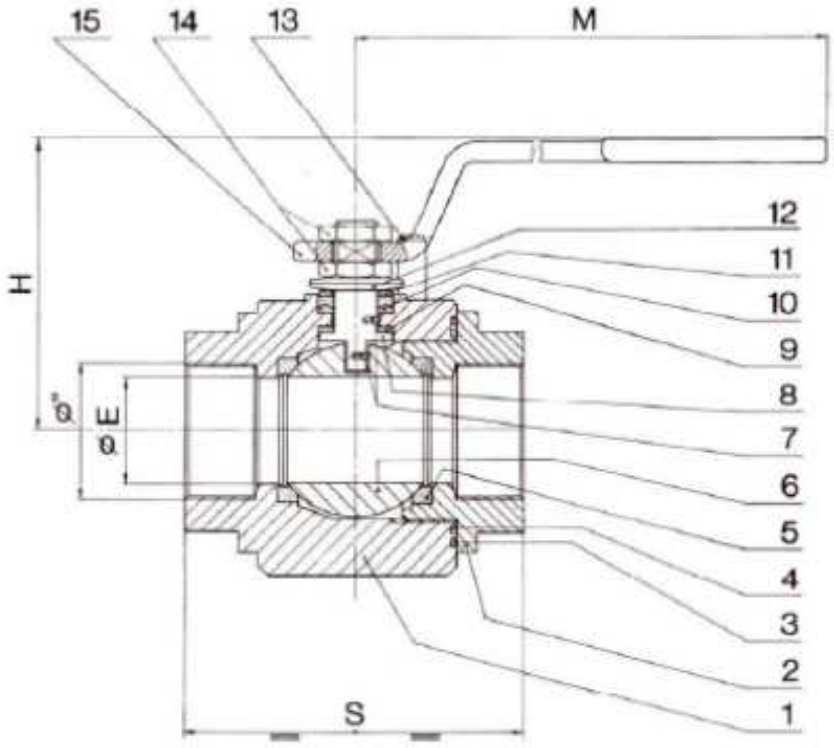
Maintenance & valve service

Ball valves do not require a lot of maintenance. However, solid or liquid particles in the gas flow may cause wear or mechanical damage to the valve plate or other valve parts.

In order to ensure a long lifetime and faultless operation, ball valves should be regularly inspected for service:

a. Clean gas or clean air: every 16,000 to 24,000 service hours
b. Slightly polluted gas: every 6,000 to 12,000 service hours
c. Heavily polluted gas: every 2,000 service hours


15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
H
ØE
S


15
14
13
M
12
11
10
9
8
7
6
5
4
3
2
1
H
E
S

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-8

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
PRESSURE CONTROL VALVE (PCV)

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-8 Pressure Control Valve

D-8.1 Introduction

NOTE

This valve is intended for a specific range of pressures, temperatures and other application specifications.

Applying different pressures and temperatures to the valve could result in damage to the valve, malfunction of the control valve, or loss of control of the process. Do not expose this product to service conditions or variables other than those for which the product was intended. If you are not sure what these conditions are you should contact Airpack for complete specifications and clarification. Provide the product serial number (shown on the nameplate) and all other pertinent information.

The pressure control valve is used to control the pressure of an air or gas system and will be activate through the PLC, computer or microprocessor, which is gnale signalled? By a pressure transmitter. For critical pressures it is necessary to monitor the position of the valve. In such cases, a limit/position switch will be mounted (see enclosed data sheet).

D-8.2 Precautions

WARNING:

INCORRECT OR IMPROPER USE OF THIS PRODUCT CAN CAUSE SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

Due to the variety of operating conditions and applications for this product, the user is solely responsible for making the final proper decisions concerning the correct assembly and functioning of the product and assuring that all the performance, safety and warning requirements are met.

- Users must be trained and equipped for the handling, use, and servicing of (high) pressure products and systems.
- Users must contact their gas or liquid supplier for specific safety precautions and instructions.
- Gaseous media should be free of excessive moisture to prevent icing at high flow.
- Always wear the appropriate protective clothing, including safety glasses, gloves etc. if required.
- Follow the applicable safety and maintenance procedures.
- Obey specific local regulations.
- Do not exceed the maximum inlet and outlet pressure of the product or its accessories.
- Operate within the temperature limits and other conditions specified for the product.
- Do not drop or damage the product in any other way. This may negatively affect the performance of the product and can cause the product to malfunction.
- Venting fluids and gases can be dangerous. Vent to a safe environment away from people. Ensure adequate ventilation in accordance with local regulations.
- This product is not oxygen clean and therefore not suitable for oxygen service.

WARNING:
Personal injury could result from packing leakage. Valve packing is tightened before shipment; however the packing might require some readjustment to meet specific service conditions.

