ROSETTI MARINO

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Sign	Date
	30-01-2025

Base Load Power Hub (BLPH)

INSTALLATION, OPERATING AND MAINTENANCE MANUAL (PUMP AND MOTOR, INCLUDING SITE ERECTION INSTRUCTIONS AND PROCEDURES)
For Sea Water Lift Progressive Cavity Pumps (P-50001 A/B)

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1 Pump

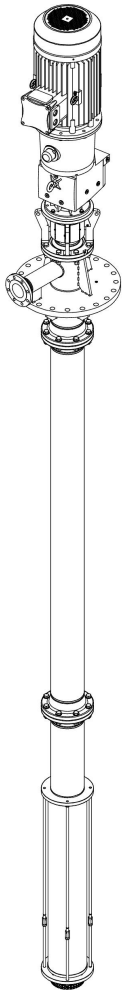
Pump Model	Product Reference	PCM serial nr	Tag number	Manual
25A24	317873	070P140016399	P-50001A	NIPMAVM00EN
		070P140016400	P-50001B	

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INSTRUCTION MANUAL

TO BE KEPT FOR FUTURE REFERENCE



PCM Moineau™ AV pump

Models: 3AV12 – 6AV6 – 6AV12 – 6AV24 – 13AV6 – 13AV12 – 13AV24 – 25AV6 – 25AV12 – 25AV24 – 40AV6 – 40AV12 – 50AV18 – 60AV6 – 60AV12 – 120AV12

Document No.: NIPMAVM00EN (genuine manual)

Date issued: 01/2019

PCM Technologies S.A.S.

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Phone: +33 (0) 1.77.68.31.00 – www.pcm.eu – contact@pcm.eu

Declaration of Conformity

We declare that the subassembly described below complies with the requirements of the Machinery Directive 2006/42/EC.

The subassembly complies with the harmonised standard EN ISO 12100.

Champtocé sur Loire, 01/01/2019

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1. Introduction

1.1. General

The pump you have just acquired was manufactured and inspected with the utmost care.

This manual contains information for qualified and authorised personnel on how to install, commission, run and maintain the equipment mentioned on the front cover. It also contains important information regarding safety and potential hazards related to the equipment. Users should read these instructions carefully before carrying out any commissioning, repair or maintenance work on or near the equipment.

The information contained in this manual may not be copied or published in any form whatsoever, whether by printing, photography, recording on microfilm or any other means (electronic or mechanical) without the prior written consent of PCM.

The information given in this manual is subject to change without notice.

PCM or its representatives decline all responsibility in the event of damage resulting from the use of this manual. This exemption from responsibility applies to damage of all types, including (without any limit) compensatory damages, whether direct or indirect, loss of data, profits or return of capital, loss or damage caused to the property of others, and third-party claims.

PCM or its representatives accept no responsibility and do not guarantee the accuracy, completeness, or up-to-date nature of the information contained in this manual.

1.2. Limits of the guarantee



Before performing any maintenance operations on the pump, check that all necessary precautions have been taken: upstream and downstream valves closed, pipework cleaned and purged, electrical power supply disconnected and disabled. Check also that all the usual precautions have been taken in accordance with the regulations in force regarding the safety of personnel.

On receiving the pump, examine it immediately to check that no signs of damage are apparent. If it is visibly damaged, indicate clearly on the carrier's documents that the merchandise was received damaged, with a brief description of the type of damage observed. If you decide to accept the equipment, please send a registered letter with acknowledgement of receipt to the carrier within forty-eight hours, with a copy to your PCM service centre.

Comply with handling and storage conditions (see page 29).

To avoid all risk of damage or accidents (in particular when the products being conveyed are hazardous), it is essential that you do not use the equipment for an application other than the one provided for in our Technical description (see Appendices).



WARNING: To maintain the original qualities of the pump and to preserve the PCM guarantee on the equipment as well as compliance with the machines directive, it is essential to use genuine PCM parts only.

1.3. Information regarding residual risks

PCM have taken into account all internal risks for the equipment and draw the attention of the user to the residual risks if the following verifications are not carried out:

- Compliance with the pump conditions of use.
- Fixing of the pump.

- Connections of the pipework to and from the pump.
- Installing security devices against overpressure, cavitation and frost.
- Installing accessories to prevent foreign bodies from entering the pumping circuit.
- Compliance with the electrical wiring instructions.
- Continuous feeding of the pump.
- Leak tightness of the assembly.
- For maintenance purposes, all necessary precautions against hazardous fluids.
- Compliance with the operating and maintenance instructions.
- Protection casing in place.
- Exclusive use of original PCM parts.

1.4. Environment

PCM is committed to an environmental protection initiative in accordance with the recommendations of the ISO 14001 standard.

PCM has set up a system through which its customers can ask PCM to handle the disposal of waste material (used pumps and spare parts). This system is especially useful for the disposal of parts containing elastomers, such as the stators of eccentric rotor pumps or hoses from peristaltic pumps.

All returns must be sent to the PCM factory, carriage paid. The equipment must be clean, with the pump and drive completely emptied of products, and must arrive with the sheet entitled: risk prevention (see Appendices)

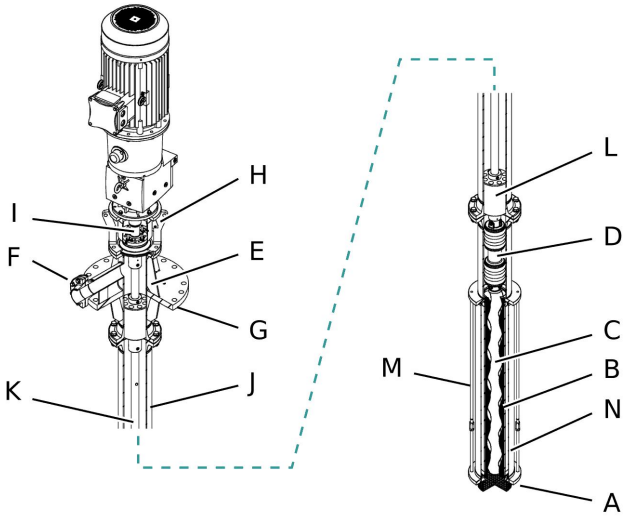
All items returned for this purpose must be legibly marked with the words 'Equipment to be recycled'.

Send to: PCM – Rue René Moineau – 49123 Champtocé-sur-Loire – France

2. Characteristics and installation

2.1. Operating principle

2.1.1. Principle of the pump



A: Stator port with strainer (suction port). B: Stator. C: Rotor. D: Connecting rod. E: Body. F: Body flange (discharge port). G: Mounting flange. H: Spacer or Bearing. I: Drive shaft. J: Body extension. K: Connecting rod extension. L: Connecting rod centring device. M: Tie-rods. N: Stator casing.

The PCM Moineau™ progressing cavity pump (or eccentric screw pump) essentially consists of two internal helical gears, which have the following features:

- The stator, which is the external element, has one more lobe than the rotor, which is the internal element.
- In any given cross-section, each section of the rotor is in contact with the stator, creating a helical seal line along the pump.
- The helical pitch of the stator is double that of the rotor.

The PCM Moineau™ AV series pump is designed according to the principles of API Standard 676 (Positive Displacement Pumps – Rotary).

When the rotor is positioned in the stator, a series of watertight cavities is created. Consequently, when the rotor turns inside the stator, these cavities progress spirally around the outside of the rotor, conveying the fluid from the inlet to the outlet.

The PCM Moineau™ pump is a volumetric pump whose displacement is equal to the volume of one cavity. The drive system is directly attached to the pump by a flange, and drives the rotation of the rotor via a connecting rod.

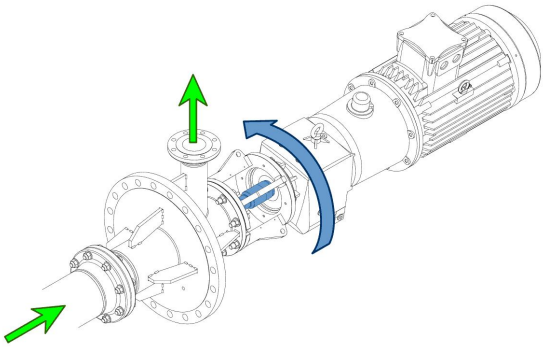
The pump body is equipped with a mounting flange enabling it to be fixed to a frame.

The pump can be supplied to customised lengths using extensions to the body and the connecting rod.

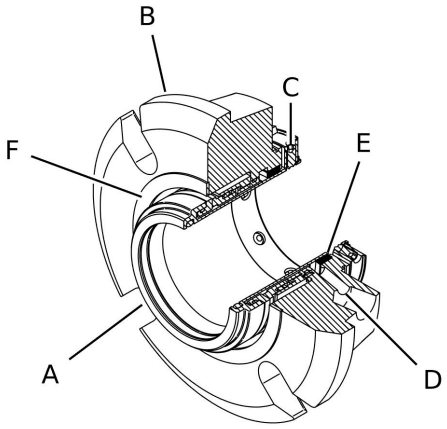
An optional stator casing is available to protect the stator against corrosion.

2.1.2. Pump rotation direction

The PCM Moineau™ AV series is designed for vertical installation, with the suction inlet at the bottom of the pump (at the level of the strainer) and the discharge on the body side. The rotor rotates clockwise when viewed from the drive shaft end.



2.1.3. Sealing by single mechanical seal



A: Sleeve. B: Body. C: Set screw. D: Orifice. E: Fix throttle bushing. F: Flat seal.

At the drive shaft, the seal between the pump body and the atmosphere is provided by a single cartridge-type mechanical seal system:

The cartridge-type mechanical seals enable rapid assembly with no need for adjustments. They must be installed in one piece.

The stationary ring is immobilised in the body (B). A rotating ring is installed on the sleeve (A), mounted on the drive shaft and fixed using set screws (C). The rotating ring comes into contact with the stationary ring via a spring. The thrusting force of the spring is preset in the factory.

The mechanical seal is equipped with lubrication orifices:

- FO ("Flush Out") orifice for lubricating the friction surfaces on the process fluid side.
- Q ("Quench") and D ("Drain") orifices for quenching the atmosphere side or collecting leaks.

Under normal operating conditions, there may be a slight leak. The mechanical seal is equipped with a fix throttle bushing (E) to contain this leak.

An optional single mechanical seal complying with API 682 is available.

NOTE: a mechanical seal must not run dry.
The auxiliary lubrication system must be clean and filtered.
The parts that receive the mechanical seal must be clean and free of defects.
Never separate the sleeve from the body.
Ensure that installation is performed under conditions of strict cleanliness.
During assembly, never force a part into position.

2.1.4. Sealing by double mechanical seal

The double mechanical seal is of cartridge type and must be installed in one piece. It consists of two single lubricated mechanical seals mounted front to back. The product to be sealed is insulated from the atmosphere by a barrier fluid confined between the two mechanical seals. With this type of seal, the pressure of the barrier fluid must be higher than the pressure of the product to be sealed.

The use of a double mechanical seal is mainly recommended with products with little lubrication, products that are very heavily solids laden or products that are dangerous in contact with the atmosphere.

The lubrication orifices are the following:

- LBI and LBO for the entry and exit of the barrier fluid
- V (if present) for venting
- D (if present) for drainage

An optional double mechanical seal complying with API 682 is available.

2.2. Markings

Information shown on the pump motor unit or on an identification plate attached to the pump:

- Manufacturer name and address.
- Serial Number
- The displacement and the rotation frequency of the pump unit.
- Maximum allowable pump pressure, according to its motor.
- Customer reference (optional).

This information is essential when ordering spare parts (contact the PCM service centre).



Pump characteristics (e.g. flow rate, pressure, speed of rotation, construction, direction of pump rotation, etc.) must not be modified without written permission from our customer services department.

2.3. Build Specifications

2.3.1. Pump

The materials used are as follows:

Element	Models	Material(s) used
Stator	All	NBR, FPM (FKM)
Sheath	All	NBR, FPM (FKM)
Static seal	All	O rings: NBR, FPM (FKM) Flange seals: Fibre and NBR binder
Dynamic seal	All	See section below
Rotor	All	X30Cr13 (1.4028 / AISI 420 – Optional chromium plating) - X2CrNiMoN22-5-3 (1.4462 / AISI 329 LN)
Drive shaft/ connecting rod extension	All	X2CrNiMoN22-5-3 (1.4462 / AISI 329 LN)
Connecting rod centring device	All	Polyoxymethylene (POMc)

Element	Models	Material(s) used
Body/stator port/body extension	All	S355JR (1.0045) - X2CrNiMo17-12-2 (1.4404 / AISI 316L) - X2CrNiMoN22-5-3 (1.4462 / AISI 329 LN) – Others on request
Strainer/ stator casing/ rods	All	X2CrNiMo17-12-2 (1.4404 / AISI 316L) - X2CrNiMoN22-5-3 (1.4462 / AISI 329 LN)
Brace	All	S355JR(1.0045)
Rod	3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12, 13AV24, 25AV6, 25AV12, 25AV24, 40AV6, 40AV12, 60AV6	Nitrided 30CrNiMo8 (1.6580 with or without E-CTFE coating)
	50AV18, 60AV12, 120AV12	X2CrNiMo17-12-2 (1.4404 / AISI 316L) - X2CrNiMoN22-5-3 (1.4462 / AISI 329 LN)

The material designation comply with the AFNOR standard.

NOTE: The PCM Moineau™ AV series pumps are designed to resist corrosive environments. This includes the systematic use of painting systems dedicated to C3 and C5M environments (following ISO 12944) for parts that may oxidise and the use of stainless steel.

The process and details of how these painting systems are applied are defined in the technical description.

PCM Moineau™ AV series pumps are equipped with ANSI B16.5 Class 150 flanged connections.

2.3.2. Dynamic seal

The materials used for the dynamic seals are as follows:

Element	Material(s) used
Mechanical seal body	X2CrNiMo17-12-2 (1.4404 / AISI 316L) – X2CrNiMoN22-5-3 (1.4462 / AISI 329LN)
Friction surfaces of mechanical seal	Carbon/silicon carbide Silicon carbide/silicon carbide
O-rings	FPM (FKM)
Flat seal	Glass-filled PTFE

Other materials are available on request.

2.3.3. Allowable force and torque

The admissible forces and moments are defined by the API 676 standard.

Examples of maximum admissible forces and moments on the suction and discharge flanges:

Models	Flange	Max. forces Fx, Fy and Fz	Max. moments Mtx, Mty and Mtz
3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12	Class 150 DN50 (NPS 2")	650 N (150 lbf)	350 Nm (250 lbf.ft)
13AV24, 25AV6, 25AV12	Class 150 DN80 (NPS 3")	1040 N (225 lbf)	560 Nm (375 lbf.ft)
25AV24, 40AV6, 40AV12, 50AV18, 60AV6, 60AV12, 120AV12	Class 150 DN100 (NPS 4")	1300 N (300 lbf)	700 Nm (500 lbf.ft)

2.4. General Dimensions

The general dimensions and weights are available in the General Arrangement Drawing of the pump submitted during execution.
If not, check the following drawing(s):

Model	Drawing number
3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12, 13AV24, 25AV6, 25AV12, 25AV24, 40AV6, 40AV12, 50AV18, 60AV6, 60AV12, 120AV12	TPE00597
Motors	TPE00571, TPE00572

2.5. Operating Specifications



WARNING: Pumps do not tolerate dry running.



WARNING: Pump specifications (capacity, pressure, speed of rotation, construction, etc.) must not be changed without written authorisation from our Customer Service Department.

The specifications are indicated on the technical description of the equipment supplied.

The A-weighted sound pressure level (SPL) of pumps manufactured by PCM is below 80 dB(A), in compliance with the European directive in force concerning noise from motor-driven equipment.

PCM Moineau™ AV Series pumps are used in the oil industry.

Their design enables them to pump any type of fluid, including aqueous solutions, oils and hydrocarbons, flashing or not.

IMPORTANT: The operating temperature limit is determined by the stator material and the specifications given in the technical description provided in Appendix.

2.5.1. Pump performance

The pumps in the PCM Moineau™ range are volumetric pumps. This means that fluid is moved by imprisoning a certain quantity of fluid in a cavity created between the rotor and the stator. The flow is then generated by rotating the rotor relative to the stator.

The cavities must be sufficiently sealed to enable pumping by generating pressure and thus to produce good hydraulic efficiency. But they must also allow a slight degree of internal leakage to lubricate the contact between the rotor and the stator in order to improve mechanical efficiency and extend the life of the components. The internal leakage rate thus plays an important role in the performance of a Moineau™ pump.

As the overall efficiency of a volumetric pump is the product of the hydraulic efficiency and the mechanical efficiency, the efficiency of a PCM Moineau™ pump will depend on the compromise made with regard to the internal leakage rate, as shown by the table below:

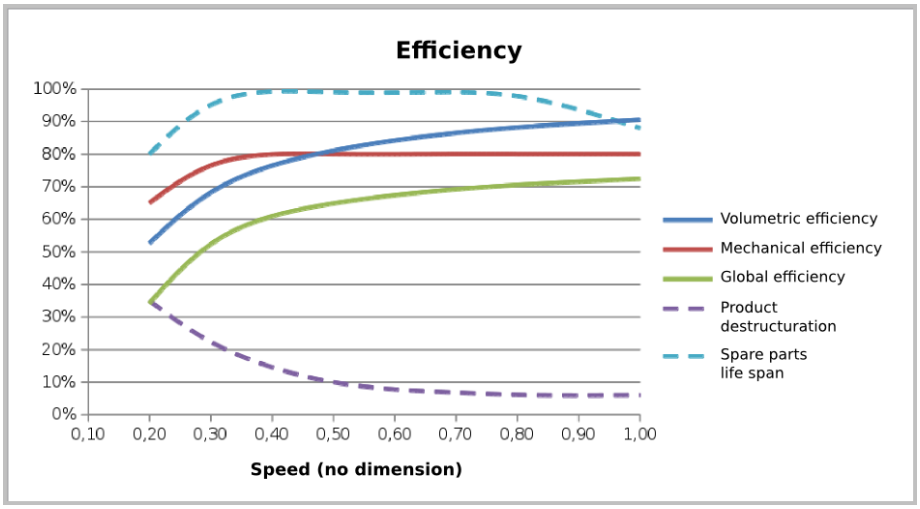
Parameter	Action	Hydraulic efficiency	Mechanical efficiency
Internal leakage rate	↗	↘	↗
	↘	↗	↘

2.5.2. Influence of rotation speed

As the internal leakage rate is independent of the rotation speed, we can increase the volumetric efficiency by increasing the rotation speed, as shown by the graph below.

In addition, the integrity of the product being pumped depends mainly on the leakage ratio. The leakage ratio is the ratio between the internal leakage rate and the total pump flow rate. Increasing the rotation speed thus reduces the leakage ratio and better respects the product being pumped.

With regard to the components' lifetimes, too low a rotation speed does not allow the hydrodynamic lubrication film to form, thus limiting the components' lifetimes. Too high a rotation speed, however, places too much mechanical stress on the components, as shown by the graph below.



Manufacturing tolerances, chemical attack on the elastomers and wear of the rotor and stator components can cause the internal leakage rate to vary from the flow rate initially predicted.

The following points should be noted:

- The flow rate will be better controlled if the leakage ratio is reduced, and thus the rotation speed slightly increased (>150 rpm). **The rotation speed must be maintained above 80 rpm during all the phases of the pump's use.**
- Respect for the integrity of the product increases with the pump's rotation speed.
- Due to the component manufacturing tolerances, two different stators may produce slightly different flow rates. The flow rate of the pump should thus be checked when new parts are installed.
- If the stator is not subject to chemical degradation or mechanical wear, the flow rate of the pump will remain constant.

2.5.3. Performance curves

The rotational speeds and pressures shown on the curves represent typical performance characteristics obtained with water at 20°C. When operating conditions differ from this standard, the performance characteristics must be adjusted according to:

- product characteristics (viscosity, fragility, abrasion),
- the characteristics of the application (operating speed, discharge pressure, available NPSH).

Inevitably with the tolerances of mechanical parts, and especially elastomer parts, after a stator is replaced the flow rate may fluctuate slightly.

The performance curves are available in the appendix.

2.5.4. Pump motors

Unless the customer issues specific requirements, the motor assemblies of PCM Moineau™ pumps are selected in order to optimise the overall efficiency of the pump motor unit and thus reduce installation costs.

Two operating phases are to be taken into account when selecting the motor assemblies: the start-up phase and the operating phase.

2.5.4.1. Start-up phase

After the stoppage phase, the coefficient of friction between the rotor and the stator is at its highest. The start-up torque can therefore be much higher than the torque in operation.

The start-up torque depends on:

- the stoppage time before start-up,
- the temperature of the stator during start-up,
- the nature of the fluid present in the stator during the stoppage (lubricity).

PCM Moineau™ pumps are specified to start at a high temperature after time-limited stoppage phases.

The gearmotors selected by PCM supply enough torque to start under normal conditions of electric power and pump operation.

2.5.4.2. Operating phase

During the operating phase, when the PCM Moineau™ pump is in its steady state, the pump operates with constant torque.

The operating torque depends on:

- mechanical efficiency,
- operating pressure.

The gearmotors selected by PCM are selected to supply enough torque to operate under the contractual conditions of pressure, viscosity and temperature.

2.5.4.3. Variable frequency operation

The use of a Variable Speed Drive (VSD) considerably extends the possibilities for using PCM Moineau™ pumps compared with fixed speed operation.

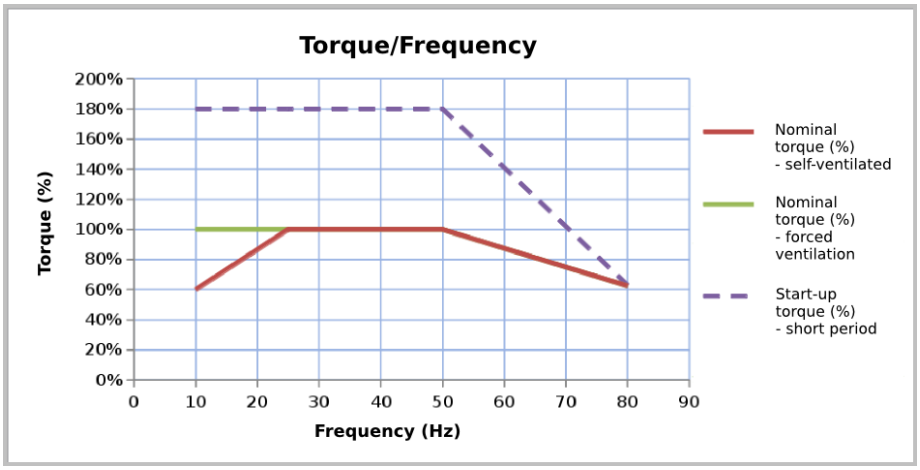
The frequency converter makes it possible to:

- extend continuous speed adjustment,
- save energy by adapting and optimising the process,
- adjust the speed for better control of the flow rate,
- configure programmable acceleration ramps for a gradual start or stop. Beneficial for the drive system and the pumped fluid, this prevents water hammer in the pipework and the pump.

2.5.4.4. Technical characteristics of variable frequency operation

Three-phase asynchronous motors supply a torque that is at its maximum at the nominal frequencies and voltages of the network to which it is connected.

Motors powered via a Variable Speed Drive (VSD) generally operate over a range of 10 to 80 Hz as shown by the graph below:



They supply a constant torque up to 50 Hz (or the nominal frequency), and then operate at constant power. The torque available thus decreases in proportion to the increase in speed.

2.5.4.5. Torque of an asynchronous motor in relation to drive frequency

For continuous operation at a **frequency of less than 25 Hz**, it is preferable to fit the motor with forced ventilation to avoid the risk of overheating and significant power loss.

For continuous operation at a **frequency of up to 80 Hz**, the motor power is chosen according to the torque available at 80 Hz.

The gearmotors powered by a Variable Speed Drive (VSD) and selected by PCM are selected to supply enough torque to start up and operate under the predefined conditions of pressure, viscosity and temperature.

2.5.4.6. Choice of the Variable Speed Drive (VSD)

The Variable Speed Drive chosen to power a PCM Moineau™ pump must:

- enable operation at a constant torque,
- be designed according to a characteristic at 50 Hz (or the nominal frequency),
- be sufficiently powerful to supply the start-up torque as a peak level and supply the pump in operation,
- supply a voltage compatible with the motor supplied by PCM,
- supply enough current to achieve the required torque,
- have electrical protection compatible with the characteristics of the installed motor.

Refer to the variator supplier's installation instructions and contact PCM customer services to validate your installation.

2.6. Equipment Installation

All PCM Moineau™ AV series pumps are inspected in our workshop before dispatch.

Large pumps can be delivered in sections for easier transport. See paragraph 4.6 for the procedure to reassemble the pump before installation.

2.6.1. Installation precautions



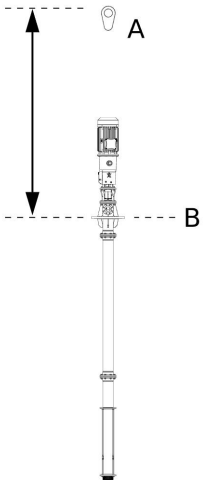
Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

Avoid installing the pump in a location where the ambient temperature might not be within the operating temperature limits of the pump (refer to the description in the Appendix). For an outdoor installation, it is

advisable to provide shelter above the equipment, and protection against freezing.

It is important to leave enough space around and above the pump to allow access for installation, maintenance and adjustments. If the pump is installed in a confined space (limited height available above the pump), it is important to leave enough space above the pump to enable it to be assembled/disassembled piece by piece (see paragraphs 4.19 and 4.20).

The height required between the lifting equipment (A) and the installation level (B) will be defined according to the dimensions of the pump and the tools used.



It is important to leave enough space next to the pump to store the pump and/or disassembled parts.

A safety valve or pressure switch and a pressure gauge located at the discharge will give protection and allow the pump's operating characteristics to be monitored. If a valve is present in the circuit, it is ESSENTIAL to provide a safety valve or pressure switch.

Without protection on the circuit, a valve at the discharge is often the cause of operating errors leading to damage to the pump or pipework, and presents a danger to personnel and equipment nearby.

The suction inlet should be sufficiently submerged to ensure proper operation of the pump. A minimum submersion level is defined for each pump on the drawing TPE00597. An anti-dry-running level sensor or transmitter installed on the tank will protect the pump when there is a shortage of the product to be pumped. Please ask PCM about our wide selection of accessories to suit your requirements.

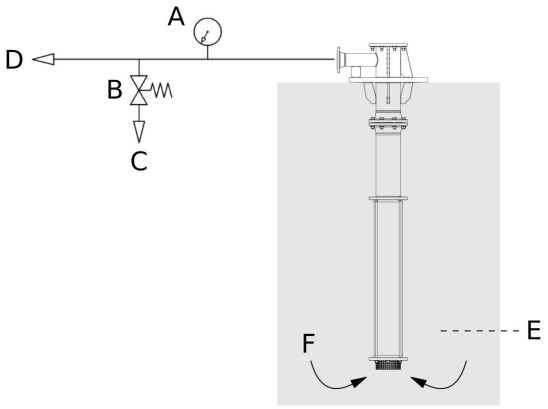
WARNING: Pumps do not tolerate dry running.

Special Addendum for Pump and Caisson Installation:

To install the Pump and the Caisson simultaneously, start by fitting Pump body extensions horizontally to the stator assembly. Do not forget the seal and tighten the screws. Re-start this operation as many time as required. Then, install the outside pump centralizers in the designated location (See specific Pump GAD).

Insert, the mounted assembly above inside the caisson. Use Glycerine to avoid friction between the pump centralizers and the inside of the caisson.

Use the special Lifting Tool T1 and T4 to lift Pump and Caisson assembly.



A: Press. gauge &/or press. switch. B: Pressure Relief Valve (PRV). C: Return to tank or drain. D: To process. E: Level sensor or transmitter to prevent dry running. F: Fluid inlet.

2.6.2. Pipework connections

The weights of the pipes must not be supported by the pump. The allowable torques and forces on the fittings are given in "Build Specifications" section.

2.6.3. Pump position

The pump and its drive mechanism must be installed vertically. The pump must be fixed to an adequately sized horizontal flange using screws and rawl plugs or anchor bolts.

2.6.4. Connecting the dynamic sealing system (cartridge type)

PCM Moineau™ AV series pumps are designed to operate solely with single or double mechanical seals.

Cartridge-type mechanical seals are pre-assembled and pre-adjusted in the factory, making maintenance operations easier.

It is important to ensure that the components of the equipment are kept as clean as possible and are protected from damage under all circumstances.

The performance characteristics of the equipment depend on its environment and the operating conditions to which it is subjected. You should therefore consider that the time spent checking the environment before installation can help to prevent premature failure and can therefore reduce equipment maintenance costs.

All handling must be done with the greatest care to protect the seal, which must not be subject to impact. An effective seal essentially depends on how carefully the mechanical seal is installed.

Before installation begins, ensure that all the parts to be installed are clean and that the products to be used are compatible with the seals.

You must also check that the O-rings have no trace of cuts, to avoid damaging the O-rings on assembly.

Ensure that there are no knocks or marks on the bearing surfaces of the O-rings, and eliminate any imperfections or scratches.

Carefully clean and examine the bearing surface and the bore of the cartridge.

2.6.4.1. Single mechanical seal

The friction surfaces are lubricated by the pumped product.

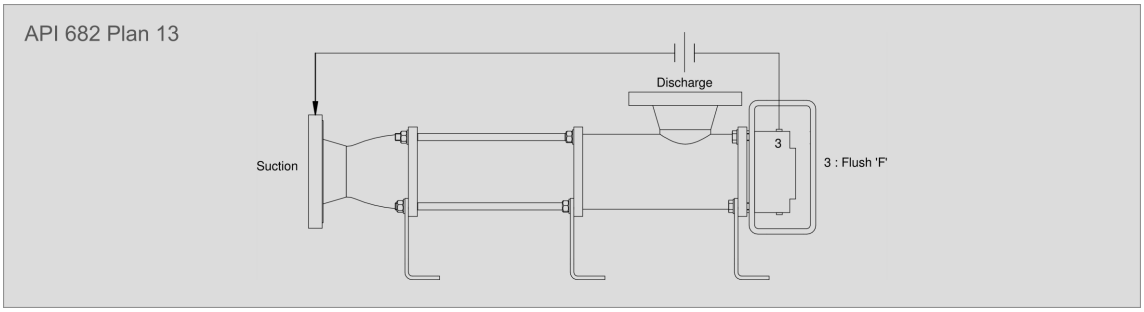
During the start-up phases, single mechanical seals with carbon/silicon carbide friction surfaces can tolerate dry running during short periods (a few minutes). However, PCM recommends adding an automatic greasing nipple for the quench "Q". Single mechanical seals with silicon carbide/silicon carbide friction surfaces do not tolerate

dry running and must be equipped with at least an automatic greasing nipple for the quench "Q".

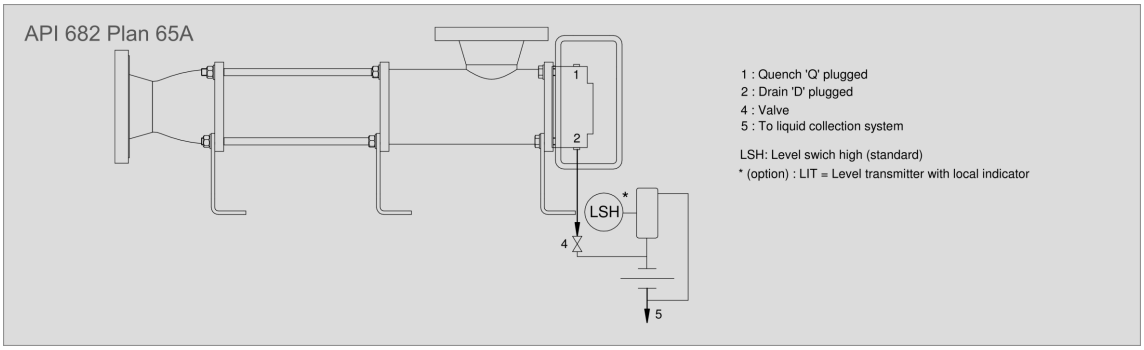
Mechanical seals can be used according to different sealing plans. These plans are described in the API 682 standard. The usual configurations are described below.

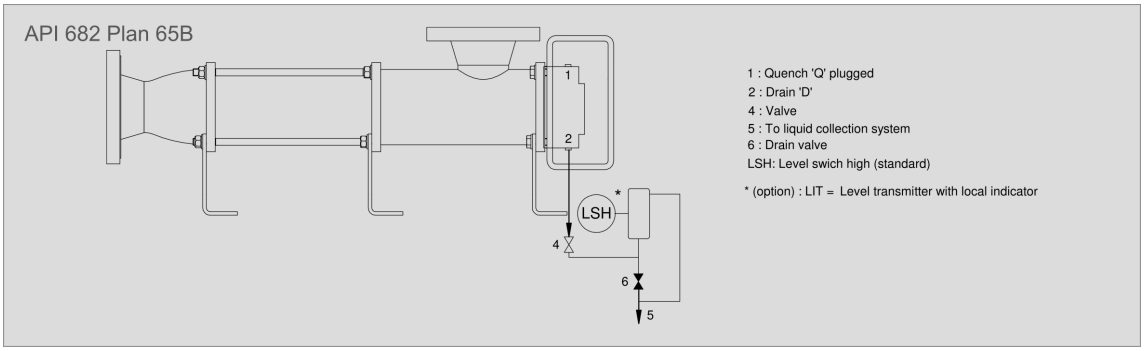
WARNING: the sealing plan connection must be carried out by qualified personnel.
The auxiliary lubrication system must be clean and filtered (if applicable).
Installation must be performed under the best conditions of cleanliness.

API 682 Plan 13 (as standard) Recirculation from pump seal chamber through a flow control orifice and back to the pump suction. This type of arrangement is suitable for vertical mounting of the pump.



API 682 Plan 65A or B (optional) Detection of any leak in the mechanical seal via an alarm system. For the assembly and installation of the lubrication system, see the specific instructions supplied with the associated lubrication system.





Note: a plan 13 can be combined with a plan 65A or B.

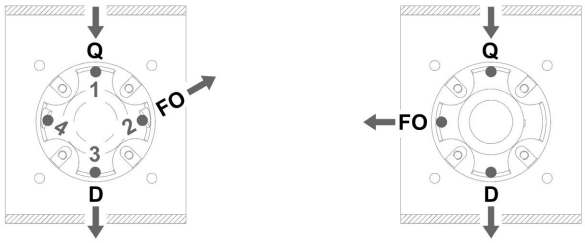
Other configurations are possible on request. For any changes of sealing plan, contact PCM.

2.6.4.1.1. Seal orientation

The seals used on vertical pumps can be oriented in any way.

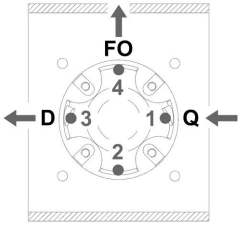
The diagrams below show an example of the orifice positions. The seals are shown seen from the motor in the direction of the pump.

Plan 13 :



API 682

Plan 65:



2.6.4.1.2. Fitting

The connections are of type 3/8" NPT on all the seal orifices.

The unused connections are closed off using metal plugs supplied with the pump.

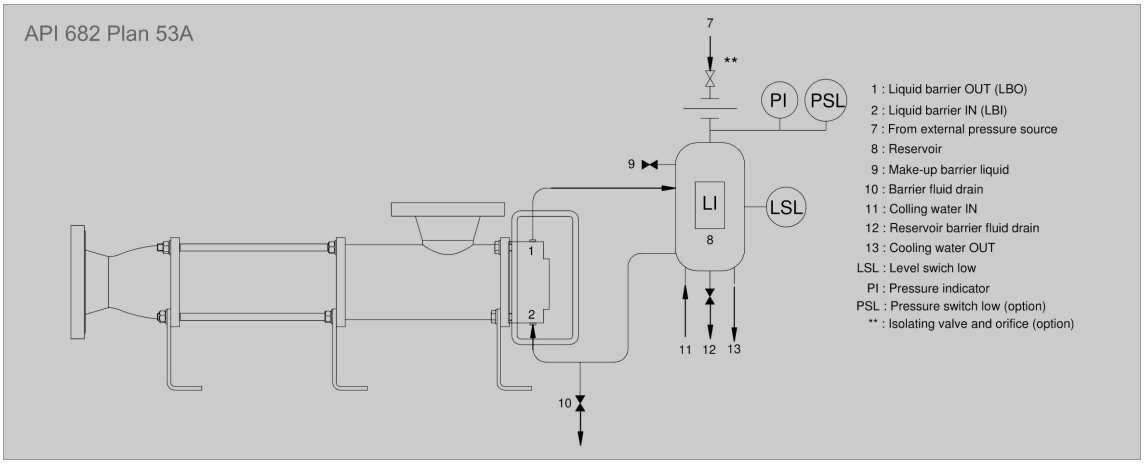
2.6.4.2. Double mechanical seal

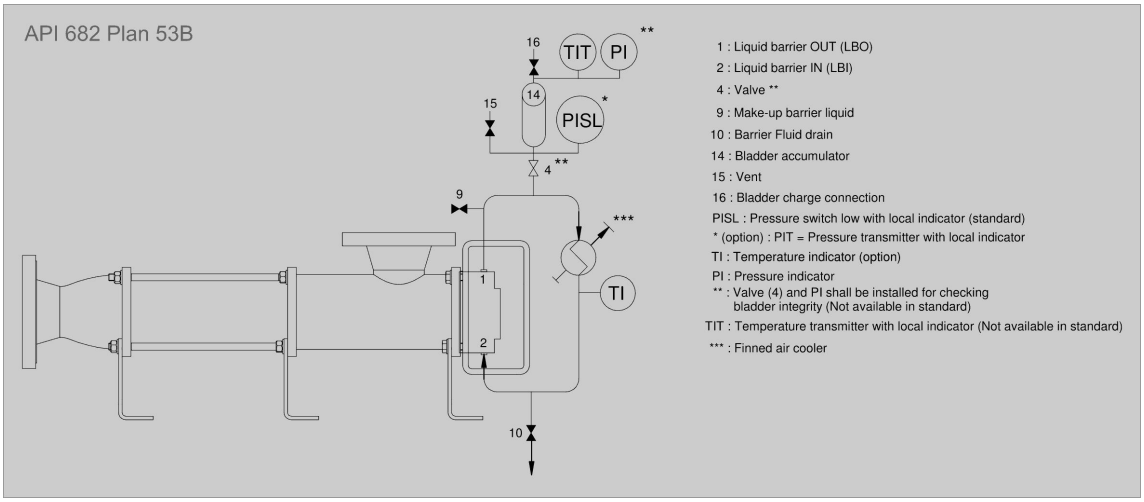
Double seals for PCM Moineau™ AV series pumps are designed to operate solely with a barrier fluid such as oil or glycol and water.

The usual configurations are API plan 53A and API plan 53B. These systems are described in the API 682 standard.

WARNING: the sealing plan connection must be carried out by qualified personnel.
The auxiliary lubrication system must be clean and filtered (if applicable).
Installation must be performed under the best conditions of cleanliness.

API 682 Plan 53A or 53B Supplied with barrier fluid from a pressurised tank.





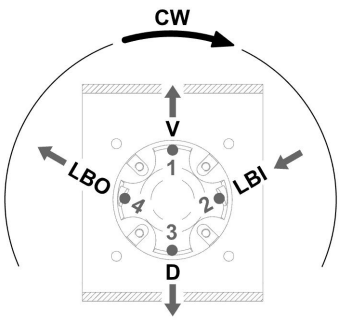
For the assembly and installation of the lubrication system, see the specific instructions supplied with the associated lubrication system.

2.6.4.2.1. Seal orientation

The seals used on vertical pumps can be oriented in any way.

The diagrams below show an example of the orifice positions. The seals are shown seen from the motor in the direction of the pump.

Plan 53A or 53B



CW: seen from the motor, the rotor turns clockwise.

2.6.4.2.2. Fitting

The connections are of type 3/8" NPT on all the seal orifices.

The unused connections are closed off using metal plugs supplied with the pump.

2.6.5. Gearbox lubrication

Gearboxes positioned vertically have a high level of oil to lubricate the first reduction gear stage.

The use of an optional expansion tank prevents oil leaking out of the vent screw if foam forms on the surface of the oil.

For the expansion tank connection procedure, see the drive system instructions in the appendix.

2.6.6. Motor connection

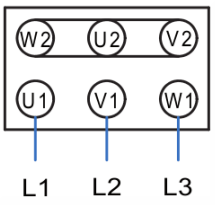
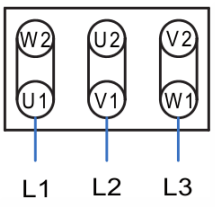
WARNING: All procedures must be performed by qualified personnel. PCM declines all responsibility if this requirement is not fulfilled. Before performing any connections, ensure that the electrical power supply has the characteristics listed on the motor plate. There is also a wiring diagram in the motor terminal box (see also the instructions in the Appendix).

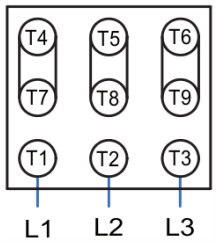
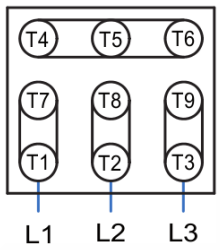
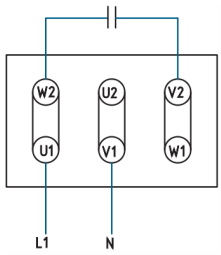
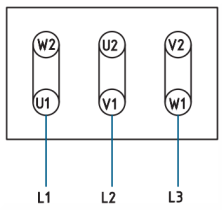
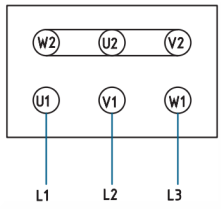
For thermal protection, the setting value is the current indicated on the motor.

When all connections have been made, the motor should be run at low speed for a few seconds (if possible using a mechanical or frequency variator) in order to check the sense of rotation as indicated by the arrow marked on the pump.

WARNING: Pumps do not tolerate dry running.

2.6.6.1. Examples of wiring diagrams

Device	Configuration	Diagram
Three-phase IEC motor	Y connection High voltage	
	Δ connection Low voltage	

Device	Configuration	Diagram
Three-phase NEMA motor	Y connection High voltage	
	YY connection Low voltage	
Forced ventilation	Single-phase operation Steinmetz connection 230V - 277V 50 + 60Hz	
	Three-phase operation Δ triangle connection 220V - 290V 50Hz 220V - 332V 60Hz	
	Three-phase operation Y star connection 380V - 500V 50Hz 380V - 575V 60Hz	

3. Operation

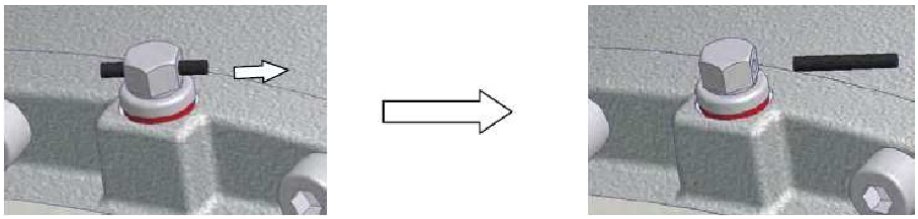
3.1. Commissioning

Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

3.1.1. Before start-up

Ensure that:

- The motor and baseplate are grounded (earthed).
- The electrical connections are correct and their arrangement does not lead to supplementary risks (falls).
- The gearbox has been filled with lubricant to the correct level.
- The motor has been filled with lubricant to the correct level.
- The gearbox screw (or vent valve or oil expansion tank) has been correctly installed and activated.



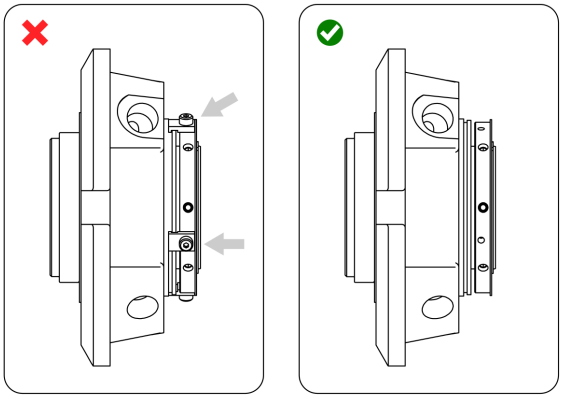
Activation of the vent screw



Installation of the vent valve

NOTE: for the positioning of the vent screw and the connection of the expansion tank, see the drive system instructions in the appendix.

- The product to be pumped is present in the tank and the pump body.
- The mechanical seal is connected to its sealing plan.
- The mechanical seal is vented (if used in a vertical installation or with a barrier fluid).
- The spacers (shown by the arrows on the diagram below) have been removed from the mechanical seal and conserved for maintenance operations.



- All valves installed upstream and downstream from the pump are open.
- The temperature and type of product to be pumped are correct.
- The alignment of the coupling has been checked.
- The screws are tightened to the right torque for their diameter.
- The direction of shaft rotation corresponds to the desired direction of pumped fluid flow.

Also follow the motor manufacturer's instructions (supplied in the appendix).

3.1.2. Start-up

WARNING: Never allow the pump to run dry!

To prevent dry running, PCM can supply a dry run protection system.

If the pump is not primed, you are advised to fill the pump body by hand. If the pump is temporarily not primed, the small amount of liquid remaining in the pump is enough to lubricate the stator until the next priming.

During the first few minutes of operation, check the following:

- The liquid being pumped reaches the end of the discharge pipe.
- The pump is not vibrating abnormally.
- No unusual noise.
- Sealing system functioning well.
- Check that the pressure stabilises, if a pressure gauge is installed.
- No abnormal heating of the stator or sealing system.

Check that the parameters (speed, flow rate, pressure, viscosity, and temperature) match the design parameters of the pump.

Note: it is normal for a fine black powder to form behind the mechanical seal. This is due to wear of the fix throttle bushing in the first moments of operation.

WARNING: If the values are not those indicated, consult your PCM service centre.

3.2. Normal operating procedure

The pump and its drive system can reach significant surface temperatures.



Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

3.2.1. Start-up procedure

Before each start-up, check the following:

- Fluid present at suction.
- Valves open on the suction and discharge pipes.
- Correct temperature of the product to be pumped.

Start the pump.

3.2.2. General Operating Precautions

During operation, ensure that:

- The pump is continuously supplied with product and power.
- The discharge pressure remains stable and below the maximum capacity of the pump.
- The temperature of the product being pumped remains within the operating limits.
- The operating instructions in force at the production site are observed.

3.2.3. Shutdown Procedure

This shutdown procedure depends on the type of product being pumped. Refer to the specific characteristics on the technical description (see Appendices).

The shutdown procedure is therefore defined by the process.

Nonetheless, the minimum procedure is to switch off the pump, then close the suction and discharge valves.



WARNING: for a product which settles, clean the pump using a suitable product in order to enable the pump to be restarted without damage. .



It is important to protect the pump against water hammer, which could destroy the equipment and cause a risk to staff and other equipment nearby.

WARNING: it is important to limit the time for which food is in contact with the pump components, and to flush the pump in the event of a prolonged stoppage (over 30 minutes).

3.2.4. Operating Procedure in the Event of an Incident

In the event of operating irregularities, such as:

- Pump does not start.
- Pump does not prime itself.
- Flow rate too low or irregular.
- Pump stops.
- Pump is not delivering.
- Pump is abnormally noisy.

Proceed as follows:

- Shut down the pump according to the shutdown procedure (see page 24).
- Hydraulically isolate the pump (suction, discharge).
- See "Troubleshooting" section (see page 37).

3.2.5. Automatic control

It is advisable to use devices that automatically control the operation of the pump.

Examples: pressure switch, valves with electrical position contact, dry running protection probe (capacitance probe).

4. Maintenance

4.1. Spare parts list

For the list of spare parts for your pump, contact the PCM service centre, giving the serial number of your equipment. This number is shown on the manufacturer identification plate.

You can ask us to repair your pump. Within three days of receiving it, we will supply a quotation showing the cost of the overhaul and how long it will take to do.