D-8.3 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This pressure control valve meets the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC
- EMC Directive 89/336/EC

And also

- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-8.4 Maintenance

This product should be checked periodically for proper and safe operation. It is the user's sole responsibility to determine the frequency of maintenance based on the application.

WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts.

Before performing any maintenance operations:

- Always wear protective gloves, clothing and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valve or completely shut off the process to isolate the valve from the process pressure. Relieve the process pressure from both sides of the valve.
- Depending on the actuator construction, it will be necessary to manage the pneumatic actuator loading pressure and any actuator spring pre-compression. It is essential to refer to the relevant actuator instructions in this manual to ensure safe removal of the actuator from the valve.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, even when the valve has been removed from the pipeline.
- Process fluids may spray out under pressure when removing the packing hardware or packing rings or when loosening the packing box pipe plug.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-9

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
CHECK VALVE

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-9 Check valve

D-9.1 Introduction

NOTE:
This valve is intended for a specific range of pressures, temperatures and other application specifications.
Applying different pressures and temperatures to the valve could result in damage to the valve, malfunction of the control valve, or loss of control of the process. Do not expose this product to service conditions or variables other than those for which the product was intended. If you are not sure what these conditions are you should contact Airpack for complete specifications and clarification. Provide the product serial number (shown on the nameplate) and all other pertinent information.

D-9.2 Precautions

WARNING:
INCORRECT OR IMPROPER USE OF THIS PRODUCT CAN CAUSE SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

WARNING
Devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

D-9.3 Certification

CE mark

CE

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

D-9.4 Maintenance

PREVENTIVE MAINTENANCE
The check valve is almost wear-free, so the amount of required maintenance is low. The materials of the valve has been selected for minimum wear. However malfunction caused by wrong operation, lack of maintenance or improper use reduces valve life. All repair and maintenance work shall be performed by qualified personnel following all safety instructions. Maintenance intervals should be selected by the valve user in compliance with the application condition.

In case spare parts or replacements are required, please contact Airpack BV.

D-9.5 Installation

On the housing of the check valve, the correct flow direction has been mentioned, always check the flow direction before installing the check valve.
Ensure to properly align the flanges before tensioning the studbolts, otherwise the check valve will be damaged.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION D-10

ELECTRICAL AND INSTRUMENTATION EQUIPMENT
Y-STRAINER

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Table of Contents

D-10 Y-strainer

D-10.1 Precautions

WARNING:
INCORRECT OR IMPROPER USE OF THIS PRODUCT CAN CAUSE SERIOUS PERSONAL INJURY AND PROPERTY DAMAGE.

WARNING
Devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

D-10.2 Certification

CE mark

This device is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The device complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EC Directives.

This solenoid valve meets the statutory requirements of the following EC Directives:

- Pressure Equipment Directive 97/23/EC
- Low voltage Directive 73/23/EEC
- EMC Directive 89/336/EC
- EAC (TR CU)

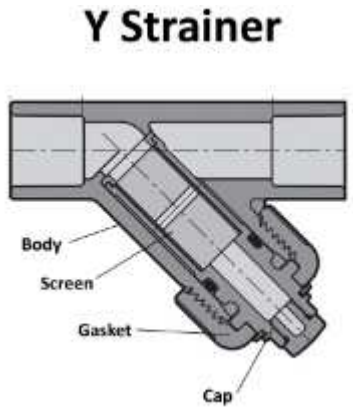
And also
- EN 61010
- EMC specification as per EN 61326/A1
- NAMUR Recommendations NE 21 and NE 43

D-10.3 Maintenance activities

CAUTION:
Please ensure to depressurize the system before conducting any maintenance to this Y-strainer.

Maintenance on the Y-strainers is only to be done on the stand-by filters or package.

If properly installed, y strainers require very little monitoring. However, it is important to keep track of the pressure to make sure that the equipment does not get too full. This would cause the screen to break and it would need to be replaced. If the screen fails, it could damage the entire system which would quickly become a very costly problem. The filter can be easily accessed which makes for a simple cleaning process overall. Remember to close off the valve connections on either side of the y strainer before starting to clean and relieve pressure. From there, empty out the unwanted material and debris. Finally, clean the mesh filter and replace.