PCM service centre address:

PCM – Rue René Moineau – 49123 Champtocé-sur-Loire – France

Phone: +33 (0) 1.77.68.31.00 – contact@pcm.eu

PCM USA Inc. – 11940 Brittmoore Park Drive – Houston, TX 77041 – USA

Phone: +1 713-896-4888 – contact@pcm.eu

PCM China – Unit 10A01, Shanghai Mart, No. 2299 – Ya Nan West Road, Shanghai, China 200336

Phone: +86 21 6236 2521 – contact@pcm.eu

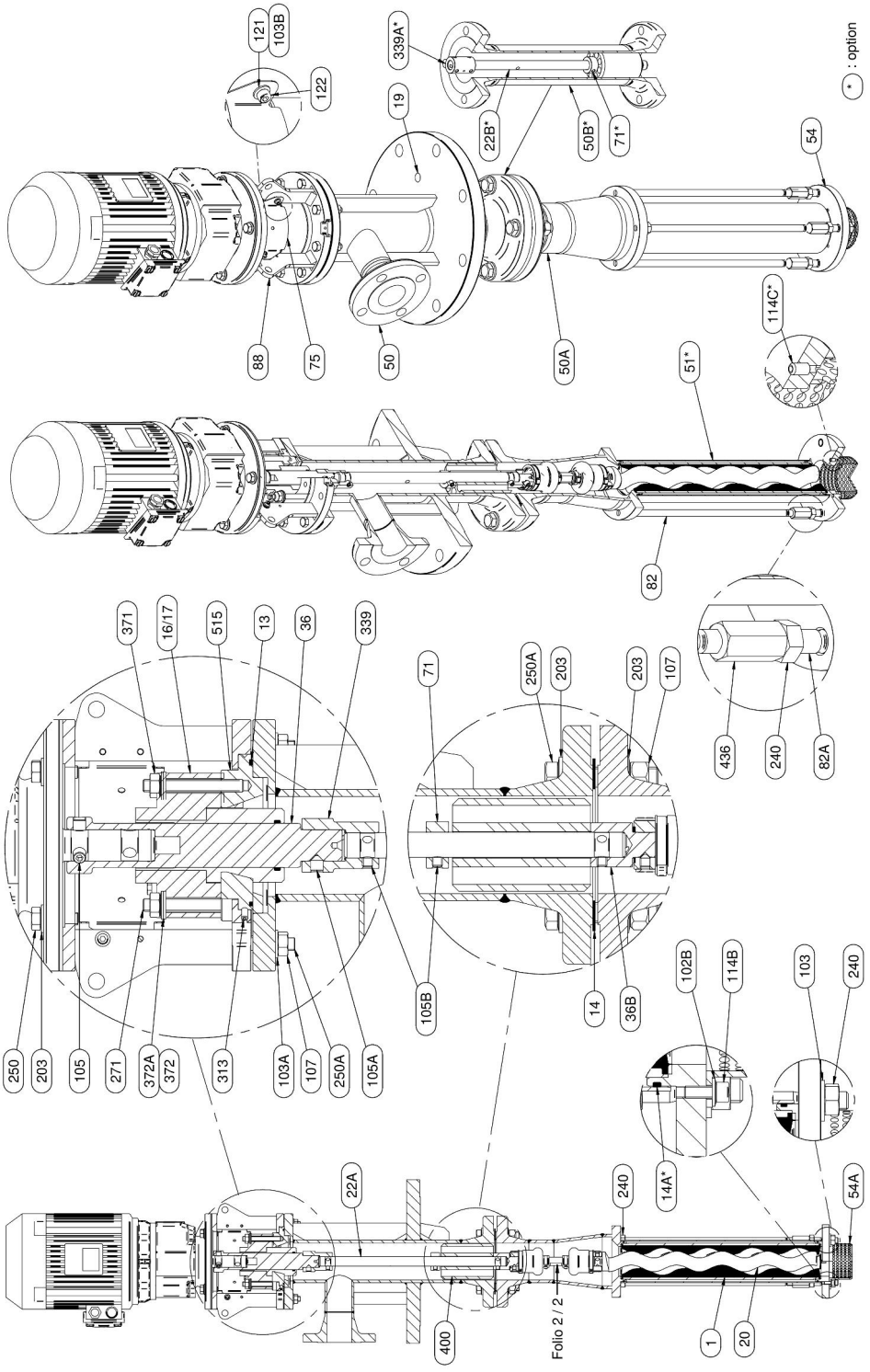
PCM MIDDLE EAST FZE – Office N° 741 – Building 5, East Wing, Block B – Dubai Airport Free Zone – PO Box 293527, Dubai – United Arab Emirates

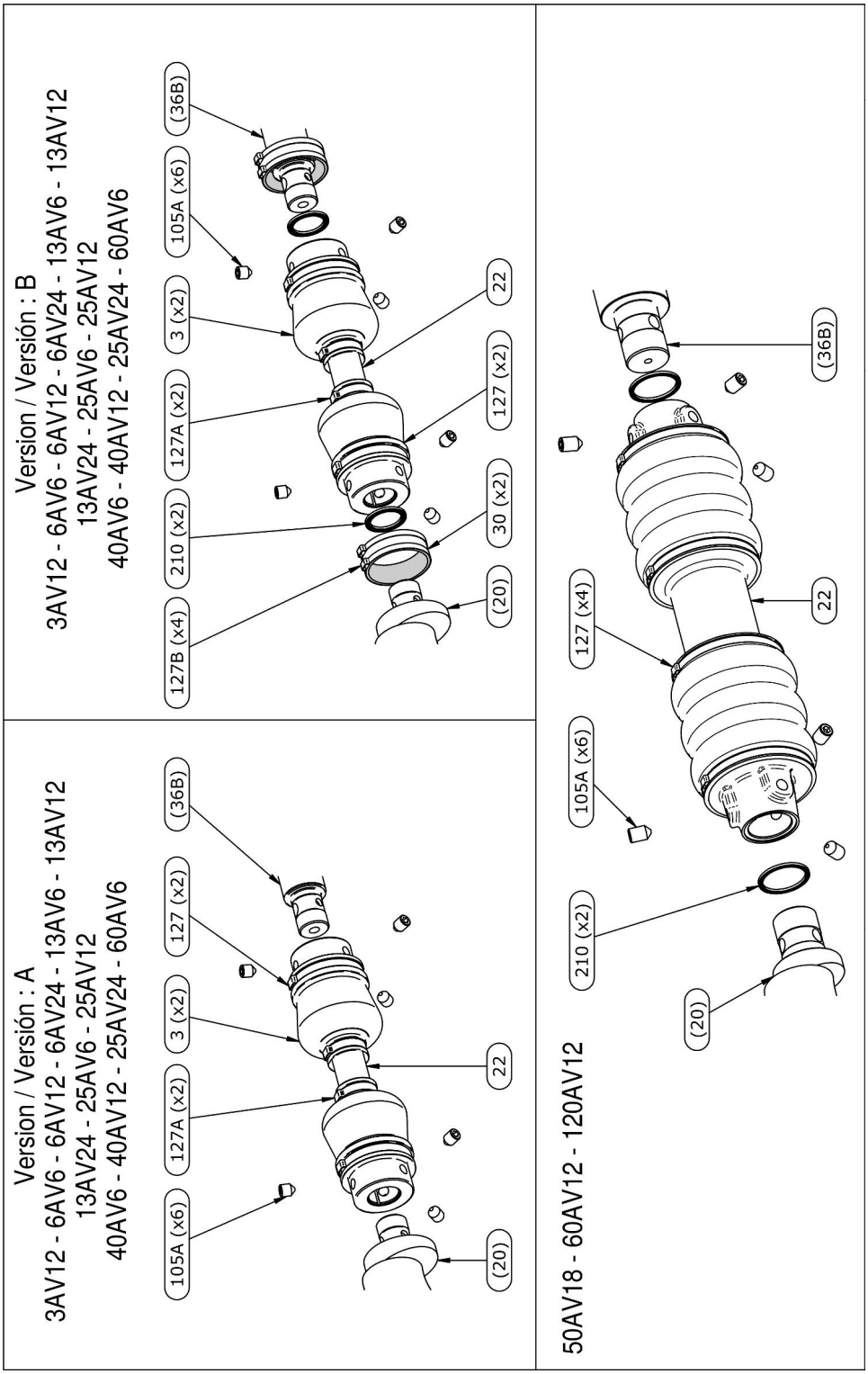
Phone: +971 42 04 58 48 – contact@pcm.eu

4.2. Cross-section of the pump

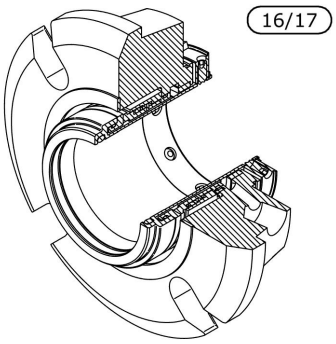
See Specific Cross-section provided during project execution.
If no specific drawing was provided, see below standard for all models.

4.2.1. Monobloc pump

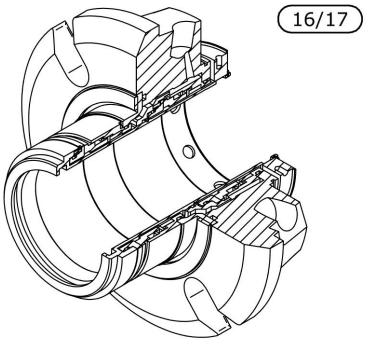



Version / Versión : B
3AV12 - 6AV6 - 6AV12 - 6AV24 - 13AV6 - 13AV12
13AV24 - 25AV6 - 25AV12
40AV6 - 40AV12 - 25AV24 - 60AV6
127B (x4)
210 (x2)
127A (x2)
3 (x2)
105A (x6)
(36B)
(20)
30 (x2)
127 (x2)
22
Version / Versión : A
3AV12 - 6AV6 - 6AV12 - 6AV24 - 13AV6 - 13AV12
13AV24 - 25AV6 - 25AV12
40AV6 - 40AV12 - 25AV24 - 60AV6
105A (x6)
127A (x2)
3 (x2)
127 (x2)
(36B)
22
(20)
50AV18 - 60AV12 - 120AV12
210 (x2)
105A (x6)
127 (x4)
(36B)
22
(20)

4.3. Sealing by single mechanical seal



4.4. Sealing by double mechanical seal



4.5. Handling Equipment and Procedure

WARNING: To handle the complete pump, refer to the procedure in force and comply with legislation concerning the safety of personnel. Slinging must be performed by trained, qualified personnel in accordance with the instructions given in this manual. Any failure to observe this rule releases PCM from all responsibility.
Before lifting the pump, ensure that all its components are securely fastened to each other. Do not sling with a single sling or an endless sling that can slip on the lifting hook.

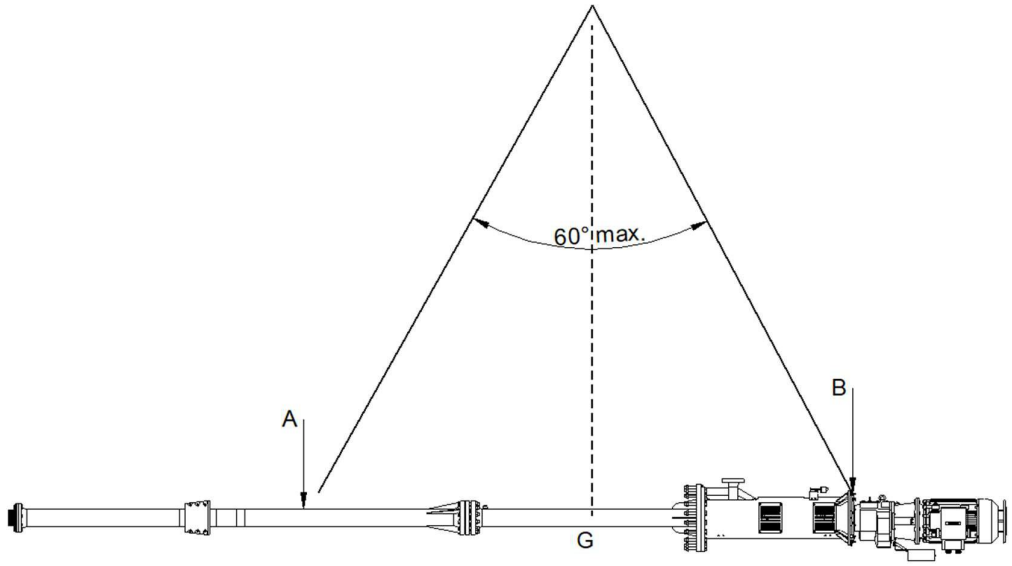
Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

4.5.1. Handling in the horizontal position

Use two single slings working in a loop on the stator (A) and the motor unit (B), while using a lining to protect the slings from sharp edges.

The hoisting rings that may be present on the motor unit (gearmotor, motor or gearbox) should not be used to lift the pump.

If the motor is equipped with an IEC or NEMA adaptor, do not attach the slings to the motor or the adaptor attach them to the gearbox.



Use a protective thimble or a sliding hook where the loop is situated. The max. loads on the pump units are available in the appendix.

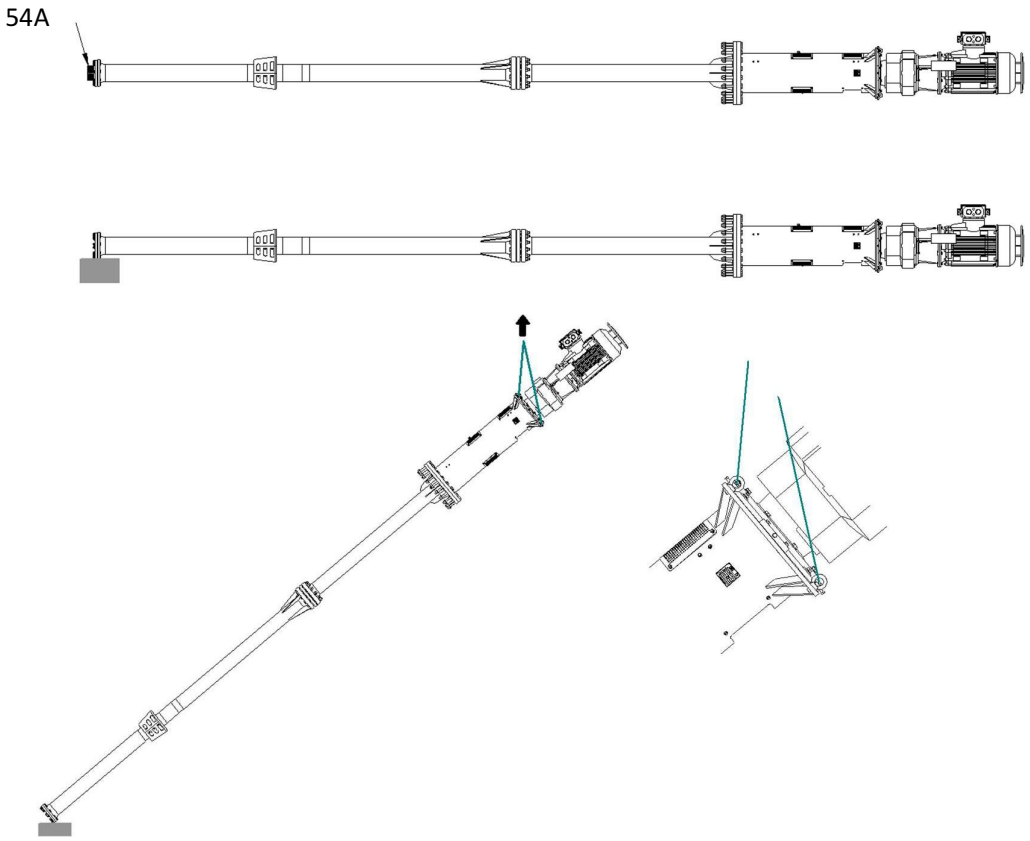
Use an adjustable sling with an adequate working load limit (WLL)[1]. Perform the adjustment with a series of tests to place the centre of gravity (G) of the load vertically below the hook (with latch), or position two slings of different lengths by attaching the shorter one on the heavier side so that the centre of gravity (G) of the load is positioned vertically below the hook (with latch).

For large pumps (longer than 7 metres), add a third lifting point at the centre of the pump.

The parts of the pump that cannot be handled may be lifted using a hoist and slings (or any similar lifting equipment). Metallic slings (chain, cable, etc.) are not recommended. Fragile parts must be handled with particular care to avoid impact. After removal, they must be laid in a stable position on wooden blocks, and protected from shocks.

1. WLL: Maximum allowable mass (kg) that can be hung vertically from the sling in normal use

4.5.2. Lifting the pump



1. Remove the strainer (54A) at the pump's suction port to avoid damaging it.
2. Install a wedge at the end of the pump beneath the stator port (54).
3. Lift the pump using the holes in the spacer (88) or the lifting eyes (310) for bearing pumps. Use lifting equipment compliant with the European machinery directive, which must be able to handle the load specified in the GAD. For large pumps (longer than 7 metres), add a lifting point at the centre of the pump.
4. Once the pump is vertical, refit the strainer (54A) at the suction port.
5. Before installing the pump, make sure the screws on the outside of the pump are correctly tightened.

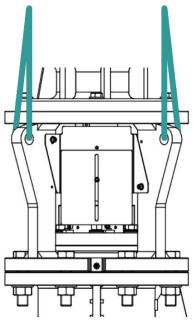
The hoisting rings that may be present on the motor unit (gearmotor, motor or gearbox) should not be used to lift the pump.

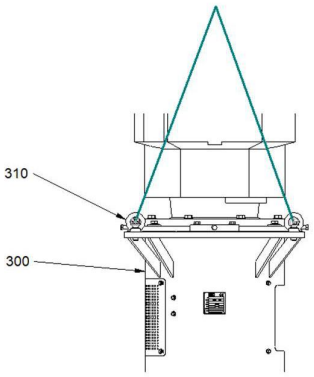
Follow the instructions in reverse order to position the pump horizontally.

For Pump and Caisson assembly lifting, use the special Lifting Tool T1 and T4.

4.5.3. Handling in the vertical position

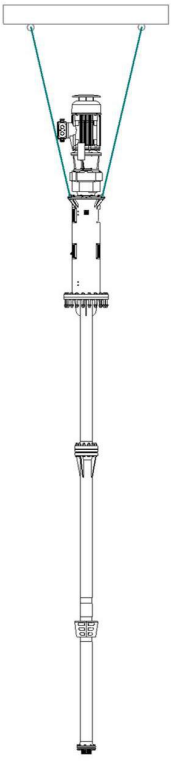
The pump must be lifted using the holes in the spacer (88) for monobloc pumps or the lifting eyes (310) available on the baseframe (300) for the bearing pumps. Use lifting equipment compliant with the European machinery directive, which must be able to handle the load specified in the General Arrangement Drawing.





The hoisting rings that may be present on the motor unit (gearmotor, motor or gearbox) should not be used to lift the pump.

The addition of a lifting beam will distance the hoists from the motor drive and from sensitive parts (motor terminal box, gearbox expansion tank), avoiding the risk of breakage during handling.



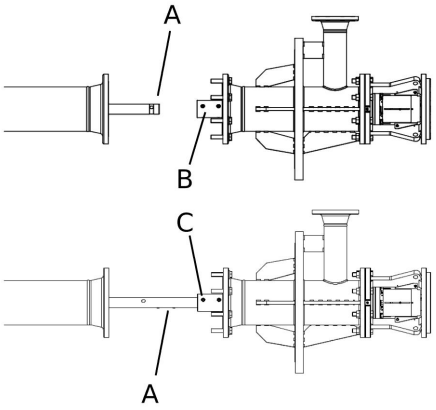
4.6 Reassembling a pump delivered in several sections

Large pumps can be delivered in sections for easier transport. The procedure for reassembling the pump in the horizontal position is described below.
NOTE: Ensure there is enough space (height) to lift the pump as a whole and position it vertically (see paragraph 4.5.2). If not, the pump must be assembled vertically section by section (see "Reassembling the pump in the vertical position" on page 60).



1.

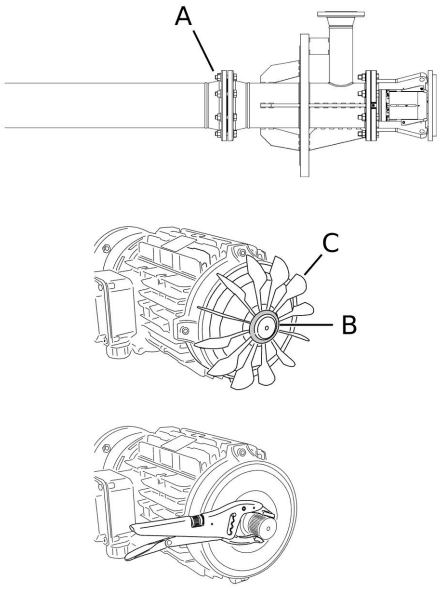
Position the sections of the pump in a straight horizontal line. Add wedges on either side of each section to prevent them moving.



2.

Grease the shaft ends (A) and insert the drive shaft (B) into the shaft (A). Coat the 3 screws (C) with Freinfilet® and screw in to the required torque:

- 10 Nm for models 3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12
- 20 Nm for models 13AV24, 25AV6, 25AV12
- 40 Nm for models 25AV24, 40AV6, 40AV12, 60AV6
- 80 Nm for models 50AV18, 60AV12, 120AV12



3.

Bring the flanges into contact and tighten the screws (A) to the required torque. Do not forget the flat seal between the flanges.

The rotor/stator connection can be used to bring the flanges into contact. To do this, remove the motor's protective casing, the ring (B) and the fins (C). Using locking pliers, turn the shaft on the motor side. Once the flanges are in contact and the screws tightened, refit the fins, the ring and the protective casing for the motor.

4.7. Storage conditions

4.7.1. In PCM standard packaging

Pumps and pump parts must be stored in their original packaging, in a stable position, protected from impact and in a dry location.

4.7.2. After Unpacking

- Protect the equipment from impact and from dust.

4.7.3. In Packaging according to S.E.I. 4c

Every six months:

- Replace the desiccant pouches.
- Check machined surfaces, and lubricate if necessary,

Every month:

- Turn the pump through four or five revolutions using the fan or bearing shaft.

4.8. Specialist Tools

No special tools are necessary for maintenance in the horizontal position (see paragraphs 4.17 and 4.18).

For maintenance in the vertical position (see paragraphs 4.19 and 4.20), a set of tools available from the PCM catalogue is required. The set includes the tools listed below.

Reference	Name	Quantity
T1	Tool for Caisson Lifting	2
T2	Body extension support flange	2
T3	Body extension support clamp (with bolts)	2
T4	Body extension lifting plate	1
T5	Body lifting plate	1
T6	Shaft line support clamp (with bolts)	1
T7	Shaft extension support clamp (with bolts)	1
T8	Hoisting ring for the shaft line and shaft extensions (with needle screw)	1

4.9. Rules on preventive maintenance operations



WARNING: All servicing must be carried out by trained, qualified personnel in accordance with the instructions given in the present manual.
Any failure to observe this rule releases PCM from all responsibility.
Before performing any maintenance operations on the pump, check that all necessary precautions have been taken: upstream and downstream valves closed, pipework cleaned and purged, electrical power supply disconnected and disabled. Check also that all the usual precautions have been taken in accordance with the regulations in force regarding the safety of personnel.

4.10. Periodic Inspection

If the equipment is used daily, the following should be checked:

- Complete leak tightness of the pump (once a week).
- Tightness of the assembly mounting hardware (port, stator, body, spacer, drive) (once a month).
- Level of lubricant in the drive, if applicable (once a month).
- Anchoring (once a year).

- Motor current and cleanliness of drive ventilation grid (once a month).
- Condition of power supply electrical ducts (once a year).
- Alignment of the coupling for bearing pumps (once a year).

4.11. Cleaning



Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

4.11.1. External cleaning

Remove any dirt that could damage the paint and corrode the pump.

4.11.2. Internal cleaning

Cleaning procedures and frequency depend on the specific application of the pump, and the product being pumped. In any case, the minimum procedure is described below.

With the pump running, feed in the cleaning product that is compatible with the pumped product and pump materials at the suction end.

Cleaning time is defined according to the process using the pump. When this time has expired, shut down the pump according to "Shutdown Procedure" section of the chapter "Normal Operating Procedure" (see page 24).

4.12. Lubrication

The gearmotor, the bearing (if applicable) and the shaft line are supplied lubricated. Check the levels before putting the pump in service.

Consult the manufacturer documentation supplied in Appendix for the precautions to be taken when lubricating the gearmotor, where applicable.

The following table indicates the recommended lubricants to be used when servicing the pump:

Component to be lubricated	Recommended lubricant	Supplier
Gearbox shaft / drive shaft (36) connection	GERALYN 2 grease	FUCHS LUBRITECH
Connection between extension coupling (339/339A)/drive shaft (36/36B) or shaft extension (22A/22B)	GERALYN 2 grease	FUCHS LUBRITECH
Connection between drive system (E)/drive shaft (36/36B) or rotor (20)	GERALYN 2 grease	FUCHS LUBRITECH
Roller bearings (65)	AVIATION N°10	ELF
	RENOLIT LXC2	FUCHS LUBRITECH
Stator (1) (for assembly)	GLYCERINE	

* The type and quantity of lubricant per sheath depends on the pump model:

Model	Recommended lubricant	Supplier	Quantity of lubricant
3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12	TOTAL AXA grease, grade 1	TOTAL	30 grams
13AV24, 25AV6, 25AV12			55 grams

Model	Recommended lubricant	Supplier	Quantity of lubricant
25AV24, 40AV6, 40AV12, 60AV6			170 grams
50A18, 60A12, 120A12	NEVASTANE EP 460 oil	TOTAL	0.75 litres

4.13. Thread locking

The following table indicates the recommended products to use when reassembling the pump:

Element to be locked	Recommended product	Supplier
Screws (105A/106A)	LOCTITE® 243	HENKEL
Nut (70)	LOCTITE® 243	HENKEL

4.14. Tightening torques

General tightening torque values for the fixing elements hardware are defined in the following table:

Screw diameter	Class 8.8 steel	Class 70 stainless steel
M4	4.1 N.m [2.95 lbf.ft]	4.1 N.m [2.95 lbf.ft]
M5	4.1 N.m [2.95 lbf.ft]	4.1 N.m [2.95 lbf.ft]
M6	10 N.m [7.38 lbf.ft]	7 N.m [5.16 lbf.ft]
M8	15 N.m [11.06 lbf.ft]	10 N.m [7.38 lbf.ft]
M10	30 N.m [22.13 lbf.ft]	20 N.m [14.75 lbf.ft]
M12	40 N.m [29.5 lbf.ft]	30 N.m [22.13 lbf.ft]
M14	65 N.m [47.94 lbf.ft]	50 N.m [36.88 lbf.ft]
M16	90 N.m [66.38 lbf.ft]	65 N.m [47.94 lbf.ft]

4.15. Troubleshooting the pump

4.15.1. Incidents and causes

Causes	Incident													Solutions (see section below)
	Pump does not start	Pump does not deliver	Pump does not prime itself	Pump stops running	Flow rate too low	Discharge pressure too low	Drive is overloaded	Pump is noisy or vibrates abnormally	Leak in shaft seal	Premature stator wear	Premature rotor wear	Flow rate is not constant	Joints deteriorate quickly	
The stator is swollen.	●			●			●			●			●	1
Rotor drive system is broken.	●	●	●	●										2
Product temperature is too high.	●		●	●	●	●	●	●		●	●		●	3
Sedimentation or precipitation of the fluid in the pump body	●	●	●	●			●	●		●	●		●	4
The solid bodies contained in the liquid are too voluminous	●	●		●			●			●	●		●	5
The electrical installation is not compliant, or is faulty.	●			●	●	●	●					●		6
The devices driving the pump are worn or broken.	●	●	●	●	●	●		●				●		7
Pump is blocked by a foreign body.	●	●		●			●			●	●		●	8
The stator has become hard and brittle.		●	●		●	●	●	●		●	●		●	9
The stator is sectioned at its rim.			●		●	●								10
The stator is worn.		●	●		●	●		●		●				11

Causes	Incident													Solutions (see section below)
	Pump does not start	Pump does not deliver	Pump does not prime itself	Pump stops running	Flow rate too low	Discharge pressure too low	Drive is overloaded	Pump is noisy or vibrates abnormally	Leak in shaft seal	Premature stator wear	Premature rotor wear	Flow rate is not constant	Joints deteriorate quickly	
The rotor is worn.		●	●		●	●		●		●				12
Leak in mechanical seal.			●						●					13
Incorrect direction of rotation.			●			●								14
Product temperature is lower than expected.		●	●		●	●								15
Net positive suction head is too low NPSHa<NPSHr		●			●	●		●		●	●	●	●	16
The pump suction is drawing in air.		●			●	●				●		●		17
Speed of rotation is too low.		●			●	●								18
Pump installation location, pipework and accessories should all be checked	●	●		●	●		●	●		●		●	●	19
The pump is running dry.		●	●					●		●				20
Viscosity of the pumped product is higher than expected.		●		●	●		●							21
Pressure at discharge is too high.	●	●		●	●		●	●		●	●		●	22
Speed of rotation is too high.							●	●		●	●		●	23

Causes	Incident													Solutions (see section below)
	Pump does not start	Pump does not deliver	Pump does not prime itself	Pump stops running	Flow rate too low	Discharge pressure too low	Drive is overloaded	Pump is noisy or vibrates abnormally	Leak in shaft seal	Premature stator wear	Premature rotor wear	Flow rate is not constant	Joints deteriorate quickly	
For a new pump or new stator: excessive static tightening.	●						●							24
Shaft is damaged (according to model).		●	●		●	●			●			●		25
The roller bearings are worn (according to model).								●	●					26
Stability of pump motor unit (according to model).								●						27

4.15.2. Solutions

Solution no.	Description
1	The stator material swells when in contact with the product being pumped. Check that the material and the product are those specified in the order. Otherwise contact the PCM service centre.
2	Determine the cause of failure by checking points 1, 3, 4, 5, 8, 22, and 23, and then replace the damaged parts.
3	The operating temperature limit is defined according to the stator material.
4	Clean the pump body and rinse the pump after each use.
5	Remove these bodies using a strainer, or contact the PCM service centre to obtain another pump.
6	Check the network voltage, motor connections, circuit breaker calibration, and number of phases.
7	Replace defective parts and check the load on the drive.
8	Disassemble the pump, clean it, and replace any defective components.
9	Check that the temperature is not higher than initially planned and that the product being pumped is the intended product. If any parameters change, contact the PCM service centre to determine a different pump construction.
10	This type of damage is typically caused by overpressure. Contact the PCM service centre.
11	Replace the stator and check the condition of the rotor.
12	Determine the cause of the wear: abrasion, corrosion, cavitation. Contact the PCM service centre to define a new rotor material if necessary, and install the new part.

Solution no.	Description
13	Remove the mechanical seal and replace it with a new one.
14	Change the electrical connections.
15	Contact the PCM service centre, who will recommend a tighter stator.
16	Reduce head loss in the suction pipe, lower the temperature, and raise the suction level.
17	Check the installation for leaks.
18	Contact the PCM service centre to determine the best way to increase the speed.
19	Check all pipes for obstruction by a foreign body, for a defective or improperly sealed valve, for a leaky poppet, etc.
20	Re-arrange the overall layout of the installation, or provide a dry running protection system.
21	For any viscosity change, contact the PCM service centre, who will re-calculate the parameters.
22	Measure the pressure using a pressure gauge, and compare it to the pressure stated in the technical description.
23	Contact the PCM service centre to determine the best way to reduce the speed.
24	Fill the pump, and rotate the motor fan about ten revolutions by hand.
25	Replace the shaft and the mechanical seal.
26	Remove the bearing or gearbox and replace the roller bearings and seals.
27	Adjust the feet or check the mountings.

4.16. Troubleshooting the seals

4.16.1. Incidents and causes

Causes	Incident				Solutions (see section below)
	Static leak in sealing system	Dynamic leak in sealing system from start-up	Abnormal heating in seal	The seal makes an abnormal noise	
The seal is damaged	●	●			1
Incorrect assembly	●	●			2
Geometric fault in the adapter fittings	●	●			3
Poor flatness of the mechanical seal surfaces	●	●			4
Operating conditions are too harsh		●			5

Causes	Incident				Solutions (see section below)
	Static leak in sealing system	Dynamic leak in sealing system from start-up	Abnormal heating in seal	The seal makes an abnormal noise	
Poor choice of seal		●			6
Poor lubrication and/or cooling			●		7
Poor lubrication, dry running				●	8

4.16.2. Solutions

Solution no.	Description
1	Check condition of seals, faces, etc.
2	(at the assembly procedure, taking care to follow the instructions.
3	Check the geometry.
4	Bed in the faces of the mechanical seal (contact your local PCM representative).
5	Check the operating conditions.
6	Review the choice of equipment to determine the most suitable seal.
7	Check the injections, sealing circuit, thermosyphon etc.
8	Restore the lubrication and pressurisation circuits. Eliminate gas pockets, etc.

4.17. Disassembling the pump in horizontal position

This paragraph describes maintenance for a pump that has been placed in horizontal position. PCM recommends maintaining the pump, excluding the tank, in horizontal position. If it is not possible to position the pump horizontally (lack of space above the pump for lifting), see "Disassembling the pump in vertical position" (page 52), which describes vertical disassembly section by section.

WARNING: Before performing any maintenance operations on the pump, check that all necessary precautions have been taken: upstream and downstream valves closed, pipework cleaned and purged, electrical power supply disconnected and disabled. Check also that all the usual precautions have been taken in accordance with the regulations in force regarding the safety of personnel.
Systems connected to the mechanical seal must be disconnected before disassembling the pump.

Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

4.17.1. Residual fluids

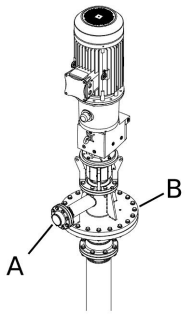
During maintenance operations, the fluid inside the pump is not fully evacuated. A certain volume of non-drainable fluid remains in the stator, with the quantity depending on the pump model:

Pump model	Fluid volume in the stator (in cm^3)
3AV12	90
6AV6	70
6AV12	200
6AV24	470
13AV6	150
13AV12	440
13AV24	1030
25AV6	470
25AV12	1400
25AV24	3310
40AV6	980
40AV12	2400
50AV18	7010
60AV6	1960
60AV12	4940
120AV12	9500

Take the necessary steps depending on the type of fluid present.

4.17.2. Disassembling the rear part of the pump in horizontal position

We recommend dismantling the pump from the drive end for maintenance operations on the motor and the sealing system.



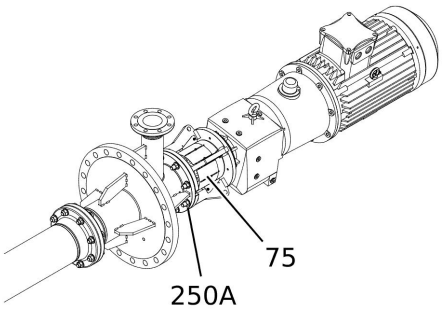
1.

Disengage the upper piping (A). Remove the fixing screws (B) from the mounting flange. If the pump is equipped with an external sealing plan, remove it and remove any pipes connected to the mechanical seal.



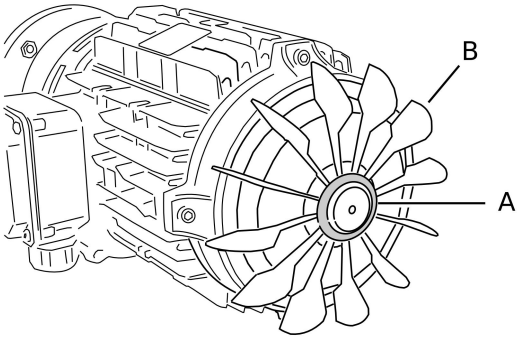
2.

Remove the pump from the tank following the instructions in paragraph 4.5 and install the pump horizontally on wedges. Add wedges on either side of the pump to prevent it moving. If it is not possible to position the pump horizontally (lack of space above the pump for lifting), see "Disassembling the pump in vertical position" (page 52), which describes vertical disassembly section by section.



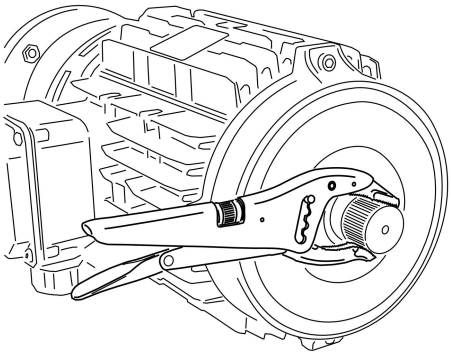
3.

Remove the fixing screws (250A) from the body and the casings (75).



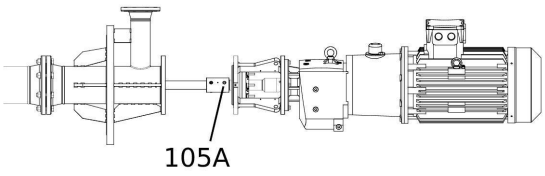
4.

Remove the motor's protective casing, the ring (A) and the fins (B).



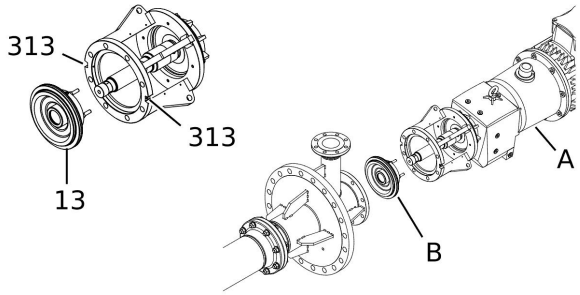
5.

Using locking pliers, turn the shaft to pull the drive back by about 70 mm.



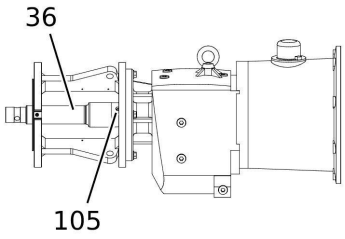
6.

Unscrew the 3 screws (105A).



7.

Remove the motor unit (A). Remove and check the seal (13). Unscrew the two screws (313) and remove the sealing system (B) only if it requires maintenance (removal instructions can be found in the "Removal of the sealing system" section, page 69).

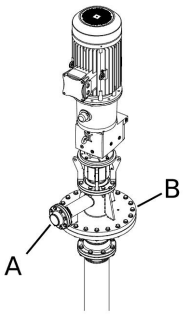


8.

Unscrew the 3 screws (105) and remove the shaft (36) for cleaning.

4.17.3. Disassembling the front part of the pump in horizontal position

We recommend dismantling the pump from the front for maintenance operations on the stator and the rotor.



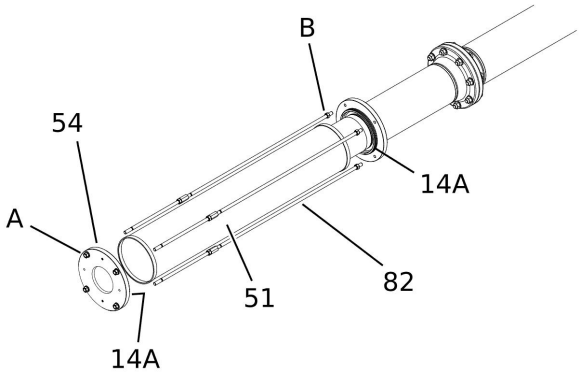
1.

Disengage the upper piping (A). Remove the fixing screws (B) from the mounting flange. If the pump is equipped with an external sealing plan, remove it and remove any pipes connected to the mechanical seal.



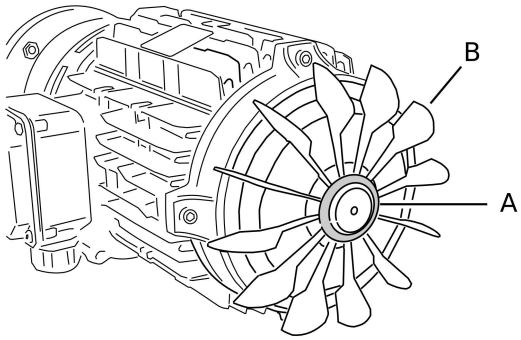
2.

Remove the pump from the tank following the instructions in paragraph 4.5 and install the pump horizontally on wedges. Add wedges on either side of the pump to prevent it moving. If it is not possible to position the pump horizontally (lack of space above the pump for lifting), see "Disassembling the pump in vertical position" (page 52), which describes vertical disassembly section by section.



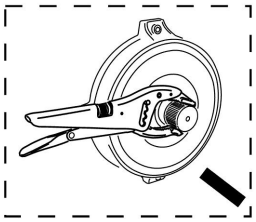
3.

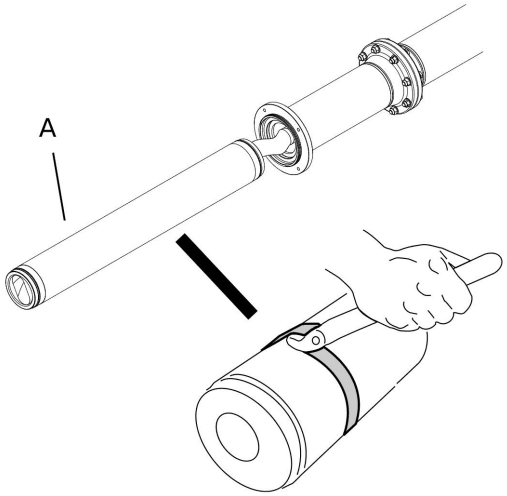
Remove the 4 nuts (A) and remove the pipe assembly (54). Unscrew the 4 nuts (B) to remove the 4 pins (82). If the pump is equipped with a protective casing for the stator (51), remove it and check the condition of the seals (14A).



4.

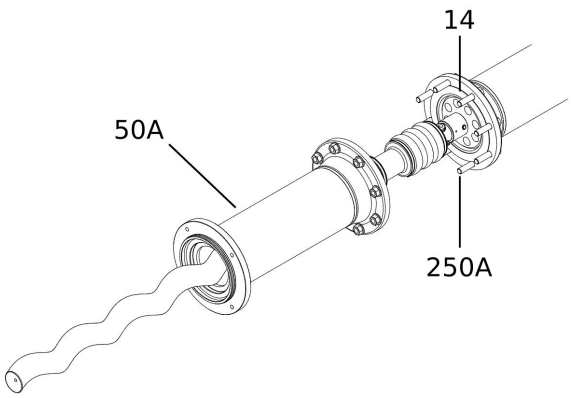
Remove the motor's protective casing, the ring (A) and the fins (B).





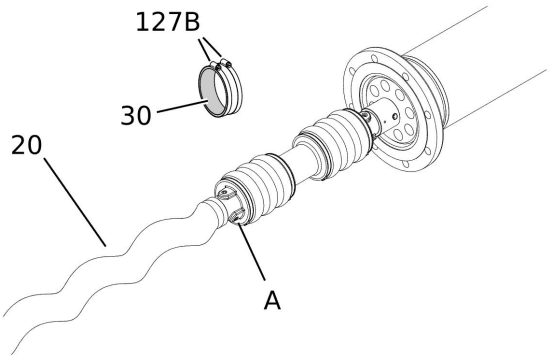
5.

Remove the stator (A). Block the shaft line on the motor side using a plier wrench and use a strap wrench to unscrew the stator.



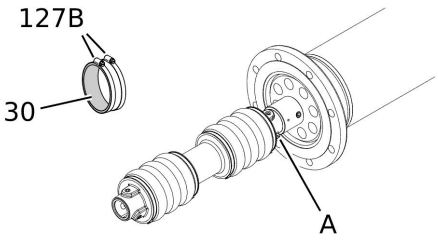
6.

Remove the screws (250A) and the body extension (50A). Remove and check the seal (14).



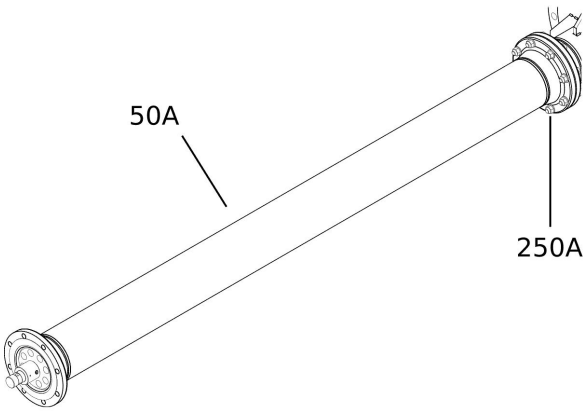
7.

Unscrew the 3 screws (A) and remove the rotor (20). If the pump is equipped with protective sheaths, the screws cannot be accessed directly. In this case, remove the collars (127B) and move the protective sheath (30) to reach the 3 screws (A). Remove and check the seal (210).



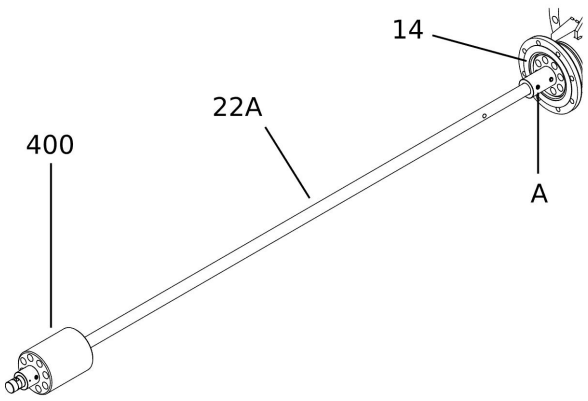
8.

Unscrew the 3 screws (A) and remove the connecting rod (22). If the pump is equipped with protective sheaths, the screws cannot be accessed directly. In this case, remove the collars (127B) and move the protective sheath (30) to reach the 3 screws (A). Remove and check the seal (210).



9.

Remove the screws (250A) and the body extension (50A).

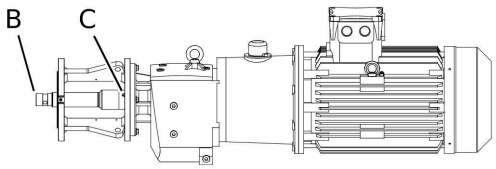


10.

Remove the 3 screws (A). Remove the shaft extension (22A) with the centring device (400). Check the condition of the centring device (400). Remove and check the seal (14).

NOTE: If the pump is equipped with several body extensions, repeat steps 9 and 10 for each extension before accessing the body (50). Check the condition of the centring devices (400) and seals (14).

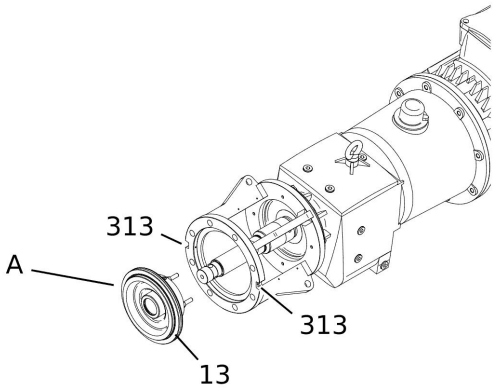
4.18. Reassembling the pump in horizontal position



1.

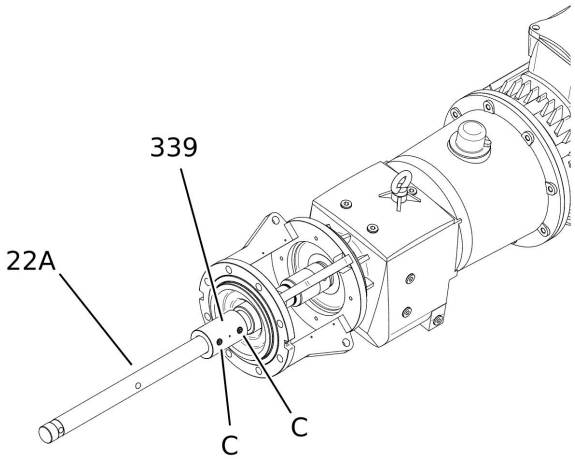
Grease the gearbox shaft and the shaft end (B). Coat the 3 screws (C) with Freinfilet® and screw in to the required torque:

- 10 Nm for models 3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12
- 20 Nm for models 13AV24, 25AV6, 25AV12
- 40 Nm for models 25AV24, 40AV6, 40AV12, 60AV6
- 80 Nm for models 50AV18, 60AV12, 120AV12



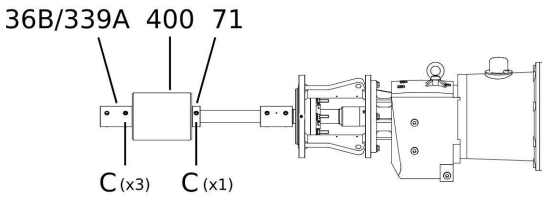
2.

Insert the sealing system (A) if it has been disassembled (reassembly instructions can be found in the "Reassembly of the sealing system" section, page 71). Insert the two screws (313) without tightening them. Do not forget the O-ring (13).



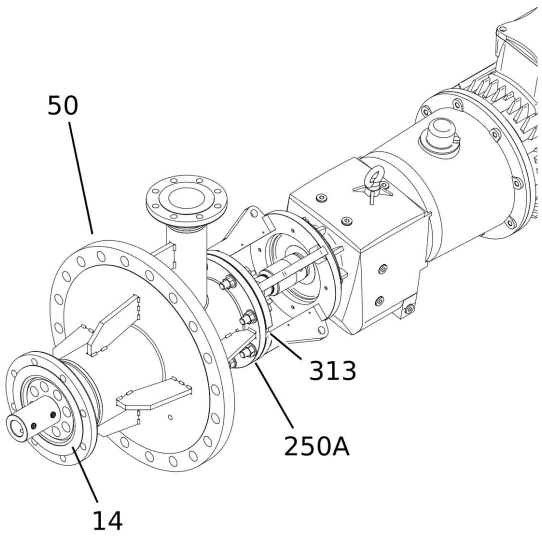
3.

Grease the shaft ends. Insert the extension coupling (339) and the shaft extension (22A). Coat the six screws (C) with Freinfilet and screw in to the required torque (see step 1).



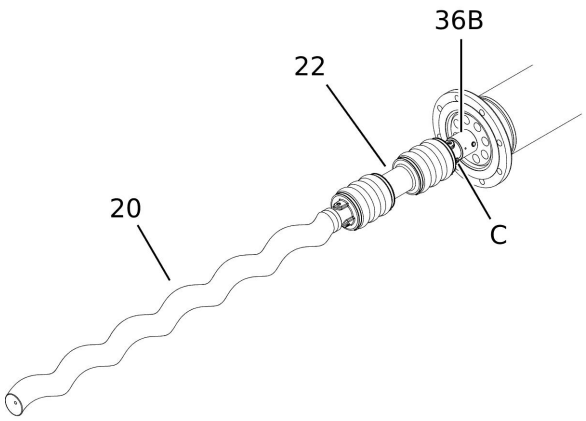
4.

Grease the shaft ends. Insert the retaining ring (71) and the centring device (400). If the pump is fitted with other shaft extensions (22A), insert an extension coupling (339A). Otherwise insert the drive shaft (36B) that links to the connecting rod assembly (22). Coat the four screws (C) with Freinfilet® and screw in to the required torque (see step 1).



5.

Fit the body (50), not forgetting the seal (13), and tighten the screws (250A). Tighten the two screws (313) in the spacer.
NOTE: If the pump is equipped with several body extensions, repeat steps 3, 4 and 5, not forgetting the seals (14) between the body extensions.



6.

Grease the shaft end and fix the connecting rod assembly (22) to the drive shaft (36B), not forgetting the seal (210). Coat the three screws (C) with Freinfilet and screw in to the required torque (see step 1). Do the same for the rotor (20).

If the pump is not equipped with protective sheaths (option A):

Insert the rotor into the connecting rod.