Flow direction

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION E

TROUBLESHOOTING

Please refer to section C-1

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION F

PREVENTIVE MAINTENANCE CHART

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Maintenance Compressor

	Maintenance intervals in operating hours[1]					
	DAILY	500 MONTHLY	1500 3 MONTHLY	3000 6 MONTHLY	5000 YEARLY	10000 TWO YEARLY
GENERAL MAINTENANCE WORK						
Keep the package clean	●					
Check all connections are securely fixed		●				
Check overall condition of the system		●				
ELECTRICAL / INSTRUMENTS						
Tighten electrical terminals			●			
Check pressure gauge and temperature indicator are working		●				
Check thermo elements for damage/bends		●				
Calibration of all transmitters including analysers				●	●	
Change solenoid coil						●
Spare kit for Control valve and actuators						●
Check complete electric control unit						●
COMPRESSOR						
Check all connections are securely fixed		●				
Check overall condition of the system	●					
Check the lubrication oil level and replenish as necessary	●					
Check the air filter pressure differential	●					
Check the condensate drain functionality	●					
Change the oil filter element		● (1)				
Clean the condensate strainers		●				
Check the cooler(s) for build-up of foreign matter. Clean if necessary by blowing out with air		●				
Operate the safety valves manually to verify that the valve mechanism is functioning			●			

	Maintenance intervals in operating hours[1]					
	DAILY	500 MONTHLY	1500 3 MONTHLY	3000 6 MONTHLY	5000 YEARLY	10000 TWO YEARLY
correctly and that a small amount of air is released.						
Check all hoses for sign if deterioration, cracks, hardening etc.			•			
Lubricate the main motor drive end bearing. Lubricate the main motor non-drive end bearing.				•		
Inspect the blowdown silencers and replace if necessary. Clean the gear case breathers				•		
Check the calibration of the pressure transducers. Change the air filter element (replace more frequently if local condition require)				•		
Fully inspect condensate separators, all external surfaces, and fittings. Report any excessive corrosion, mechanical or impact damage, leakage or other deterioration					•	
Rebuild blowdown valve using field kit					•	
Inspect the starter contactors, replace if required.					•	
Clean the condensate strainers.					•	
Change the lubricating oil and filter element.					•	
Remove the safety valves from compressor, inspect and re-calibrate					•	

NOTE:

(1) Only first time.

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION G

OVERALL SPARE PARTS LIST

This chapter will follow

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION H

LOGBOOK

Logbook

Customer : Lavan Industry Development Company (LIDCO)
Contractor : Nargan Company
Agent : HSE GRoup
Purchase order number : LIDCO-PO-NEC-278-6019
Airpack reference : 17735-COM
Serial number : T-2023-00799
Page : 1

Each plant operator shall duly enter all maintenance and service work that has been carried out, and shall see that the person responsible confirms such work by signing below.

MAINTENANCE WORK	DATE	SIGNATURE PLANT OPERATOR	CONFIRMED BY RESPONSIBLE PERSON

Logbook

Customer	:	Lavan Industry Development Company (LIDCO)
Contractor	:	Nargan Company
Agent	:	HSE GRoup
Purchase order number	:	LIDCO-PO-NEC-278-6019
Airpack reference	:	17735-COM
Serial number	:	T-2023-00799
Page	:	2

Each plant operator shall duly enter all maintenance and service work that has been carried out, and shall see that the person responsible confirms such work by signing below.

MAINTENANCE WORK	DATE	SIGNATURE PLANT OPERATOR	CONFIRMED BY RESPONSIBLE PERSON

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION I

PLANT MANAGER LIABILITY LIST

Plant manager liability list

Customer	:	Lavan Industry Development Company (LIDCO)
Contractor	:	Nargan Company
Agent	:	HSE GRoup
Purchase order number	:	LIDCO-PO-NEC-278-6019
Airpack reference	:	17735-COM
Serial number	:	T-2023-00799
Page	:	1

Operating instructions

Each plant manager must sign below to confirm that he or she has received, read, and understands these operating instructions. By signing below the plant manager(s) also agrees to follow all instructions and understands that if these instructions are not followed, the manufacturer's guarantee and any liability will not be applicable.

NAME	DATE	SIGNATURE

Plant manager liability list

Customer	:	Lavan Industry Development Company (LIDCO)
Contractor	:	Nargan Company
Agent	:	HSE GRoup
Purchase order number	:	LIDCO-PO-NEC-278-6019
Airpack reference	:	17735-COM
Serial number	:	T-2023-00799
Page	:	2

Operating instructions

Each plant manager must sign below to confirm that he or she has received, read, and understands these operating instructions. By signing below the plant manager(s) also agrees to follow all instructions and understands that if these instructions are not followed, the manufacturer's guarantee and any liability will not be applicable.

NAME	DATE	SIGNATURE

Integrated Methanol and Ammonia Plant

VENDOR NAME	: Airpack Nederland B.V
EQUIPMENT DESCRIPTION	Instrument Air Package
EQUIPMENT TAGNUMBER	K-20

SECTION J

LUBRICANT CHART

Airpack Netherlands	Vendor doc. Number 17735-19	P.O. NO.: LIDCO-PO-NEC-278-6019
	Vendor: Airpack Nederland B.V.	