Coat the screws with Freinfilet and screw in to the required torque (see step 1).

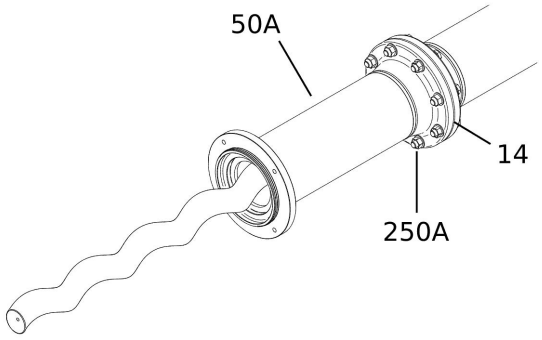
If the pump is equipped with protective sheaths (option B):

First fit the sheath and the seal together, then insert the rotor into the connecting rod.

Coat the 3 conical screws with Freinfilet® before screwing them in.

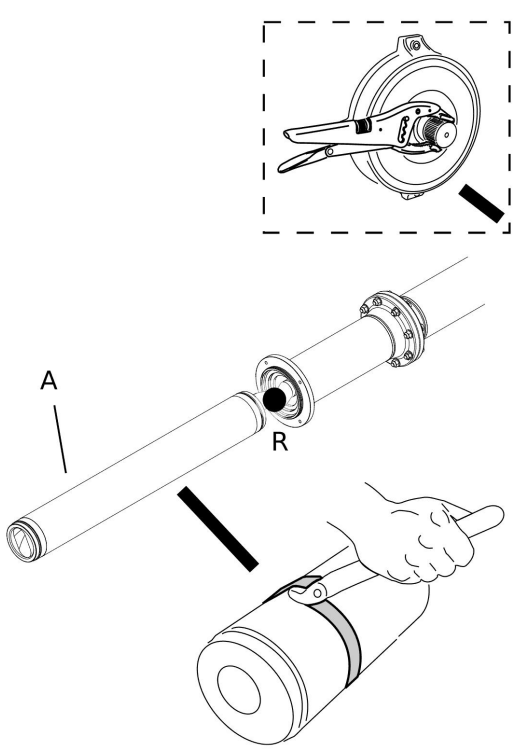
Check that the tightening torque (see step 1) is the same for all 3 screws.

Cover the screws with the sheath and tighten the collars at each end of the sheath.



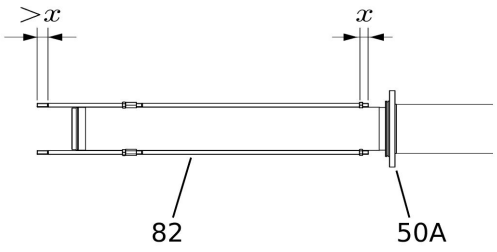
7.

Fit the last body extension (50A), not forgetting the seal (14), and tighten the screws (250A).



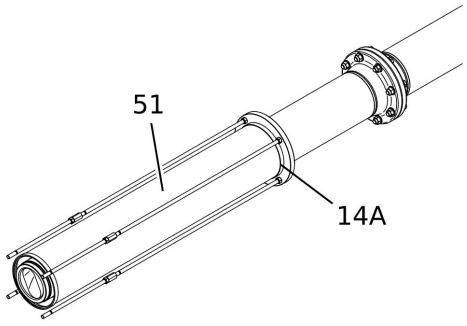
8.

Block the shaft line on the motor side using a plier wrench. Temporarily support the rotor at point R using a wedge or slings. Using a strap wrench, fit the stator (A).



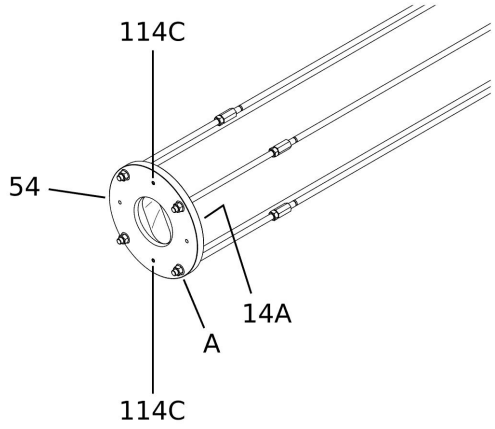
9.

The threads at the ends of the pins (82) do not have the same length. Position each pin so that the shortest thread, equipped with a nut, is screwed into the body extension (50A).



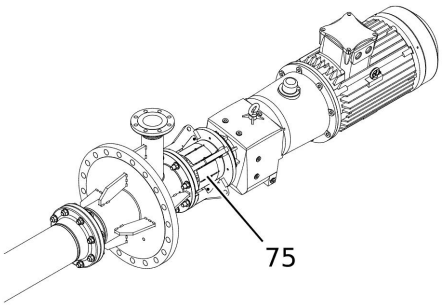
10.

Fit the protective casing for the stator (51) if the pump has one. Do not forget the O-ring (14A).



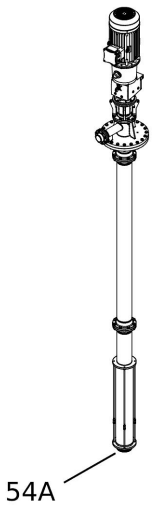
11.

Fit the pipe assembly (54) and tighten the nuts (A). Do not forget the seal (14A) if the pump is equipped with a protective casing for the stator (51). Tighten the two screws (114C) to hold the casing (51) in place. The strainer (54A) should only be fitted after lifting the pump.



12.

Finish reassembling the sealing system (see step 7 on page 73) and fix the casings (75).



13.

Lift the pump according to the instructions in paragraph 4.5. Once the pump is vertical, refit the strainer (54A) at the suction port.

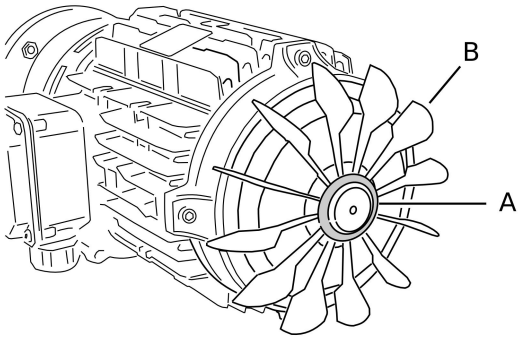
4.19. Disassembling the pump in the vertical position

This paragraph describes maintenance for a pump in vertical position. This type of maintenance is appropriate for an installation in a confined space (limited height available above the pump) and requires the use of special tools available in the PCM catalogue (see paragraph 4.8).

WARNING: Before performing any maintenance operations on the pump, check that all necessary precautions have been taken: upstream and downstream valves closed, pipework cleaned and purged, electrical power supply disconnected and disabled. Check also that all the usual precautions have been taken in accordance with the regulations in force regarding the safety of personnel.
Systems connected to the mechanical seal must be disconnected before disassembling the pump.

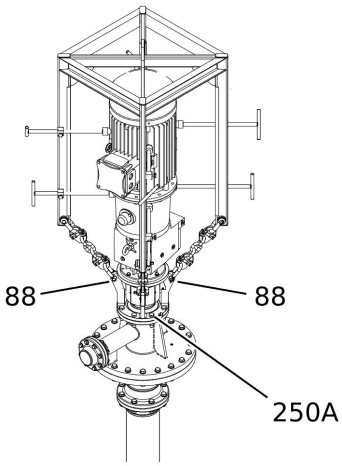
Always wear personal protective equipment (at least shoes, gloves, goggles/mask and ear defenders) when working on or near the pump.

During maintenance operations, the fluid inside the pump is not fully evacuated. A certain volume of non-drainable fluid remains in the stator, its quantity depending on the pump model (see the table in the "Residual fluids" section on page 42). Take the necessary steps depending on the type of fluid present.



1.

Remove the motor's protective casing, the ring (A) and the fins (B).



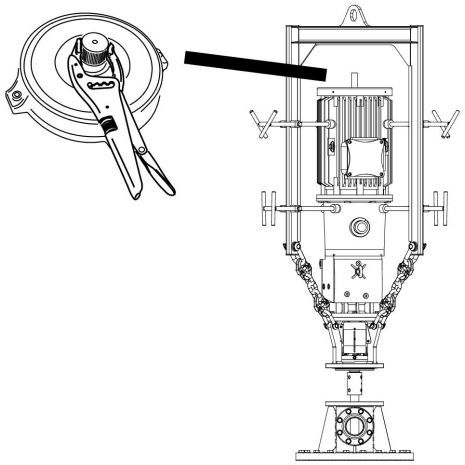
2.

For Monobloc Pumps :

Install the lifting tool in the holes in the spacer (88). Remove the fixing screws from the body (250A). If the pump is equipped with an external sealing plan, remove it and remove any pipes connected to the mechanical seal.

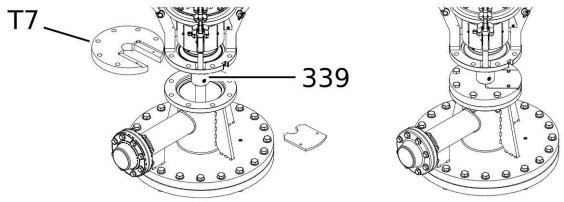
For Bearing Pumps :

Motor and Gear Unit to be removed separatly, then follow above instruction with spacer and bearing.



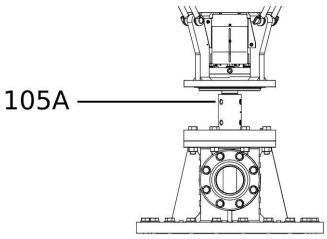
3.

Using locking pliers, turn the shaft to pull the drive back by about 70 mm.



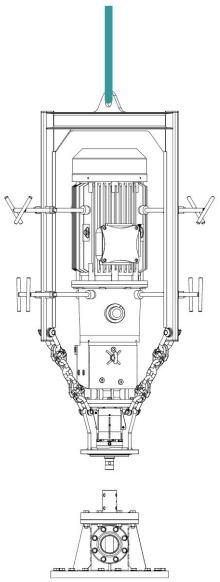
4.

Block the shaft beneath the extension coupling (339) using the support clamp (T7).



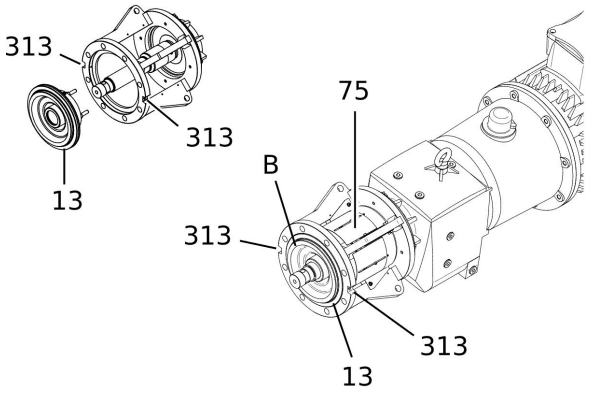
5.

Unscrew the three screws (105A) at the top of the extension coupling.



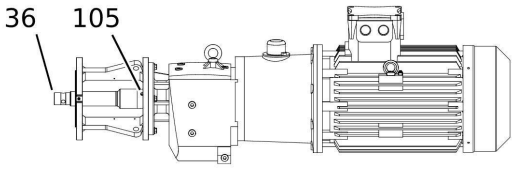
6.

Remove the motor unit.



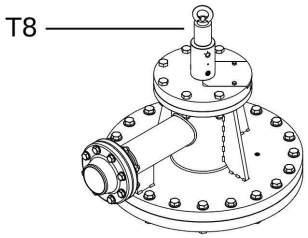
7.

Remove and check the seal (13). Unscrew the two screws (313), remove the casings (75) and remove the sealing system (B) only if it requires maintenance (removal instructions can be found in the "Removal of the sealing system" section, page 69).



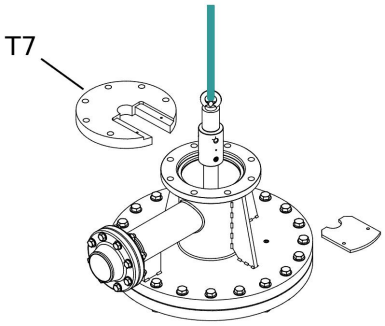
8.

Unscrew the 3 screws (105) and remove the shaft (36) for cleaning.



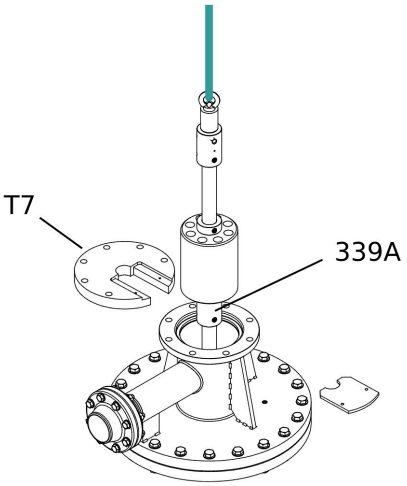
9.

Fit the lifting tool (T8) to the extension coupling (339) using three needle screws.



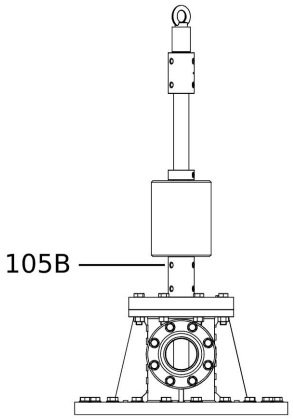
10.

Support the shaft with the lifting equipment and remove the support clamp (T7).



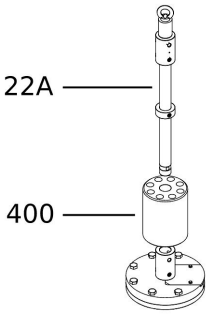
11.

Lift the shaft as far as the next extension coupling (339A) and block the shaft beneath the extension coupling (339A) using the support clamp (T7).



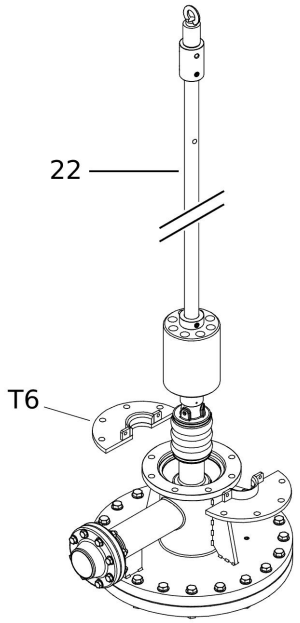
12.

Unscrew the three screws (105B) at the top of the extension coupling (339).



13.

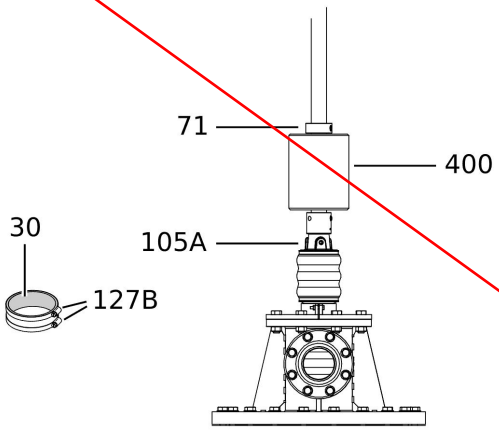
Remove the shaft extension (22A). Check the condition of the centring device (400).



14.

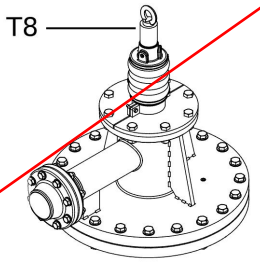
Repeat operations 9 to 13 for each shaft extension until you reach the shaft line (22). Use the support clamp (T6) to block the shaft line (22).

Tool not always required. If PCM does not provide it, remove the rotor/shaft line assembly with the final shaft extension available.



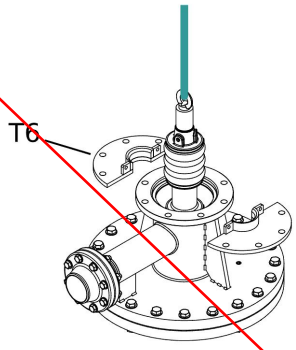
15.

Unscrew the three screws (105A) from the shaft line (22) and remove the shaft extension (22B). If the pump is equipped with protective sheaths, the screws cannot be accessed directly. In this case, remove the collars (127B) and move the protective sheath (30) to reach the three screws. Check the condition of the centring device (400) and seal (210).



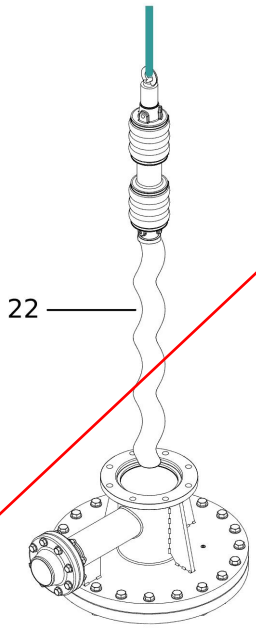
16.

Fit the lifting tool (T8) to the shaft line (22) using three needle screws.



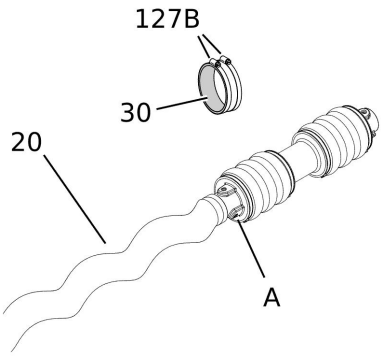
17.

Support the shaft line (22) with the lifting equipment and remove the support clamp (T6).



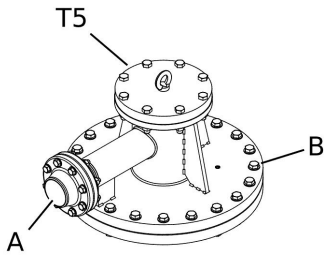
18.

Remove the shaft line (22) and the rotor (20).



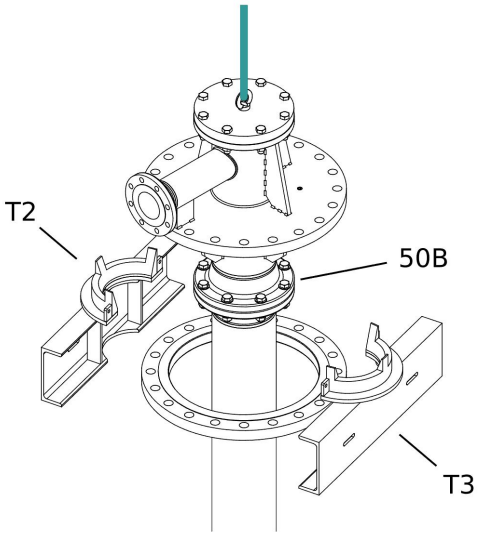
19.

Unscrew the 3 screws (A) and remove the rotor (20). If the pump is equipped with protective sheaths, the screws cannot be accessed directly. In this case, remove the collars (127B) and move the protective sheath (30) to reach the 3 screws (A). Remove and check the seal (210).



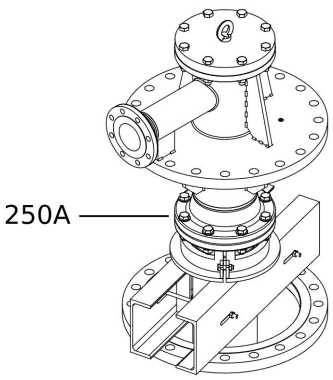
20.

Fit the lifting tool (T5) to the body. Disengage the upper piping (A). Remove the fixing screws (B) from the mounting flange.



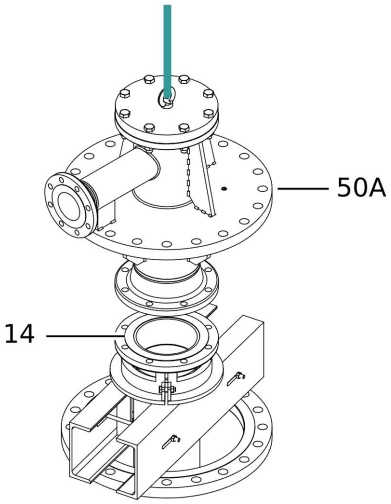
21.

Lift the body as far as the next body extension (50B). Install the support beams and clamps (T2 and T3) beneath the body extension flange (50B).



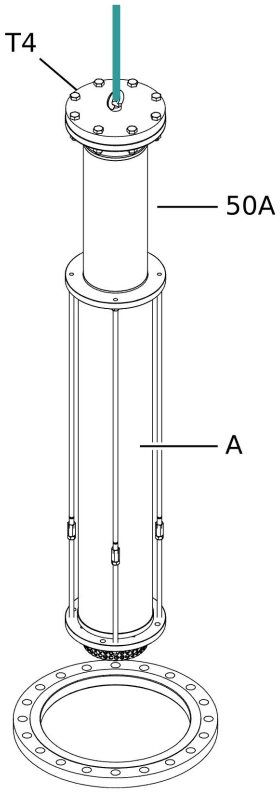
22.

Unscrew the screws (250A).



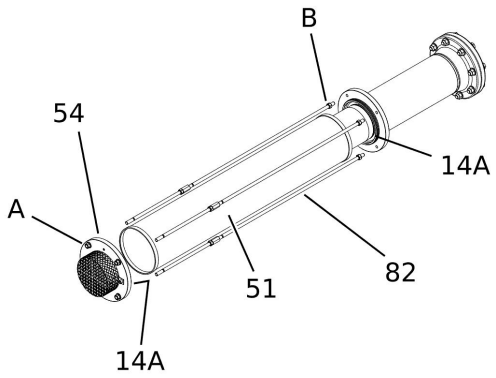
23.

Remove the body (50A). Remove and check the seal (14).



24.

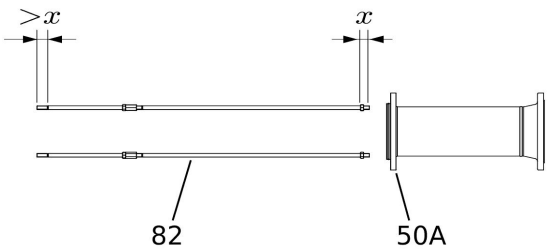
Repeat operations 20 to 23 until you can extract the last body extension (50A) and the stator (A). To lift the body extensions, use the lifting tool (T4).



25.

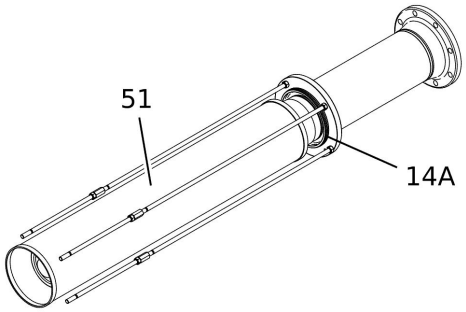
Remove the 4 nuts (A) and remove the pipe assembly (54). Unscrew the 4 nuts (B) to remove the 4 pins (82). If the pump is equipped with a protective casing for the stator (51), remove it and check the condition of the seals (14A). Remove the stator.

4.20. Reassembling the pump in the vertical position



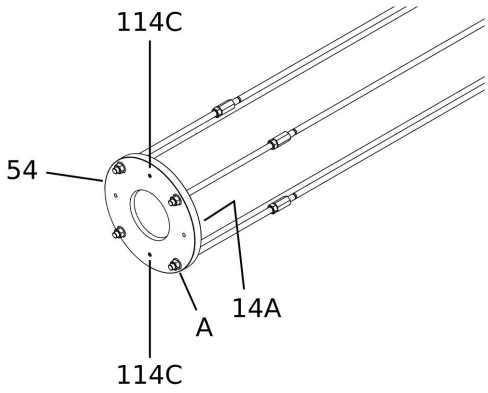
1.

Screw the four pins (82) to the body extension (50A). The threads at the ends of the pins (82) do not have the same length. Position each pin so that the shortest thread, equipped with a nut, is screwed into the body extension (50A).



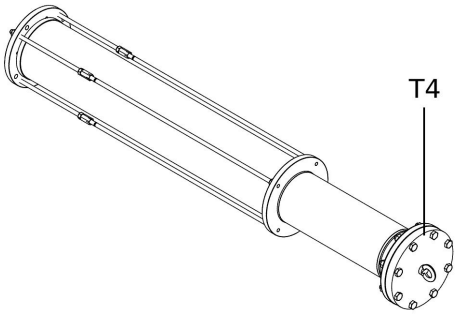
2.

Position the stator (1) and fit the protective casing for the stator (51) if the pump has one. Do not forget the O-ring (14A).



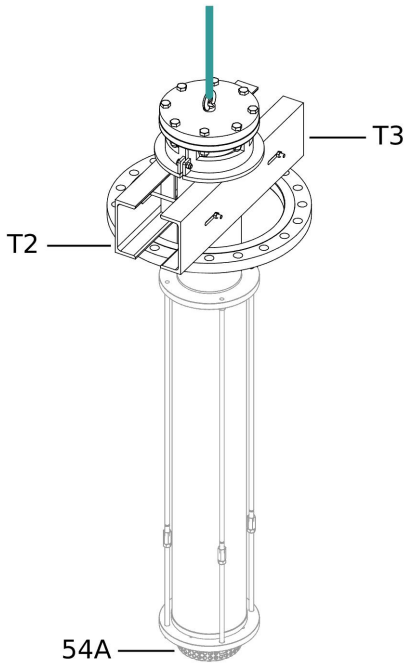
3.

Fit the pipe assembly (54) and tighten the four nuts (A). Do not forget the seal (14A) if the pump is equipped with a protective casing for the stator (51). Tighten the two screws (114C) to hold the casing (51) in place.



4.

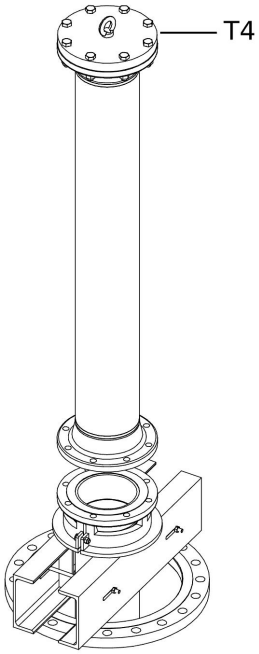
Fit the lifting tool (T4) to the body extension (50A).



5.

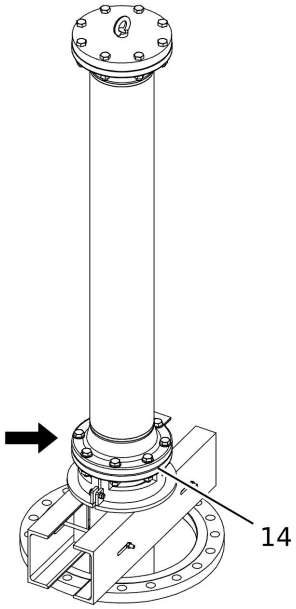
Lift the assembly above the tank and fit the strainer (54A).

Lower the assembly and install the support beams and clamps (T2 and T3) beneath the body extension flange (50A).



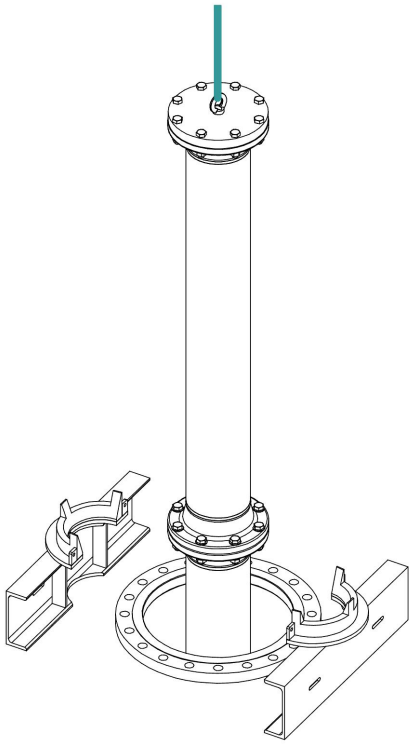
6.

Retrieve the lifting tool (T4). Fit it to another body extension (50B).



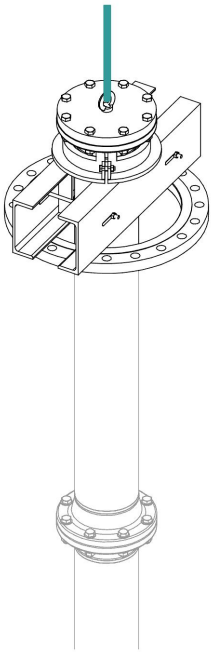
7.

Fit the body extension (50B) and screw in the screws to the required torque. Do not forget the O-ring (14).



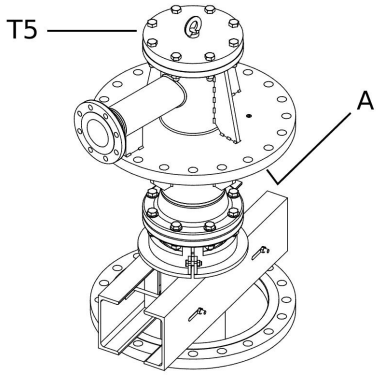
8.

Support the body extension with the lifting equipment and remove the support beams and clamps (T2 and T3).



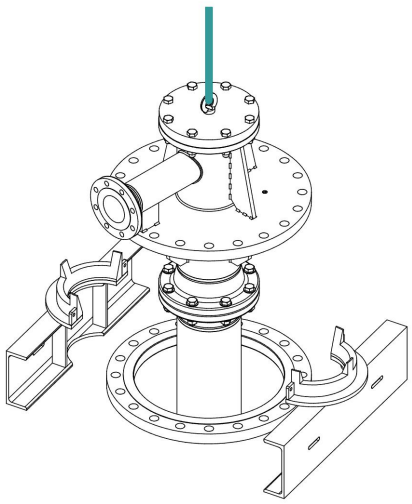
9.

Lower the body extension and reinstall the support beams and clamps (T2 and T3) beneath the body extension flange (50A).



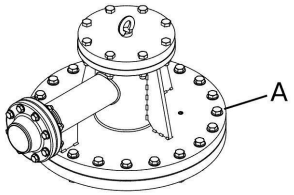
10.

Repeat operations 6 to 9 until the body is fixed (50). To lift the body, use the lifting tool (T5). Do not forget the mounting flange seal (A) before fixing the body.



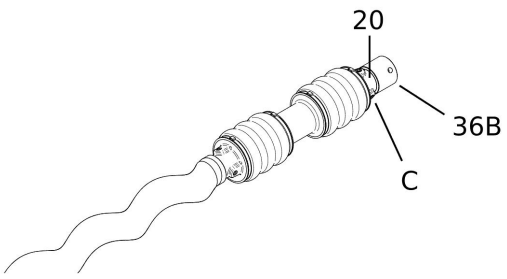
11.

Support the body and the body extensions with the lifting equipment and remove the support beams and clamps (T2 and T3).



12.

Lower the assembly and tighten the mounting flange fixing screws (A).



13.

Grease the end of the rotor (20) and the drive shaft (36B). Coat the screws (C) with Freinfilet® and screw in to the required torque:

- 10 Nm for models 3AV12, 6AV6, 6AV12, 6AV24, 13AV6, 13AV12
- 20 Nm for models 13AV24, 25AV6, 25AV12
- 40 Nm for models 25AV24, 40AV6, 40AV12, 60AV6
- 80 Nm for models 50AV18, 60AV12, 120AV12

Do not forget the O-rings (210).

If the pump is not equipped with protective sheaths (option A):

Insert the rotor into the connecting rod.

Coat the screws with Freinfilet and screw in to the required torque (see above).

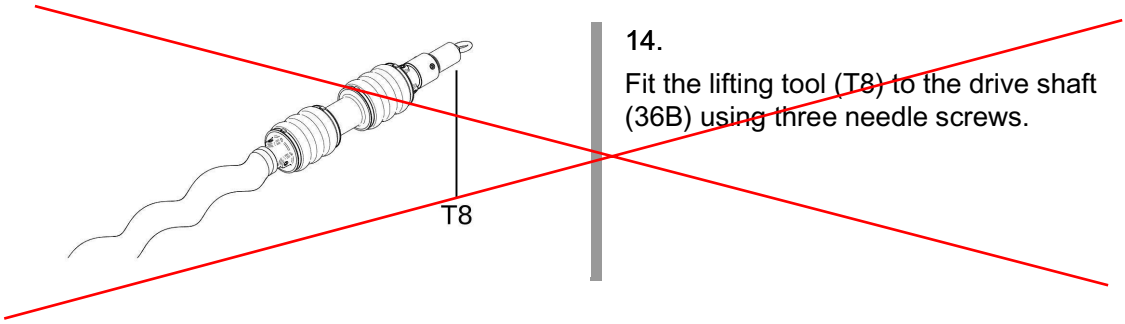
If the pump is equipped with protective sheaths (option B):

First fit the sheath and the seal together, then insert the rotor into the connecting rod.

Coat the 3 conical screws with Freinfilet® before screwing them in.

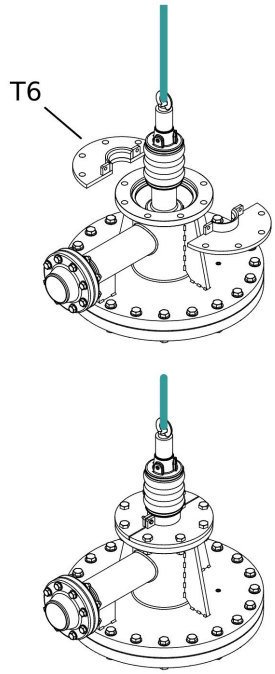
Check that the tightening torque (see above) is the same for all 3 screws.

Cover the screws with the sheath and tighten the collars at each end of the sheath.



14.

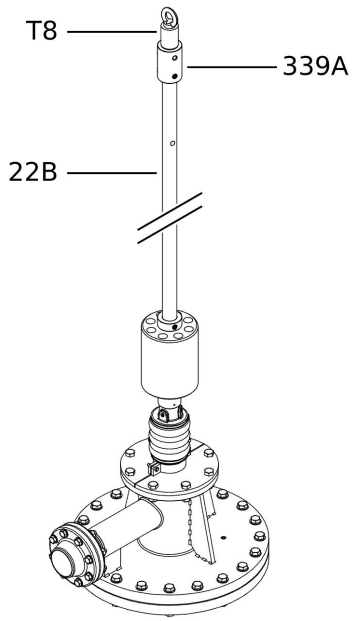
Fit the lifting tool (T8) to the drive shaft (36B) using three needle screws.



15.

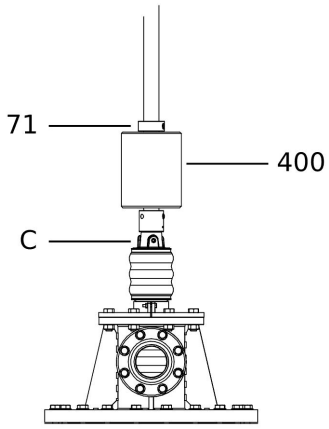
Lift the assembly above the body. Fit the support clamp (T6) to the shaft line (22).

Tool (T6) not always required. If not provided by PCM, lift the rotor and shaft line assembly with the final shaft extension.



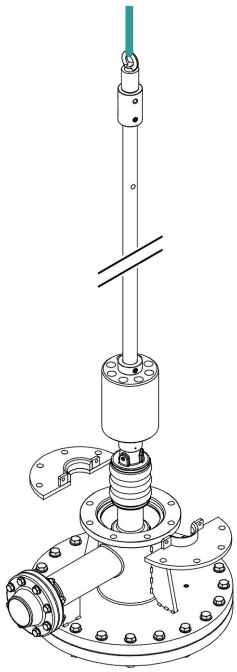
16.

Retrieve the lifting tool (T8). Fit it to another shaft extension (22B) with an extension coupling (339A).



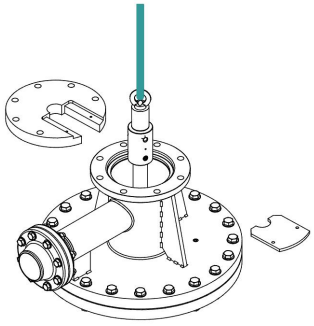
17.

Fit the shaft extension (22B). Coat the screws (C) with Freinfilet and screw in to the required torque (see step 13). Do not forget the centring device (400) and the retaining ring (71).



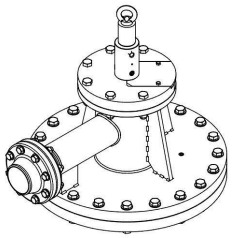
18.

Support the shaft extension with the lifting equipment and remove the support clamp (T6).



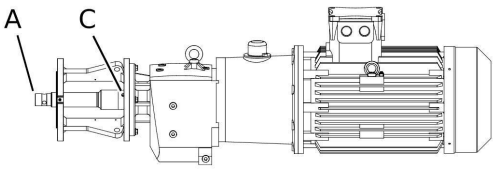
19.

Lower the shaft extension and install the support clamp (T7) beneath the extension coupling (339).



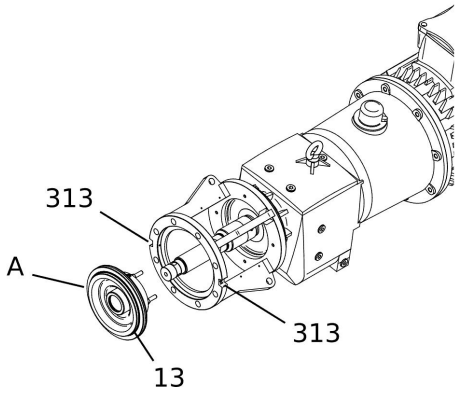
20.

Repeat operations 16 to 19 until the last extension is fixed (22A).



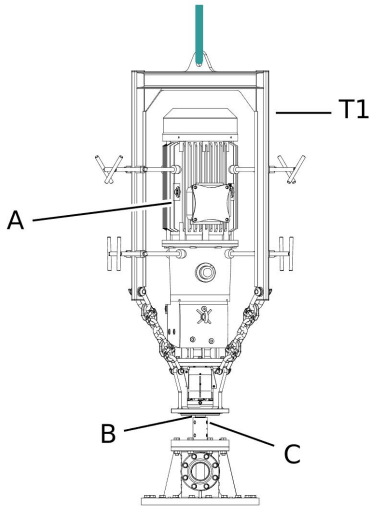
21.

Grease the shaft ends (A) and (B). Coat the three screws (C) with Freinfilet® and screw in to the required torque (see step 13).



22.

Insert the sealing system (A) if it has been disassembled (reassembly instructions can be found in the "Reassembly of the sealing system" section, page 71). Insert the two screws (313) without tightening them. Do not forget the O-ring (13).



23.

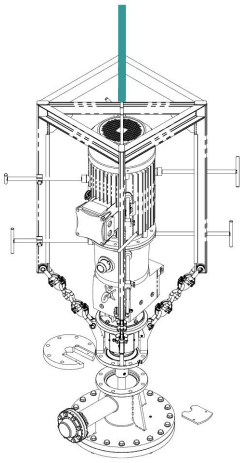
For Monobloc Pumps:

Lift the motor unit (A) using the lifting tool.

Grease the shaft end (B). Coat the three screws (C) with Freinfilet® and screw in to the required torque (see step 13).

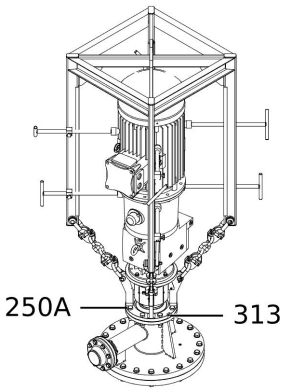
For Bearing Pumps:

Follow the steps 23 to 26, only with spacer (88) and bearing assembly. Motor and Gear Unit will be mounted separatly.
Install the coupling on the bearing shaft.
Install the Trunk / Baseframe on the mounting flange.
Install the Gear Unit and the Motor.
Proceed to the coupling alignment
Fix the guards for spacer and Trunk/Baseframe.



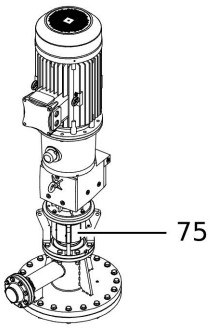
24.

Remove the support tool (T7) while supporting the motor unit.



25.

Lower the motor unit (A). Tighten the screws (250A). Tighten the two screws (313).

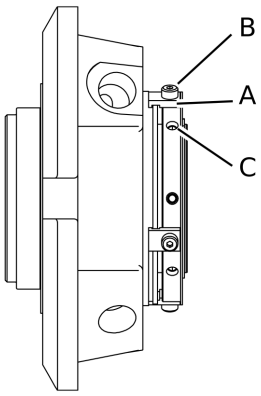


26.

Finish reassembling the sealing system (see step 7 on page 73) and fix the casings (75).

4.21. Disassembling the sealing system

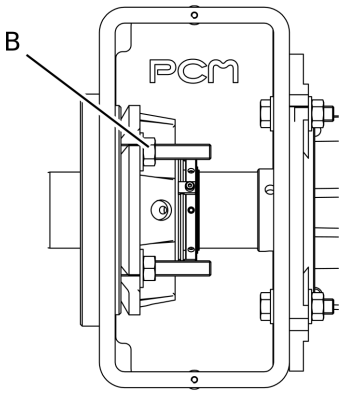
WARNING: Before any procedures are performed, the equipment must be at atmospheric pressure, ambient temperature, purged, and degassed. All control valves must be locked.
Before performing any servicing on the pump, please check that all necessary precautions have been taken: pump switched off, upstream and downstream valves closed, pipes cleaned and purged, electrical power supply disconnected and made inaccessible. All the usual precautions must be taken, in accordance with the texts in force regarding the safety of personnel.



1.

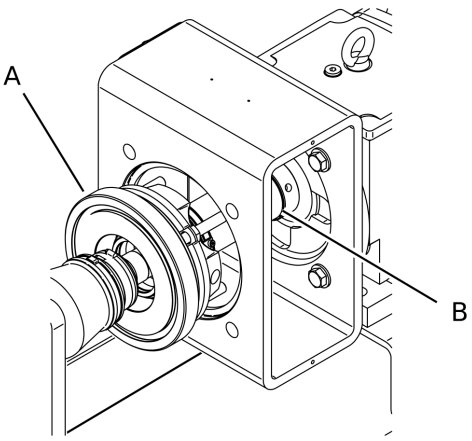
Fit the spacers (A) using screws (B).

Release the set screws (C).



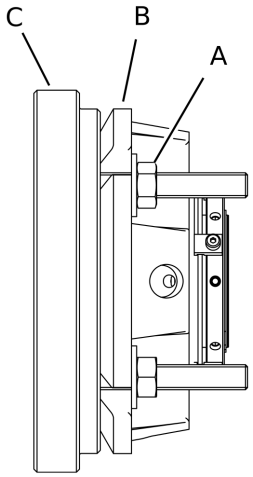
2.

Loosen the 4 screws (B) without removing them.



3.

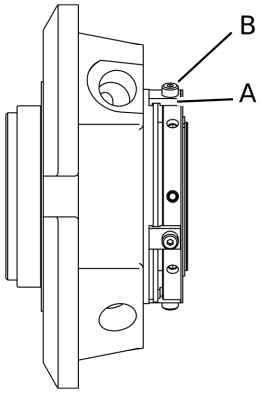
Remove the mechanical seal and mechanical seal support assembly (A) from the drive shaft (B).



4.

Remove the 4 nuts (A) and disassemble the mechanical seal (B) from the mechanical seal support (C).

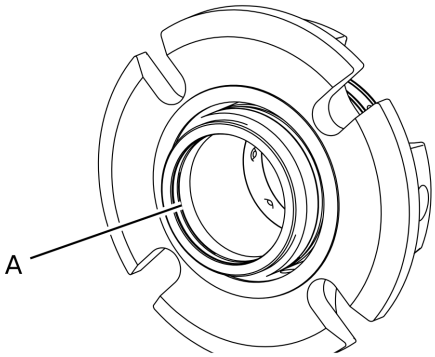
4.22. Reassembling the sealing system



1.

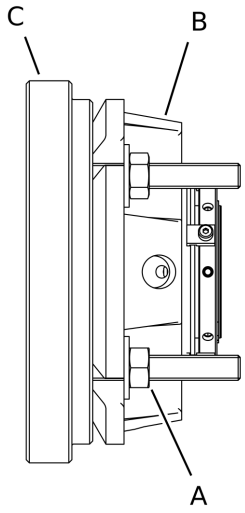
Ensure the seal gland is correctly positioned in its housing.

Check that the spacers (A) are in place and held by screws (B).



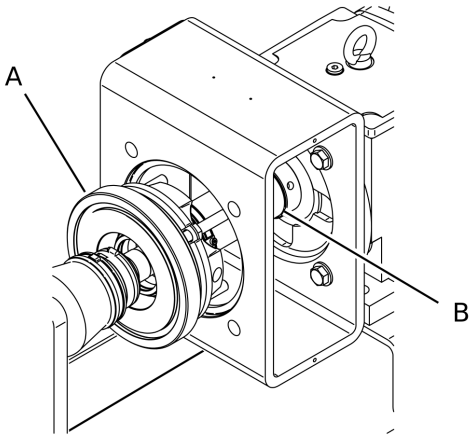
2.

Grease the sleeve O-ring (A).



3.

Position the mechanical seal (B) against the mechanical seal support (C) and position the nuts (A) without tightening them.



4.

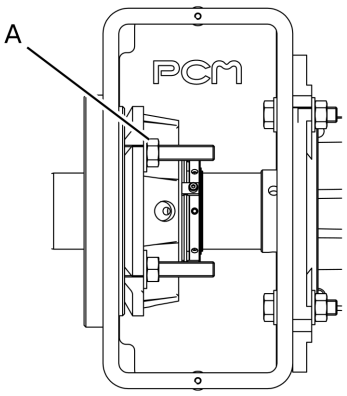
Fit the mechanical seal and mechanical seal support assembly (A) to the drive shaft (B).

5.

Orient the mechanical seal according to the lubrication system chosen (see the "Connecting the dynamic sealing system" section, page 16).

6.

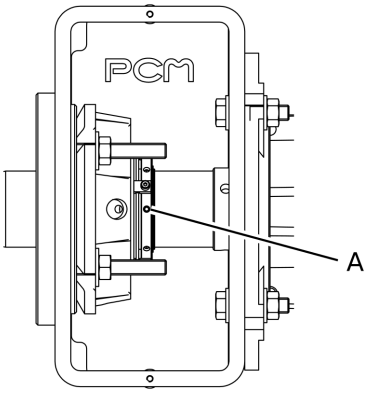
Follow the procedure to reassemble the pump.



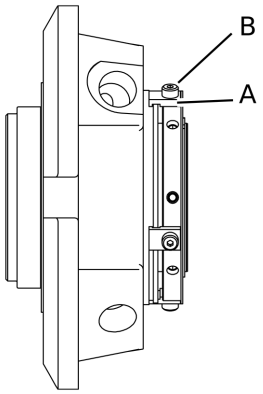
7.

Once the pump is fully assembled, tighten the nuts (A) to the recommended torque (see the "Tightening torques" section, page 36).

WARNING: If the mechanical seal is sealed by a flat seal, check the tightness again after an hour.



8.



9.

Remove the spacers (A) and screws (B).

10.

Connect the sealing system (see the "Connecting the dynamic sealing system (cartridge type)" section, page 16).

4.23. Equipment Storage when not in Use

Proceed as follows:

1. Release pressure at the suction and discharge.
2. Drain the pipework and the pump.
3. Clean the pipework and the pump using a cleaning product that is compatible with the pumped product and pump materials.
4. Run the pump for more effective cleaning.
5. Switch off the pump.
6. Isolate the pump from the rest of the circuit.

Prolonged stoppage of the pump can damage the hose fitted inside. Removing the hose is advisable if the pump needs to be stopped for more than three days.

4.23.1. Preserving the Rubber Components

We recommend that you store all rubber parts in a cool location, away from light to avoid damage by UV rays.

4.23.2. Preserving the sealing systems

When the seal is stored fitted to the machine, it is recommended that you rotate the shaft one quarter turn every two months to prevent the sealing faces from sticking.

5. Appendices

Risk prevention

Technical description

Accessories (optional)

Automatic control (optional)

Risk prevention

To return any equipment, please complete this form and include it with the equipment.

Equipment Return

Company using the equipment

.....

Activity

.....

Equipment Part No.

.....

Is the equipment likely to present any particular risks due to its use ?

☐ yes ☐ no

Chemical risks ☐ yes ☐ no

Product or Substance	Mode of Contamination	Prevention
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Biological risks ☐ yes ☐ no

Biological Agents	Mode of Contamination	Prevention
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

2 Mechanical Seal

Description	Model - Size	Drawing number	PCM Reference	Manual
Single Inside-Cartridge	ISC2-PX - 60mm	F001604380_rev0	DIGIAN-392481-01	FIS190

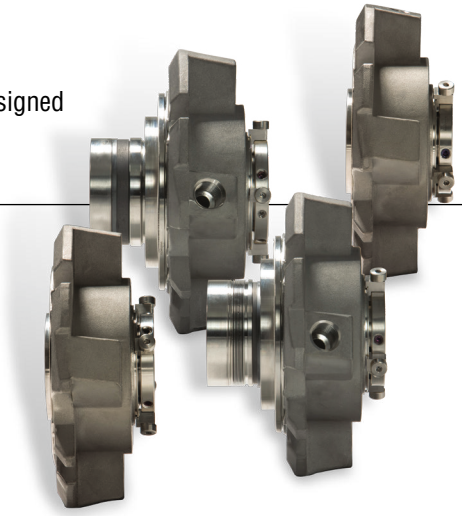
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FLOWSERVE

Installation Instructions

ISC2 Series

Innovative Standard Cartridge seal designed for general purpose applications.



1 Equipment Check

1.1 Follow plant safety regulations prior to equipment disassembly:

- 1.1.1 Wear designated personal safety equipment
- 1.1.2 Isolate equipment and relieve any pressure in the system
- 1.1.3 Lock out equipment driver and valves
- 1.1.4 Consult plant Safety Data Sheet (SDS) files for hazardous material regulations

1.2 Disassemble equipment in accordance with the equipment manufacturer's instructions to allow access to seal installation area.

1.3 Remove existing sealing arrangement (mechanical seal or otherwise). Clean seal chamber and shaft thoroughly.

1.4 Inspect surfaces under gaskets to ensure they are free from pits or scratches. Break all sharp corners on shaft steps, threads, reliefs, shoulders, key ways, etc. over which gasket(s) must pass and/or seal against.

1.5 Check shaft or sleeve OD, seal chamber bore, seal chamber depth, gland pilot, stud diameter, stud bolt pattern and distance to first obstruction to ensure they are dimensionally the same as shown in the seal assembly drawing.

1.6 Check seal assembly drawings for any modifications (reworks) to be made to the equipment for mechanical seal installation and act accordingly.

1.7 The equipment must be earthed to prevent sparks due to static electricity discharge

Shaft runout should be checked against the equipment manufacturer's specifications. Generally, should not exceed 0.05 mm (0.002 inch) TIR (Total Indicator Reading) at any point along the shaft for ball or roller type bearings. For sleeve type bearings, refer to manufacturer instructions. If the equipment is not completely dismantled, verify runout near seal location.

The above values apply to shaft speeds in the range from 1000 to 3600 RPM. For values above and below, consult your Flowserve representative. See Figure 1.

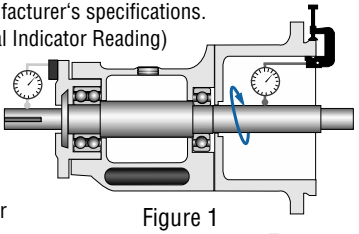


Figure 1

Shaft endplay should not exceed 0.25 mm (0.010 inch) TIR, regardless of thrust bearing type. See Figure 2.

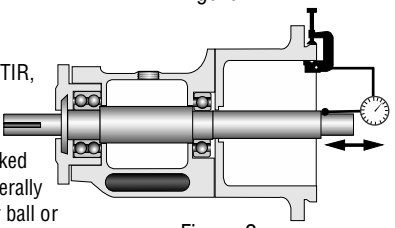


Figure 2

Radial bearing play at seal chamber face should be checked against the equipment manufacturer's specifications. Generally 0.05 - 0.10 mm (0.002 - 0.004 inch) will be applicable for ball or roller type bearings. For sleeve or journal type bearings, values will generally be in the order of 0.10 - 0.15 mm (0.004 - 0.006 inch). If equipment is found outside the general range, contact the equipment manufacturer and your Flowserve representative to verify the equipment's suitability for the seal.

Seal chamber squareness to the shaft centerline should be within 0.0005 mm/mm (0.0005 inch/inch) of seal chamber bore TIR.

Note: make sure that shaft endplay does not affect the reading. Verify the smoothness of the seal chamber face for a good gasket joint. See Figure 3.

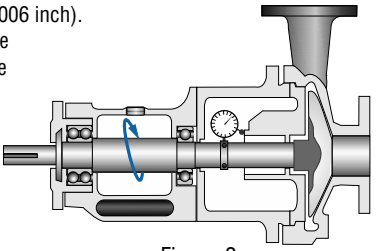


Figure 3

Concentricity of the shaft to the seal chamber bore or gland pilot register should be within 0.025 mm per 25 mm shaft diameter (0.001 inch per 1 inch shaft diameter) to a maximum of 0.125 mm (0.005 inch) TIR. See Figure 4.

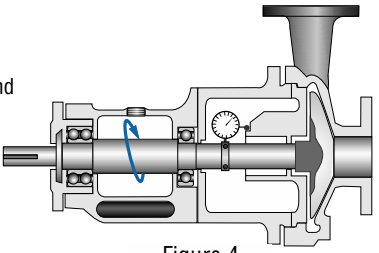
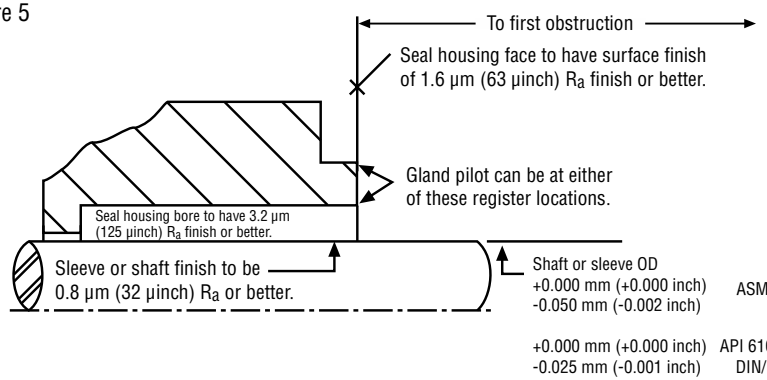


Figure 4

Surface finish requirements

Figure 5



Description

This ISC2 seal is a versatile cartridge mounted mechanical seal, designed for ease of installation and reliable operation. **No seal setting dimensions are required.** Removable setting devices provide proper alignment.

The ISC2 seal family consists of:

ISC2-PX - Single pusher seal with stationary springs

ISC2-PP - Dual pusher seal with stationary springs

ISC2-BX - Single metal bellows seal with rotating bellows

ISC2-BB - Dual metal bellows seal with rotating bellows

ISC2-XP - Single pusher seal with a pumping device for a Plan 23

ISC2-XB - Single metal bellows seal with a pumping device for a Plan 23

2 ISC2 Seal Installation

Note: No seal setting measurements are needed to install the seal. Instructions are for end-suction back pull-out pumps. Modification of these procedures may be required for other style pumps. Consult Flowserve for installation support.

2.1 **Lubricate the shaft** or pump sleeve lightly with silicone lubricant unless otherwise specified.

2.2 **Tighten the setting device cap screws** to ensure they are tight before installation.

2.3 **Slide the ISC2 seal cartridge** onto the shaft or pump sleeve with the setting devices toward the bearing housing. See Figure 2.

2.4 **Install the seal chamber** and bolt it in place on the bearing frame. See Figure 3.

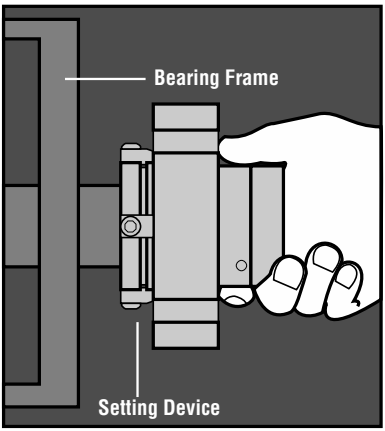


Figure 2

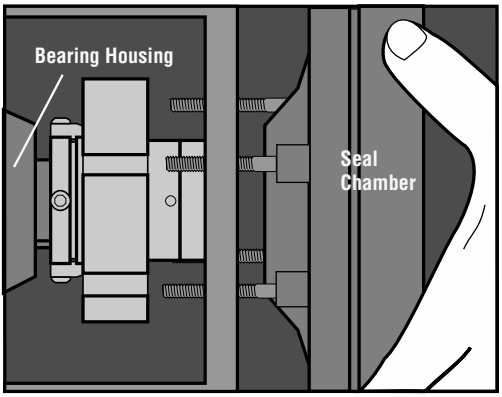


Figure 3

2.5 **Position the ISC2 seal** with the gland tight against the seal chamber.

2.6 **Orient the ISC2 seal** with the ports aiming as shown on the seal assembly drawing. See Section 3 for Piping Recommendations.

2.7 **Tighten the gland nuts evenly in a diagonal sequence.** Do not over-tighten the gland nuts, as this can warp seal parts and cause leakage. Confirm adequate thread engagement before final torque setting.

Recommended ISC2 seal minimum **gland nut torque** by size range:

Seal mm **Size** (inch)	25 - 50 (1.000 - 2.000)	54 - 70 (2.125 - 2.750)	75 - 102 (2.875 - 4.000)	108 - 152 (4.250 - 6.000)	159 - 203 (6.250 - 8.000)
Torque	**20 N-m (15 ft-lbs)**	**27 N-m (20 ft-lbs)**	**40 N-m (30 ft-lbs)**	**47 N-m (35 ft-lbs)**	**54 N-m (40 ft-lbs)**

Note: Some equipment with small bore seal chambers provide limited access to the gland bolting and setting device cap screws. In some situations, the gland fasteners interfere with the setting devices and window access may require deviation from the standard fastening sequence.

For example, the collar/sleeve assembly may need to be rotated slightly from its factory-set position by loosening the setting device cap screws, rotating the collar/sleeve assembly, then tightening the screws. When nonstandard processes are followed, be careful to maintain the integrity of the seal cartridge at all times.

2.8 Assemble the equipment per manufacturer specifications. Avoid pipe strain.

Align the coupling per manufacturer specifications.

2.9 With the impeller, shaft, coupling and bearings in their final operating position, tighten the drive collar set screws. See Figure 4.

Note: in designs that have two smaller screws, these are quarter dog screws that hold the collar to the sleeve and should not be tightened. A hex key was provided for the set screws, not for the quarter dog screws.

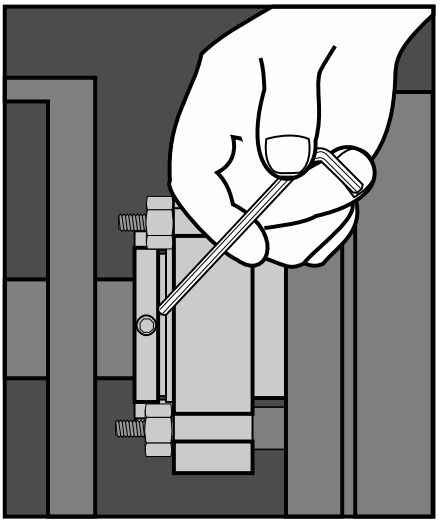


Figure 4

Recommended ISC2 seal minimum **set screw torque** by size range:

Seal mm **Size** (inch)	25 - 60 (1.000 - 2.500)	67 - 70 (2.625 - 2.750)	75 - 203 (2.875 - 8.000)	75 - 203 (2.875 - 8.000)
Gland Size	All	All	Standard Bore	Enlarged Bore
Torque	**4.5 N-m (40 in-lbs)**	**13.5 N-m (120 in-lbs)**	**16.9 N-m (150 in-lbs)**	**27.1 N-m (240 in-lbs)**

2.10 **Remove the setting devices** from the drive collar by loosening the cap screws. See Figure 5. Save the setting devices and fasteners for future use when the pump impeller is reset or when the seal is removed for repairs.

2.11 **Turn the shaft** by hand to ensure unobstructed rotation.

2.12 See **Operational Recommendations** before start-up.

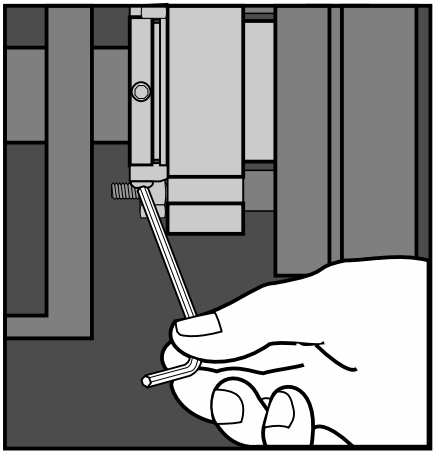


Figure 5

3 Piping Recommendations

3.1 Install and maintain an adequate piping plan. The ISC2 seal requires a clean, cool environment for maximum seal life. Typical piping plans are listed below. Contact Flowserve for additional piping plan information or technical support.

Important: *All red plastic caps/thread guards are for shipping protection only and should be replaced with either a piping connection or a metal plug in the same metallurgy as the gland.*

Plan 02: dead-ended seal chamber with no flush (single seals, always plug Flush port)

Plan 03: circulation created by the design of the seal chamber (single seals, always plug Flush port)

Plan 11: default inner seal flush from pump discharge on horizontal pumps (single seals)

Plan 13: default inner seal flush and vent from pump suction on vertical pumps (single seals

Plan 21: inner seal flush from pump discharge through a cooler for use with hot products (single seals)

Plan 23: inner seal flush from internal pumping device through cooler (ISC2-XP and ISC2-XB designs)

Plan 32: inner seal clean external flush for use with abrasive products or products that are incompatible with the seal (single seals)

Plan 52: dual seal circulation through a low pressure reservoir (dual seals)

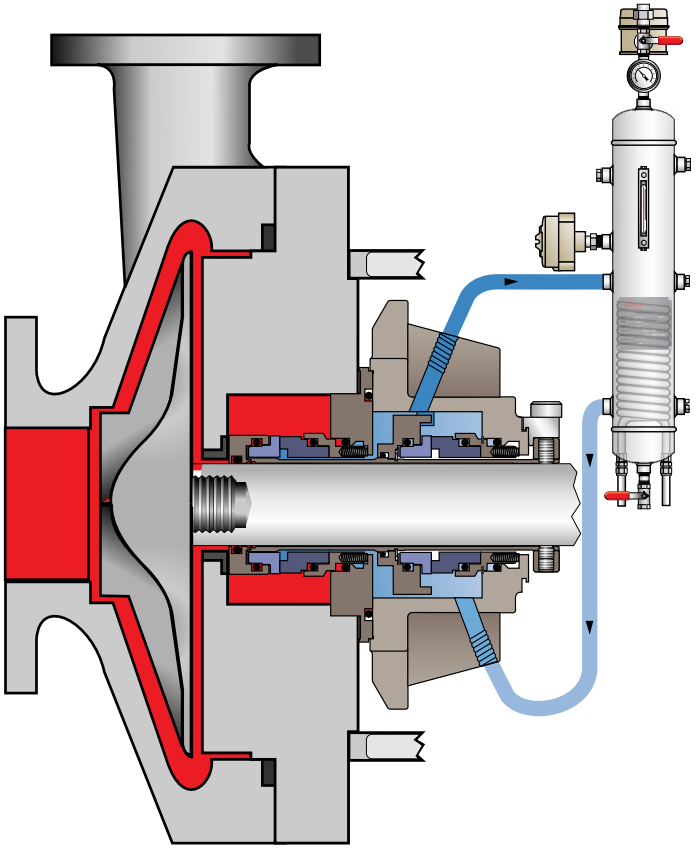
Plan 53: dual seal circulation through a pressurized reservoir (53A), finned tube array (53B) or piston accumulator (53C) (dual seals)

Plan 62: external quench on atmospheric side of seal (single seals)

3.2 For **dual seals,** LBI (Liquid Barrier Inlet) and LBO (Liquid Barrier Outlet) are marked on the gland. ISC2 seals are unidirectional and piping the correct inlet and outlet is important to proper circulation. The liquid barrier inlet should draw from the bottom of the support system while the liquid barrier outlet feeds the top of the system.

3.3 For **dual pressurized seal (Plan 53, double seal) operation**, supply a clean, compatible barrier fluid at a pressure at least 1.7 bar (25 psi) above the seal chamber pressure. See Figure 6. The pressure of the barrier fluid must not exceed the recommended maximum pressure.

Dual pressurized (Plan 53A) ISC2 with Supply Tank Figure 6



3.4 For **dual unpressurized (Plan 52, tandem seal) operation**, supply a clean, compatible buffer fluid at a pressure below the seal chamber pressure. The pressure in the seal chamber must not exceed the recommended maximum pressure.

3.5 For **single seal operation excluding Plan 23**, ensure all ports are fitted with piping or plugs. Plans 02 and 03 must close the Flush port with a metal plug in the same metallurgy as the gland. If Plan 62 is not used, the Quench port should be plugged. The Drain port should be connected to a drain line to prevent leakage along the shaft. Note: the Quench and Drain ports are smaller than the flush port as a distinguishing feature.

3.6 For **single seal operation with Plan 23,** FI (Flush Inlet) and FO (Flush Outlet) are marked on the gland. ISC2 seals are unidirectional and piping the correct inlet and outlet is important to proper circulation. The flush inlet should draw from the bottom of the cooler while the flush outlet feeds the top of the cooler. Ensure piping is optimized for thermosyphon flow.

4 Operational Recommendations

4.1 **Remove lock outs** on equipment and valves.

4.2 **Do not start up the pump dry** to check motor rotation or for any other reason. Open valves to flood pump with product fluid. Ensure that the seal flush or support system is operating. Vent air from the casing of the pump and the seal chamber before start-up.

4.3 **Observe the start-up.** If the seal runs hot or squeals, check the seal flush system. Do not allow the pump to run for any extended time if the seal gets hot or squeals.

4.4 **Do not exceed corrosion limits.** The ISC2 seal is designed to resist corrosion through proper material selection. Do not expose the ISC2 seal materials of construction to products outside of their corrosion limits. Consult Flowserve for chemical resistance recommendations.

4.5 **Do not exceed pressure and speed limits** established for the ISC2 seal.

4.6 **Do not exceed the temperature limits** of the ISC2 seal based on the materials of construction. For dual seals using supply tanks with cooling coils, turn on cooling water to the supply tank before start-up.

4.7 **Do not start up or run the ISC2 seal dry.** The seal chamber, pump and support systems should be thoroughly vented before start-up. Buffer or barrier fluid must flood the seal cavity of dual seals at all times during operation. Process fluid must be in the seal chamber at all times during single seal operation.

5 Repairs

This product is a precision sealing device. The design and dimension tolerances are critical to seal performance. Only parts supplied by Flowserve should be used to repair a seal.

To order replacement parts, refer to the part code and B/M number. A spare backup seal should be stocked to reduce repair time.

When seals are returned to Flowserve for repair, **decontaminate the seal assembly** and include an order marked **"Repair or Replace." A signed certificate of decontamination** must be attached. **A Safety Data Sheet (SDS) must be enclosed** for any product that came in contact with the seal. The seal assembly will be inspected and, if repairable, it will be rebuilt, tested, and returned.

The images of parts shown in these instructions may differ visually from the actual parts due to manufacturing processes that do not affect the part function or quality.

FLOWSERVE®

TO REORDER REFER TO
B/M # _____
F.O. _____

FIS190eng REV 09/2018 Printed in USA

To find your local Flowserve representative
and find out more about Flowserve Corporation,
visit www.flowserve.com

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3 API Plan 51

Description	Flowserve Order Number	PCM reference	Main Manual
Plan 51 Reservoir	400370175-000200	DI317873-02	See below
MAIN COMPONENTS			
Type	Instrument Tag nr	Manual	
Level Indicator	50-LG-001 50-LG-002	76NOT028-An-01/2001	

FLOWSERVE®

After Market Services and Solutions
Manufacturing HUB Etten-Leur

Plan 51 Reservoir

Operation and Maintenance Manual

Flowserve order number : 400370175-000200

Manufacturing year : 2024

Customer order number : PO070-24-07869

Equipment item number : 50001A/B

Flowserve B.V.
Parallelweg 6
4878 AH Etten-Leur
The Netherlands

Revision 0, August 2024

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1.0 INTRODUCTION

All illustrations and details in these installation and operating instructions are subject to changes that are necessary to improve product performance without prior notice.

The copyright of these instructions is the property of Flowserve. These instructions are intended for Maintenance, Operating and Supervisory personnel and contain regulations and drawings of a technical character that may not, in full or in part, be copied, distributed, used without authorisation for competitive purposes, or given to others.

It should be understood that Flowserve does not accept any liability for instances of damage and/or malfunctioning incurred through non-adherence to these installation instructions.

2.0 BRIEF DESCRIPTION

The reservoir assembly drawing is included in this manual and can be found in attachment 1.

The reservoir is delivered as a complete assembled unit. Depending on customer requirements the reservoir design and additional components may vary. For the exact execution of the system, reference is made to the a.m. system assembly drawing. On the assembly drawing the design and operating conditions of the system can be found (pressure, temperature and volume) as well as the instrument settings.

The reservoir assembly consists of the following components:

Reservoir
The most popular use of the Plan 51 system is to supply a de- icing fluid to the atmospheric side of a single seal which is handling fluids at below freezing temperature.

Hand pump
The hand pump is used to refill the reservoir during operation.

Instrumentation
Various instruments can be fitted to the reservoir depending on the execution.
In general for plan 51 the instrumentation is limited only for level indication.

Valves
Valves are used for filling the vessel and for isolation of the vessel from the mechanical. The assembly drawing indicates the position of the valves that are supplied with the reservoir. The valves might also be part of the plant piping.

3.0 FUNCTION

The function of a Plan 51 reservoir system is:

- To prevent ice formation at the atmospheric side of the single mechanical seal this is handling fluids at below freezing temperature.

This is the simplest of the "vessel type systems" and is generally used to supply a 'dead ended' blanket of buffer fluid to the seal.

The most popular use of the Plan 51 system is to supply a de- icing fluid to the atmospheric side of a single seal which is handling fluids at below freezing temperature. The pumps handling these low temperature fluids are often covered in ice, frequently inches thick. Even in the warmest parts of the world. When the pumps are running the heat generation at the seal faces is sufficient to prevent icing occurring within seal components. However, when stopped. On cold standby duty the moisture in the atmosphere around the seal will freeze which unless cleared could cause the seal to fail. Assuming the prime mover is powerful enough to turn the pump with the seal iced up.

For these 'de-icing' applications glycol or methanol are typically used as the buffer fluid but the hazardous nature of the latter means that an auxiliary seal. Typically a lip seal will be needed in the seal to prevent leakage of the buffer fluid to atmosphere.

Any leakage of the seal will be carried to the reservoir by the buffer fluid.

Depending on the vapor pressure of the pumped product at ambient temperature, this leakage will be in gaseous form (volatile products) or as a liquid (non-volatile products).

In the case the pumping fluid is of a light hydrocarbon it could 'bubble' up through the vessel to vent but for heavier products this could be a problem.

Seal leakage will contaminate the buffer fluid and will be accumulated in the system. The leakage will cause a rise in level in the reservoir. The reservoir should be periodically drained and refilled with fresh buffer fluid to avoid a too high degree of contamination. It should be borne in mind that one now effectively has a single seal operation so that regular manual surveillance is recommended.

Flowserve doesn’t recommends plan 51 for non-volatile products.

The buffer fluid is required only prior to start-up and hence an isolating valve fitted in the drain line which is closed prior to start up, and an isolating valve between the seal and vessel. The vessel isolating valve is opened to flood the seal with buffer fluid prior to start up.

Note: The isolation valve in the gland drain is not supplied by Flowserve.

4.0 SAFETY

Please read these instructions carefully. Installation in accordance with the following instructions will contribute to long and trouble free operation of the Plan 51 reservoir.

For related mechanical seals, separate instructions are provided.

The ultimate user must ensure that personnel assigned to handle, install and operate the reservoir and related equipment is well acquainted with the design and operating requirements of such equipment.
Damage to any of the reservoir’s components may result in unsatisfactory performance, which can eventually result in (excessive) seal leakage. The degree of hazard depends on the sealed product and may have an effect on people and/or the environment.

Plant regulations concerning work safety, accident prevention and pollution must be strictly adhered to:

- Wear designated personal safety equipment
- Isolate equipment and relieve any pressure in the system
- Lock out equipment driver and valves
- Consult plant Material Safety Data Sheet (MSDS) files for hazardous material regulations
- Installation in hazardous areas is dependant on the explosion protection of the instrumentation. The ultimate user must judge in case of conflicting standards.

5.0 TRANSPORT, STORAGE

The Plan 51 reservoir and related equipment must be transported and stored in the unopened, original shipping box. The warehouse in which the reservoir and related equipment are stored must be dry and free of dust. Avoid exposing equipment to large temperature fluctuations, high humidity and radiation.

Reservoirs that have been dropped or have otherwise been subjected to heavy impacts during transport must not be installed. An inspection by Flowserve or its appointed representative is strongly advised

After a storage period of 3 years the reservoir must be inspected for its “as new” properties. This applies in particular to the instrumentation. An inspection by Flowserve is mandatory.

If the equipment is to be preserved with the reservoir installed, the preserving medium must not impair the function of the system by e.g. fouling and/or attack the secondary seals.

6.0 INSTALLATION

Mount the reservoir in the vertical position to a stand using the mounting lugs. Locate seal system as close to the seal as possible, while leaving sufficient room for operation and maintenance. To promote thermosyphoning in standby condition the reservoir must be mounted above the seal. For horizontal pumps the reservoir must be mounted 45 to 60 cm (18” to 24”) above the shaft centerline, for vertical pumps 45 to 60 cm above the seal gland inlet or outlet connection, whichever is the highest (unless otherwise specified).

6.1 Interconnecting piping

In a Plan 51 system, there is no circulation takes place; therefore no special attention must be paid to the execution of the interconnecting piping between the reservoir and the mechanical seal. Piping instructions are detailed on the system assembly drawing.

Minimize restrictions (e.g. use full port valves, limit the number of fittings). Unless otherwise specified, the minimum pipe size to be used is ¾”, schedule 80S maximum. Piping must be clean and free of burrs.

Total pipe length and number of bends should be kept to a minimum. Use smooth, large radius bends; do not use elbows, tees, etc. Ideally for plan 51 the pipe runs should be up right vertical to allow free flow of buffer fluid and hence make sure that the loop, including seal flange, does not include vapor traps.

Where applicable the following connections should be made. Note that the name of the connections on the seal /system assembly drawing may differ from those used in these instructions. In case of doubt contact you Flowserve representative.

Buffer fluid supply line to mechanical seal
The ***to seal*** connection should be connected to tap BI (buffer fluid inlet) on the mechanical seal flange.

Buffer fluid return line from mechanical seal
Not applicable for plan 51.

Flare connection/drain/disposal point connection
Depending on the execution of the Plan 51 reservoir, the ***vent / to flare*** connection should be connected to a drain or a disposal point.

Cooling water connections coil Inlet and coil outlet
Not applicable for plan 51.

6.2 Electrical connections (if applicable)
Electrical connections for instrumentation should be wired in accordance with the applicable instrument and plant requirements. Power supply for the electric motor of a forced draft cooler and external circulation pump should be wired in accordance with the applicable electric motor and plant requirements.

7.0 SET-UP

- Check whether the block bleed valve to the instrumentation is open (if applicable).
- Check whether the block valves of the level indicator are open and the drain and vent valves of the level indicator are closed (if applicable).
- Check whether the block valve to the flare is open (if applicable).
- Check whether the block valve in the drain line is closed (if applicable).
- Open the fill line and fill the reservoir with clean buffer fluid until normal liquid level. Buffer fluid may be specified on the reservoir assembly drawing. Flowserve can supply information on buffer fluid, temperature and flow requirements based on product type, seal size and product temperature. Ensure that the buffer fluid is clean and compatible with the product.
- Check the functionality of the level switch (es) during filling (if applicable).
- Close the block valve in the fill line (if applicable).
- Check for leakages at fittings and pipe work, rectify when necessary.

8.0 START-UP AND OPERATION

- Pressurize the equipment in which the seals are installed, following the instructions supplied by the equipment manufacturer.
- Check the seals, interconnecting piping and system for leakage, rectify when necessary.
- Buffer fluid pressure is usually equal to atmospheric or vapor recovery system pressure, unless otherwise specified.
- Start-up the equipment in accordance with the equipment's operating procedures unless specifically requested otherwise by Flowserve. If the equipment is not operating properly (e.g. seals and/or bearings running hot, cavitation, heavy vibration, etc.), shut down the equipment, investigate and remove the cause.

If seals are operated on a non-volatile product, the seal leakage will not evaporate, resulting in contamination of the buffer fluid. Because the level in the reservoir will rise over time, periodically drain the reservoir and refill with fresh buffer fluid at the quickest turn around if the equipment is not in shut down condition.

8.1 Refilling without a refill unit

- Close the valve between reservoirs and flare (if applicable).
- Open a vent valve to de-pressurize the reservoir.
- Refill the reservoir with clean buffer fluid using the fill connection.
- Close the fill connection.
- Close the vent valve.
- Follow the instructions as per 8.0.

8.2 Refilling with a refill unit

In this case the vessel can be refilled without de-pressurizing the vessel (if connected to a flare system). A refill unit can be a separate system that needs to be connected to the reservoir or it can be a hand pump that is supplied with the reservoir.

- Open the shutoff valve in the connecting line between refill unit and reservoir.
- Operate the hand lever or operate the motorized refill unit, at the same time checking the buffer fluid pressure by means of the pressure indicator.
- Upon completing the refill procedure, close the shutoff valve in the line between the refill unit and the reservoir.

9.0 SYSTEM CHECK, PROBLEM SOLVING

Checking of the system, limits itself to monitoring pressure, temperature, leakage and consumption of buffer fluid.

- Check the buffer fluid pressure regularly (typically once a week). The buffer fluid pressure must be equal to the flare/drain/disposal point pressure. (If applicable)
- Check the liquid level regularly (typically once a week). If the level is too high drain the buffer fluid to safe minimum level; refill with clean buffer fluid.
- Check the seals, system and interconnecting piping for leaks, rectify when necessary.
- Check the buffer fluid for impurities by collecting a sample (typically once a month). If dirty, drain the reservoir to safe minimum level and refill with clean buffer fluid.

Problem solving

PARAMETER	INDICATION (1)	POSSIBLE CAUSE	SOLUTION
Liquid level	Reducing fast (2)	• Too high lip seal leakage • Leakage in the system	• Check lip seal condition • Check connections for leakage
	High (3)	• Too high seal leakage	• Check primary seal condition

Notes:

(1): The liquid level drop should be monitored over time. A too a fast drop in liquid level compared to previous measurements could be an indication for one of the mentioned possible causes.

(3): A high liquid level with a non-volatile product indicates a too high primary seal leakage. This is an indication that the reservoir needs to be drained. The need for frequent draining is an indication of too high seal leakage.

10.0 MAINTENANCE

Renewal of buffer fluid

- Stop and de-pressurize the equipment in which the seals are installed.
- Close the valve between the reservoir and the flare (if applicable)
- De-pressurize the reservoir.
- Drain the reservoir.
- Refill the reservoir with clean buffer fluid.
- Check all components for damage or leaks and replace or repair when necessary.
- Follow instructions as per paragraphs 7.0 and 8.0 prior to re-starting the equipment.

11.0 SHUT-DOWN, DISASSEMBLY

The equipment can be shut down at any time. Before the reservoir can be removed the equipment in which the seal is installed must be de-pressurized.

For (re)-installation, removal and maintenance work, the complete reservoir system must be de-pressurized (and drained if required).

Product may be released during removal of the reservoir. Safety measures and protective equipment is required as per the plant's safety regulations.

12.0 SPARE PARTS, REPAIRS

The reservoir system is designed to provide reliable operation under a wide range of operating conditions. However, repairs will be necessary when components of the system reach the end of their normal life expectancy or when the system has been operated outside of its design capabilities.

All liabilities and warranties to Flowserve for damage incurred through the use of non-original replacement parts and accessories will be rendered null and void.

Please note that special manufacturing and delivery specifications exist for all parts of our products manufactured or produced by ourselves and the replacement parts are always offered in accordance with the latest technology and with the most current regulations and laws.

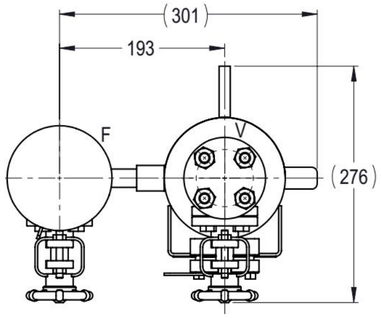
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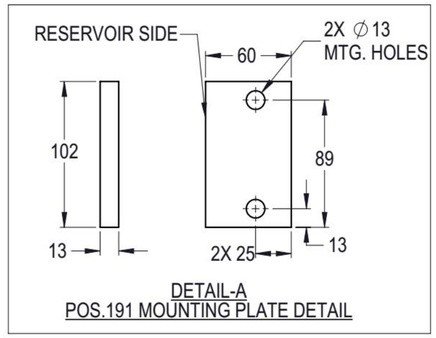
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ATTACHMENT 1

Reservoir Assembly Drawing

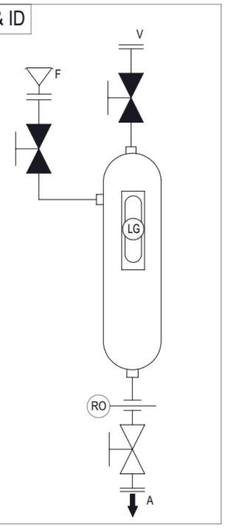
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DETAIL-A
POS.191 MOUNTING PLATE DETAIL

P & ID



DESIGN CONDITIONS

		UNIT
QUENCH FLUID	WATER	
DESIGN PRESSURE	12	BARG
DESIGN TEMPERATURE	-10 TO 93	°C
OPERATING PRESSURE	ATMOSPHERIC	BARG
OPERATING TEMPERATURE	MAX.80	°C
DESIGN CODE (VESSEL)	ASME VIII DIV 1	
DESIGN CODE (PIPING)	ASME B31.3	
EC DIRECTIVE	PED 2014/68/EU	
PED CATEGORY	SEP	
TOTAL VOLUME	7	LITER
VOLUME AT NLL	5	LITER
WEIGHT EMPTY	~40	KG

N.D. TESTING / INSPECTION

HYDROTEST PRESSURE	18	BARG
RADIOGRAPHY	NONE	
DYE-PENETRANT	100%	
MATERIAL CERTIFICATES	REFER NOTE 3	
INSPECTION	FLOWSERVE	

WELDING

WPS & PQR IN ACCORDANCE WITH ASME IX.

REMARKS

STAINLESS STEEL SURFACES SHALL NOT BE PAINTED.
CLEANING IN ACCORDANCE WITH RSD-SP-ENG-089E.
BOLTHOLES STRADDLE TO CENTERLINE.
STAINLESS STEEL WELDS TO BE PICKLED & PASSIVATED OR GLASS-PEARL CLEANED.
DO NOT USE TEFLON TAPE, BUT USE LOCTITE 577.

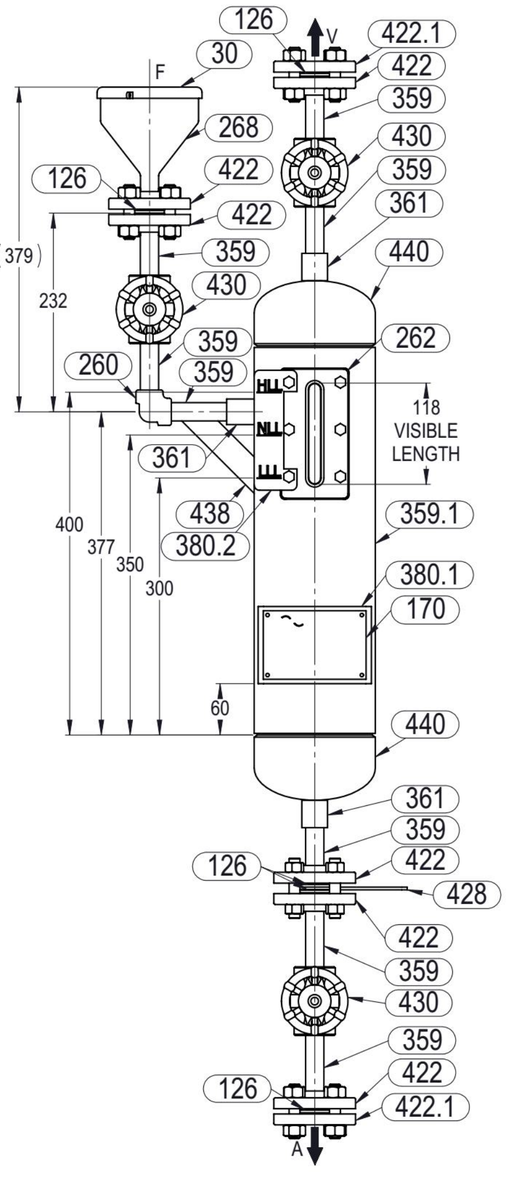
CONNECTIONS

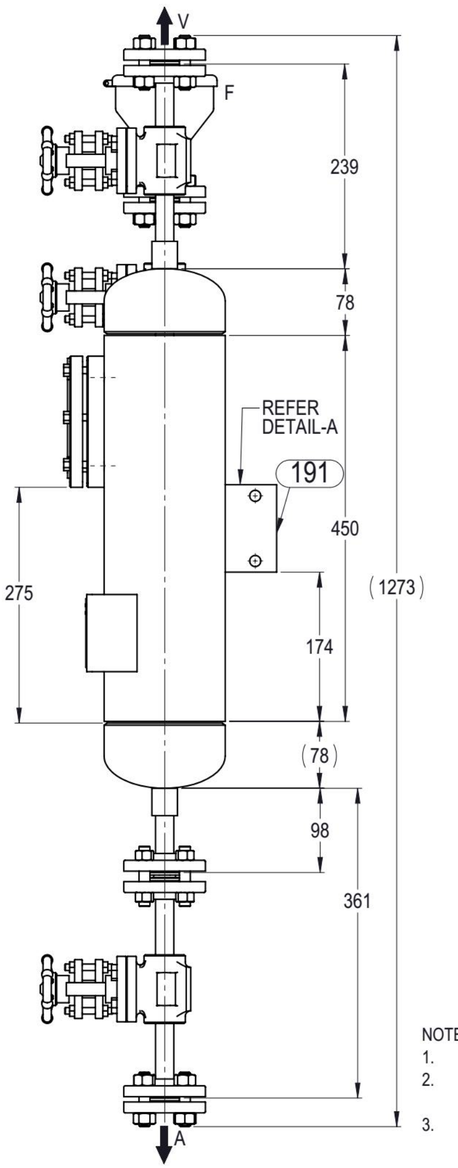
NO.	NAME	SIZE
A	TO SEAL	1/2 IN 300# RF + BLIND
F	FILLING	4 IN FUNNEL
V	VENT	1/2 IN 300# RF + BLIND

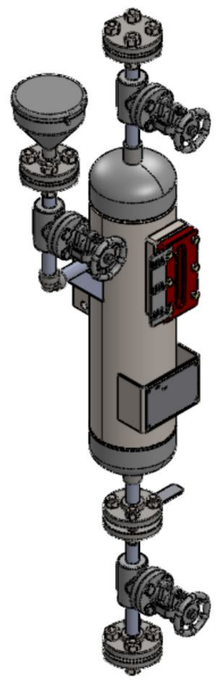
BILL OF MATERIAL NO: C100033782

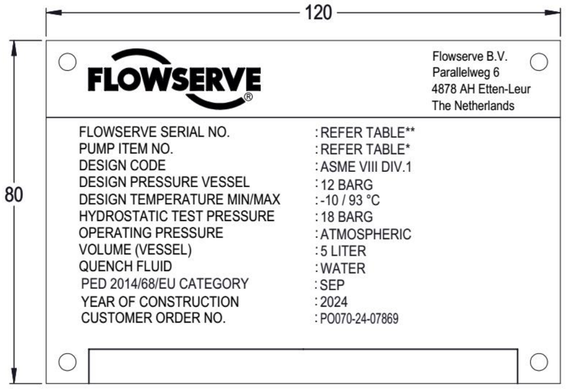
SPARE PARTS: [1] STARTUP [2] 2 YEAR [3] CAPITAL/CRITICAL

NO	PART CODE	QTY	DESCRIPTION	MATERIAL
30	C0538533ZZ-Q2	1	CAP, OTHER - DUST, 4 IN WITH CHAIN	GRADE 316/316L
126	C0111934ZZ	5	GASKET, SPIRAL WOUND -CL 300, 1/2 IN, SPIRAL WOUND	STAINLESS STEEL 316 + GRAPHITE
170	C100032896	1	PLATE, NAME - FOR AUXILIARY PLAN 51	316
191	C0243841ZZ-Q1	1	PLATE, MOUNTING - 102 X 60X 13 MM THK.	316
260	C0216202X941	1	ELBOW FITTING, PIPE - 1/2 IN, SOCKET WELD, CL 3000, 90 DEG	ASME SA-182 GRADE F316/F316L
262	C0560271ZZ	1	INDICATOR, LEVEL - GAUGE, WELD ON TYPE, VISIBLE LENGTH : 118 MM, BOROSILICATE GLASS	GRADE 316/316L
268	C0405667X941	1	STRAIGHT FITTING, PIPE - SWAGE, 4 IN X 1/2 IN, SCH 40, PBE, SMLS	ASME SA-182 GRADE F316/F316L
359	C0063392X951	1	PIPE, OTHER - SCH.80, 1/2 IN, SEAMLESS, PLAIN BOTH END	ASME SA-312 GRADE TP316/316L
359.1	C0172048X951	1	PIPE, OTHER - 5 IN X 450 MM LG, SCH 40, SMLS, BBE	ASME SA-312 GRADE TP316/316L
361	C0215993X941	3	STRAIGHT FITTING, PIPE - HALF COUPLING, 1/2 IN SW, CL. 3000	ASME SA-182 GRADE F316/F316L
380	4R124140ZZ-Q1	2	PLATE, NAME - FOR INSTRUMENT	ASME SA-240 GRADE 316/316L
380.1	C0234657ZZ-Q1	1	PLATE, NAME - BRACKET FOR NAMEPLATE	316
380.2	C0538973ZZ-Q2	1	PLATE, NAME - FOR LEVEL INDICATION, SIZE 2	316
422	C0362295X941	6	FLANGE, PIPE - 1/2 IN, CL 300, RFSW	ASME SA-182 GRADE F316/F316L
422.1	C0363170X941	2	FLANGE, PIPE - BLIND 1/2 IN CL 300	ASME SA-182 GRADE F316/F316L
428	C0095396ZZ	1	PLATE, ORIFICE - 1/2 IN, CL 300, 3.2 MM ORIFICE	316
430	C0369816ZZ	3	VALVE, GATE CL 800,1/2 IN SOCKET WELD,SCH 80,BOLTED BONNET,REDUCED BORE	316
438	C0493357X944-Q2	1	GUSSET, OTHER - 6 MM THK X 30 MM WIDE	ASME SA-240 GRADE 316/316L
440	C0489371X947	2	HEAD, RESERVOIR - CAP, 5 IN BUTT WELD, SCH 40	ASME SA-403 GRADE WP316/316L

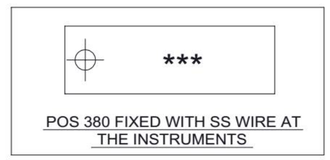








POS.170 NAMEPLATE DETAIL
(SCALE: NTS)



POS 380 FIXED WITH SS WIRE AT THE INSTRUMENTS

NOTES:
1. ALL VALUES IN () ARE REFERENCE DIMENSIONS.
2. CARBON STEEL STUDS(ASME SA-193 GR B7) & NUTS(ASME SA 194 GR 2H) WITH HOT-DIP GALVANIZED. ALL MISCELLANEOUS FASTENERS MUST BE 316 SS.
3. MATERIAL CERTIFICATE OF ALL PRESSURE CONTAINING PARTS (PIPES/FLANGES/PIPE FITTINGS) REQUIRES EN 10204 3.1. EN 10204 2.2 FOR NON-PRESSURE CONTAINING PARTS.

REV.	CHG NO.	DATE	REVD	CHKD	APVD
0	00210008	21-Aug-2024	HaMa	LoSh	HaSc
	DESC: RELEASE TO MANUFACTURE				

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* PUMP ITEM NO.	** FLOWSERVE SERIAL NO.	*** INSTRUMENT TAG NUMBER LG	RO
50001 A	400370175-000200-001	TBA	TBA
50001 B	400370175-000200-002	TBA	TBA

DIM TOLERANCES (UNLESS SPECIFIED)
X. = ± 5 ANGLE = ± 0.5°
X.X = ± 2.5

ALL DIMENSIONS ARE REFERENCES UNLESS OTHERWISE SPECIFIED

OPERATING DATA
PRODUCT: SEA WATER
SEAL CHAMBER PRES: 5.9 barG Max
BARRIER FLUID: WATER
DISCHARGE PRES: 5.9 barG Max
API PLAN: 13/51

CUSTOMER DATA
CUSTOMER: PCM MANUFACTURING FRANCE SAS
ADDRESS: CHAMPTOCE-SUR-LOIRE FRANCE
ULTIMATE USER: CROSSWIND (JV SHELL + ENECO)
ADDRESS: THE NETHERLANDS
CUSTOMER P.O.: PO070-24-07869

SEAL DATA
MATL CODE: ----

JOB NUMBER	400370175-000200
DRWN	LoSh
DATE	23-Jul-2024
CHKD	LoSh
DATE	23-Jul-2024
APVD	HaSc
DATE	24-Jul-2024
3D MODEL NO. / REV.	F001614989 / 0
≈ WEIGHT ( )	64.95 lb (29 kg)

FLOWSERVE AMSS Seals & Systems

DRAWING TITLE
SEAL SYSTEM - GENERAL ARRANGEMENT
PLAN 51 -

SIZE	DRAWING NUMBER	REV.
A2	F001615657	0

3rd ANGLE | SCALE: 1:1 | DIM. UNITS: mm | SHEET: 1 OF: 1

TEMPLATE VERSION 4.5.10, JAN 2024

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ATTACHMENT 2

Instrumentation

LEVEL INDICATOR

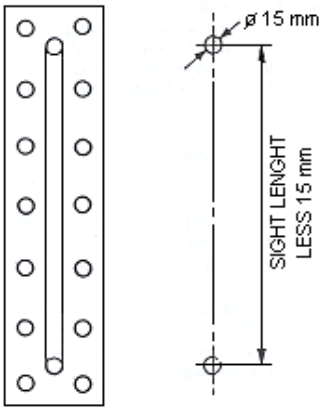
The Klinger and Trouvay & Cauvin alliance
Tel: +33 (0) 2.35.25.65.64 - Fax +33 (0) 2.35.25.65.53
www.ktc-fluidcontrol.com

INSTALLATION AND SERVICE GUIDE
KLINGER Weld-on Level Gauges for process applications

Models MWR (PN 100), MWT (PN 100), UWR (PN 100) & UWT (PN 100)

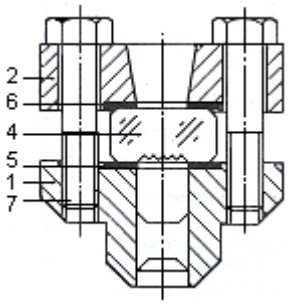
1 FITTING

First dismantle the gauge as shown in 3.2 changing glasses.
It is not necessary to cut a slot in the vessel wall. Two 15mm diameter holes should be drilled in the vessel with centres 15mm less than the sight length of the gauge, as shown in Fitting diagram. With combined sight gauges, it is recommended that two holes be drilled for each section of the sight. The centre piece should then be positioned accurately over the holes and tack welded into place. Check for correct alignment, and finish weld ensuring that the heat does not distort the centre piece. The gauge can then be reassembled using reverse procedure to that shown in 3.2.

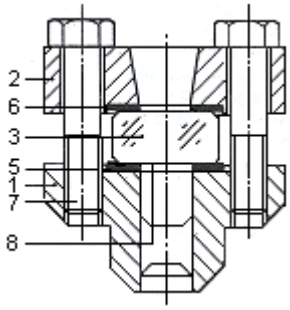


2 COMMISSIONING

Thermal shock considerably affects the life and performance of the glasses. Therefore, sharp changes in temperature should be avoided as much as possible. During initial warning up period, the cover and joints may settle and it is essential, therefore, to follow up all the clamping bolts to maintain the recommended torque (for correct order and torque see Tightening procedure).



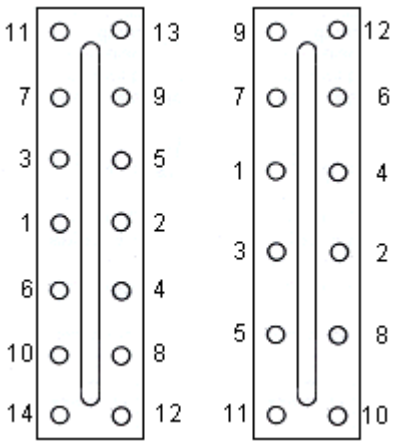
MWR :
ANSI class 600
PN 100
Max. temp. 400°C
Actual rating subject to pressure limitation of vessel and quality of weld.



MWT :
ANSI class 600
PN 100
Max. temp. 400°C
Actual rating subject to pressure limitation of vessel and quality of weld.

TIGHTENING PROCEDURE

COVER BOLT TORQUE		
Gauge	**DaN.m**	**Lbs.ft**
MWR	5.0	36
MWT	5.0	36



Item	Part list
1	Centre piece
2	Cover
3	Transparent glass type B
4	Reflex glass type B
5	Sealing joint
6	Cushion joint
7	Bolt
8	Protective shield (when fitted)

Note : UWR and UWT gauges can be supplied where the applications requires an enclosed glass. Please refer to MWR and MWT data for maintenance.

Further information

For further information, please send an E-mail to the following address: mkt@ktc-fluidcontrol.com
The characteristics of the products described on this page may be modified without notice, in the interests of regular improvement. In addition, the technical data reproduced here is provided for information only.

Ref: 76NOT028-An-01/2001

INSTALLATION AND SERVICE GUIDE
KLINGER Weld-on Level Gauges for process applications

Models MWR (PN 100), MWT (PN 100), UWR (PN 100) & UWT (PN 100)

3 MAINTENANCE INSTRUCTIONS

3.1 Any leaks which appear during service should immediately be stopped by following up all the clamping bolts in the correct order with the recommended torque (see Tightening procedure). If this fails to stop the leak it may be necessary to change the joints and the glass because the sealing surface may have suffered damage.

3.2 Changing glass

- Drain vessel to below level of glass to be changed,
- Relieve gauge and vessel of internal pressure,
- Release the clamping bolts,
- Remove the bolts from the gauge (supporting covers and internals),
- Remove the cover, glass, joints and protective shields, part 8 (if fitted),
- Clean joint faces of centre piece and cover, taking care not to damage joint face of centre piece,
- With new glass, joints and protective shields (if fitted) re-assemble gauge using reverse procedure, re-torque bolts from centre bolts as shown in Tightening procedure,
- Follow the commissionning procedure (point 2) to bring the gauge back into service.