Lubrication List (K-020)

Code 1
M.Dalakeh

REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
03	17-04-2024	Issued for Approval	S.K.	J.J.	S.K.
02	30-01-2024	Issued for Approval	T.T.	J.J.	S.K.
01	14-09-2023	Issued for Approval	S.K.	J.J.	S.K.

LIST OF REVISED PAGES

Page \ Rev.	01	02	03	04	05	Page \ Rev.	01	02	03	04	05	Page \ Rev.	01	02	03	04	05	Page \ Rev.	01	02	03	04	05
1	X	X	X			**26**						**51**						**76**					
2	X	X	X			**27**						**52**						**77**					
3	X	X	X			**28**						**53**						**78**					
4	X	X	X			**29**						**54**						**79**					
5						**30**						**55**						**80**					
6						**31**						**56**						**81**					
7						**32**						**57**						**82**					
8						**33**						**58**						**83**					
9						**34**						**59**						**84**					
10						**35**						**60**						**85**					
11						**36**						**61**						**86**					
12						**37**						**62**						**87**					
13						**38**						**63**						**88**					
14						**39**						**64**						**89**					
15						**40**						**65**						**90**					
16						**41**						**66**						**91**					
17						**42**						**67**						**92**					
18						**43**						**68**						**ATTACHMENT**					
19						**44**						**69**						**1**					
20						**45**						**70**						**2**					
21						**46**						**71**						**3**					
22						**47**						**72**						**4**					
23						**48**						**73**						**5**					
24						**49**						**74**						**6**					
25						**50**						**75**						**7**					

LUBRICATION DATA SHEET — NUMBER

PAGE **1** OF **2**

A	B	C				D	E			F		G	H	I		J		K
EQUIPMENT NUMBER	NO. IDENT. UNITS	LUBE				LUBRICANT RECOMMENDED MFG. TRADE NAME & NO.	PER UNIT			VISCOSITY CENTISTOKES		POUR POINT OR DROPPING POINT	FLASH POINT	PRELUBED		FACTORY SEALED		NOTES AND ATTACHMENTS
		NOT REQ'D	OIL	GREASE	MIST		QUANTITY TO FILL **1**	PERIOD BETWEEN CHANGES **2**	ESTIMATED CONSUMP-TION **3**									
K-020-C-001 Compressor	1		x			Klüber Summit PS300 Eurol Vacuum pump Oil Metropa Vacuum pump Oil ISO-VG 10	Middle of the oil inspection glass	2000 hours	NIL	**97,1 @ 40 °C**	**≥ 90**	POUR POINT < -30	> 204	**YES**	~~NO~~	~~YES~~	**NO**	
K-020-M-001 Main motor bearings	1			x		Esso Unirex N3 Mobil Grease XHP 221 AeroShell Grease NLGI Grade 3	**30 gram**	4000 hours	NIL	**220 @40 °C**	**94**	DROPPING POINT 230	N/A	**YES**	~~NO~~	~~YES~~	**NO**	
N/A Cooling Motor Bearings	1			x		N/A	N/A	Lubricated for life	NIL	N/A	N/A	N/A	N/A	**YES**	~~NO~~	**YES**	~~NO~~	

INSTRUCTIONS

COLUMN

A- List each equipment item no. included on reference P.O No.
B- Total number of identifical units covered by equipment item No.
C- A separate line entry is required for each different lubricant type. Indicate lube application in column "A" Below equipment item No. e.q. frame/cylinders; bearings/hydraulic fluid gear/chain/motor etc.
bearings/hydraulic fluid gear/chain/motor etc.
Group equipment item Nos. with common lube systems.
D- Provide complete nomenclature for proper identification of lubricant characteristics. Alternate lubricats may be listed by referencing column "K".
E- Units of measure : Volume l(litres) of m^3(cubic metres); weight g(grams); time h(hours) / mo.(monthly) / yr.(year)
E-1 include capacity of filters, coolers and piping when necessary.
For common systems enter "incl"(include) under capacity indicated for basic equipment item No.
E-2 Based on normal operation. Special break-in requirements are to be referenced in col. "K"
E-3 Write "nil" of "0" if, consumption is negligible.
F- Show viscosity at both temperatures listed
G- Pour point for oil; dropping point for grease.
H- May be used for other than flash point if properly identified.
I- Check "yes' if equipment is pre - lubed and requires no initial lubrication in the field.
J- Check "yes" if equipment is factory sealed and requires no field lubrication.
K- Provied additional details and explanations when required by referencing notes in section
"K" e.q. additives/thickeners required, to identifu attachments, special cautions, break-in Procedures, etc.

CROSS REFRENCE TO EQUIPMENT ITEM NO. (COL. K)

K	NOTES & ATTACHMENTS (DETAILED LUBRICANT REQUIREMENTS)								