4 REFURBISHING

No refurbishing should be necessary other than the replacement of glasses, joints and Protective shields (refer to 3.2).

5 IMPORTANT INSTRUCTIONS

5.1 Use only original KLINGER replacement parts,

5.2 Cleanliness is most essential when assembling and points listed under 3.2 must be observed,

4.3 Draughts may cause thermal shock, resulting in glass breakages. If there are windows, lift doors, etc..., in the vicinity it is advisable that the gauge should be screened.

5.4 Glass corrosion - if the glasses become opaque or the liquid level definition deteriorates, the glasses should be examined, cleaned and if worn, replaced at once.

5.5 Protective shields can only be fitted to Transparent Level Gauges - they must never be fitted to Reflex Level Gauges.

When protective shields are fitted, they should be positioned between sealing joint (5) and gauge glass (3).

6 SPARES

It is recommended that one complete set of glasses, joints and Protective shields be kept for spares and a new set ordered as soon as these are used.

6.1 When ordering spares, please quote :

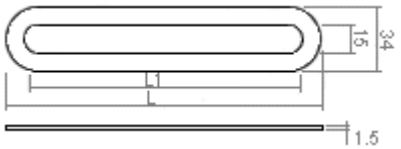
- type and size of gauge, e.g. MRW 2 - IX as stated on gauge type plate.
- construction of the level gauge components as stated on gauge plate, e.g. FS/H, M/H or M.

6.2 When ordering glasses, please quote transparent glasses type B + size :



Size	II	III	IV	V	VI	VII	VIII	IX
L	140	165	190	220	250	280	320	340

6.3 When ordering gaskets or Protective shields, please quote glasses type B + size of glass on which they are fitted :



Further information

For further information, please send an E-mail to the following address: mkt@ktc-fluidcontrol.com

The characteristics of the products described on this page may be modified without notice, in the interests of regular improvement. In addition, the technical data reproduced here is provided for information only.

Ref: 76NOT028-An-01/2001

4 HEATING JACKET SYSTEM

	Type	ATEX marking	PCM reference	Manual
THERMON	Terminator™ ZP	Zone 1, AEx eb IIC T4-T6	DI317873-03	PN50845-0320

Terminator™ ZP

Power Connection Kit

INSTALLATION PROCEDURES

For Power Connection, In-Line Splice Connection,
T-Splice Connection, or End Termination Applications



Receiving, Storing and Handling

1. Inspect materials for damage incurred during shipping.
2. Report damages to the carrier for settlement.
3. Identify parts against the packing list to ensure the proper type and quantity has been received.

4. Store in a dry location.

Kit Contents



Item	Quantity	Description
1	1	Expediter Assembly Support Cap with O-Ring Threaded Grommet Compressor Grommet Support Base with O-Ring
2	1	Junction Box Lid
3	1	Junction Box Base with O-Ring
4	1	Nut
5	1	Banding
6	1	Banding Guide
7	1	Terminal Blocks with DIN Rail (Refer to terminal specifications for maximum allowable wire size)
8	1	Junction Box Cord

Order Separately

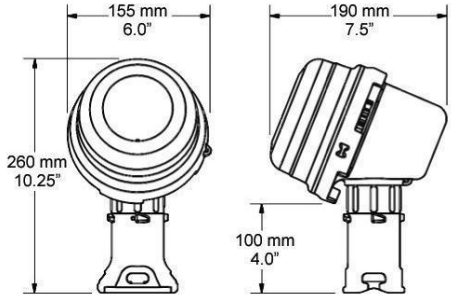
PETK Power and End Termination Kits (per cable)

PETK-1	for BSX, RSX, VSX-HT
PETK-2	for KSX, HTSX, USX
PETK-3	for HPT, FP



Item	Quantity	Description
1	1	RTV Tube
2	1	Power Connection Boot
3	1	End Cap
4	1	Tape Strip 6" (PETK-3 only)
5	1	End Termination Caution Label
6	1	GRW-G Grommet (PETK-3 only)
7	1	Ground Sleeve

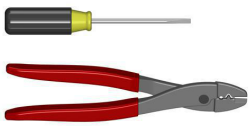
Dimensions



Installation Precautions

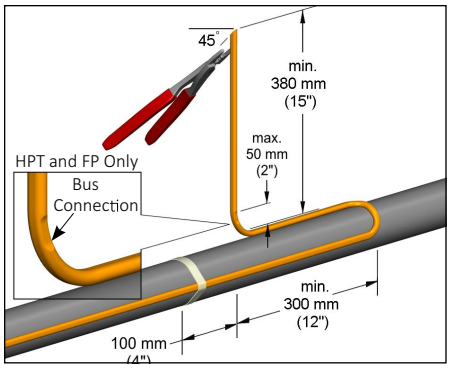
- To minimize the potential for arcing and fire caused by product damage or improper installation use ground-fault protection. The National Electrical Code (NEC) and Canadian Electrical Code (CEC) require ground-fault protection of equipment for each branch circuit supplying electric heat tracing.
- Installation must comply with Thermon requirements and be installed in accordance with the NEC, CEC, or any other applicable national and local codes.
- Component approvals and performance ratings are based on the use of Thermon specified parts only. User supplied power connection fittings must be listed or certified for intended use.
- Avoid electrostatic charge. Clean only with a damp cloth.
- De-energize all power sources before opening enclosure.
- Keep ends of heating cable and kit components dry before and during installation.
- Individuals installing these products are responsible for complying with all applicable safety and health guidelines. Proper personal protective equipment, or PPE, should be utilized during installation. Contact Thermon if you have any additional questions.

Tools Required

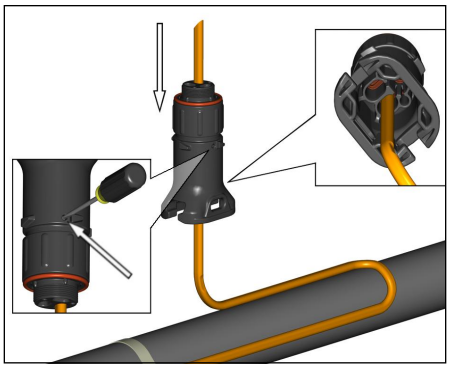


Certifications/Approvals

IP66/Type 4X -60°C ≤ Ta ≤ +55°C
Ordinary & Hazardous Locations
Class I, Division 2, Groups A, B, C, & D
Class II, Division 2, Groups F & G, Class III
Class I, Zone 1, AEx eb IIC T4-T6

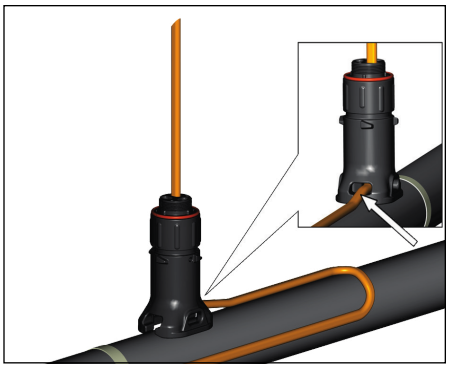


1. Locate bus connection (HPT and FP only) and cable as shown. Cut end of cable at angle to aid in piercing grommet. Leave additional cable for expansion loop. See page 5 for multiple cable installation tips.



2. Insert cable into expediter. If mounted on bottom or side of pipe, punch out weep hole

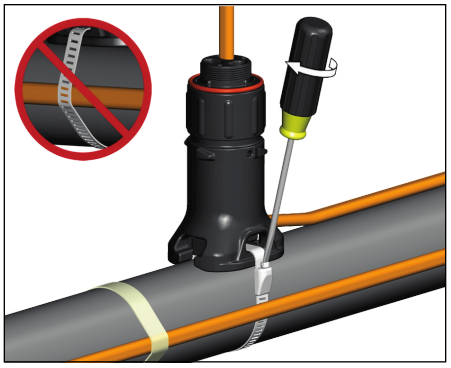
Note: For HPT and FP cable, exchange grommet in Terminator with GRW-G provided in PETK-3.



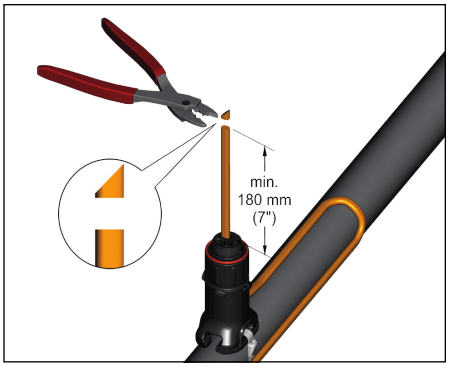
3. Slide expediter toward pipe and route cable through support base entry.



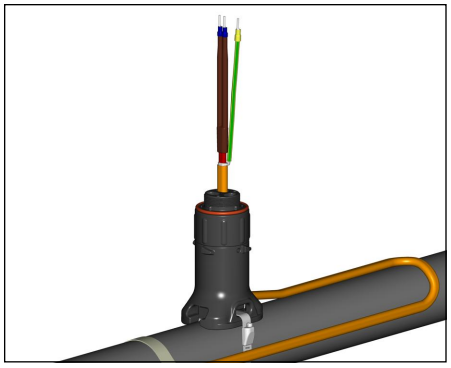
4. Insert banding guide into expediter and snap into place.



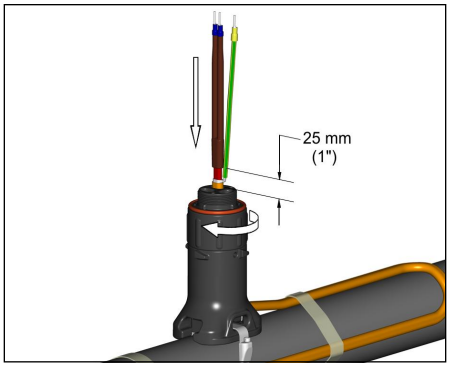
5. Mount expediter to pipe using pipe band. Do not band over cable.



6. Cut off end of cable.



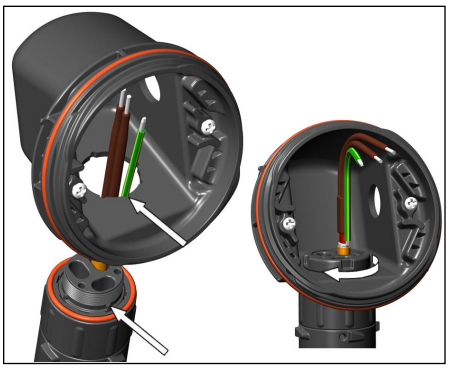
7. Terminate cable with appropriate PETK termination kit. Refer to PETK installation instructions.



8. Push excess cable back through expediter. Tighten cap securely. Tape cable expansion loop to pipe.



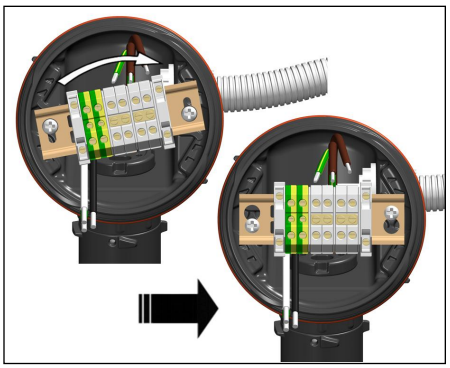
9. For power connection applications: Use dimple molded into side of junction box base to locate center of hole, drill for user supplied power connection fittings per manufacturer's recommendations.



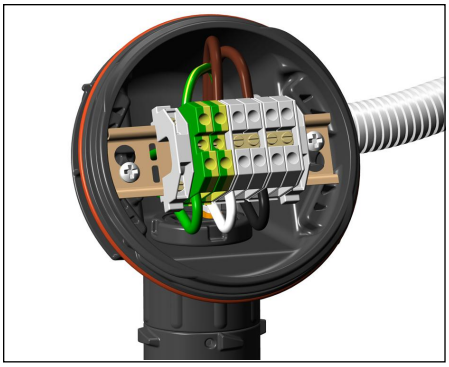
10. Mount junction box base on expediter. Make sure to align slots to properly orient junction box base. Tighten nut securely.



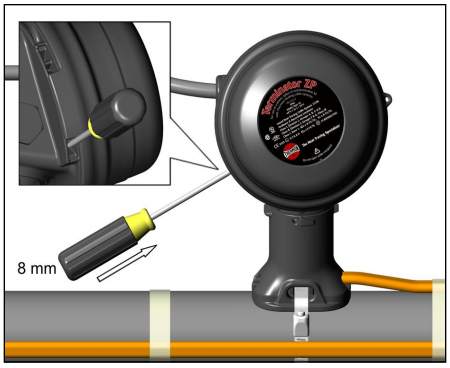
11. For power connection applications: Install power connection fittings (user supplied) and pull in power and ground wires.



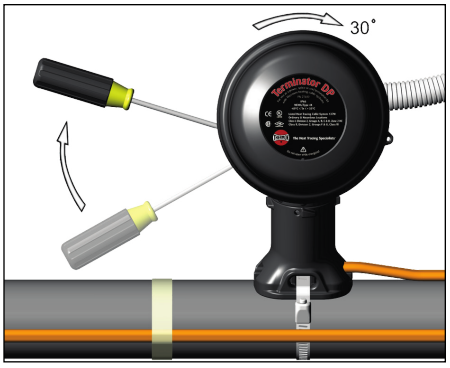
12. Install quick mount terminal blocks.



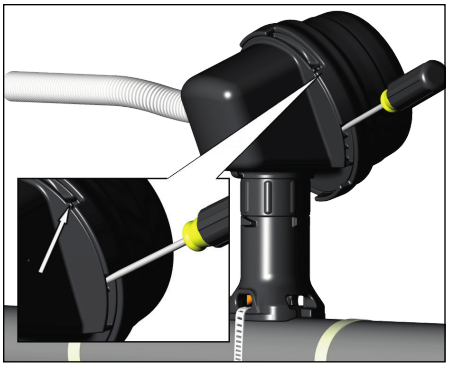
13. Complete system wiring. Refer to typical wiring details on page 5. Tightening torque 1.5 Nm–1.8 Nm (1.1 ft-lb–1.3 ft-lb).



14. Install junction box lid and twist hand tight. Insert screwdriver into ratchet slots located on side of junction box base.

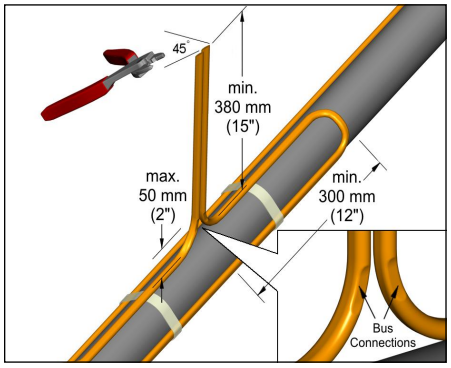


15. Use screwdriver to ratchet on junction box lid. Lid will rotate 30 degrees.

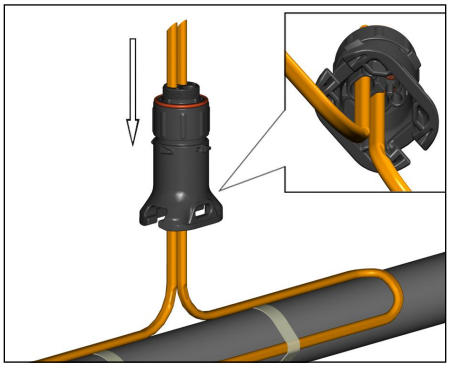


16. Lid latch mechanism fully engaged. To remove lid, repeat steps 14 and 15 but in the opposite direction.

Two Cable Layout Tips



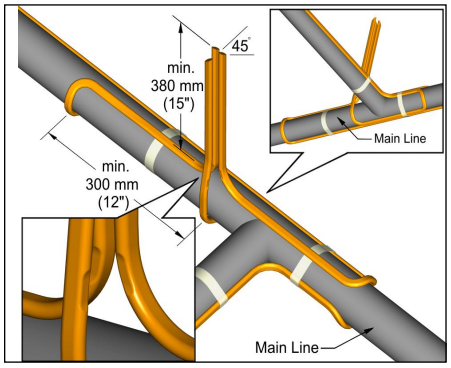
Locate bus connection (HPT and FP only) and cable as shown. Cut end of cable at angle to aid in piercing grommet. Leave additional cable for expansion loop.



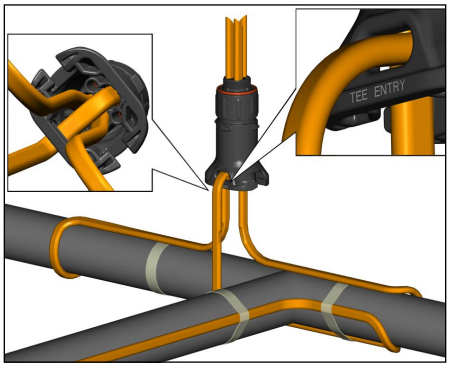
Insert two cables into expediter.

Note: For HPT and FP cable, exchange grommet in Terminator with GRW-G provided in PETK-3.

Three Cable Layout Tips

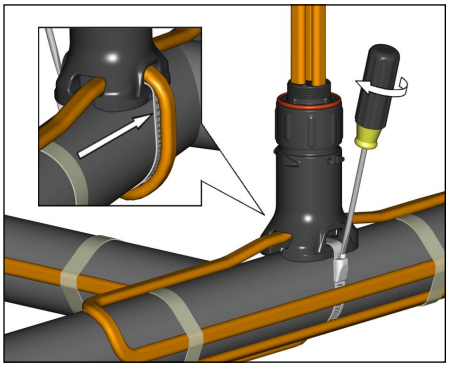


Locate bus connection (HPT and FP only) and cable as shown. Cut end of cable at angle to aid in piercing grommet. Leave additional cable for expansion loop.



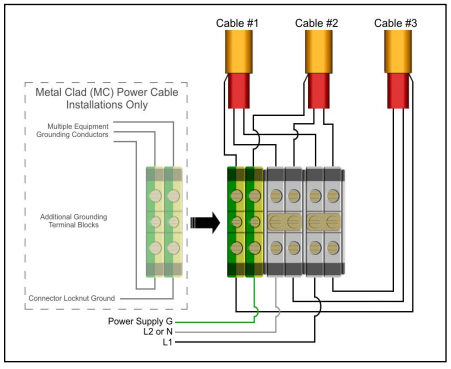
Insert three cables into expediter.

Note: For HPT and FP cable, exchange grommet in Terminator with GRW-G provided in PETK-3.

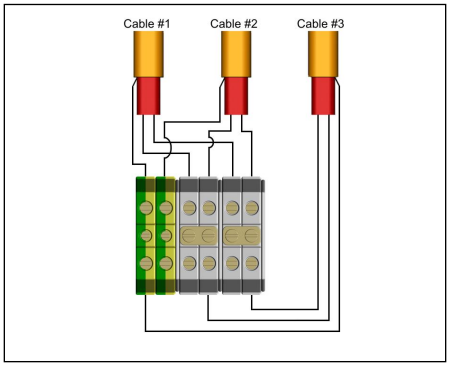


Mount expediter with three cables. Do not band over cable.

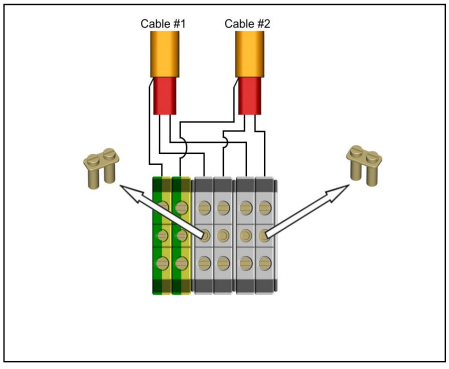
Typical Wiring Details



Power Connection (1 to 3 Cables). For 3 cable power connections, additional terminal blocks will be required when using 10mm² (#8 AWG) power supply wiring.



In-Line Splice and T-Splice



End Termination (1 to 2 Heating Cables) Remove jumpers for 2 cable terminations.



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5 COUPLING

	Type	ATEX marking	PCM reference	Manual
john crane	Serie L size 0090	II 2GD$_c$T3	C15099J000	IOM-L-EO/L-ES

L-EO & L-ES

L SERIES METAL MEMBRANE COUPLINGS

Fitting & Maintenance Instructions

FIGURE 1A. Spacer Option

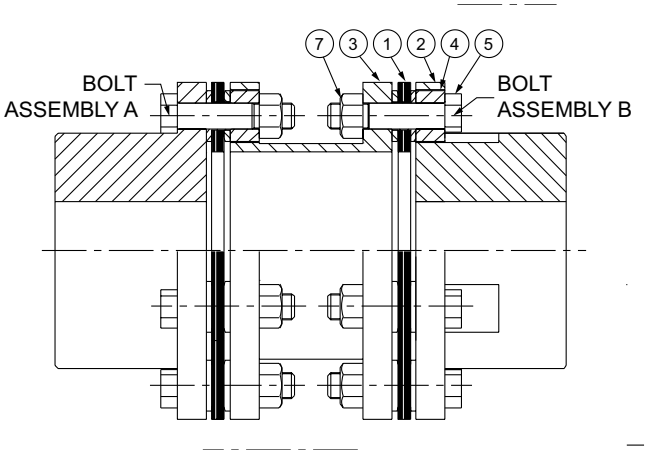
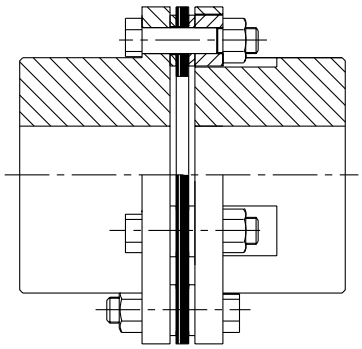


FIGURE 1B. Non-spacer Option



1 – Membrane pack

2 – Hub

3 – Spacer

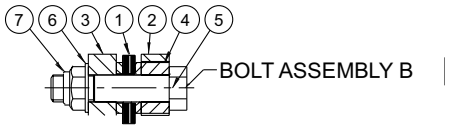
4 – Overload collar

5 – Bolt

6 – Washer (1850 and above)

7 – Locknut

FIGURE 1C. Bolt Assembly for Sizes LLES-1850 to 9025



Foreword

These instructions are provided to familiarize the user with the coupling and its designated use. These instructions must be read and applied whenever work is carried out on the coupling and must be kept available for future reference.

ATTENTION These instructions are for the fitting, operation and maintenance of the coupling as used in rotating equipment and will help to avoid danger and increase reliability. The information required may change with other types of equipment or installation arrangements. These instructions must be read in conjunction with the instruction manuals for both the driver and driven machinery. If the coupling is to be used for an application other than that originally intended or outside the recommended performance limits, John Crane must be contacted before its installation and use.

Any warranty may be affected by improper handling, installation or use of this coupling. Contact the company for information as to exclusive product warranty and limitations of liability.

If questions or problems arise, contact your local John Crane sales/service engineer or the original equipment manufacturer as appropriate.

ATTENTION John Crane couplings are precision products and must be handled appropriately. Take particular care to avoid damage to spigots, mating faces, hub bores, keyways and membranes. Do not excessively compress the coupling membranes during assembly. Refer to Table 1 for compression limits [Min gap 'X'].

These instructions are written for standard catalog products, generally designed in accordance with the drawing shown.

Safety Instructions

The following designations are used in the installation instructions to highlight instructions of particular importance.

IMPORTANT is used for items of particular concern when using the coupling.

ATTENTION where there is an obligation or prohibition concerning the avoidance of risk.

⚠ **where there is an obligation or prohibition concerning harm to people or damage to the equipment.**

Safety Instructions (continued)

IMPORTANT All reasonable care has been taken in the design and manufacture of this coupling to ensure that it will be safe when properly used. It is assumed that the user is aware of the statutory requirements of his plant.

ATTENTION When repairing John Crane's Metastream flexible disc couplings, only John Crane-approved parts should be used.

Maintenance work must only be carried out:
- **when the equipment is stationary and has been made safe**
- **by suitably trained and qualified personnel.**

Prior to installing or removing the coupling, ensure that the machinery is made safe.

Hubs must be adequately supported during installation or removal to avoid accidental damage should they slip.

The spacer must be adequately supported during installation or removal to avoid accidental damage should it slip.

ATTENTION Before starting the machinery, ensure that all necessary safety procedures are being observed.

IMPORTANT These instructions are of a general nature; if a general arrangement (GA) drawing is supplied with the coupling then all data indicated on that drawing takes precedence over information included in these instructions.

The usual extent of supply comprises:

- A hub for the driving machine (e.g., motor) shaft
- A hub for the driven machine shaft
- Two membrane pack assemblies (one for the non-spacer option)
- A spacer (distance piece). The overall length of the spacer plus membrane units is sized to suit the shaft end separation of the coupled machines
- A set of fasteners to assemble the unit between the two hub flanges

Storage

If the coupling is not to be used immediately, it should be stored away from direct heat in its original packing.

All documentation supplied with the coupling should be retained for future reference.

Spares

When requesting spares, always quote the full designation of the coupling,

The following spares can be purchased from John Crane:

- Bolt-set (ref. 4, 5, 6, 7)
- Hubs, bored to your requirement or unbored (ref. 2)
- Spacer (ref. 3)
- Membrane packs (ref. 1)

Installation

Remove coupling from packaging and carefully inspect for signs of damage. Pay particular attention to the hub bores and the spigot/recess location features, which should be free from burrs and other damage.

Installation of hubs

Prior to installing the coupling, ensure that the machinery is made safe. Hubs must be adequately supported during installation to avoid accidental damage should they slip.

L-EO & L-ES

L SERIES METAL MEMBRANE COUPLINGS

Installation (continued)

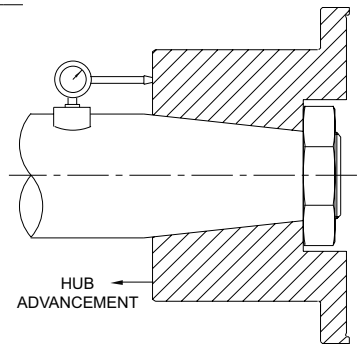
Parallel bore with keyed drive

1. Ensure the hub bore and mating shaft are clean.
2. The hub is usually installed with the hub face and shaft end flush although ±1-2 mm overhang is acceptable to correct for errors in setting distance between shaft ends (DBSE).
3. Measure the shaft diameter and hub bore to confirm the correct fit.
4. For clearance fits, install the key(s) into the shaft keyway and with a little lubrication on the shaft, slide the hub onto the shaft. The key should be a tight sliding fit in the keyway with a small clearance at the top of the key. Secure the hub to the shaft in the correct axial position with one or more grub screws.
5. John Crane recommends a light interference fit for most applications, and it may be necessary to apply heat to assist fitting of such hubs. A warm oil bath will usually be adequate. DO NOT spot heat or exceed 175°C as this may cause distortion. A thermal heat stick can be used to estimate the temperature before quickly sliding the hub onto the shaft. A suitable stop will ensure the correct axial position is located.

Taper bore with keyed drive (see Figure 2)

1. Thoroughly clean all contact surfaces and smear the tapered surfaces with oil.
2. Fit the hub onto the shaft without the key(s). Lightly hammer the hub with a soft-faced mallet to ensure metal-to-metal contact takes place.
3. Measure the distance from the end of the shaft to the face of the hub using a depth micrometer (record this measurement).
4. Securely mount a dial gauge onto the inboard hub flange and set to zero.
5. Remove the hub and fit the key(s), which should be a tight sliding fit in the keyway with a small clearance at the top of the key.
6. Refit the hub and draw up the shaft to the correct axial position indicated by the dial gauge. If an interference fit is required the hub may have to be heated (this is rare, however).
7. When the hub has cooled remeasure the distance from the end of the shaft to the face of the hub to confirm the correct axial position.
8. Fit the shaft-end retaining nut if applicable to ensure the hub is locked in position axially.
   NOTE: *The hub face may not be flush with the shaft end when taper bores are used.*

FIGURE 2



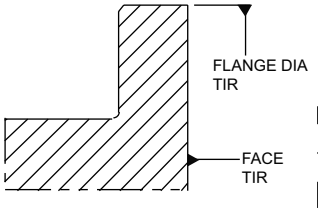
Hubs mounted by FB taper bushes

To mount hubs supplied with taper bushes, refer to the FB Taper Bushes Fitting & Maintenance Instructions, I-FB BUSH.

Unbored hubs

John Crane recommends a light interference fit for keyed hubs and shafts (e.g., a P7/h6 fit). The finished bore size can be calculated from the measured shaft diameter. When setting up the hub to machine the bore, use the hub location recess and face as datum surfaces, as shown in Figure 3. The hub face should be set such that the maximum runout does not exceed 0.025 mm TIR. The hub location recess should be set so the maximum runout does not exceed 0.03 mm TIR. Please note that for API 671 applications the required tolerances will be tighter.

FIGURE 3



Adapters

For machines where the coupling bolts to a flywheel, the coupling will be supplied with a SAE flange adapter. Refer to L-Series supplement for flywheel adaptor location and mounting details.

Shaft alignment

Align the center lines of the driving and driven machine shafts as follows:

1. Move the equipment into position.
2. Check for any soft foot and correct before commencing alignment.
3. With one machine firmly bolted down, set the DBSE according to the drawing or catalog dimension.

IMPORTANT DBSE should be measured between the inner faces of the hubs. DBSE may not be equal to the precise distance between shaft ends. In particularly, the faces of taper bored hubs may not be flush with the shaft end.

Installation (continued)

4. Align the shaft center lines both horizontally and vertically by aligning the hub flanges. John Crane recommends the reverse periphery method for accurate alignment. This can be done using dial gauges or with laser shaft alignment kit. Further details are available from John Crane on request.
5. Recheck the DBSE after the shafts have been aligned.

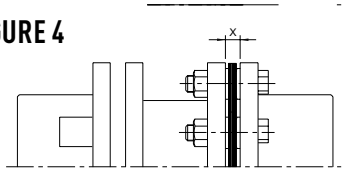
IMPORTANT The misalignment tolerances quoted in literature and on drawings allow for dynamic conditions and variations. For the best service from the coupling, John Crane recommends that installed misalignment is no more than 10% of the maximum allowable misalignment, allowance being made for any anticipated movements that will occur during operation (e.g., thermal movements on hot pumps).

Installation of the Transmission Unit

Spacer option – with flanged spacer and two membrane units

1. Support the spacer (3) in position between the hubs and align the larger sets of holes in the spacer flanges with the smaller sets of holes in the hub flanges, and vice versa.
2. Slide a membrane unit (1) between one end of the spacer and its corresponding hub, such that the holes in the membrane unit align with the holes in the spacer and hub flanges.
3. Assemble drive bolts as instructed in the Bolt Assembly section on below.
4. Moving to the other end of the coupling, check that the smaller bolt holes in the hub align with the larger bolt holes in the spacer flange, and vice versa.
5. Insert the second membrane unit (1) between the two flanges.
   NOTE: *To assist in this operation, a lever may be inserted between the spacer and hub flanges to move the spacer slightly against the flexibility of the membrane unit that was first fitted (Figure 4). Minimum gap 'X' when compressed is given in Table 1.*

FIGURE 4



6. Assemble drive bolts as instructed in the Bolt Assembly section on below ensuring all bolts are inserted from the hub towards the spacer.

Non-spacer option – with single membrane unit

1. Align the larger sets of holes in one hub flange with the smaller sets of holes in the other hub flange.
2. Slide a membrane unit (1) between the hubs, such that the holes in the membrane unit align with the holes in the hub flanges.
3. Insert drive bolts as instructed in the bolt assembly section below [Bolt Assembly A].

Finally, rotate the machinery two or three times slowly to ensure it moves freely. The coupling is now ready for continuous and trouble free service.

Bolt Assembly

Bolt assembly A

1. Sizes 0007 to 1560 Ensure the large flat machined on the head of the bolt (5) is next to the hub boss.
   Sizes 1850 to 9025 Place plain washer (6) over bolt (5).
2. Insert bolt from hub side into one of the smaller bolt holes in the hub flange and through the sleeve in the membrane unit (see Bolt Assembly A on the drawing).
3. Place collar (4) onto bolt shank (5) and secure using locknut (7).
4. Repeat Bolt Assembly A steps 1 through 3 for alternate holes around the hub flange.

Bolt assembly B

1. Place collar (4) over bolt (5), ensuring that the chamfer accommodates the bolt head radius.
2. From the hub side, pass bolt through one of the larger holes in the hub flange and insert through the sleeve in the membrane unit into the small hole of the spacer flange (see Bolt Assembly B on the drawing).
3. Sizes 0007 to 1560 Secure using locknuts (7).
   Sizes 1850 to 9025 Place plain washer (6) onto bolt shank (5). Secure using locknuts (7).
4. Repeat Bolt Assembly B steps 1 through 3 for the remaining holes around the hub flange.

NOTE:

- *Drive bolts must not be turned; hold the bolt and tighten the locknuts evenly one flange at a time in a "diametrically opposite" sequence.*
- *If a GA drawing is supplied with the coupling, tighten the nuts to the torque values quoted on that drawing, otherwise use the values quoted in Table 1.*

TABLE 1. Standard Coupling Bolt Tightness Torques

Coupling		Compressed 'X' Min. mm	Bolt	Spanner A/F mm	Bolt Tightening Torque	
					N-m	lb-ft
LDES-0007	L001	4.6	M5	8	4	3
LDES-0014	L002	4.6	M5	8	4	3
LDES-0028	L003	4.6	M6	10	6	4
LSES-0045	L004	5.0	M6	10	6	4
LSES-0090	L009	5.4	M8	13	15	11
LSES-0175	L017	6.1	M10	17	30	22
LSES-0265	L026	4.6	M12	19	54	40
LSES-0525	L052	8.1	M14	22	86	63
LSES-0810	L081	9.9	M16	24	165	122
LSES-1150	L115	10.1	M18	27	225	166
LSES-1560	L156	13.1	M20	30	322	237
LLES-1850	L185	20.4	M20	30	286	211
LLES-3000	L300	21.1	M22	32	389	287
LLES-4200	L420	21.9	M24	36	494	364
LLES-6000	L600	23.0	M30	46	981	724
LLES-9009	L909	24.1	M33	50	1335	985
LLES-9012	L912	25.0	M36	55	1714	1264
LLES-9015	L915	25.5	M36	55	1714	1264
LLES-9025	L925	27.6	M42	65	2741	2022

Operation, Inspection and Maintenance

Routine examination should include a periodic check on the tightness of fasteners and visual inspection of transmission components for signs of fatigue or wear.

If the coupled machinery is disturbed at any time, shaft alignment should be rechecked. Alignment checking is recommended if a deterioration of installation alignment during service is suspected.

Failures are rare and can generally be attributed to excessive misalignment and/or severe torsional overload. In all cases of coupling failure, the cause should be identified and corrected before replacing the coupling.

It is possible to repair the coupling by fitting replacement disc pack assemblies and, if necessary, the spacer.

Removing the coupling spacer

1. Having ensured that the equipment is safely isolated, loosen all the nuts (7) at both ends of the coupling, but do not remove them.
2. Support the spacer (3) and remove all the fasteners (4, 5, 6 and 7) from one end of the coupling.
3. Gently withdraw the membrane unit (1) from between the hub and spacer flanges, using a combined pulling and rotational action. If necessary, a lever may be used to move the spacer slightly against the flexibility of the other membrane unit (see Figure 4).
4. Remove all the fasteners from the second membrane unit and pull out the spacer and membrane unit. Separate the membrane unit from the spacer.
   - Do not attempt to dismantle the membrane units (disc pack assemblies) any further; replacements are always supplied as assembled units.
   - It is recommended that BOTH membrane units be replaced, as failure of one inevitably results in some damage to the other.

IMPORTANT Fastener sets (4, 5, 6 and 7) should be replaced after the coupling has been disassembled five times.

This section refers to couplings that bear the CE and ATEX required markings:

CE / ATEX Marking

All couplings that comply with CE and ATEX legislation will be marked as shown. This will be etched on the spacer element of the transmission unit if enough room is available.

A) Ambient temperature is standard (40ºC max)

CE Ex I $M2_C$ Ex II $2GD_C$ T6 (T85°C) john crane SL1 4LU, UK. XX

John Crane's Metastream metal membrane couplings are required for use in higher ambient temperatures, John Crane UK Ltd certifies that the equipment complies with the temperature classification range listed below in Table 2, and in all other respects complies with the type certificates.

TABLE 2

Ambient Range Marking		Group II, Category 2 GD **	Group I, Category 2 M2	Marking Option
Min.	Max.			
Unknown		T3 (T200°C)	Not Applicable	B
-55°C <	Ta < 150°C	T3 (T200°C)	Not Applicable	B
-55°C <	Ta < 90°C	T4 (T135°C)	150°C	C
-55°C <	Ta < 55°C	T5 (T100°C)	150°C	C
-55°C <	Ta < 40°C	T6 (T85°C)	150°C	A

B) Ambient temperature is (-55°C < Ta < 150ºC) OR ambient temperature is unspecified, the equipment is not suitable for mining applications, Group I, Category 2.

CE Ex II $2GD_C$ T3 (T200°C) john crane SL1 4LU, UK. XX

C) Ambient temperature is (-55°C < Ta < 90ºC)

When the ambient temp. is specified, 'T3' is replaced by the following 'T' mark (**) according to Table 2.

CE Ex I $M2_C$ Ex II $2GD_C$ ** john crane SL1 4LU, UK. XX

NOTE:

'XX' is the year of manufacture and will change. For example, for year 2016; XX = 16.
CE and EX marks must meet requirements of Annex II in Reg. (EC) No. 765/2008 and Annex II in Dir. 84/47/EEC respectively.

Operation in aggressive atmospheres

The following components contain non-metallic materials. Confirm compatibility or provide suitable protection if the coupling is to operate in an aggressive atmosphere.

- The hub electrical insulation (if supplied option) – reinforced thermosetting plastic
- Limited end float bearings (if supplied option) – PTFE based plastic

Temperature classification of John Crane's Metastream couplings

John Crane's metal membrane couplings, supplied in conformance with Directive 2014/34/EU, have to meet the classifications specified in Table 2 when used in accordance with instructions and information supplied.

T, L and H series couplings, using the disk type flexible elements, are covered by type examination certificate **Sira 02ATEX9403**.

M series couplings, using the diaphragm type flexible elements, are covered by type examination certificate **Sira 02ATEX9404**.

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Declaration of Conformity

EEC Directive 2014/34/EU of 26.02.2014
and resultant legislation and standards

We, the manufacturers – John Crane UK Ltd, – confirm that the explosion prevention requirements have been implemented for

Metastream® metal-membrane couplings

Equipment complies with the requirements of directive 2014/34/EU. It is in accordance with article 1 3. (a) of the directive and the fundamental Health and Safety requirements of Annex II, are fulfilled.

The current Type Examination Certificates for the couplings are:-

'T', 'L' & 'H' Series -	Sira 02ATEX9403
'M' Series -	Sira 02ATEX9404

The technical documentation is deposited with the designated notified body in accordance with article 13 (b) (ii) of the Directive 2014/34/EU.

SIRA Certification Services
Unit 6, Hawarden Industrial Park
Hawarden, Chester, CH5 3US
United Kingdom

Signed: 

Date: 20th July 2016

S. Pennington
(Engineering Manager - Couplings)

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Declaration of Incorporation

E.C. Machinery Directive (2006/42/EC)

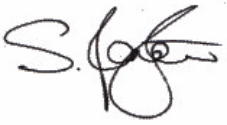
Section 1.0 - Machinery Description:
Flexible Power Transmission Ring and Diaphragm Form Membrane Couplings
Types:

'H', 'T', 'L' & 'M' Series

Section 2.0 - Applicable Harmonised Standards
ISO13709 (API 610) for centrifugal pumps
ISO14691 couplings for - General-purpose applications
ISO10441 (API 671) (opt) couplings for - Special-purpose applications

Section 3.0 - Declaration:
We, John Crane declare that under our sole responsibility for the supply of the machinery defined in Section 1.0 above, the said machinery parts are intended to be incorporated into other machinery or assembled with other machinery to constitute machinery as covered by this Directive.

The machinery parts, covered by this declaration must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive.

Signed: 

Date: 20th July 2016

S. Pennington
(Engineering Manager - Couplings)

If the products featured will be used in a potentially dangerous and/or hazardous process, your John Crane representative should be consulted prior to their selection and use. In the interest of continuous development, John Crane Companies reserve the right to alter designs and specifications without prior notice. It is dangerous to smoke while handling products made from PTFE. Old and new PTFE products must not be incinerated. ISO 9001 and ISO14001 Certified, details available on request.

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6 GEAR BOX

	Type	PCM reference	Manual
NORD DRIVESYSTEMS	SK672.1F IEC132K	FGAHXCG1256CEAA	B1000

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Intelligent Drivesystems, Worldwide Services

INSTALLATION & OPERATING INSTRUCTIONS



NORD.COM/DOCS
DOCUMENT COLLECTION

Order number: 204154484-100
Type Description: SK672.1F IEC132K

NORD DRIVESYSTEMS

Order details

Order Number:	204154484-100
Equipment number:	
Product Name:	Nordbloc helical gearbox
NORD Model Type:	SK672.1F IEC132K
Ratio:	12,56
Mounting Position:	M4
Lubricant:	ISO VG 220 synthetic oil
Lubrication Quantity:	2,700 L

Table of contents

Operation and maintenance manual

Operating and installation instructions – Gear unit
B1000 Version: 3023

Operating and installation instructions – Gear unit
B1000 Version: 2424

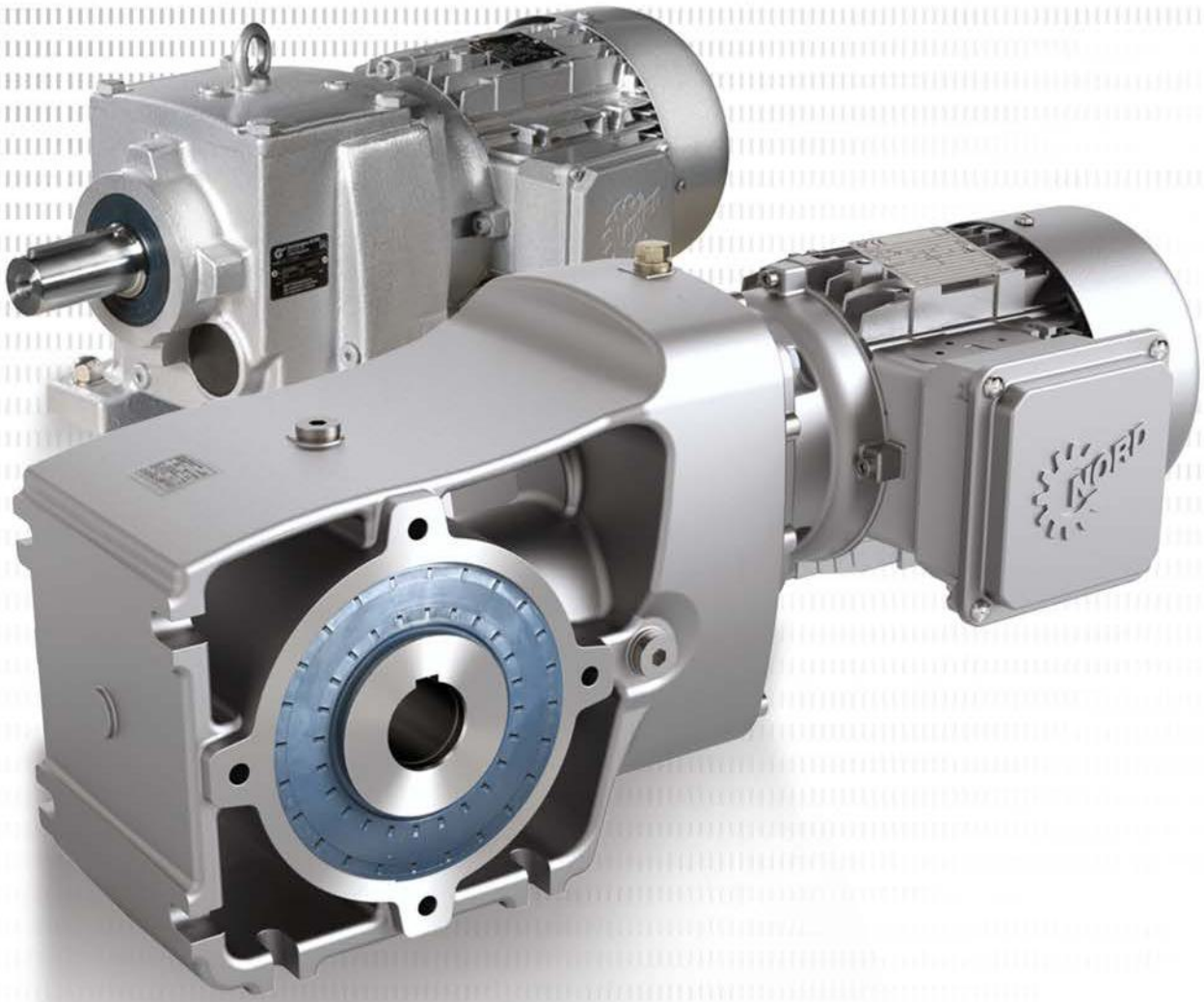
Spare part list

Spare parts list – NORDBLOC helical in-line gear unit
PL1011 Version: 1019

Spare parts list – Attachment Options
PL1080 Version: 3321

Declaration of manufacturer

Manufacturer`s declaration within the meaning of the RoHS Directive
C060000 Version: 2022



B 1000 – en

Gear units

Manual with installation instructions



Read document and keep for future reference

Read this document carefully prior to performing any work on or putting the device into operation. It is essential to read and observe the instructions in this document. They serve as the prerequisite for smooth and safe operation and the fulfilment of any warranty claims.

Contact Getriebebau NORD GmbH & Co. KG if your questions regarding the handling of the device are not answered in this document or if you require further information.

The German version of this document is the original. The German document is always decisive. If this document is available in other languages, this will be a translation of the original document.

Keep this document in the vicinity of the device so that it is available if required.

Use the version of this documentation that is valid for your device at the time of delivery. You can find the currently valid version of the documentation under www.nord.com.

Please also note the following documents:

- Gear unit catalogues,
- Documentation for the electric motor,
- Documentation for equipment which is attached or provided.

Documentation

Designation:	**B 1000**
Part no.:	**6052802**
Series:	Gear units and geared motors
Type series:	
Gear unit types:	**Helical gear unit** **NORDBLOC.1® helical in-line gear unit** **Standard helical gear unit** **Parallel shaft gear unit** **Bevel gear unit** **Helical worm gear unit** **MINIBLOC worm gear unit** **UNIVERSAL worm gear unit**

Version list

Title, **Date**	**Order number** / Version Internal code	**Remarks**
B 1000, February 2013	**6052802** / 0713	-
B 1000, September 2014	**6052802** / 3814	• General corrections
B 1000, April 2015	**6052802** / 1915	• New gear unit types SK 10382.1 + SK 11382.1
B 1000, March 2016	**6052802** / 0916	• General corrections • New bevel gear units SK 920072.1 + SK 930072.1
B 1000, September 2016	**6052802** / 3816	• General corrections • New helical gear units SK 071.1, SK 171.1, SK 371.1, SK 571.1, SK 771.1
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Table 1: Version list B 1000

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1 Safety information

1.1 Intended use

These gear units are used to transmit rotary movements. They convert velocity and torque. They are intended for use as part of a drive system in commercially used plant and machinery. The gear units must not be operated until it has been established that the plant or machinery can be safely operated with the gear unit. Suitable protective measures must be provided if failure of a gear unit or a geared motor could result in a risk to persons. The plant or machinery must comply with local legislation and directives. All applicable health and safety requirements must be met. In particular, the Machinery Directive 2006/42/EC and UKCA "Supply of Machinery (Safety) Regulations 2008" must be especially observed in the relevant areas of application.

The gear units and geared motors to which this manual with installation instructions refers to are usually components for installation in machines according to the current EC Machinery Directive 2006/42/EG.

In certain individual cases in which the gear unit or the geared motor is considered as a ready-to-install drive system for specific applications, this drive system is classified as a incomplete machine according to the current EC Machinery Directive 2006/42/EG. A corresponding declaration of incorporation is enclosed with the product.

The gear units may not be used in environments in which an explosive atmosphere can occur.

The gear units may only be used according to the information in the technical documentation from Getriebebau NORD GmbH & Co. KG. Damage to the gear unit may result if the gear unit is not used as intended and according to the information in the operating and installation manual. This may also result in personal injury.

The base or the gear unit mount must be appropriately dimensioned for the weight and torque. All of the fastenings provided must be used.

Some gear units are equipped with a cooling coil/cooling system. These gear units may only be operated if the cooling circuit is connected and in operation.

1.2 Do not make any modifications.

Do not make any structural modifications to the gear unit. Do not remove any protective guards. Do not change the original coating / paint or apply additional coatings / paints.

1.3 Performing inspection and maintenance work

Due to lack of maintenance and damage, malfunctions may occur which can result in personal injury.

- Carry out all servicing and maintenance work at the specified intervals.
- Also note that servicing is necessary after long storage periods prior to commissioning.
- Do not operate damaged gear units. The gear unit must not have any leaks.

1.4 Personnel qualification

All transport, storage, installation, commissioning and maintenance work must be carried out by qualified specialist personnel.

Qualified specialist personnel are persons who have the training and experience to recognise and avoid any possible risks.

1.5 Safety for particular activities

1.5.1 Check for transport damage

Transport damage may cause malfunctions of the gear unit, which may cause personal injury. Oil which escapes due to leaks may cause a slipping hazard.

- Check the packaging and the gear unit for transport damage.
- Do not operate damaged gear units.

1.5.2 Safety information for installation and maintenance

Before starting work on the gear unit disconnect the drive from the power supply and secure it against accidental switch-on. Allow the gear unit to cool down. Depressurise the cooling circuit lines.

Damaged or defective components, attachment adapters, flanges and covers may have sharp edges. Wear work gloves and work clothing.

1.6 Hazards

1.6.1 Hazards when lifting

Persons may be injured by falling or swinging gear units. Therefore also observe the following information:

- Cordon off a wide area around the hazard area. Take care that there is adequate space to avoid swinging loads.
- Never stand under suspended loads.
- Use adequately dimensioned means of transport which are suitable for the purpose. The weight of the gear unit can be obtained from the type plate.
- Only lift the gear unit by the factory-mounted eyebolts.

  If there are no eyebolts available, screw one eyebolt according to DIN 580 into each provided threaded hole. The eyebolts must be fully screwed in.
  Tighten the eyebolts only according to Chapter 3.1 "Transporting the gear unit". Only use the eyebolts to lift the gear unit without other components. The eye bolts are not designed for lifting the gear unit with attachments. Use the eyebolts on both the gear unit and the motor to lift a geared motor (observe the manufacturer's instructions for the motor).

1.6.2 Hazards due to rotating parts

Rotating parts cause a risk of entanglement. This may lead to severe injuries such as crushing or strangling.

- Provide contact protection. In addition to shafts, this also applies to fans as well as drives and driven elements such as belt drives, chain drives, shrink discs and couplings. Take possible run-on of the machine into consideration for the design of protective devices.
- Do not operate the drive without covers or hoods.
- Secure the drive to prevent activation during installation and maintenance work.
- For test operation do not switch on the drive without an installed driven element or secure the motor shaft key.
- Also observe the safety information in the operating and installation instructions provided by manufacturers of components supplied.

1.6.3 Hazards due to high or low temperatures

The gear unit may heat up to 90 °C during operation. Touching hot surfaces or contact with hot oil may result in burns. At very low ambient temperatures freezing may occur on contact.

- Only touch the gear unit when wearing gloves after operation or at very low ambient temperatures.
- Before starting maintenance work, allow the gear unit to cool down sufficiently after operation.
- Provide a contact guard if there is a risk that persons may touch the gear unit when it is in operation.
- Bursts of hot oil mist may be emitted from the pressure vent screw during operation. Provide a suitable guard so that persons cannot be injured by this.
- Do not place any flammable materials on the gear unit.

1.6.4 Hazards due to lubricants and other substances

Chemical substances which are used with the gear unit may be toxic. Eye injuries may result if these substances enter the eyes. Lubricants and adhesives may cause skin irritation.

Oil mist may escape when vent screws are opened.

Due to lubricants and conservation materials, gear units may be slippery and slip out of the hands. There is a slipping hazard from spilled lubricants.

- When working with chemical substances wear chemical-resistant gloves and work clothing. Wash your hands after working.
- Wear protective goggles if there is a possibility of splashed chemicals, for example when filling oil or during cleaning work.
- If chemicals enter the eyes, rinse with large amounts of cold water immediately. Consult a physician in case of symptoms.
- Observe the safety data sheets for the chemicals. Keep the safety data sheets in the vicinity of the gear unit.
- Collect spilled lubricants immediately with a binding agent.

1.6.5 Hazards due to noise

Some gear units or attached components may cause hazardous noise levels during operation. Wear hearing protection if work has to be carried out close to such gear units.

1.6.6 Hazards due to pressurised coolants

The cooling system is under high pressure. Damage or opening a cooling line which is under pressure may result in injury. Depressurise the cooling circuit before working on the gear unit.

2 Description of gear units

2.1 Gear unit types and type designations

Gear unit types / Type designations
UNICASE helical in-line gear unit **2-stage:** SK 02, SK 12, SK 22 SK 32, SK 42, SK 52, SK 62N, SK 62, SK 72, SK 82, SK 92, SK 102 **3-stage:** SK 03, SK 13, SK 23, SK 33N, SK 43, SK 53, SK 63, SK 73, SK 83, SK 93, SK 103
NORDBLOC.1® helical in-line gear unit **1-stage:** SK 071.1, SK 171.1, SK 371.1, SK 571.1, SK 771.1, SK 871.1, SK 971.1, SK 1071.1 **2-stage:** SK 072.1, SK 172.1, SK 372.1, SK 572.1, SK 672.1, SK 772.1, SK 872.1, SK 972.1 **3-stage:** SK 373.1, SK 573.1, SK 673.1, SK 773.1, SK 873.1, SK 973.1
STANDARD helical gear unit **2-stage:** SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 **3-stage:** SK 010, SK 200, SK 250, SK 300, SK 330
UNICASE parallel gear unit **2-stage:** SK 0182NB, SK 0182.1, SK 0282NB, SK 0282.1, SK 1282, SK 1282.1, SK 1282.1 GJL, SK 2282, SK 3282, SK 4282, SK 5282, SK 6282, SK 7282, SK 8282, SK 9282 **3-stage:** SK 1382.1, SK 1382.1 GJL, SK 2382, SK 3382, SK 4382, SK 5382, SK 6382, SK 7382, SK 8382, SK 9382, SK 10382, SK 10382.1, SK 11382
UNICASE bevel gear unit **3-stage:** SK 9012.1, SK 9016.1, SK 9022.1, SK 9032.1, SK 9042.1, SK 9052.1, SK 9062.1, SK 9072.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1 **4-stage:** SK 9013.1, SK 9017.1, SK 9023.1, SK 9033.1, SK 9043.1, SK 9053.1
NORDBLOC.1® bevel gear unit **2-stage:** SK 920072.1, SK 92072.1, SK 92172.1, SK 92372.1, SK 92672.1, SK 92772.1, SK 930072.1, SK 93072.1, SK 93172.1, SK 93372.1, SK 93672.1, SK 93772.1
UNICASE worm gear unit **2-stage:** SK 02040, SK 02040.1, SK 02050, SK 12063, SK 12080, SK 32100, SK 42125 **3-stage:** SK 13050, SK 13063, SK 13080, SK 33100, SK 43125
UNIVERSAL SI worm gear unit **1-stage:** SK 1SI31, SK 1SID31, SK 1SI40, SK 1SID40, SK 1SI50, SK 1SID50, SK 1SI63, SK 1SID63, SK 1SI75 **2-stage (helical worm gear unit):** SK 2SID40, SK 2SID50, SK 2SID63
UNIVERSAL SMI worm gear unit **1-stage:** SK 1SMI31, SK 1SMID31, SK 1SMI40, SK 1SMID40, SK 1SMI50, SK 1SMID50, SK 1SMI63, SK 1SMID63, SK 1SMI75 **2-stage (helical worm gear unit):** SK 2SMID40, SK 2SMID50, SK 2SMID63

Table 2: Gear unit types and type designations

Double gear units consist of two single gear units. The type designation of the SK 73/22 double gear unit, for example, means that the double gear unit consists of the single gear units SK 73 and SK 22.

Abbreviation	Description
(without)	Foot mounting with solid shaft
/31	Worm gear first stage
/40	Worm gear first stage
5	Reinforced output shaft
A	Hollow shaft
AI	Standard IEC motor attachment
AI…BRG1	Standard IEC motor attachment with manual re-lubrication
AI…RLS	Standard IEC motor attachment with integrated back stop
AL	Reinforced axial bearing
AN	Standard NEMA motor attachment
AN…BRG1	Standard NEMA motor attachment with manual re-lubrication
AN…RLS	Standard NEMA motor attachment with integrated back stop
B	Fastening element
CC	Cooling coil
D	Torque arm
DR	Pressure vent
EA	Splined hollow shaft
F	B5 flange
G	Rubber buffer for torque arm
H	Cover cap
/H10	Modular helical pre-stage for universal worm gear units
H66	IP66 cover
IEC	Standard IEC motor attachment
K	Torque bracket
L	Solid shaft both sides
M	GRIPMAXX™
MK	Motor bracket
NEMA	Standard NEMA motor attachment
OA	Oil expansion chamber
OT	Oil level tank
R	Back stop
S	Shrink disc
SCP	Screw conveyor flange
SO1	Synthetic oil ISO VG 220
V	Solid shaft (for standard helical gear units: reinforced drive)
VG	Reinforced rubber buffer
VI	Viton radial shaft seals
VL	Reinforced output bearings
VL2	Agitator version - Reinforced bearings
VL3	Agitator version - Reinforced bearings - Drywell
VS	Reinforced shrink disc
W	Free drive shaft
X	Housing foot mounting
Z	B14 flange

Table 3: Versions and options

2.2 Name plate

The name plate must be firmly attached to the gear unit and must not be subjected to permanent soiling. Please contact the NORD service department if the name plate is illegible or damaged.

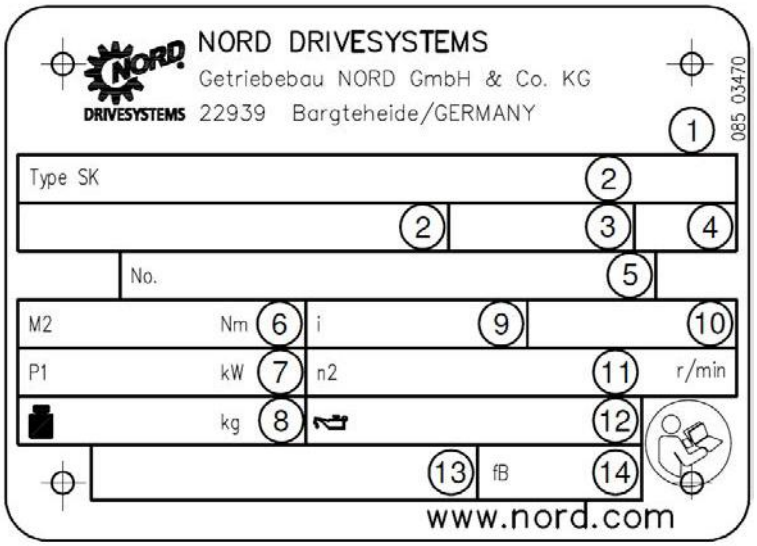


Figure 1: Name plate

Explanation

1	DataMatrix code	8	Weight
2	NORD gear unit type	9	Overall gear unit ratio
3	Operating mode	10	Installation position
4	Year of manufacture	11	Rated speed of gear unit output shaft
5	Serial number	12	Lubricant type, viscosity and quantity
6	Rated torque of gear unit output shaft	13	Customer part number
7	Drive power	14	Operating factor

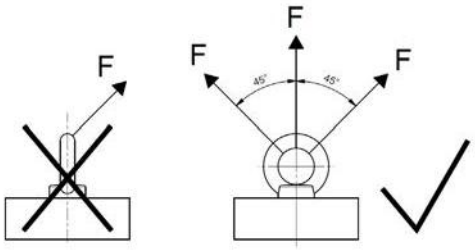
3 Transport, storage, assembly

3.1 Transporting the gear unit

⚠ WARNING

Hazard due to falling loads

- The thread of the eyebolt must be fully screwed in.
- As shown in the illustration to the right, only lift on the eyebolts vertically to the female thread and not more oblique than 45° to the vertical.
- Note the centre of gravity of the gear unit.



Only use the eyebolts attached to the gear unit for transport. If geared motors have an additional eyebolt attached to the motor, this must also be used.

Transport the gear unit with care. Impacts to the free ends of shafts may cause internal damage to the gear unit.

No additional loads must be attached to the gear unit.

Use suitable aids such as cross-beams or similar to facilitate the attachment or transportation of the gear unit. Gear units without eyebolts may only be transported with shackles and lifting straps or chains at an angle of 90° to 70° to the horizontal.

3.2 Storage and downtimes

3.2.1 General measures

- Store the gear unit in a dry space, relative humidity less than 60%.
- Store the gear unit at a temperature in the range of – 5 °C to + 50 °C without severe temperature fluctuations.
- Do not expose the gear unit to direct sunlight or UV light.
- There must be no aggressive or corrosive substances (contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity etc.) in the immediate vicinity.
- The gear unit must not be exposed to vibration or oscillation.
- Store the gear unit in the mounting position (see chapter 7.1 "Versions and mounting position"). Secure it against falling.

3.2.2 Storage and downtimes in excess of 3 months

Note the following measures in addition to Section 3.2.1 "General measures".

- Repair damages to the coating. Check if a corrosion protection agent has been applied to the flange bearing surfaces, the shaft ends and the unpainted surfaces. If required, apply a suitable corrosion protection agent to the surfaces.
- Seal all openings on the gear unit.
- The output shaft must be rotated by at least one revolution every 3 months so that the contact position of the gear teeth and the roller bearings are changed.

3.2.3 Storage and downtimes of more than 9 months

Under certain conditions, storage of 2 to 3 years is possible. The specified storage duration is only approximate. The actual storage duration depends on the local conditions. Note the following measures in addition to Sections 3.2.1 "General measures"and 3.2.2 "Storage and downtimes in excess of 3 months".

Gear units can be supplied prepared for long-term storage. The gear units are completely filled with lubricant, or a VCI corrosion protection agent is added to the gear oil. The adhesive label on the housing shows the respective information.

Conditions of the gear unit and storage area for long-term storage prior to commissioning:

- Store the gear unit at a temperature in the range of -5 °C to +40 °C without severe temperature fluctuations.
- Check if the sealing cord in the vent screw is in place. It must not be removed during storage.
- Store the gear unit in a dry space. With a relative humidity less than 60%, the gear unit can be stored for up to 2 years; with a relative humidity less than 50%, storage of up to 3 years is possible.
- In tropical regions, protect the gear unit against damage by insects.
- Gear unit components such as motors, brakes, couplings, belt drive, and cooling units must be protected for a long-term storage in accordance to their operating instructions.

In addition to the preparations listed in 4 "Commissioning", the following measures are necessary before commissioning:

- Check the gear unit for external damage.
- After storage of more than 2 years, or with storage temperatures outside the permissible range from -5 °C to +40 °C, change the lubricant and the radial shaft seals in the gear unit before commissioning.
- If the gear unit is completely filled, the oil level must be reduced according to the mounting position. For the lubricant quantity and lubricant type, refer to the information on the name plate.
- For the option with manual re-lubrication, change the bearing grease after a storage period of more than two years. The service life of the grease is reduced after a storage time or gear unit shutdown of more than 9 months (see chapter 5.2.6 "Re-greasing (Option: VL2, VL3, W, AI, AN)").

3.3 Preparing for installation

3.3.1 Check for damages

Please examine the delivery for transport and packaging damage immediately on receipt. Pay particular attention to radial shaft seals and sealing caps. Report any damage to the carrier immediately.

Do not put the drive into operation if damage such as leaks are visible.

3.3.2 Remove corrosion protection agents

All bare metal surfaces and shafts of the drive are protected with corrosion protection agents before shipping.

Thoroughly remove corrosion protection agents and any dirt (e.g. colour residues) from all shafts, flange surfaces and gear unit attachment surfaces before assembly.

3.3.3 Check rotational direction

If an incorrect rotational direction may result in damage or potential risk, check for the correct rotational direction of the output shaft during a test run before attaching it to the machine. Ensure the correct rotational direction during operation.

For gear units with an integrated back stop, switching the drive motor to the blocked direction of rotation, may result in damage to the gear unit. Gears with integrated back stops are marked with arrows on the drive/driven sides. The arrows point in the rotation direction of the gear unit. When connecting the motor and during motor control, ensure, e.g. by testing the field of rotation, that the gear unit can only operate in the direction of rotation.

3.3.4 Check ambient conditions

Make sure that no aggressive or corrosive substances which attack metal, lubricants or elastomers are present at the installation site or are subsequently expected during operation. If such substances are to be expected, contact Getriebebau NORD.

The gear unit, especially its radial shaft seals should be protected from exposure to direct sunlight.

The standard permissible ambient temperature range for synthetic gear unit oils (CLP PG … and CLP HC…) is –20 °C to +40 °C. This temperature range can be extended according to the lubricant table (see chapter 7.2.2 "Gear oils"), if all mounted materials of the gear unit and the application-related speed, torques and modes of operation allow this. Note the project planning documents of the order for this. In case of doubt, ask Getriebebau NORD.

For mineral oil (CLP), the permissible ambient temperature range in accordance to the above stated lubricant table is restricted. The lubricant type is indicated on the name plate (see chapter 2.2 "Name plate ").

For installation altitudes above 1000 m above sea level, the permissible speed and torques may be reduced. Note the project planning documents of the order for this. In case of doubt, ask Getriebebau NORD.

3.3.5 Drives with nsd tupH surface treatment

Drives with **nsd tupH** surface treatment must be electrically decoupled from other components by the use of non-conductive intermediate layers in order to prevent galvanic corrosion.

3.3.6 Installing the oil expansion chamber (Option: OA)

Mount the oil expansion chamber (Option OA) according to Chapter 3.14 "Installation of an oil expansion chamber (Option: OA)".

3.3.7 Installing the oil reservoir tank (Option: OT)

Mount the oil reservoir tank (Option OT) according to document WN 0-521 30.

A pressure vent is optionally available. If available, screw the M12x1.5 pressure relief vent into the oil reservoir tank.

3.4 Installing the gear unit

NOTICE!

Gear unit damage through overheating

- For geared motors, check that the cooling air from the motor fan can circulate around the gear unit without obstruction.

NOTICE

Damage of bearing and gear wheel

- Do not carry out any welding work on the gear unit.
- Do not use the gear unit as earth connection for welding work.

The following conditions must be met at the installation site in order to prevent overheating during operation:

- There must be adequate space around the gear unit.
- Air must be able to flow freely past all sides of the gear unit.
- For geared motors, the cooling air from the motor fan must be able to circulate around the gear unit without obstruction.
- The gear unit must not be enclosed or encased.
- The gear unit must not be exposed to high energy radiation.
- Do not direct warm exhaust air from other units onto the gear unit.
- The base or flange to which the gear unit is attached must not input any heat into the gear unit during operation.
- Do not allow dust to accumulate in the area of the gear unit

Install the gear unit in the correct mounting position (see chapter 7.1 "Versions and mounting position")**. Oil checking and oil drain screws must be accessible.**

The base or flange to which the gear unit is fitted should be vibration-free, torsionally rigid and flat. The flatness of the bolting surface on the base or flange must comply with DIN ISO 2768-2 tolerance class K.

Precisely align the gear unit with the drive shaft of the machine in order to prevent additional forces from being imposed on the gear unit due to distortion.

Fasten the gear unit to all gear unit feet of one side or to all flange holes. Use bolts with a minimum quality of 8.8. Tighten the bolts with correct torques (see chapter 7.3 "Screw tightening torques").

For foot and flange-mounted gear units (Option XZ or XF), ensure tension-free bolting. The foot mounting is used to fasten the gear unit. It is designed to absorb the reaction forces from the torque, radial and axial forces as well as the weight. B5 or B14 flanges are basically not designed to absorb the reaction forces. In case of doubt, contact Getriebebau NORD for investigation of the particular case.

Earth the gear unit housing. For geared motors, ensure the earthing via the motor connection.

3.5 Installation of a hub on solid shaft (option: V, L)

NOTICE

The gear unit may be damaged by axial forces.

Bearings, gearwheels, shafts and housings may be damaged by incorrect fitting.

- Use a suitable pulling device.
- Do not hit the hub with a hammer.

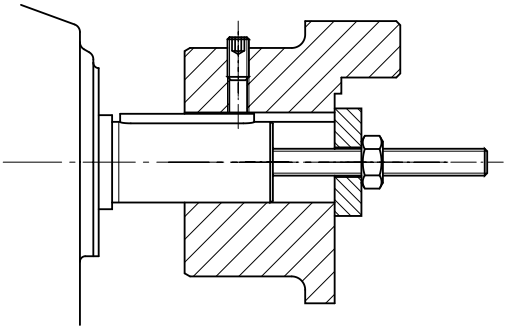


Figure 2: Example of a simple pulling device

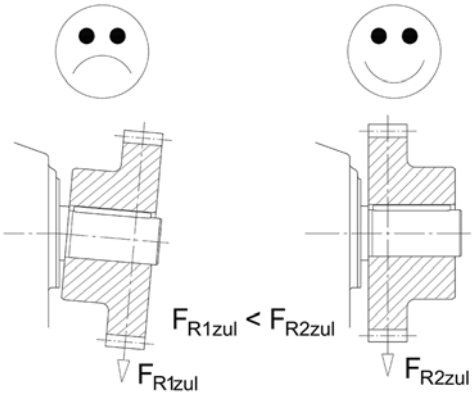
During fitting, ensure that the shaft axes are precisely aligned with each other. Comply with the permissible tolerance details provided by the manufacturer.

Information

Use the end thread of the shafts for pulling. Fitting can be facilitated by coating the hub with lubricant or heating it up to approx. 100 °C beforehand.

The maximum radial forces FR1 and FR2 and axial forces FA2 which are imposed on the driving and driven elements of the gear unit must not be exceeded (refer to the name plate). Pay particular attention to the correct tension of belts and chains.

Additional loads due to unbalanced hubs are not permitted.



The transverse force must be applied as closely as possible to the gear unit. For drive shafts with free shaft ends (Option W), the maximum permissible transverse force F_{R1} applies for the application of the transverse force to the centre of the free shaft journal. For output shafts, the application of the transverse force F_{R2} must not exceed the dimension x_{R2}. If the radial force F_{R2} is stated on the name plate, but no dimension x_{R2} is stated, application of force is assumed to be to the centre of the shaft journal.

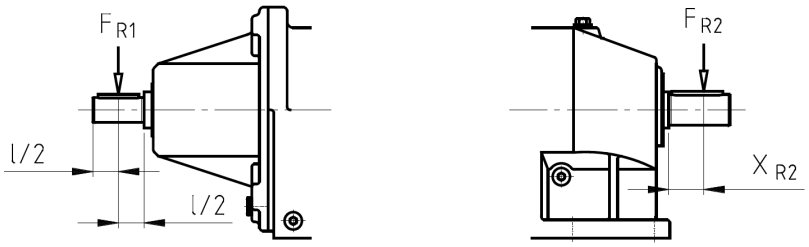


Figure 3: Permissible application of force to drive and driven shafts

3.6 Fitting push-on gear units with fastening element (option: B)

⚠ WARNING

Risk of severe injuries

If the screw fastenings of the torque arm are removed during operation, the gear unit will rotate around the output shaft.

- Secure the screw fastening against loosening, e.g. with Loctite 242 or a second nut.

NOTICE

The gear unit may be damaged by axial forces.

Bearings, gearwheels, shafts and housings may be damaged by incorrect fitting.

- Use a suitable pulling device.
- Do not strike the gear unit with a hammer.

Assembly and subsequent dismantling is facilitated by applying an anti-corrosive lubricant to the shaft before fitting (e.g. NORD Anti-Corrosion Part No. 089 00099). Excess lubricant may escape after fitting and may drip off. This escape of grease is not due to a leak in the gear unit. Thoroughly clean these points on the output shaft after a running-in time of approx. 24 hours.

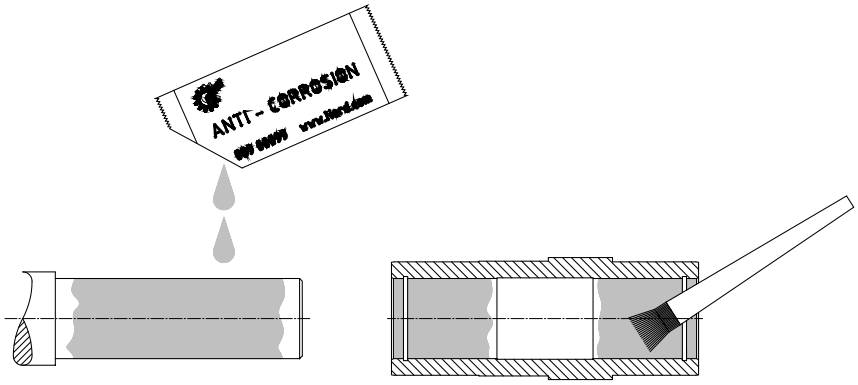


Figure 4: Applying lubricant to the shaft and the hub

For push-on gear units with cover cap IP66 (Option H66) and fastening element (Option B) the pressed-in closing cap must be pushed out before installing the gear unit. The pressed-in closing cap may be destroyed during dismantling. A 2nd closing cap is supplied as a spare part. Fit the closing cap after installation of the gear unit as described in Section 3.9 "Fitting the covers (option: H, H66)".



Figure 5: Removing the factory-fitted closing cap

The gear unit can be fitted to solid shafts with and without a shoulder using the fixing element (Option B). Tighten the fastening element bolt with correct torque (see chapter 7.3 "Screw tightening torques").

When fastening without a contact shoulder, a circlip is used in the hollow shaft for axial fastening.

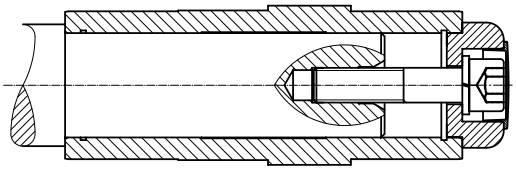


Figure 6: Gear unit mounted on shaft with a shoulder using the fastening element

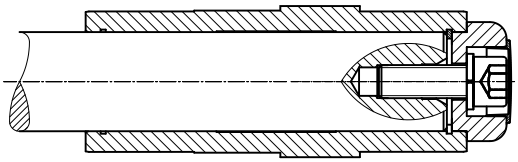


Figure 7: Gear unit mounted on shaft without a shoulder using the fastening element

A gear unit can be removed from a shaft with a shoulder e.g. using the following device.

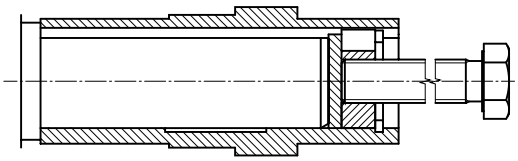


Figure 8: Removal using dismantling device

Do not distort the support when installing push-on gear units with a torque support. Tension-free mounting is aided by the rubber buffer (Option G or VG).

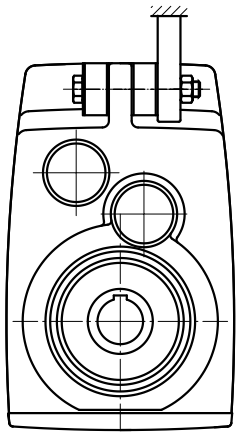
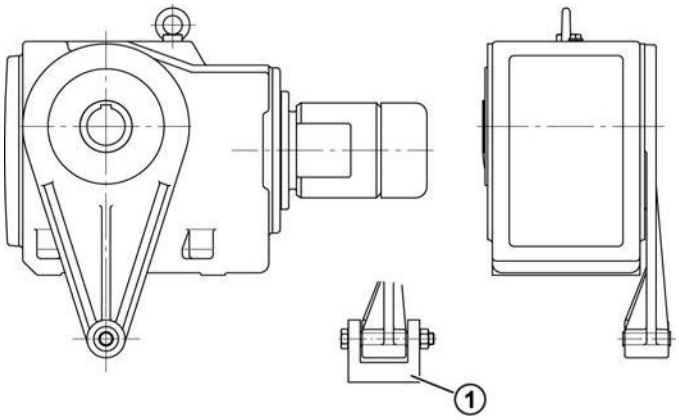


Figure 9: Mounting the rubber buffer (Option G and/or VG) on parallel shaft gear units

To fit the rubber buffer, tighten the screw fastening until there is no play between the contact surfaces when there is no load. For screw fastenings with standard thread, then rotate the fastening nut half a turn in order to pre-tension the rubber buffer. Greater pre-tension is not permissible.



Explanation	
1	Always support torque support on both sides

Figure 10: Attaching the torque support on bevel gear and worm gear units

Tighten the fastenings of the torque support with the correct torque (see chapter 7.3 "Screw tightening torques")and secure them against loosening, e.g. with Loctite 242 or Loxeal 54-03.

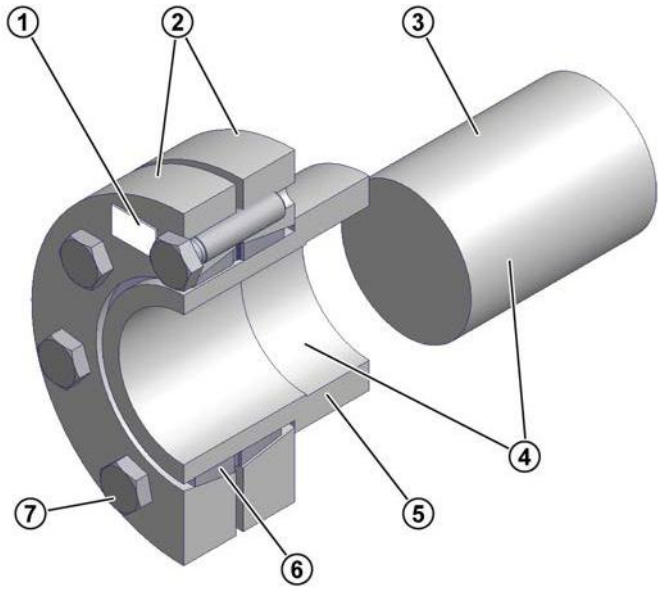
3.7 Fitting a hollow shaft with shrink disc (Option: S)

NOTICE

Risk of damage to the gear unit if the shrink disk is installed incorrectly

- Do not tighten the tensioning bolts if the solid shaft is not installed. This would permanently deform the hollow shaft.

Hollow shafts with shrink discs must be protected from dust, dirt and moisture. NORD recommends option H/H66 (see chapter 3.9 "Fitting the covers (option: H, H66)").



	Explanation
1	Shrink disc, type, part no. and torque details for tensioning bolts
2	Tensioning flanges
3	Solid shaft of machine
4	Shaft and hollow shaft bore **FREE OF GREASE**
5	Hollow shaft of gear unit
6	Double half-slotted inner ring
7	Tensioning bolts DIN 931 (933) -10.9

Figure 11: Hollow shaft with shrink disc

The shrink disc is supplied ready for fitting. It must not be dismantled prior to fitting.

The solid shaft material must have a minimum yield strength of 360 N/mm^2. This ensures that no permanent deformation occurs due to the clamping force.

If necessary, also observe the documentation from the manufacturer of the shrink disc.

Prerequisites

- The hollow shaft must be completely free of grease.
- The solid shaft of the machine must be completely free of grease.
- The external diameter of the solid shaft must be within the tolerance h6 or k6 for highly irregular operation, unless otherwise specified in the order-related dimension sheet. The fit must be according to DIN EN ISO 286-2.

Fitting procedure

1. Remove the cover, if any.
2. Loosen the tensioning bolts of the shrink disc, but do not unscrew them completely. Tighten the tensioning bolts gently by hand until there is no play between the flanges and the inner ring.
3. Lightly grease the bore of the inner ring. Push the shrink disc onto the hollow shaft until the outer clamping flange is flush with the hollow shaft.
4. Grease the solid shaft of the machine in the area which will later come into contact with the bushing in the hollow shaft. Do not grease the bronze bushing. It is essential that the tensioning seat of the hollow shaft is free of grease.
5. Insert the solid shaft of the machine into the hollow shaft so that the area around the shrink connection is completely filled.
6. Tighten the tensioning bolts of the shrink disc with approx. ¼ rotation of the bolt per turn **in sequence** in a clockwise direction by several turns.

   Use a torque wrench to tighten the tensioning bolts to the tightening torque specified on the shrink disc.
7. Check if there is an even gap between the clamping flanges. If this is not the case, the shrink disc connection must be dismantled and checked for correct fit.
8. Mark the hollow shaft of the gear unit and the solid shaft of the machine with a label in order to detect any slippage under load.

Standard disassembly procedure:

⚠ WARNING

Danger of injury due to sudden mechanical release

The elements of the shrink disc are under great mechanical tension. Sudden release of the outer rings produces high separating forces and can result in uncontrolled detachment of shrink disc components.

- Do not remove any tensioning bolts if you have not ensured that the external outer rings of the shrink disc have been released from the inner ring.

1. Loosen the tensioning bolts of the shrink disc with approx. ¼ rotation of the bolt per turn **in sequence** in a clockwise direction by several turns. Do not remove the tensioning bolts from their thread.
2. Loosen the clamping flanges from the cone of the inner ring.
3. Remove the gear unit from the solid shaft of the machine.

If a shrink disc has been in use for a long period or is dirty, dismantle it and clean it before refitting. Check the shrink disc for damage or corrosion. Replace the damaged elements if they are not in perfect condition.

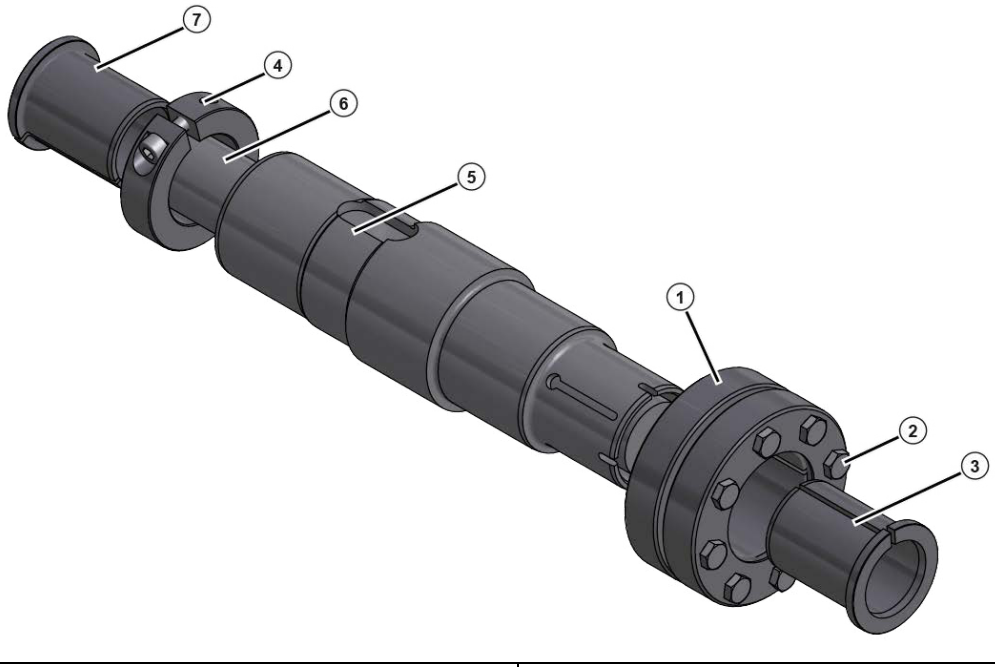
Coat the conical surfaces with MOLYKOTE® G-Rapid Plus or a similar lubricant. Place some multi-purpose grease on the screw thread and the contact surfaces of the screw heads.

3.8 Fitting a hollow shaft with GRIPMAXX™ (Option: M)

NOTICE

Damage to the gear unit due to incorrect installation

- Do not tighten the tensioning bolts of the shrink disc until the solid shaft and the torque bush are in the correct position.



1	Shrink disc	5	Hollow shaft (gear unit)
2	Tensioning bolts	6	Solid shaft (machine)
3	Torque bush	7	Support bush
4	Clamping ring		

Figure 12: GRIPMAXX™, exploded diagram

Take all expected peak loads into account when dimensioning the solid shaft or the machine shaft.

The solid shaft material must have a minimum yield strength of 360N/mm^2. This ensures that no permanent deformation occurs due to the clamping force.

Do not use any lubricants, corrosion protection agents, assembly paste or other coatings on the mating surfaces of the shaft, the bushes, the clamping rings or the shrink disc.

Prerequisites

- The solid shaft [6] must be free from burrs, corrosion, lubricants or other foreign bodies.
- The hollow shaft [5], the bushes [3], [7], the clamping ring [4] and the shrink disc [1] must be free from dirt, grease or oil.
- The solid shaft diameter must be within the following tolerances:

Metric machine shafts		
From	To	ISO 286-2 Tolerance h11(-)
Ø [mm]	Ø [mm]	[mm]
10	18	-0.11
18	30	-0.13
30	50	-0.16
50	80	-0.19
80	120	-0.22
120	180	-0.25

Imperial machine shafts		
From	To	ISO 286-2 Tolerance h11(-)
Ø [in]	Ø [in]	[in]
0.4375	0.6875	-0.004
0.7500	1.0625	-0.005
1.1250	1.9375	-0.006
2.0000	3.1250	-0.007
3.1875	4.6875	-0.008
4.7500	7.0625	-0.009

Table 4: Permissible machine shaft tolerances

Fitting procedure

1. Determine the correct installation position of the shrink disc [1] on the gear unit. Ensure that the position of the hollow shaft [5] corresponds to the details in the order.
2. Slide the support bush [7] and the clamping ring [4] onto the solid shaft [6]. Ensure that the support bush is correctly positioned. Secure the support bush [7] with the clamping ring [4] by tightening the clamping ring bolt with the appropriate torque (see chapter 7.3 "Screw tightening torques").
3. Push the gear unit onto the secured support bush [7], up to the stop against the clamping ring.
4. Slightly loosen the tensioning bolts [2] and push the shrink disc [1] onto the solid shaft.
5. Push the torque bush [3] onto the solid shaft.
6. Tighten the 3 or 4 tensioning bolts [2] until finger-tight and ensure that the outer rings of the shrink disc are pulled together parallel. Then tighten the remaining bolts.
7. Tighten the tensioning bolts successively in a clockwise direction by several turns – **not crosswise** – with approx. ¼ rotation of the bolt per turn. Use a torque wrench to achieve the tightening torque specified on the shrink disc.

   After tightening the tensioning bolts, there must be an even gap between the clamping flanges. If this is not the case, dismantle the shrink disc connection and check the fit.

Dismantling procedure

⚠ WARNING

Danger of injury due to sudden mechanical release

The elements of the shrink disc are under great mechanical tension. Sudden release of the outer rings produces high separating forces and can result in uncontrolled detachment of shrink disc components.

- Do not remove any tensioning bolts if you have not ensured that the external outer rings of the shrink disc have been released from the inner ring.

1. Unscrew the tensioning bolts [2] of the shrink disc in sequence, with approximately half a turn (180°), until the inner ring of the shrink disc can be moved.
2. Pull the shrink disc [1] with the torque bush [3] off from the shaft.
3. Remove the outer rings of the shrink disc from the conical inner ring. For this it may be necessary to lightly tap the bolts with a soft-face hammer or to lightly lever the outer rings apart.
4. Pull the gear unit off the machine shaft.

Clean all individual components before refitting. Check the bushes and the shrink disc for damage or corrosion. Replace the bushes and the shrink disc if they are not in perfect condition. Coat the conical seat of the outer rings and the outside of the clamping ring with MOLYKOTE® G-Rapid Plus or a similar product. Place some multi-purpose grease on the screw thread and the contact surfaces of the screw heads.

3.9 Fitting the covers (option: H, H66)

Use all fastening screws. Secure the fastening screws by coating them with securing lubricant, e.g. Loctite 242, Loxeal 54-03. Tighten the fastening screws with the correct torque (see chapter 7.3 "Screw tightening torques").

For covers with Option H66, press in the new condition closing cap by tapping it lightly with a hammer.

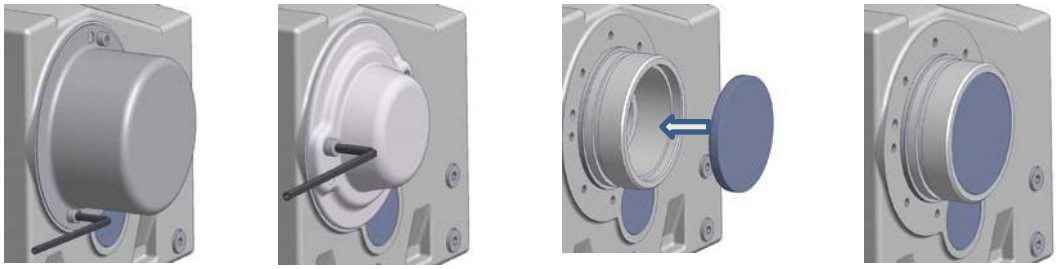


Figure 13: Fitting the covers, Option SH, Option H, and Option H66

3.10 Fitting the covers

Some versions of universal worm gear units are delivered as standard with a plastic cover cap. The cover cap protects the radial shaft seals against the entry of dust and other contamination. The cover cap can attached on the A side or the B side. It can be removed by hand without tools.

NOTICE

Damage to the expansion elements of the cover cap

- Do not jam the cover cap when pulling it off or attaching it.

Pull the cover cap off vertically prior to the installation of the universal worm gear unit. After completing the fitting, attach the cover cap onto the right side by attaching the expanding elements into the threaded holes on the output flange.



Figure 14: Disassembly and assembly of the cover cap

3.11 Fitting a standard motor (Option: IEC, NEMA, AI, AN)

Depending on the gear unit type, exceptions are permissible with the maximum motor weights. These are indicated in the tables below and must not be exceeded.

Maximum permitted motor weights														
Motor size	63	71	80	90	100	112	132	160	180	200	225	250	280	315
Max. motor weight [kg]	**25**	**30**	**50**	**50**	**80**	**80**	**100**	**250**	**250**	**350**	**500**	**1000**	**1000**	**1500**
SK 32, SK 3282, SK 9032.1, SK 32100, SK 772.1, SK 773.1					100	100								
SK 42, SK 4282, SK 9042.1, SK 42125					100	100	130	200						
SK 52, SK 63, SK 5282, SK 6382, SK 9052.1, SK 872.1, SK 873.1, SK 972.1, SK 973.1					100	100	130							
SK 62, SK 73, SK 83, SK 6282, SK 7382, SK 8382, SK 9072.1					100	100	130							
SK 72, SK 82, SK 93, SK 103, SK 7282, SK 8282, SK 9382, SK 10382.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1							130							
SK 920072.1, SK 92072.1, SK 0, SK 071.1, SK 0182.1, SK 930072.1, SK 93072.1, SK 93372.1			40											
SK 1382NB, SK 1382.1, SK 92372, SK 92372.1, SK 12063, SK 372.1, SK 371.1, SK 1382.1 GJL					60									
SK 971.1										250 [1]				
SK 1091.1											350 [2]			

1 In mounting positions M2, M4, M6: 350 kg, otherwise, as indicated.

2 In mounting positions M1, M2, M4, M5, M6: 500 kg, otherwise, as indicated.

Table 5: Motor weights IEC motors

Maximum permitted motor weights														
Motor size		56C		140TC		180TC	210TC	250TC	280TC	320TC	360TC	400TC		
Max. motor weight [kg]		**30**		**50**		**80**	**100**	**200**	**250**	**350**	**700**	**700**		
SK 62, SK 72, SK 73, SK 83, SK 93, SK 9072.1, SK 6282, SK 7282, SK 7382, SK 8382, SK 9382											500	500		

Table 6: Motor weights NEMA motors

Fitting a standard motor to the IEC adapter (Option IEC) or NEMA adapter (Option NEMA)

1. Clean the motor shaft and the flange surfaces of the motor and motor adapter, and check them for damage. Check the motor dimensions. The dimensions must be within the tolerances according to DIN EN 50347 or NEMA MG1 Part 4.
2. For motor sizes 90, 160, 180 and 225, position the spacer bushes that may be provided onto the motor shaft.
3. Position the half-coupling onto the motor shaft so that the motor parallel key engages into the groove of the half-coupling. Tighten the half-coupling in accordance with the motor manufacturer's instructions. With standard helical gear units, observe dimension B between the half-coupling and the collar (see "Figure 15"). Adjust the coupling in accordance with the specifications indicated on the adhesive plate for certain **NEMA adapters** .
4. If the half-coupling contains a setscrew, secure the coupling axially on the shaft. Coat the setscrew with securing adhesive before screwing it in, e.g. Loctite 242 or Loxeal 54-03, and tighten it with the correct torque (see chapter 7.3 "Screw tightening torques").
5. Sealing of the flange surfaces is recommended if the motor is installed outside or in a humid environment. Completely coat the flange surfaces with surface sealant, e.g. Loctite 574 or Loxeal 58-14.
6. Attach the motor to the adapter. Also attach the enclosed ring gear or the enclosed gear sleeve (see figure below).
7. Tighten the adapter bolts with the correct torque (see chapter 7.3 "Screw tightening torques").

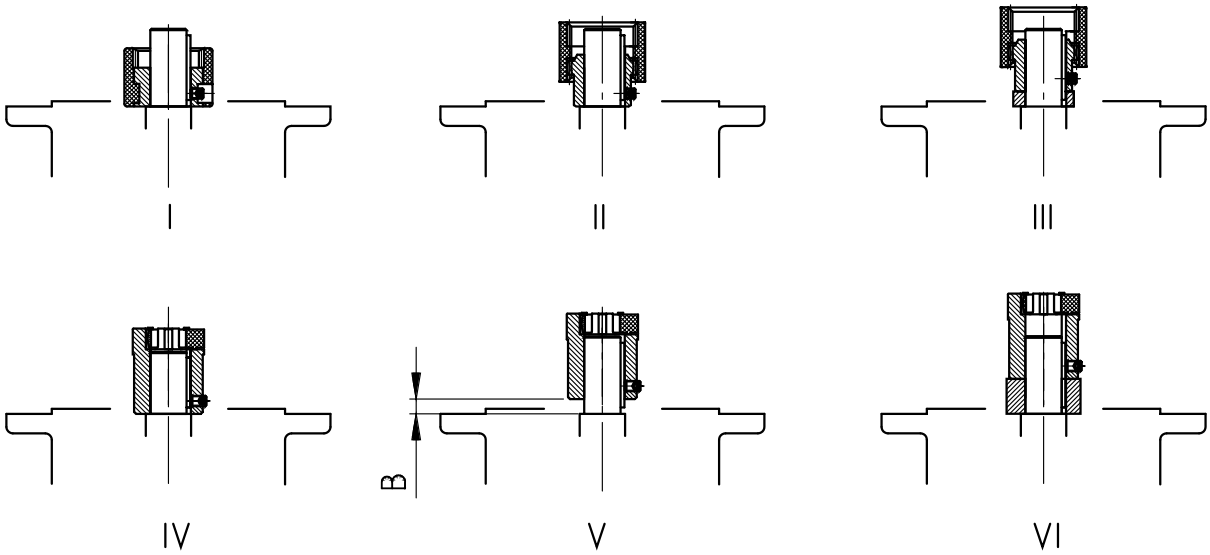


Figure 15: Fitting the coupling onto the motor shaft - various types of coupling

I Curved tooth coupling (BoWex®), one-piece

II Curved tooth coupling (BoWex®), two-piece

III Curved tooth coupling (BoWex®), two-part with spacer bush

IV Claw coupling (ROTEX®), two-piece

V Claw coupling (ROTEX®), two-piece, observe dimension B:

Standard helical gear units: SK 0, SK 01, SK 20, SK 25, SK 30, SK 33 (2-stage) SK 010, SK 200, SK 250, SK 300, SK 330 (3-stage)		
	IEC size 63	IEC size 71
Dimension B (Fig. V)	B = 4.5 mm	B = 11.5 mm

VI Claw coupling (ROTEX®), two-piece with spacer bush

Fitting a standard motor to the IEC adapters AI160–AI315 (Option AI) or NEMA adapters AN250TC–AN400TC (Option AN)

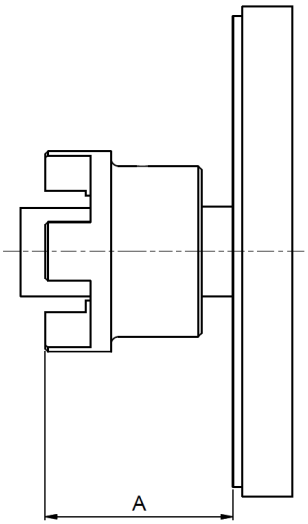
1. Clean the motor shaft and the flange surfaces of the motor and motor adapter, and check them for damage. Check the motor dimensions. The dimensions must be within the tolerances according to DIN EN 50347 or NEMA MG1 Part 4.
2. Remove the motor shaft's key.

   Note: For adapter AI315, the key does not have to be dismantled. Continue with Step 5. of this description.
3. With the adapters AI160, AI180 and AI225, attach the spacer bush supplied with the product.
4. Attach the key supplied with the product (see "Table7: Motor parallel keys").
5. For the attachment of the half-coupling, heat up the half-coupling to approx. 100 °C. Position the half-coupling as follows:
   - Push AI160, AI180 and AI225 on to the spacer bush.
   - Push AI200, AI250, AI280 and AI315 on to the motor shaft collar.
   - AN250TC–AN400TC until dimension A has been attained (see "Table 8: Position of the half-coupling on the NEMA motor shaft")

6. If the half-coupling contains a setscrew, secure the coupling axially on the shaft. Coat the setscrew with securing adhesive before screwing it in, e.g. Loctite 242 or Loxeal 54-03, and tighten it with the correct torque (see chapter 7.3 "Screw tightening torques").
7. Sealing of the flange surfaces is recommended if the motor is installed outside or in a humid environment. Completely coat the flange surfaces with surface sealant, e.g. Loctite 574 or Loxeal 58-14.
8. Attach the motor to the adapter. Also attach the enclosed ring gear or the enclosed gear sleeve (see **Figure 15: Fitting the coupling onto** the motor shaft - various types of coupling). For the AN360TC and AN400TC adapters, attach the adapter flange to the motor first, and screw the motor onto the adapter.
9. Tighten the adapter bolts with the correct torque (see chapter 7.3 "Screw tightening torques").

IEC/NEMA type	Coupling	Shaft ø	Motor shaft's key
AI 160	R42	42	AB12x8x45
AI 180	R48	48	AB14x9x45
AN 250	R42	41.275	B3/8x3/8x1 1/2
AN 280	R48	47.625	B1/2x1/2x1 1/2
AI 200	R55	55	B16x10x50x
AN 320	R55	53.976	B1/2x1/2x1 1/2
AI 225	R65	60	B18x11x70
AN 360 R350	R65	60.325	B5/8x5/8x2 1/4
AI 250	R75	65	B18x11x70
AI 280	R75	75	B20x12x70
AN 360 R450	R75	60.325	B5/8x5/8x3 1/8
AN 400	R75	73.025	B3/4x3/4x3 1/4

Table7: Motor parallel keys



NEMA type	Coupling size	A [mm]
N250TC R350	R42	83
N250TC 300S	R42	86
N280TC R350	R48	87.5
N280TC 300S	R48	102.5
N320TC	R55	91
N360TC/350	R65	126.5
N360TC/450	R75	150.5
N400TC	R75	164.5

Table 8: Position of the half-coupling on the NEMA motor shaft

3.12 Mounting of the cooling coil onto the cooling system

WARNING

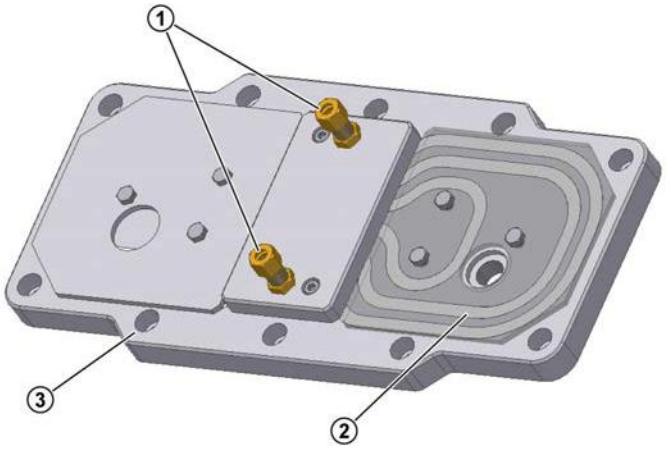
Risk of injury due to pressure discharge

- Ensure that the pressure is released from the cooling circuit before carrying out any work on the gear unit.

NOTICE

Damage to the cooling coil

- Do not twist the connection pieces during installation.
- Ensure load-free assembly of the connection pipes or hoses.
- Even after the installation, no external forces must be able to act on the cooling coil via the connection pieces.
- Prevent vibrations from reaching the cooling coil during operation.



Explanation

1 Connection pieces with cutting ring screw connections
2 Cooling coil
3 Housing cover

Figure 16: Cooling cover

The cooling coil is installed in the housing cover. For the inlet and outlet of cooling fluid, connection pieces with cutting ring screw connections according to DIN 2553 are provided on the housing cover for a connection of a pipe with an external diameter of 10 mm.

Remove the sealing plug from the screw necks prior to assembly and flush the cooling coil to prevent any contamination of the cooling system. Then, connect the connection pieces with the coolant circuit. The flow direction of the coolant is irrelevant.

3.13 Installation of the external oil/air cooler

Information

Installation information

To ensure optimal air supply, the distance between the cooling unit and the wall should be at least 600 mm.

3.13.1 Connecting hose lines

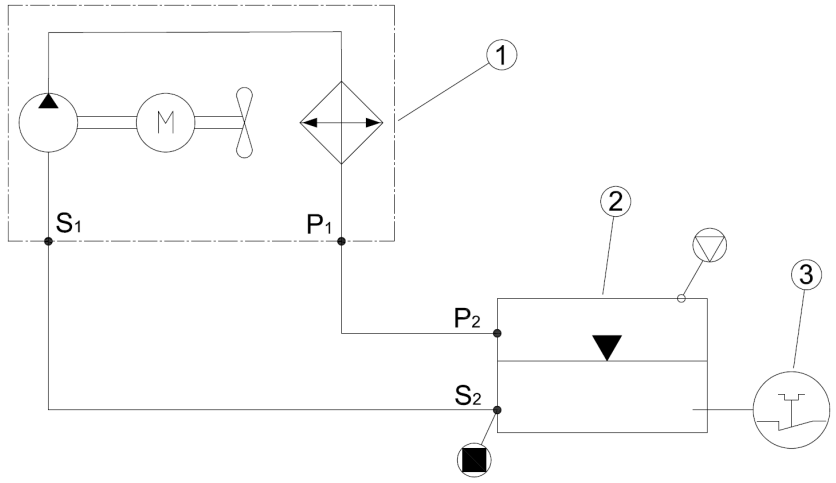
NOTICE

Gear unit is supplied without oil filling

- Fill the gear unit with oil before commissioning.

The scope of delivery includes the oil/air cooler and the necessary hose lines.

Connect the oil/air cooler according to the illustration. Make sure that the oil/air cooler has not been mounted above the gear unit.



1	Oil/air cooler
2	Gear unit
3	Optional temperature monitoring
S	Intake connection/oil drain of the gear unit
P	Gear unit pressure connection/connection above or below the oil level

Figure 17: Connection of the oil/air cooler

Fasten the union nuts according to 7.3 "Screw tightening torques".

After assembling the oil lines, fill the gear unit housing with the gear oil type that is printed on the name plate. The oil quantity on the name plate is a guide value and may vary depending on the gear ratio. Approximately 4.5 l of oil are additionally required for the hose lines. When filling, use the oil level screw as an indicator for the correct oil level.

3.13.2 Electrical connection

Ensure the electrical connection according to the operating and installation instructions of the oil/air cooler. Make sure that the direction of rotation of the motor or the fan wheel matches the information provided by the manufacturer of the cooling unit.

3.14 Installation of an oil expansion chamber (Option: OA)

3.14.1 Installation of the sizes I, II and III

The oil expansion chamber is available in 3 sizes with different capacities:

- 0.7 l (size I)
- 2.7 l (size II)
- 5.4 l (size III)

The oil expansion chamber must be mounted vertically with the hose connection facing downwards and the vent screw facing upwards. Taking the hose length into account, the container should be fitted as high as possible. For suggestions for the position of the oil expansion chamber, see the following illustration.

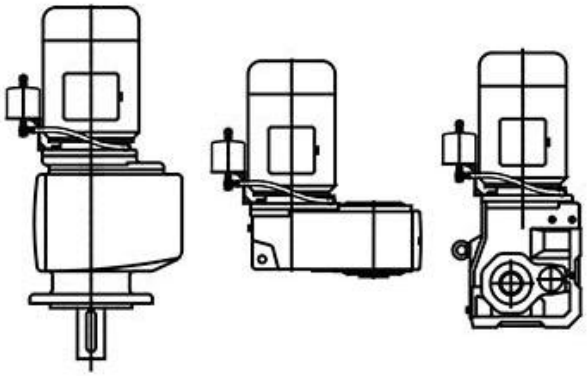


Figure 18: Position of the oil expansion chamber

1. After installing the gear unit, remove the top screw plug.
2. Screw in the reduction or extension with the existing sealing ring.

   For gear units having an oil maintenance bore with an M10x1 thread, also consider document WN 0-521 35.

3. If the fastening screw is screwed into a through hole, seal the thread with a medium-strength screw-securing material such as LOXEAL 54-03 or Loctite 242.
4. Screw on the expansion tank. If the necessary screw insertion depth of 1.5 × d can no longer be achieved, use a 5 mm longer screw. If a longer screw cannot be fitted, use a stud and a nut with appropriate dimensions.
5. Attach the vent hose with the enclosed hollow screws and seals.
6. Screw the enclosed M12 x 1.5 vent plug and sealing ring into the tank.

3.14.2 Installation of sizes 0A and 0B

The oil expansion chamber must be mounted vertically with the connection pipe facing downwards and the vent screw facing upwards. Install the container as high as possible. Suggestions for the position of the oil expansion chamber see Figure 18. Note that with the M4 configuration with terminal box position in position 2, the installation of the oil expansion chamber is not possible.

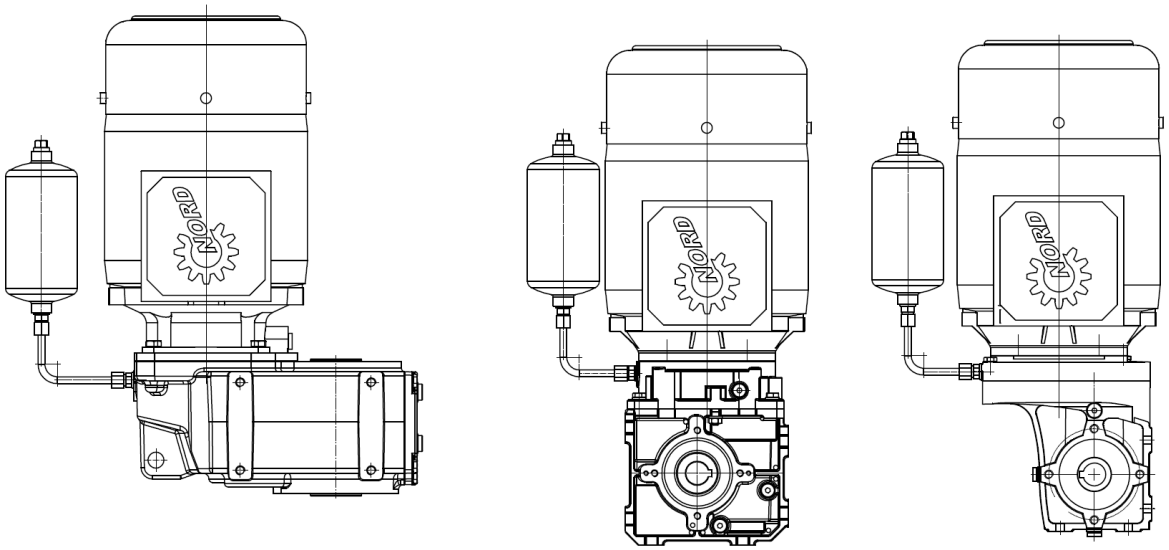


Figure 19: Position of the oil expansion chamber

1. After installing the gear unit, remove the oil level screw or the top screw plug.
2. Install the oil expansion chamber according to Figure 18. Align it parallel to the motor shaft.
3. Maintain the maximum tightening torque of 12 Nm for screwing the oil expansion chamber onto the gear unit housing.

3.15 Subsequent painting

For retrospective painting of the gear unit, the shaft sealing rings, rubber elements, pressure vent screws, hoses, type plates, adhesive labels and motor coupling components must not come into contact with paints, lacquers or solvents, as otherwise the components may be damaged or made illegible.

3.16 Electrical connection of the mounted motor

For geared motors (gear units with attached electric motor), the electric motor has its own operating instructions. If these operating instructions are not available, please request them from the motor manufacturer Ensure the electrical connection of the motor in accordance with the operating instructions of the motor. Usually, there is a connection diagram in the terminal box of the motor.

4 Commissioning

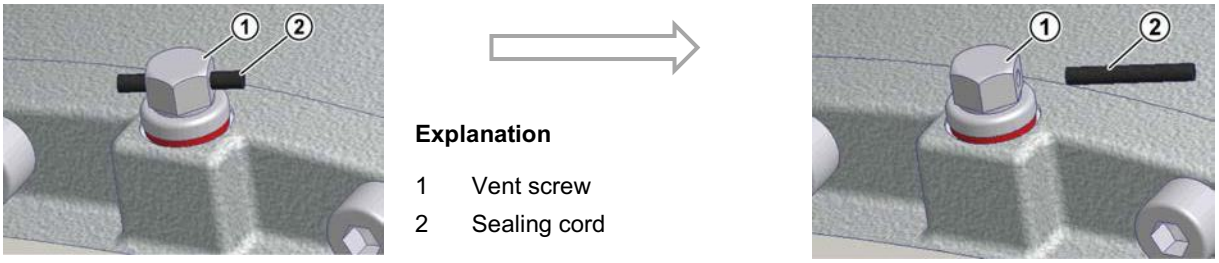
4.1 Checking the oil level

Check the oil level before commissioning (see chapter 5.2 "Service and maintenance work").

4.2 Activating the vent

If venting of the gear unit is provided, the vent or the pressure vent must be activated before commissioning. Double gear units consist of two single units, are equipped with 2 oil chambers and possibly 2 vents.

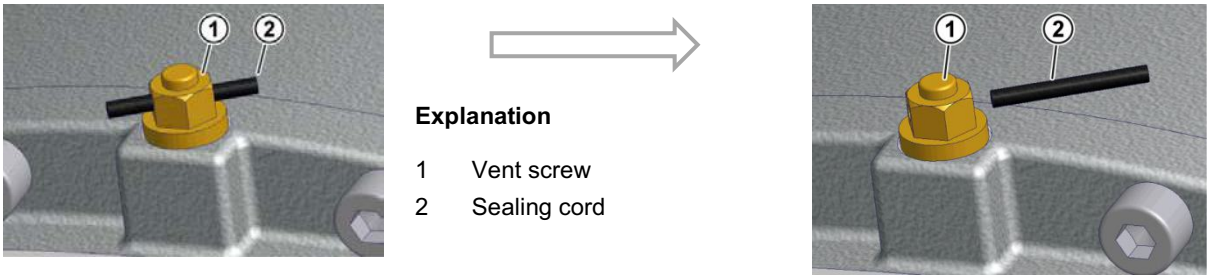
To activate, remove the sealing cord in the vent screw. For the vent screw position, see Section 7.1 "Versions and mounting position".



Explanation

1 Vent screw
2 Sealing cord

Figure 20: Activating the vent screw

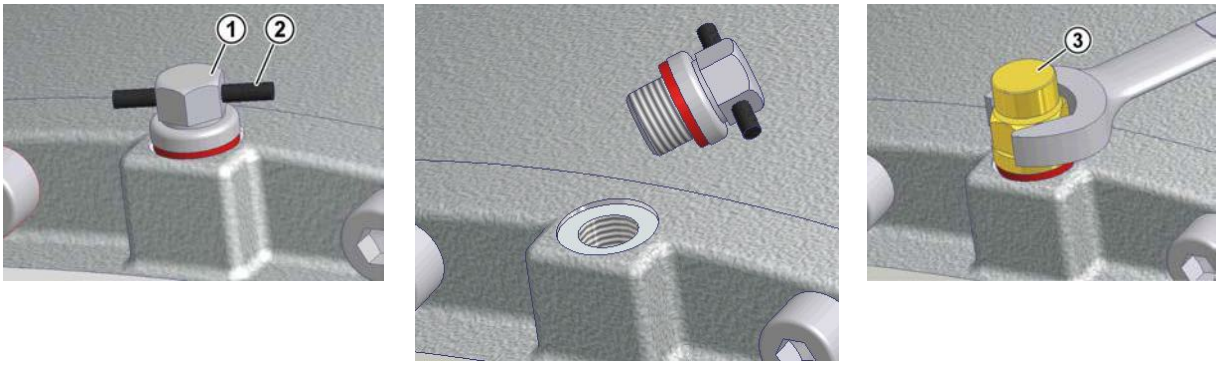


Explanation

1 Vent screw
2 Sealing cord

Figure 21: Activating the pressure vent screw

Special pressure vents are supplied as loose parts. Unscrew the vent screw and replace it with the special pressure vent and seal.



Explanation

1	Vent screw	2	Sealing cord	3	Special vent screw

Figure 22: Removing the vent plug and fitting the special pressure vent

4.3 Activating the automatic lubricant dispenser

Some gear unit types with standard motor (Option IEC/NEMA, not AI/AN) have an automatic lubricant dispenser for the roller bearings. The lubricant sensor must be activated prior to commissioning the gear unit The cartridge case cover of the adapter for attaching an IEC/NEMA standard motor has a red information sign for activation of the lubricant dispenser. Opposite to the lubricant dispenser there is a grease escape hole which is closed with a G1/4 cap screw. After activation of the lubricant dispenser, the cap screw can be removed and replaced with the grease collection container (Part No. 28301210) which is supplied separately with the delivery.

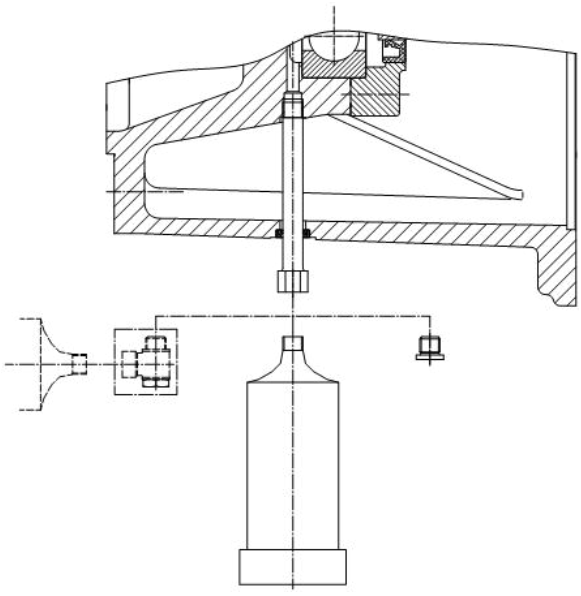
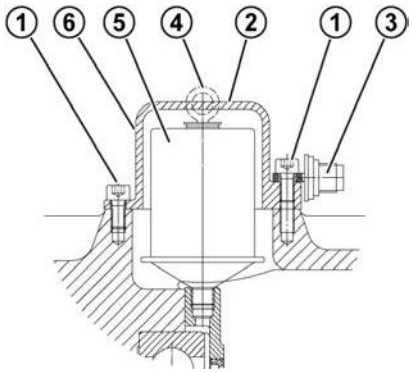


Figure 23: Fitting the grease collection container

Procedure:

1. Loosen and remove the cap screws.
2. Remove the cartridge cover.

3. Screw the activation screw into the lubricant dispenser until the lug breaks off at the defined fracture point.
4. Re-fit the cartridge cover. Attach the cartridge cover with the cap screws (see chapter 7.3 "Screw tightening torques").
5. Mark month and year of activation on the adhesive label.



	Explanation
1	Cap screws M8 x 16
2	Cartridge cover
3	Activation screw
4	Lug
5	Lubricant sensor
6	Position of adhesive label

Figure 24: Activating the automatic lubricant sensor with standard motor mounting

Adhesive label



Figure 25: Adhesive label

4.4 Cooling coil (Option: CC)

NOTICE

Gear unit damage due to overheating

- Only start up the drive after the cooling coil has been connected to the cooling circuit, and the cooling circuit has been put into operation.

If there is a danger of frost, a suitable anti-freeze solution must be added to the cooling water in due time.

The coolant must have a thermal capacity similar to water.

- Specific thermal capacity of water at 20 °C: c = 4.18 kJ/kgK

Clean, industrial water without any air bubbles or sediments is recommended as a coolant. The hardness of the water must be between 1 dH and 15 dH; the pH value must be between pH 7.4 and pH 9.5. No aggressive liquids may be added to the coolant!

The **coolant pressure** must not exceed **8 bar**. We also recommend fitting a pressure reducer at the coolant inlet to avoid damage due to excessive pressure.

The **coolant inlet temperature** must not exceed 40 °C. **10 °C** are recommended.

The required **coolant flow rate** is **10 l/min**.

The temperature and the flow rate of the cooling fluid must be monitored and ensured. The drive must be shut down if the permissible temperature is exceeded.

4.5 External oil/air cooler

NOTICE

Gear unit damage due to overheating

- Only start up the drive after the external oil/air cooler has been connected and put into operation.

NOTICE

Damage due to high line pressure

- In case of cold starting, ensure that the maximum permissible viscosity of the lubricant is not exceeded, in order to prevent excess pressure in the pump and the lubrication lines.

Main components of the external oil/air cooler:

- Motor
- Pump
- Heat exchanger

After mounting and filling the oil/air cooler, check the oil level in the gear unit. Make sure that the oil/air cooler is vented.

For basic information on the available versions of the oil/air cooler, refer to our G1000 catalogue (see www.nord.com).

For detailed information on the external oil/air cooler, refer to the relevant operating instructions. The information contained therein takes precedence.

Unless otherwise indicated by the manufacturer of the external oil/air cooler, the following applies to it:

- Minimum line pressure on the suction side: -0.4 bar
- Maximum viscosity of the lubricant: 1000 mm²/s

Select a motor speed on the coil/air cooler, which ensures complete filling of the pump. This can be achieved by not falling below the minimum line pressure on the suction side.

Information

Gear oil temperature regulation

It is recommended to only switch on the cooling unit at an oil temperature above 60 °C and to switch it off at an oil temperature below 45 °C. For this purpose, temperature regulation can be optionally provided by means of a thermistor (PT100), which has been installed in the oil sump of the gear unit.

The maximum permissible gear oil temperature must not exceed +90 °C.

4.6 Running-in time for the worm gear unit

In order to achieve maximum efficiency of the worm gear unit, the gear unit must be subjected to a running-in period of approx. 25 h – 48 h under maximum load.

There may be a reduction in efficiency before the running-in period is complete.

4.7 AI/AN adapter operation with option BRG1

In connection with option BRG1 (manual re-lubrication), the IEC adapters (option: AI) or the NEMA adapters (option: AN) may be operated at a maximum input speed of 1800 min^{-1}. Higher speeds would lead to premature failure of the seals and coupling spider.

4.8 Checklist

Checklist		
Subject of check	**Date of check:**	**Information see Section**
Is the vent screw activated or the pressure vent screwed in?		4.2
Does the required mounting position comply with the actual position?		7.1
Are the external gear shaft forces within permitted limits (chain tension)?		3.5
Is the torque arm installed correctly?		3.6
Are rotating parts covered with a contact guard?		3.9
Is the automatic lubricant sensor activated?		4.3
Is the cooling system connected?		3.12 3.13

Table 9: Checklist for commissioning

5 Service and maintenance

5.1 Inspection and maintenance intervals

Inspection and maintenance intervals	Inspection and maintenance work	Information, see Section
At least every six months	• Visual inspection	5.2.1
	• Check for running noises	5.2.2
	• Oil level check	5.2.3
	• Visual inspection of hose	5.2.5
	• Re-grease/remove excess grease (only applicable for free input shaft/option W, for agitator bearings/option VL2/VL3 and for AI…/AN… adapters with option BRG1)	5.2.6
	• Replace the automatic lubricant sensor/remove excess grease (for IEC/NEMA standard motor installations, an interval of one year for the replacement of the lubricant sensor is permissible for running times of < 8 h/day); drain or replace the lubricant collection container at each second replacement of the lubricant sensor	5.2.7
For operating temperatures up to 80 °C Every 10,000 operating hours, at least every 2 years	• Change the oil (if filled with synthetic products, the interval is doubled; with the use of ***SmartOilChange***, the interval is specified by ***SmartOilChange***)	5.2.8
	• Clean or replace the vent screw as necessary	5.2.9
	• Replacing the radial shaft seals; see Chapter 5.2.1 for further information	5.2.10
Every 20,000 operating hours, at least every 4 years	• Re-lubricate the bearings in the gear unit	5.2.11
At least every 10 years	• General overhaul	5.2.12

Table 10: Inspection and maintenance intervals

Information

The oil change intervals apply for normal operating conditions and operating temperatures up to 80 °C. The oil change intervals are reduced in the case of extreme operating conditions (operating temperatures higher than 80 °C, high humidity, aggressive environment and frequent fluctuations in the operating temperature).

Information

SmartOilChange determines the optimum time for an oil change based on a continuous determination of the oil temperature. With ***SmartOilChange*** from Getriebebau NORD, this is achieved entirely on the basis of product-specific key data, the specified ambient temperature and internal measurement values of the power electronics such as the current consumption. Additional hardware is therefore not required for the Getriebebau NORD solution.

The measurement results are processed and interpreted by the integrated software and result in the display of the calculated residual time until the next oil change.

5.2 Service and maintenance work

5.2.1 Visual inspection for leaks

The gear unit must be checked for leaks. Attention should be paid to escaping gear oil and traces of oil on the exterior or underneath the gear unit. In particular, the radial shaft seals, cover caps, screw fittings, hoses and housing joints should be checked.

Information

Radial shaft seals are components with a limited life and are subject to wear and ageing. The service life of radial shaft seals depends on various ambient conditions. Temperature, light (especially UV light), ozone and other gases and liquids affect the ageing process of radial shaft seals. Some of these influences may change the physical or chemical properties of the radial shaft seals and result in a significant reduction of their service life. Foreign matter (e.g. dust, sludge, sand, metallic particles) and excess temperature (excessive speed or external heating) accelerate the wear of the sealing lip. These sealing lips are made of an elastomer material and are lubricated with a special grease at the factory. This reduces the wear due to their function and ensures a long service life. An oil film in the region of the rubbing sealing lip is therefore normal and is not due to leakage (see chapter 7.5 "Leakage and leak-tightness").

The following applies to radial shaft seals on gear unit output shafts: "Under moderate operating conditions (up to 80 °C oil temperature), the manufacturers of radial shaft seals state non-binding typical lifetimes of up to 10,000 operating hours."

NOTICE

Damage to the radial shaft seals through unsuitable cleaning agents

Unsuitable cleaning agents may damage the radial shaft seals, which may then cause an increased risk of leaks.

- Do not clean the gear unit with cleaning agents which contain acetone or benzol.
- Avoid contact with hydraulic oils.

If leaks are suspected, the gear unit should be cleaned, the oil level checked and checked again for leaks after approx. 24 hours. If a leak is confirmed (dripped oil), the gear unit must be repaired immediately. Please contact the NORD service department.

If the gear unit is equipped with a cooling coil in the housing cover, the connections and the cooling coil must be checked for leaks. If there are any leaks, these must be repaired immediately. Please contact the NORD service department.

5.2.2 Check for running noises

If the gear unit produces unusual running noises or vibrations, this could indicate damage to the gear unit. In this case the gear unit must be repaired immediately. Please contact the NORD Service department.

5.2.3 Checking the oil level

Section 7.1 "Versions and mounting position"describes the mounting positions and the corresponding oil level screws. With double gear units, the oil level must be checked on both units. The pressure vent must be at the position marked in Section 7.1 "Versions and mounting position".

The oil level does not need to be checked on gear units without oil level screw (see chapter 7.1 "Versions and mounting position").

Gear unit types that are not supplied with an oil filling must be filled before the oil level is checked.

The oil level must only be carried out when the gear unit is at a standstill and has cooled down. Provide protection against accidental activation. Check the oil level with an oil temperature of between 10 °C to 40 °C.

Gear units with oil level screw

1. Unscrew the oil level screw corresponding to the mounting position (see chapter 7.1 "Versions and mounting position").

Information

At the first oil level check a small amount of oil may escape, as the oil level may be above the lower edge of the oil level hole.

2. The correct oil level is at the lower edge of the oil level hole. If the oil level is too low, adjust the oil level with the corresponding oil type.
3. Screw the oil level screw and all previously loosened screw connectors back in correctly.

Gear units with an oil level tank

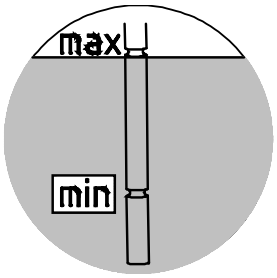


Figure 26: Checking the oil level with a dipstick

1. Screw the screw plug with dipstick (thread G1¼) out of the oil level container.
2. The oil level must be between the upper and lower marking when the dipstick is fully screwed in (see Figure 26). If the oil level is too low, adjust the oil level with the corresponding oil type.
3. Screw the screw plug with dipstick and all previously loosened screw connectors back in correctly.

Gear units with oil inspection glass

1. The oil level can be seen directly in the window.
2. The correct oil level is:
   - Maximum: the middle of the oil inspection glass,
   - Minimum: Lower edge of the oil inspection glass.
3. If the oil level is not correct, adjust the oil level by draining off oil or topping up with the type of oil stated on the name plate.

5.2.4 Visual inspection of the rubber buffers (Option: G, VG)

If these show damage such as tears to the surface, the rubber elements must be replaced. In this case, please contact NORD Service.

5.2.5 Visual inspection of the hoses (Option: OT, CS2-X)

Gear units with an oil tank and external cooling units have rubber hoses.

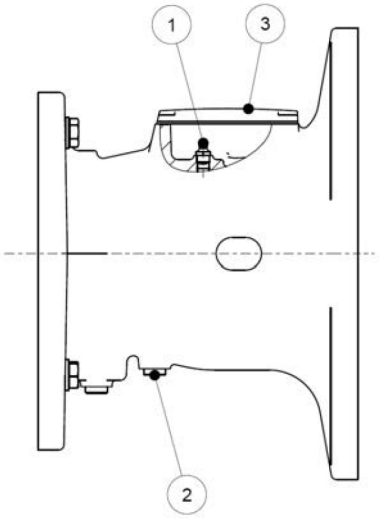
Check the hoses and screw connectors for leaks, cuts, tears, porous areas and chafing. In case of damage, the hoses must be replaced. Please contact the NORD service department.

5.2.6 Re-greasing (Option: VL2, VL3, W, AI, AN)

Some gear unit designs are equipped with a re-greasing device.

For the agitator versions VL2 and VL3, unscrew the vent screw opposite the grease nipple prior to re-greasing. Inject grease until a quantity of 20 - 25g escapes from the vent hole. Screw the vent screw back in.

For option W and the IEC/NEMA adapters AI and AN with option BRG1, grease the outer roller bearing with approx. 20–25 g of grease at the grease nipple. With the IEC/NEMA adapters AI and AN, the grease nipple is located under a bolt-on inspection cover. Before re-greasing, unscrew the grease drain screw so that the excess grease can drain off. Remove the excess grease on the motor adapter.



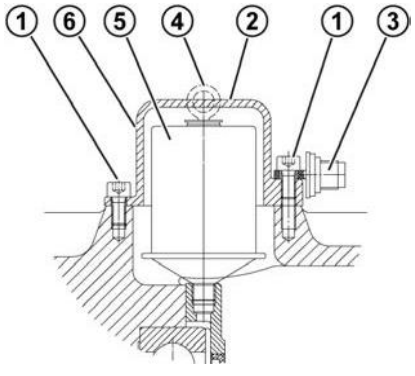
1: Conical grease nipple
2: Grease drain screw
3: Inspection cover

Figure 27: Re-grease IEC/NEMA adapters AI and AN with option BRG1

Recommended grease:

- Petamo GHY 133N (Klüber Lubrication)

5.2.7 Replacing the automatic lubricant dispenser



Explanation

1 Cap screws M8 x 16
2 Cartridge cover
3 Activation screw
4 Lug
5 Lubricant dispenser
6 Position of adhesive label

Figure 28: Switching the automatic lubricant sensor with standard motor mounting

(Lubricant sensor: Part No.: 28301000 or for food-compatible grease Part No.: 28301010)

1. Unscrew the cartridge cover.
2. Unscrew the lubricant sensor.
3. Screw in the new lubricant sensor.
4. Remove excess grease from the adapter.
5. Activate the full lubricant sensor (see chapter 4.3 "Activating the automatic lubricant dispenser").

The grease collection container (Part No. 28301210) must be replaced or drained with every second replacement of the lubricant sensor. Due to the form of the container, a residual amount of grease remains in the container.

1. Unscrew the grease collection container from the screw connector.
2. Press grease out of the grease collection container. To do this, push the internal piston back with a rod. The rod may have a maximum diameter of 10 mm. Collect the extracted grease and dispose it properly.
3. Check the collecting vessel. If the collecting vessel is damaged, replace it with a new one.
4. Screw the collecting vessel back into the drain hole on the motor adapter.

5.2.8 Change the oil

On the figures in Section 7.1 "Versions and mounting position"the positions of the oil drain screw, the oil level screw and the vent screw, if present, are shown depending on the mounting position.

WARNING

Danger of burns

The oil may be very hot. Use protective equipment.

Procedure:

1. Place a collection vessel under the oil drain screw or the oil drain tap.
2. Screw out the oil level screw (if present) and the oil drain screw. When using an oil reservoir tank, screw out the screw plug with dipstick.
3. Completely drain the oil from the gear unit.
4. Check the sealing rings of the oil drain screw and the oil level screw. If a sealing ring is damaged, replace the corresponding screw. You can also clean the threads and coat them with securing adhesive e.g. Loctite 242 54-03 before screwing them in.
5. Screw the oil drain screw into the hole and tighten to the correct torque (see chapter 7.3 "Screw tightening torques").
6. Using a suitable filling device, refill with oil of the same type through the oil level hole until oil emerges from the oil level hole. The oil can also be filled through the hole of the pressure vent screw or of a screw plug located higher than the oil level. If an oil reservoir tank is used, fill the oil through the upper inlet (thread G1¼) until the oil level is set as described in Section 5.2.3 "Checking the oil level".
7. Check the oil level after at least 15 min, if using an oil level container after at least 30 min.

Information

The oil does not need to be replaced for gear units without oil drain screws (see chapter 7.1 "Versions and mounting position"). The gear unit are lifelong lubricated.

Standard helical gear units do not have an oil level screw. Here, new oil is injected through the threaded hole of the vent.

5.2.9 Clean and check vent screw

1. Unscrew the vent screw.
2. Thoroughly clean the vent screw, e.g. with compressed air.
3. Check the vent screw and the sealing ring. If the sealing ring is damaged, use a new vent screw.
4. Screw the vent screw back in.

5.2.10 Replacing the shaft sealing ring

Once the shaft sealing ring has reached the end of its service life, the oil film in the region of the sealing lip increases and a measurable leakage with dripping oil occurs. **The radial shaft seal must then be replaced.** The space between the sealing lip and the protective lip must be filled approximately 50 % with grease on fitting (recommended grease: PETAMO GHY 133N). Take care that after fitting, the new radial shaft seal does not run in the old wear track.

5.2.11 Re-lubrication of bearings in the gear unit

NOTICE

Damage to the gear unit due to insufficient lubricant

There is a risk of bearing failure in the event of inadequate lubrication.

- It is essential to comply with the recommended intervals.
- Only use greases which are approved by Getriebebau NORD.
- Never mix different greases. If different greases are mixed, the gear unit may be damaged due to inadequate lubrication caused by incompatibility between the different greases.
- Avoid contamination of the grease with foreign substances and washing out of the grease by lubricating oil.

Please contact the NORD Service department for replacement of the grease in the roller bearings.

Recommended grease: Petamo GHY 133N - Klüber Lubrication. (see chapter 7.2.1 "Roller bearing greases")

5.2.12 General overhaul

The general overhaul must be carried out by a specialist workshop with suitable equipment and be qualified personnel with appropriate equipment in observance of national regulations and laws. We recommend that the general overhaul is carried out by the NORD Service Department.

During general overhaul, the gear unit is completely dismantled. The following work steps are carried out:

- All gear unit components are cleaned.
- All gear unit components are checked for damage.
- Damaged parts are replaced.
- All roller bearings are replaced.
- Replace all seals, radial shaft seals and Nilos rings.
- Optional: The back stop will be renewed.
- Optional: Replace the elastomers in the coupling.

6 Disposal

Observe the current local regulations. In particular, lubricants must be collected and disposed of correctly.

Gear unit components	Material
Gearwheels, shafts, roller bearings, keys, circlips, …	Steel
Gear unit housing, housing components, …	Grey cast iron
Light alloy gear unit housing, light alloy housing components, …	Aluminium
Worm gears, sockets, ...	Bronze
Radial shaft seals, sealing caps, rubber components, …	Elastomers with steel
Coupling components	Plastic and steel
Flat seals	Asbestos-free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (adhesive label: CLP PG)	Polyglycol-based lubricants
Synthetic gear oil (adhesive label CLP PG)	Poly-alpha-olefin based lubricants
Cooling coil, embedding material of the cooling coil, screw fittings	Copper, epoxy, yellow brass

Table 11: Materials

7 Appendix

7.1 Versions and mounting position

Information

The gear unit types SK 320, SK 172, SK 272, SK 372 as well as SK 273 and SK 373, the gear unit types SK 01282 NB, SK 0282 NB and SK 1382 NB and the UNIVERSAL/MINIBLOC gear unit types are lifelong lubricated. These gear units do not have oil level screws.

7.1.1 Explanation of symbols



Vent



Oil level



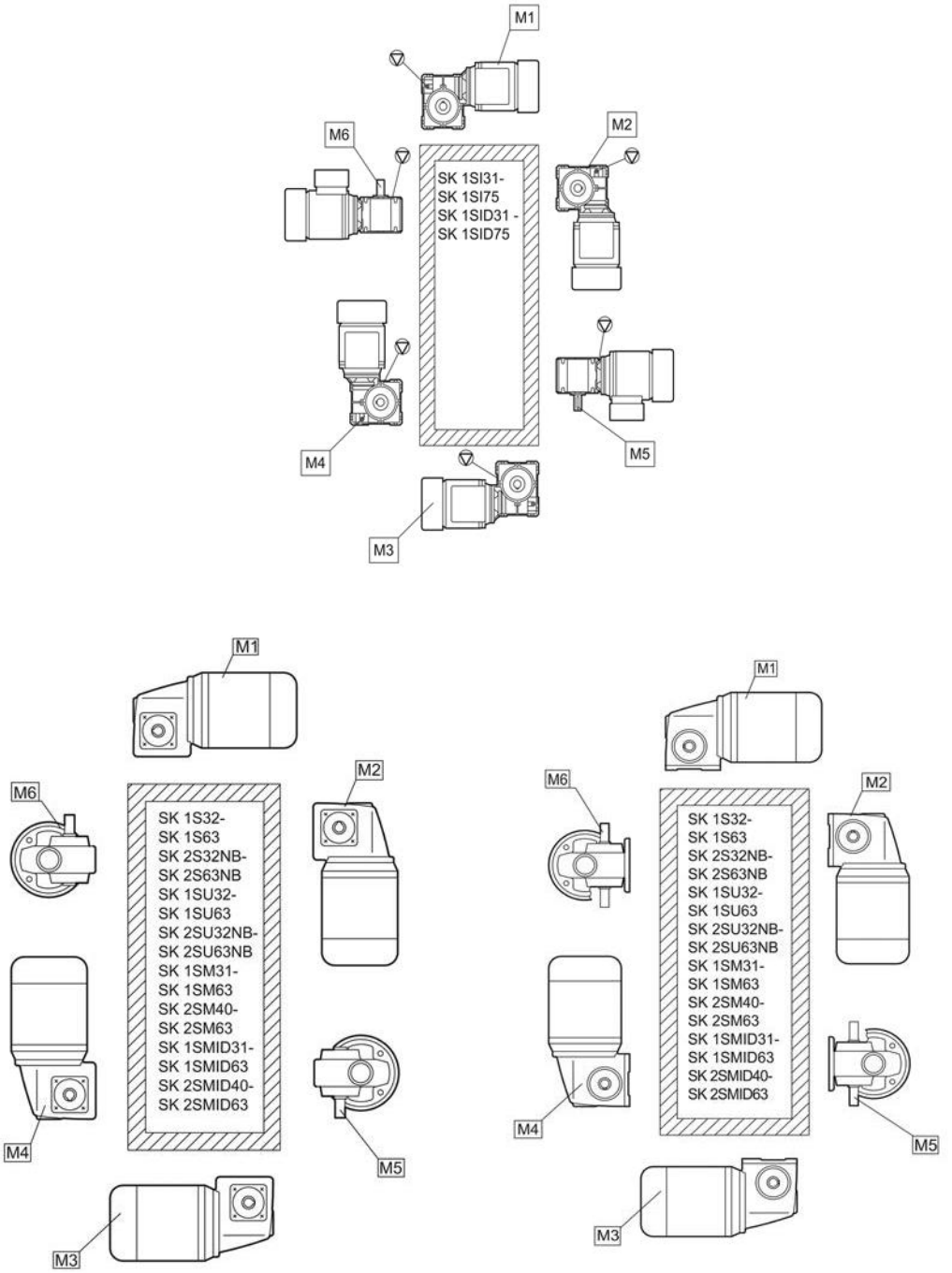
Oil drain

7.1.2 UNIVERSAL/MINIBLOC worm gear units

NORD UNIVERSAL/MINIBLOC worm gear units are suitable for all installation positions. They have an oil filling which is independent of the mounting position.

As an option, types SI and SMI can be equipped with a vent screw. Gear units with vents must be installed in the stated mounting position.

Types SI, SMI, S, SM and SU as 2-stage gear unit types and types SI, SMI as worm gear units for direct motor mounting have an oil filling which depends on the mounting position and must be installed in the stated position.



7.1.3 Parallel shaft gear units with oil level tank

The following illustration applies to the M4 configuration of gear unit types SK 9282, SK 9382, SK 10282, SK 10382, SK 10382.1, SK 11282, SK 11382, SK 11382.1 and SK 12382 with oil reservoir tank.

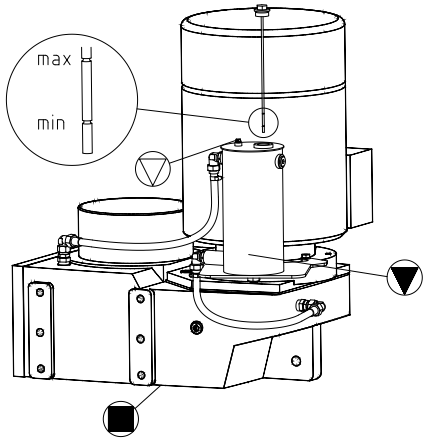
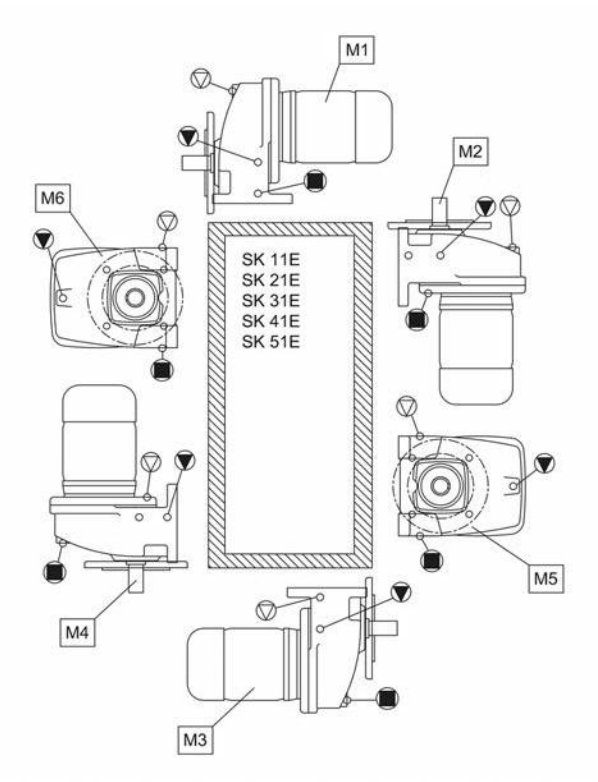
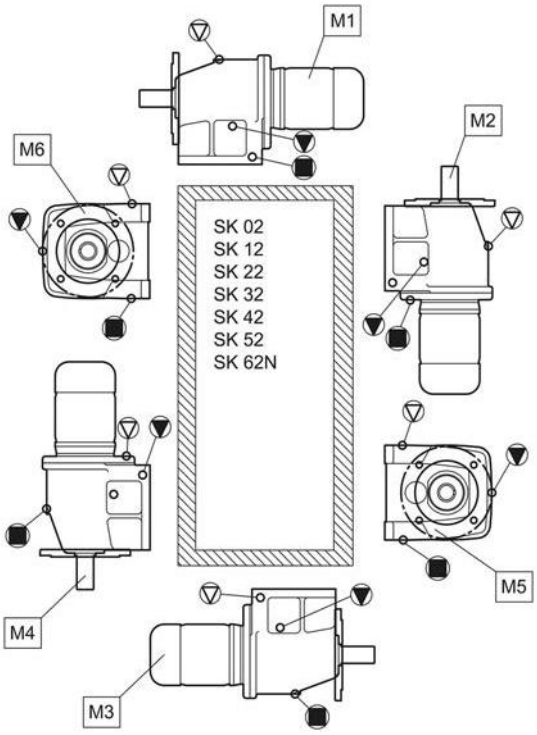
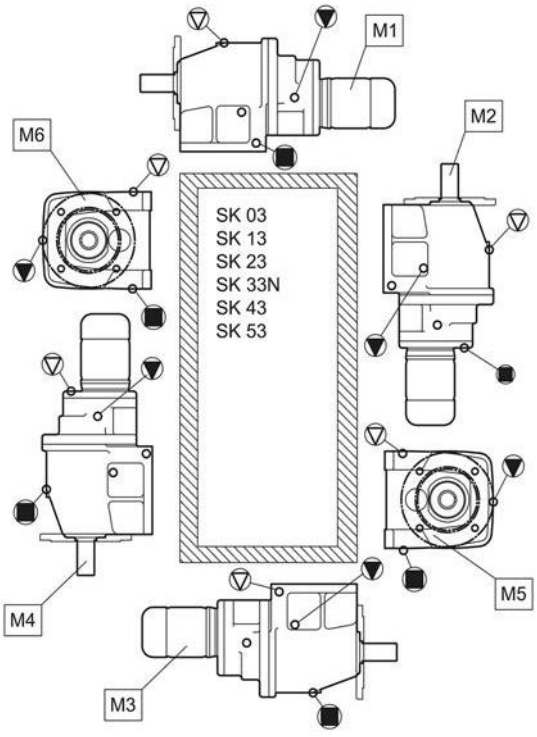


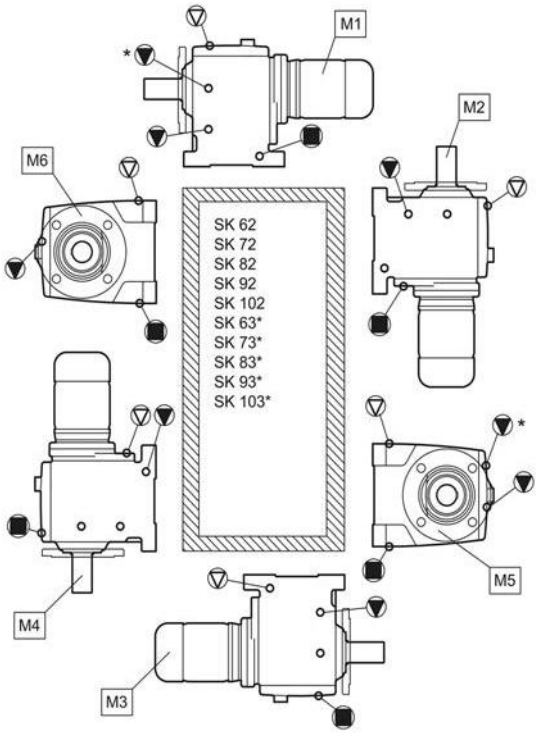
Figure 29: Parallel shaft gear units with oil level tank

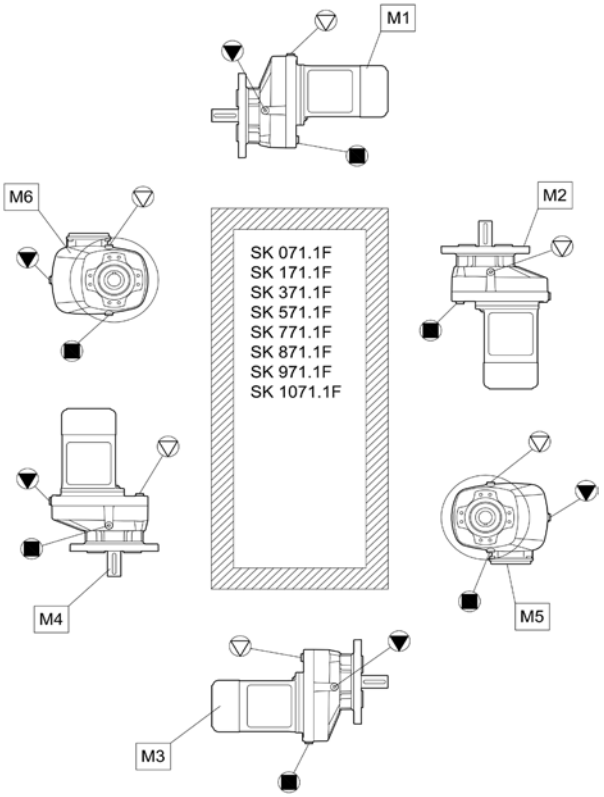
7.1.4 Overview of mounting positions

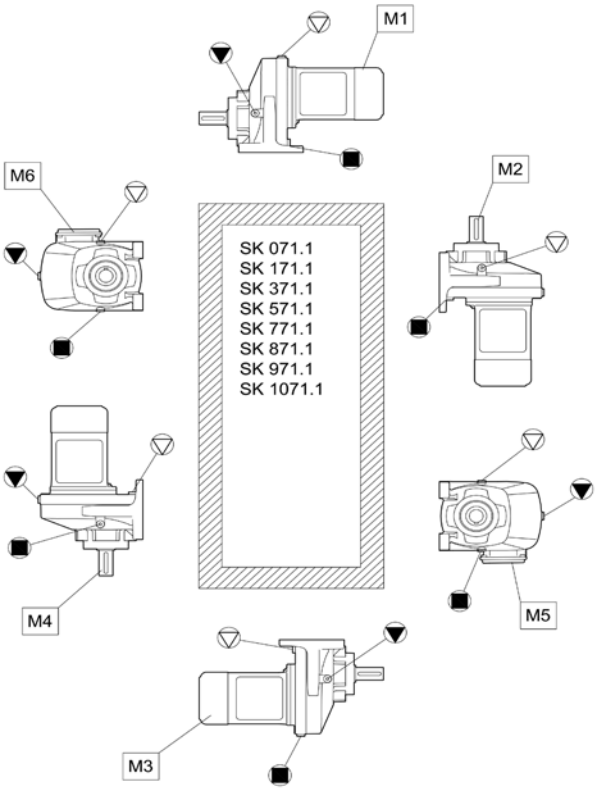


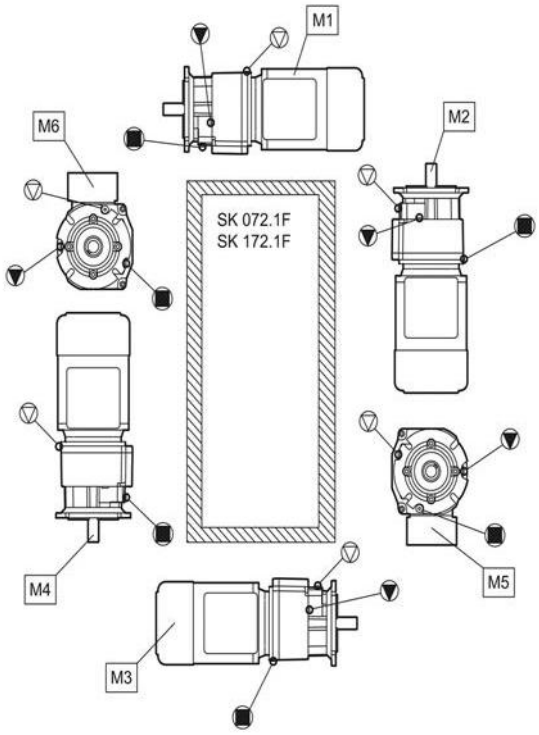


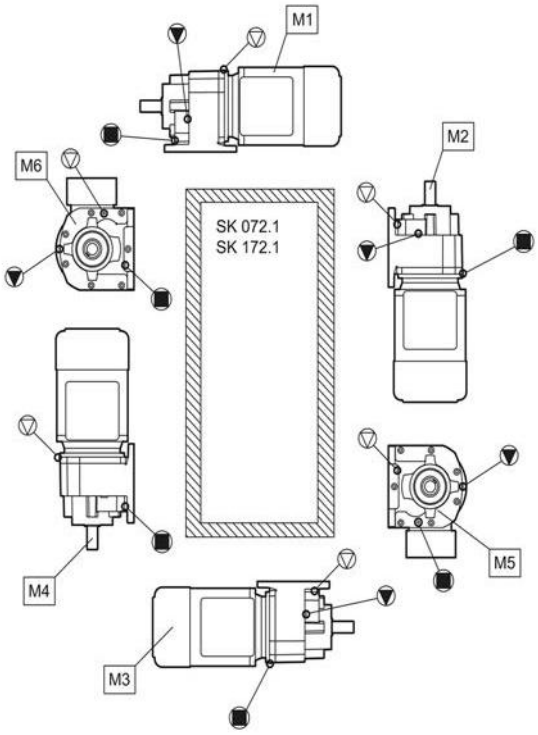


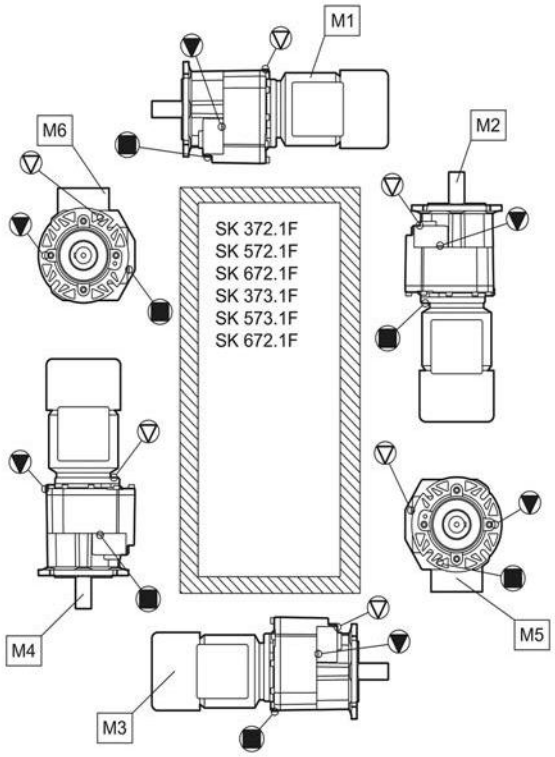


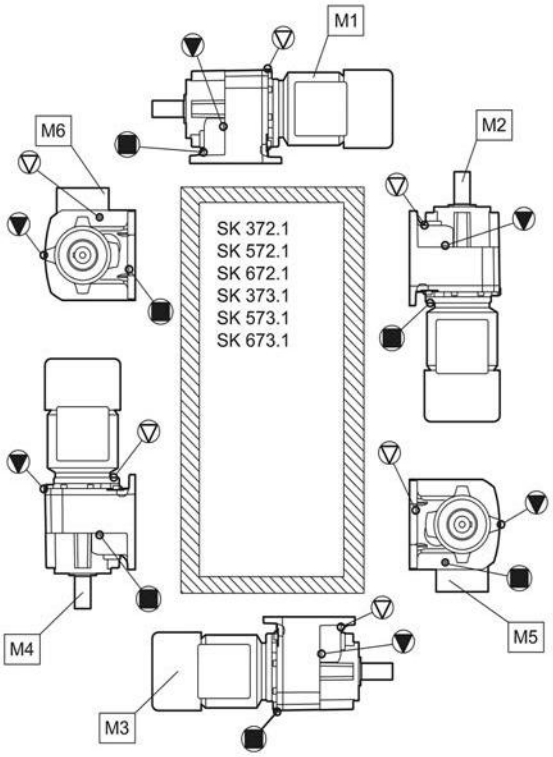

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SK 371.1F
SK 571.1F
SK 771.1F
SK 871.1F
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SK 1071.1F
M4
M5
M3

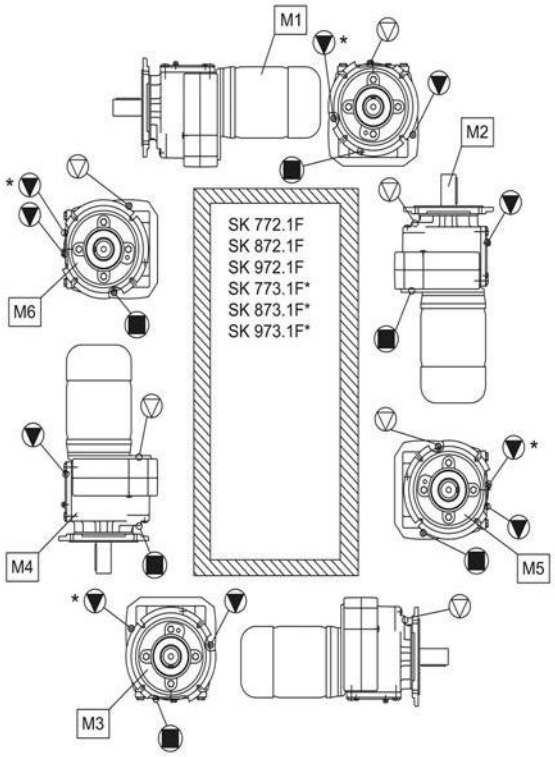

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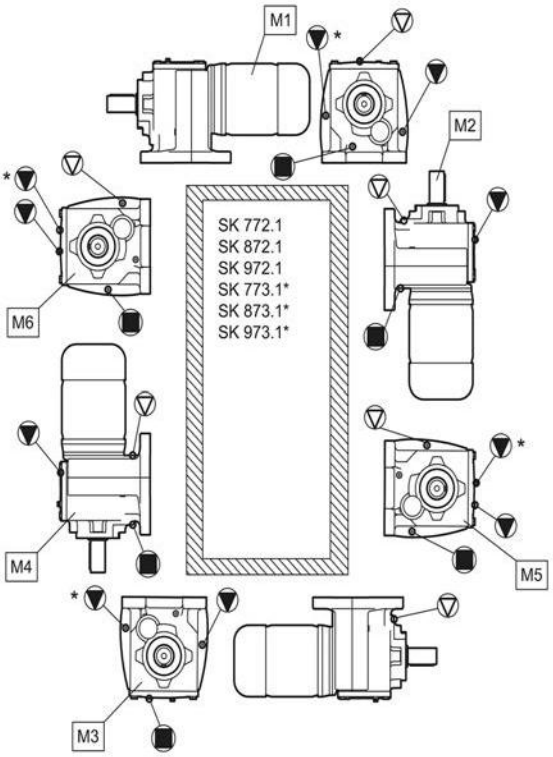

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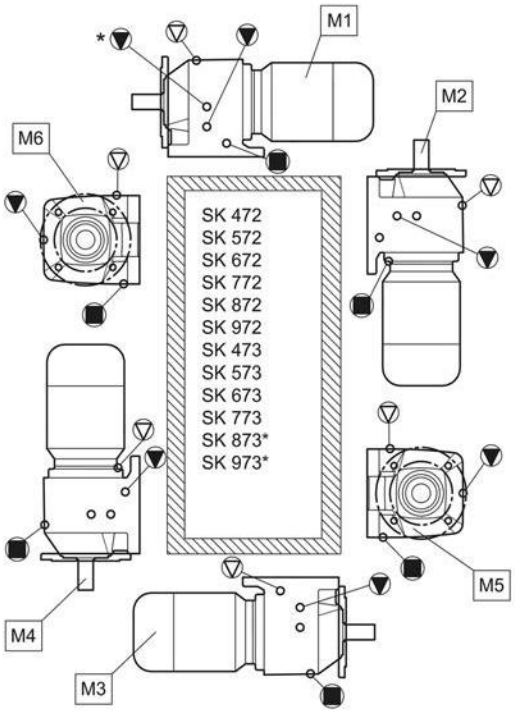

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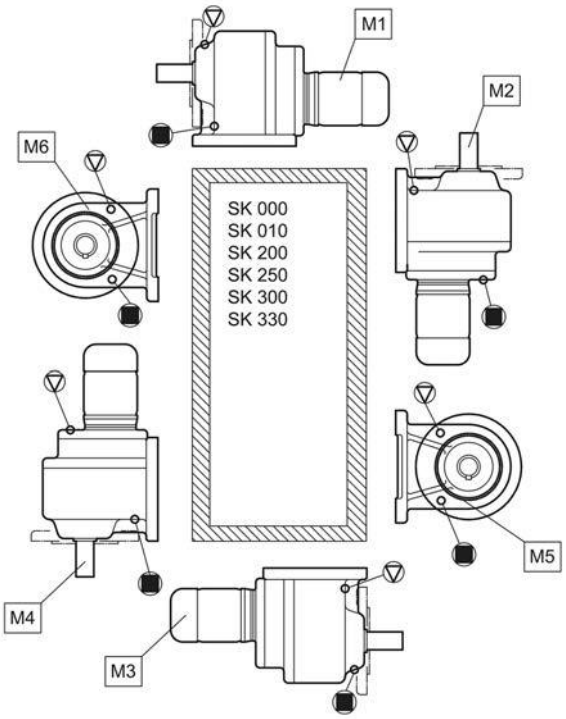

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SK 373.1F
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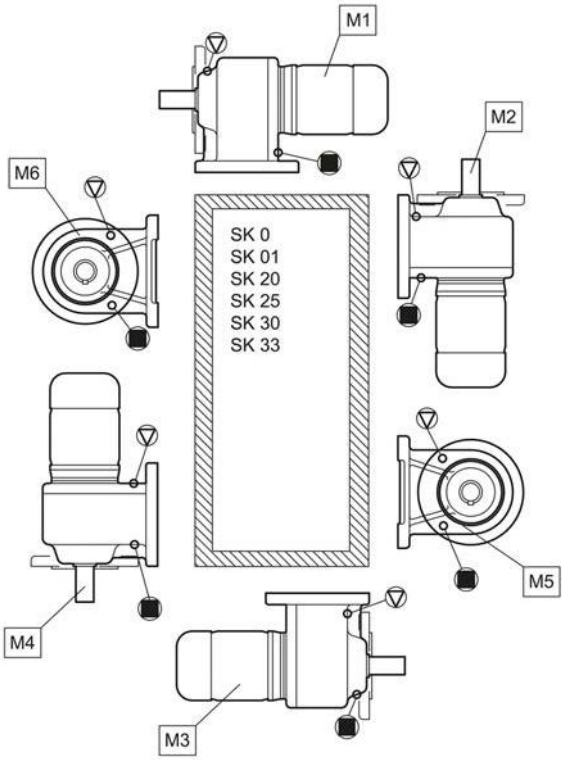

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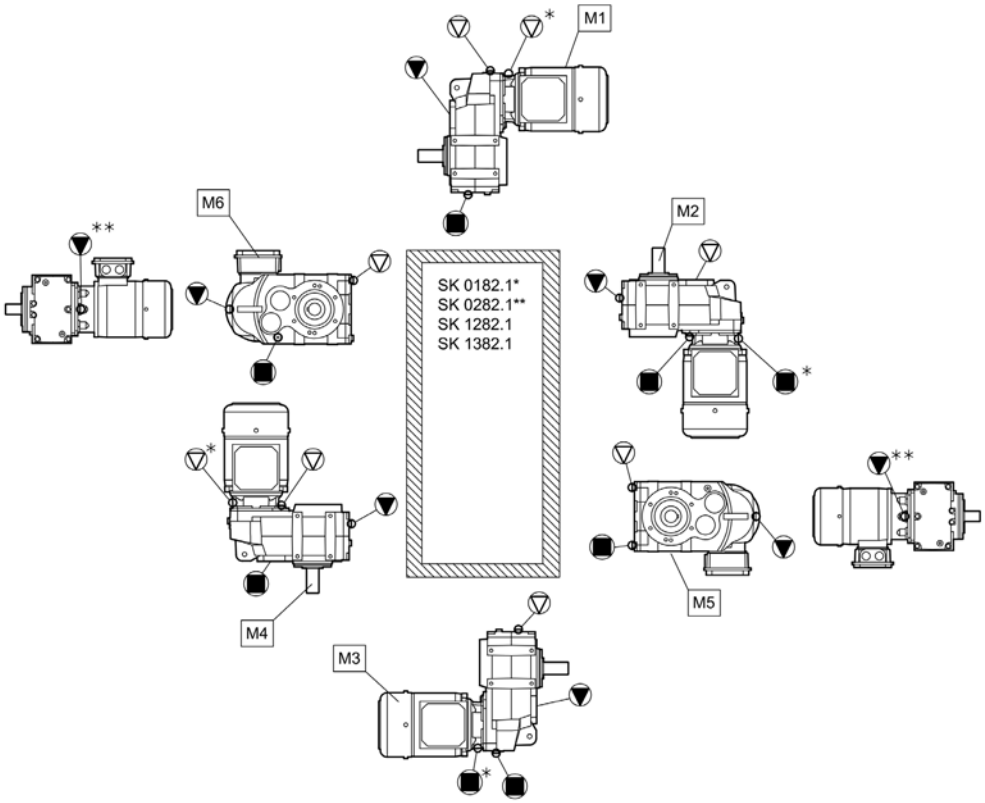

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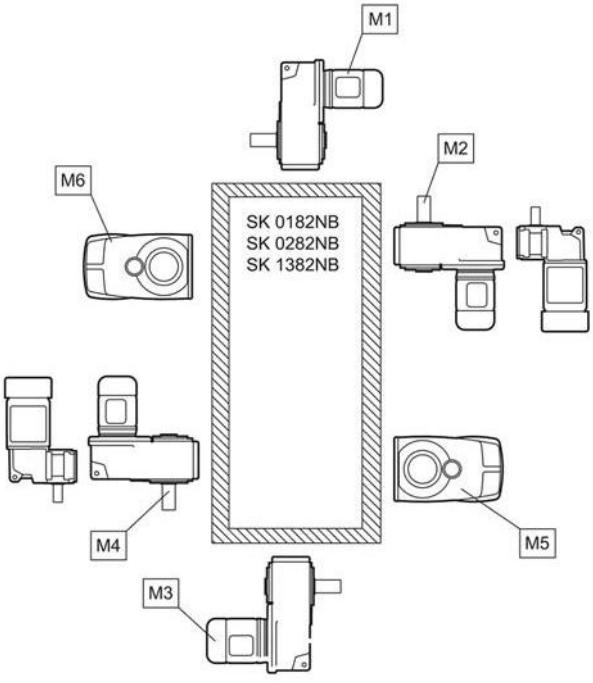

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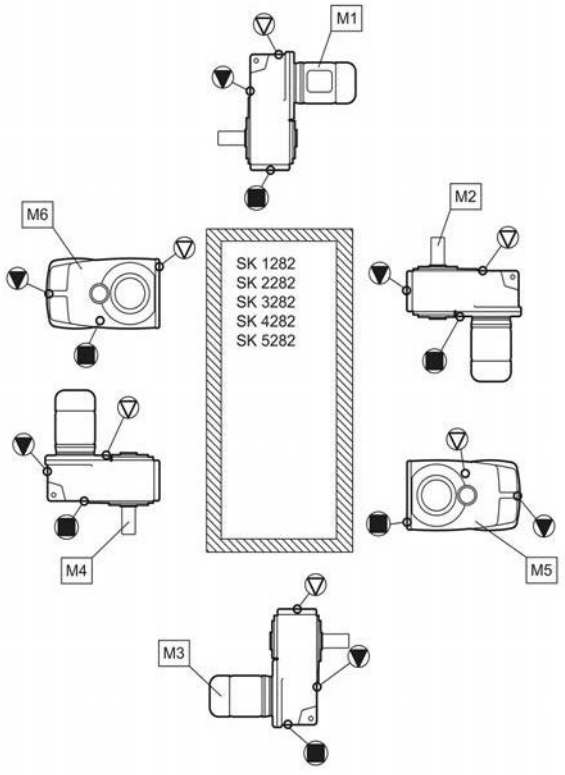

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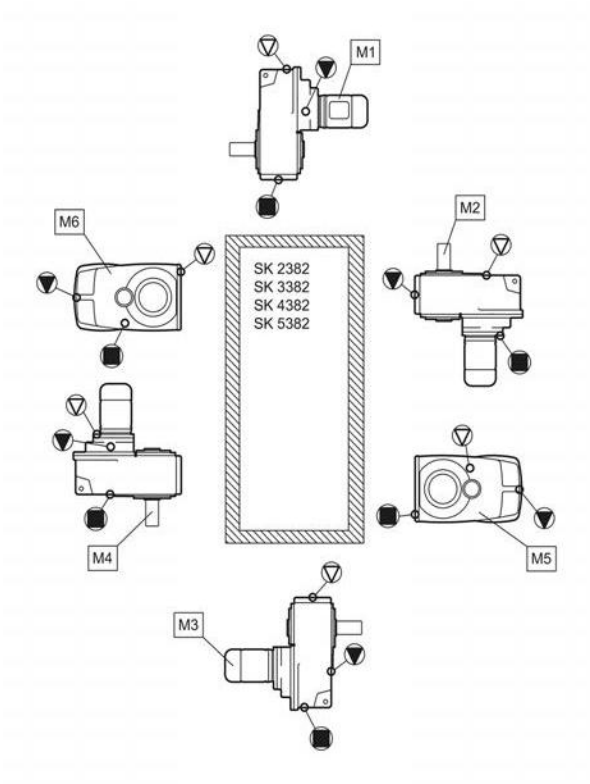

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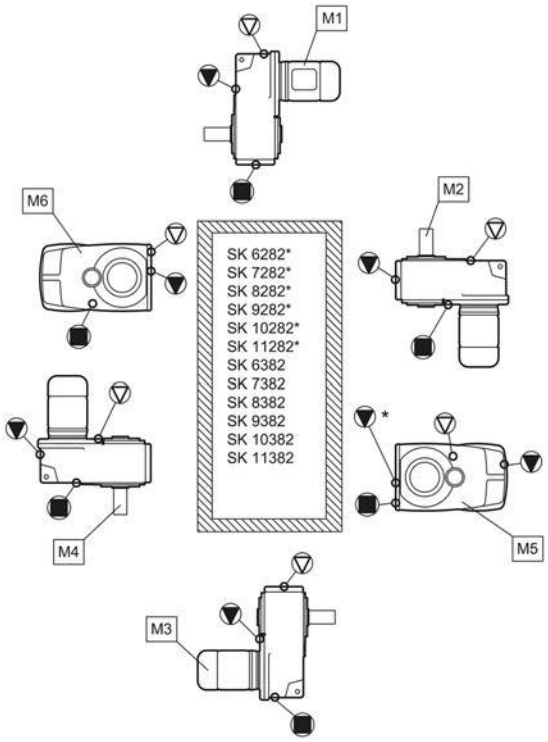

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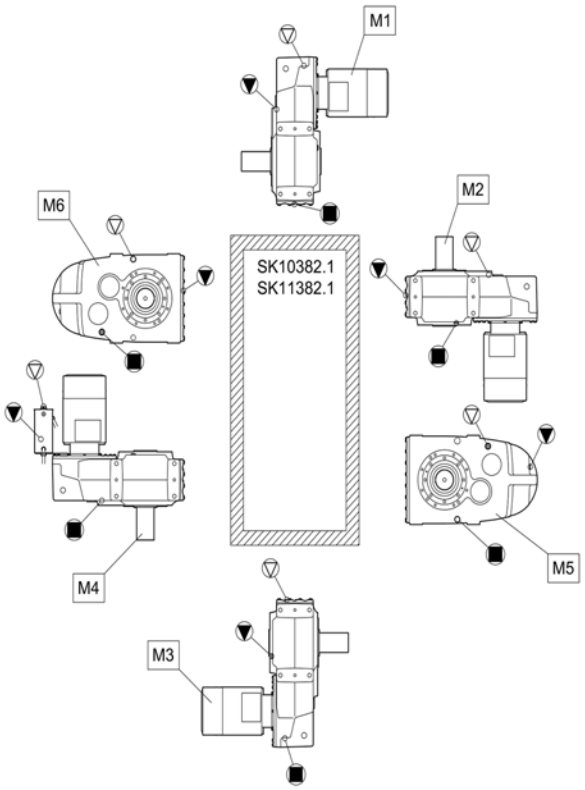

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SK 0282.1**
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SK 1382.1

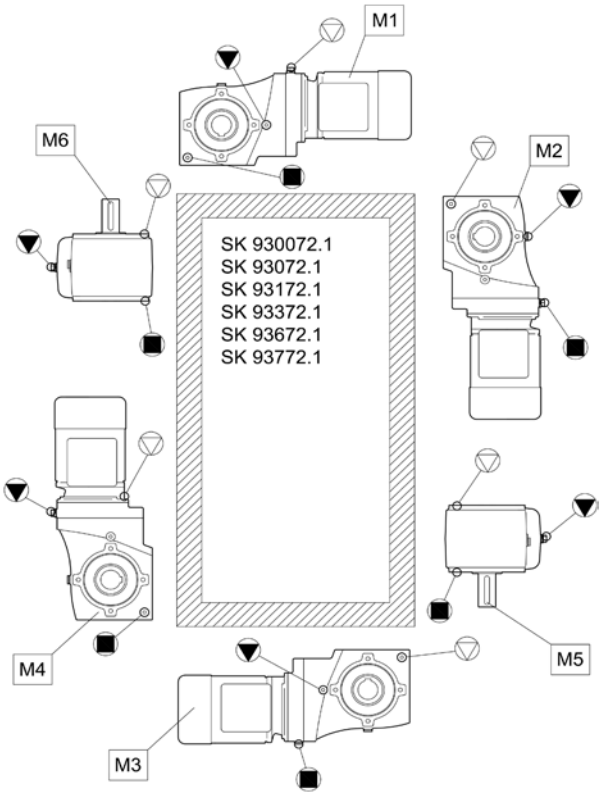

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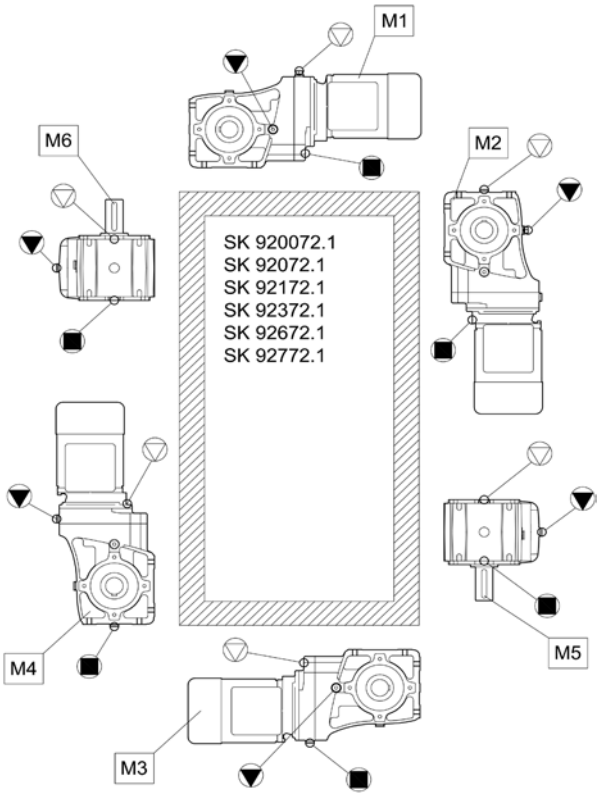

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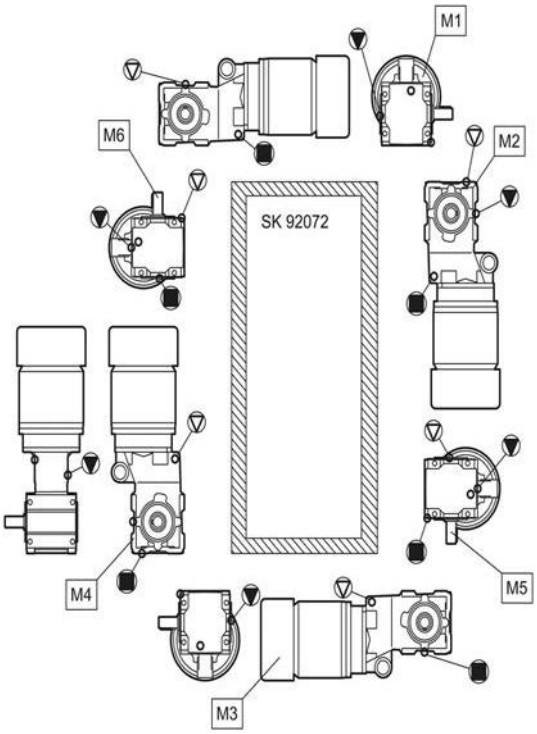

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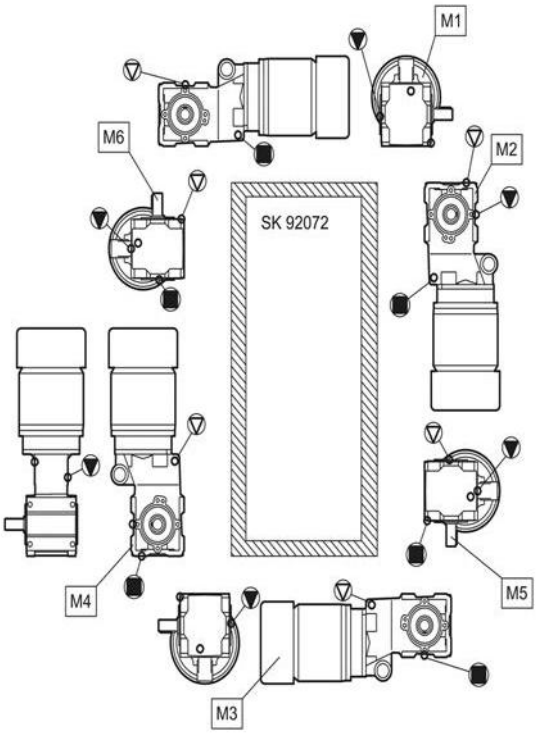

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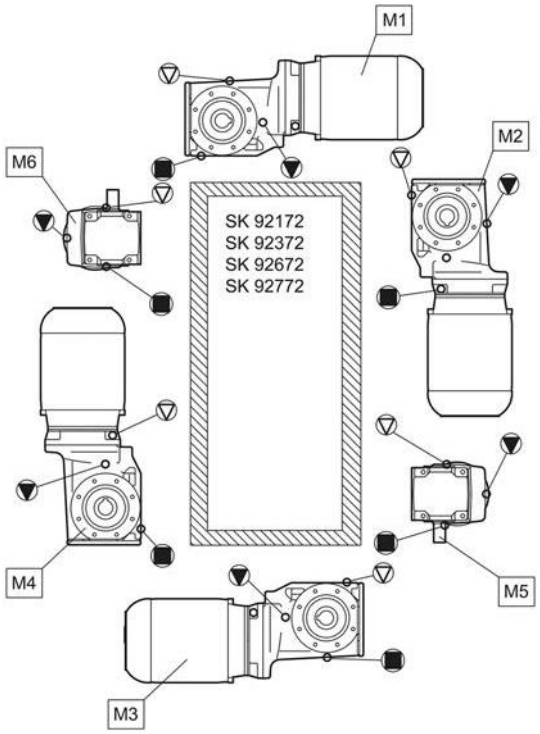

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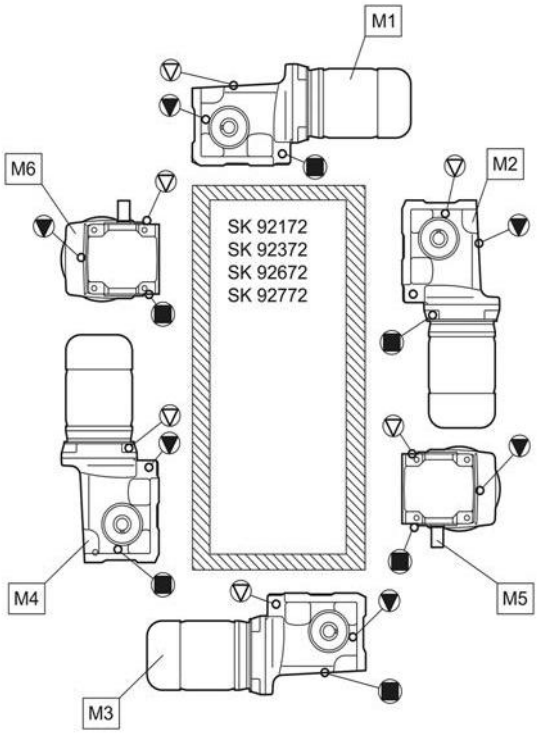

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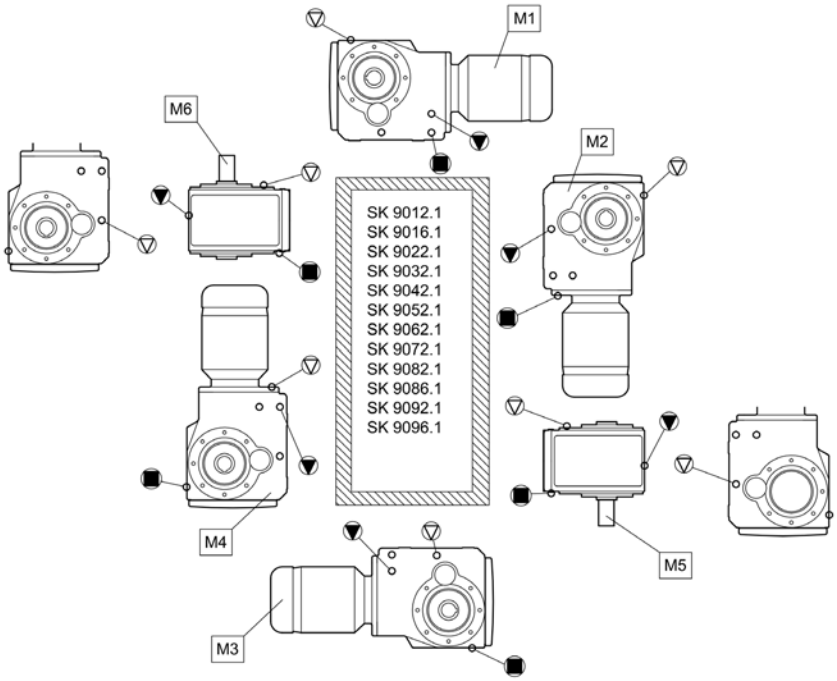

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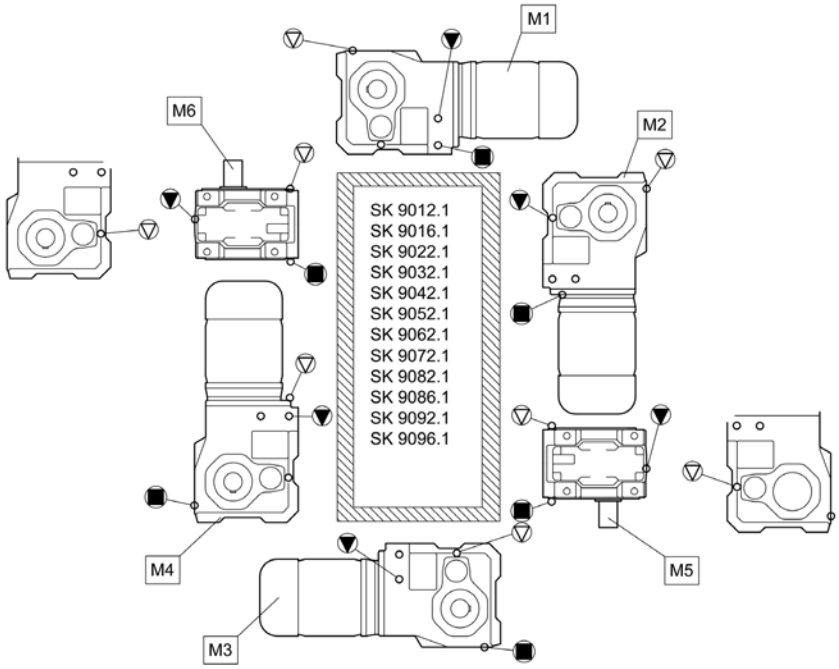

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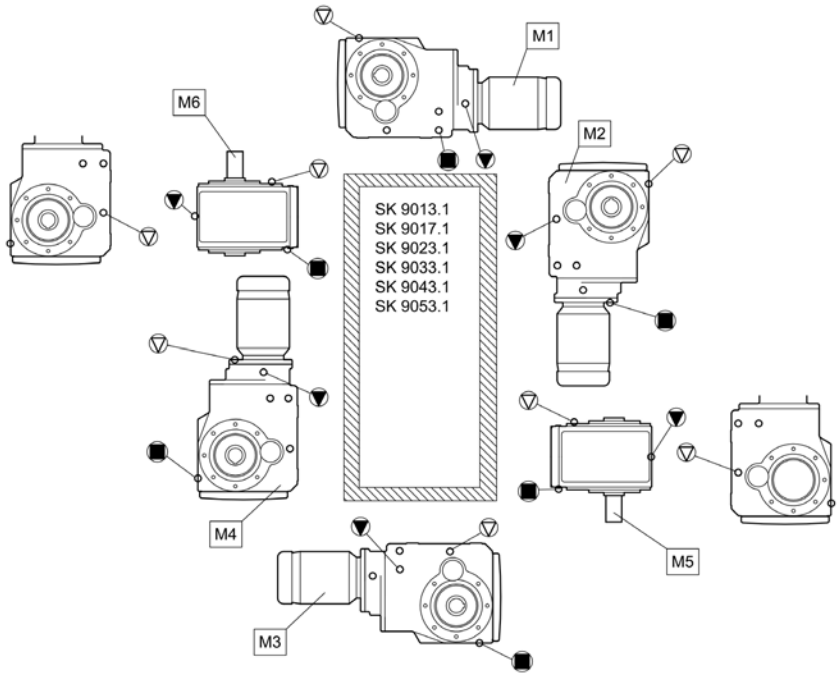

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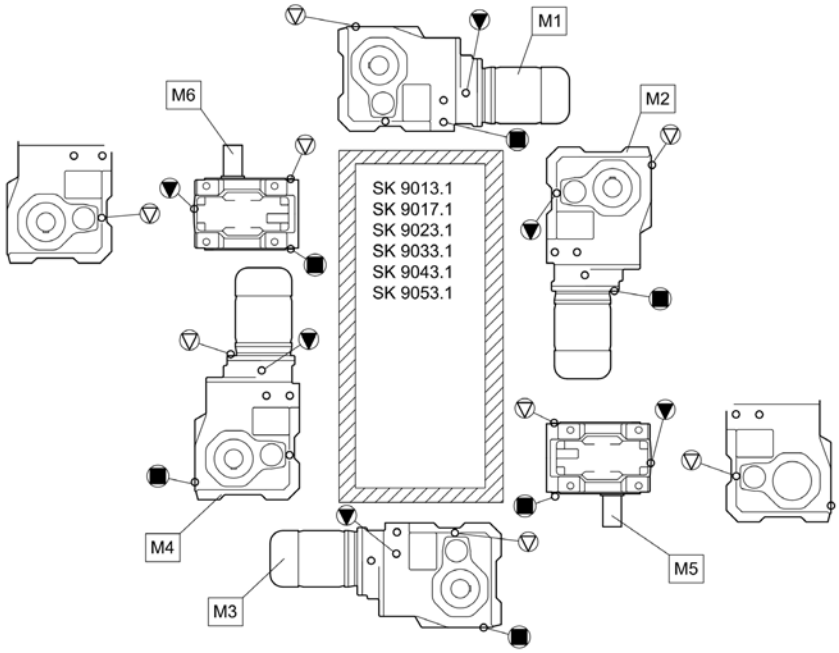

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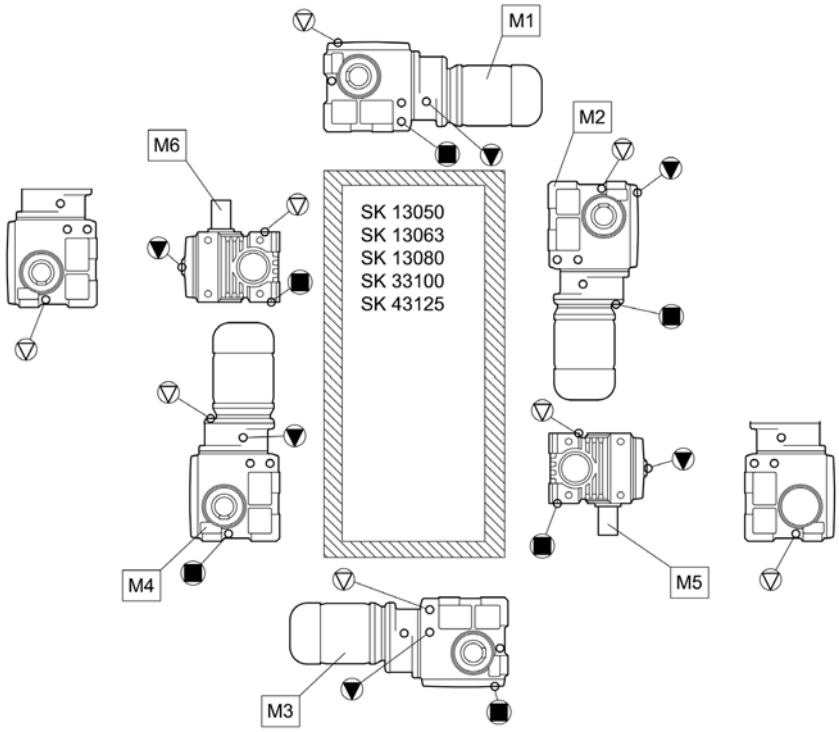

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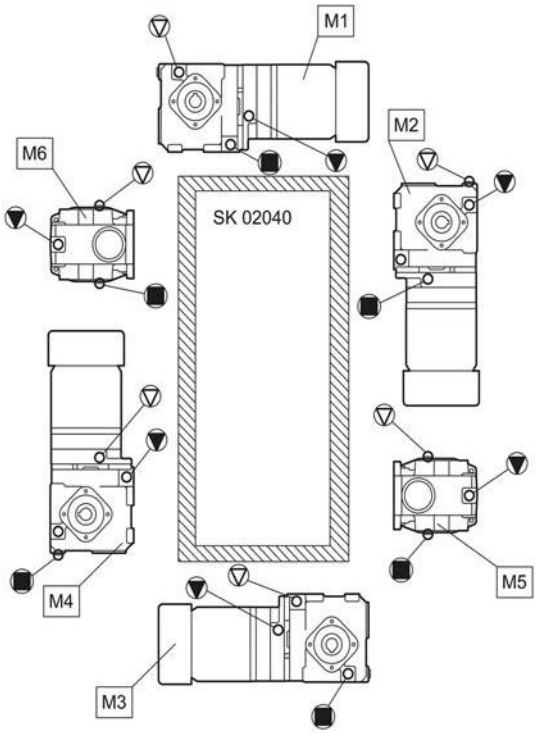

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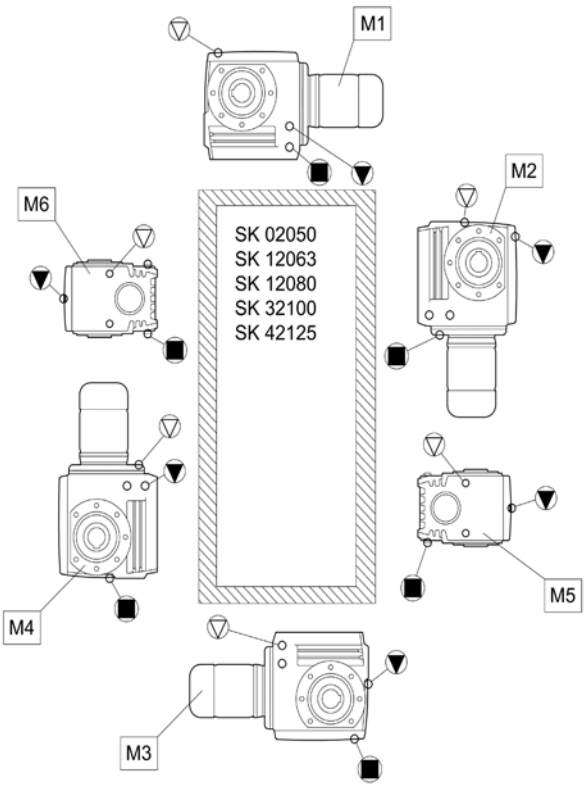

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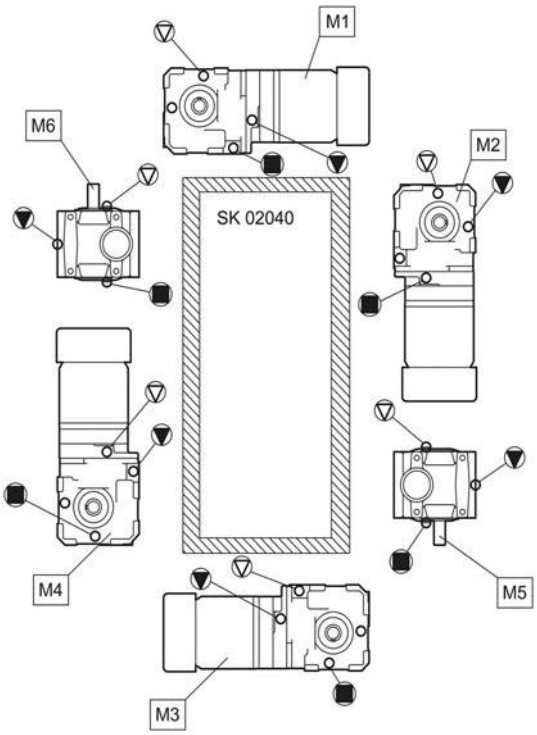

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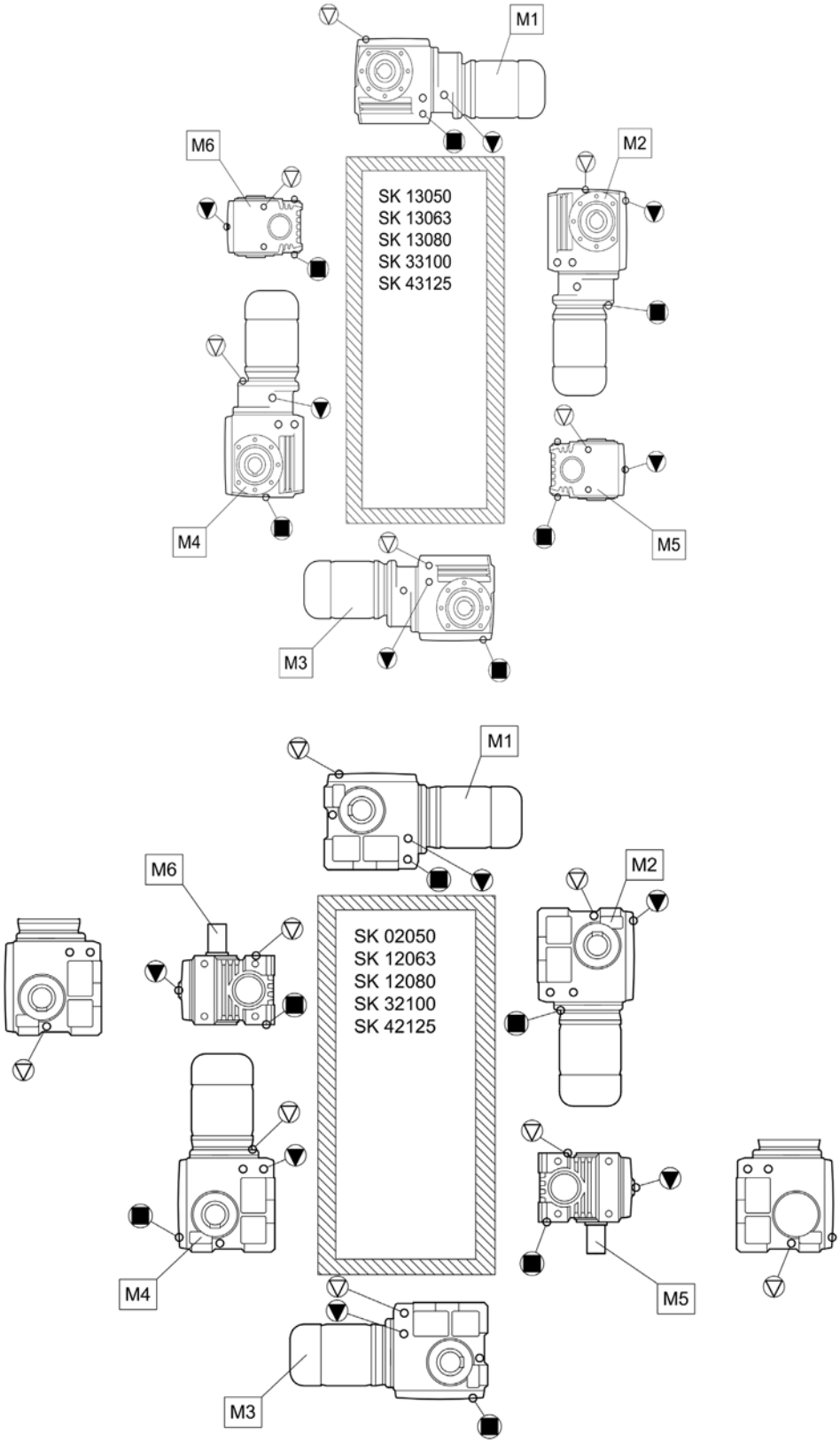

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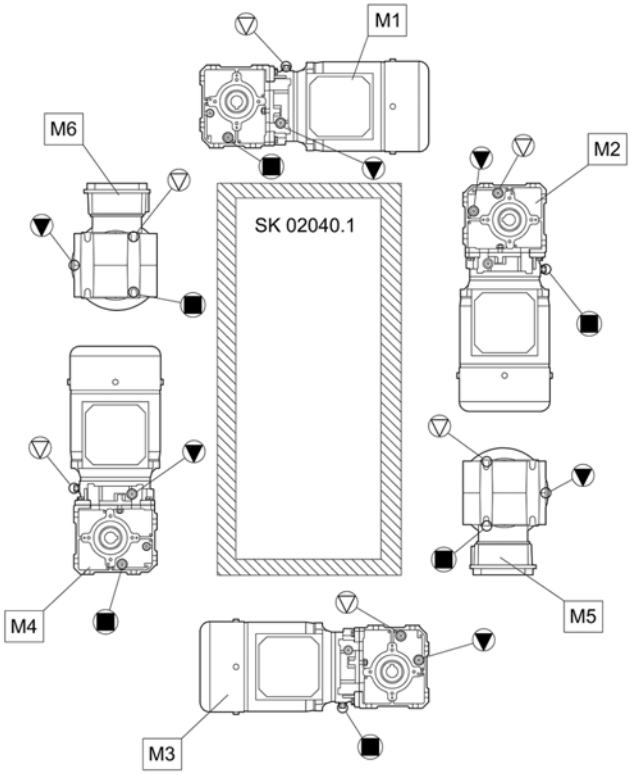

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M5
M3


M1
M2
M6
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M4
M5
M3


M1
M2
M6
SK 02050
SK 12063
SK 12080
SK 32100
SK 42125
M4
M5
M3


M1
M6
M2
SK 02040
M4
M5
M3


M1
M6
M2
SK 13050
SK 13063
SK 13080
SK 33100
SK 43125
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M5
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M6
M2
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SK 12080
SK 32100
SK 42125
M4
M5
M3


M1
M6
M2
SK 02040.1
M4
M5
M3

7.2 Lubricants

With the exception of types SK 11382.1, SK 12382 and SK 9096.1, the gear units are filled with lubricant for the required mounting position and are ready for operation as delivered. The initial filling corresponds to a lubricant from the column for the ambient temperatures (standard version) in the lubricant table.

7.2.1 Roller bearing greases

This table contains comparable approved roller bearing greases from various manufacturers. The manufacturer can be changed within a lubricant type. Observe the ambient temperature range.

Mixing different greases is not permissible. When changing the grease, different greases of one lubricant type within the relevant ambient temperature range may be mixed in a maximum ratio of 1/20 (5%).

When changing the lubricant type or the ambient temperature range, please consult Getriebebau NORD. Otherwise, no warranty can be accepted for the function of the gear units.

Lubricant type	Ambient temperature	Castrol	KLÜBER LUBRICATION	Mobil	
Grease (mineral oil)	-30…60 °C	Spheerol EPL 2	-	Mobilux EP 2	Gadus S2 V220 2
Grease (PAO)	-25…80 °C	-	PETAMO GHY 133 N	-	-

Table 12: Roller bearing greases

7.2.2 Gear oils

This table shows comparable approved lubricants from various manufacturers. The oil manufacturer can be changed within a viscosity and lubricant type. Only change the lubricant type or the viscosity after consultation with Getriebebau NORD.

Mixing different oils is not permissible. When changing the gear oil, different oils of one lubricant type with the same viscosity may be mixed in a maximum ratio of 1/20 (5%).

Lubricant type	Details on name plate	DIN (ISO) / Ambient temperature	Castrol	FUCHS	KLÜBER LUBRICATION	Mobil	Shell
Mineral oil	CLP 680	ISO VG 680 0...40 °C	-	-	-	Mobilgear 600 XP 680	Omala S2 GX 680
	CLP 220	ISO VG 220 -10…40 °C	Alpha EP 220 Alpha SP 220	Renolin CLP 220 Renolin CLP 220 VCI	Klüberoil GEM 1-220 N	Mobilgear 600 XP 220	-
	CLP 100	ISO VG 100 -15…25 °C	-	-	Klüberoil GEM 1-100 N	-	-
Synthetic oil (Polyglycol)	CLP PG 680	ISO VG 680 -20...40 °C	-	-	Klübersynth GH 6-680	-	-
	CLP PG 460	ISO VG 460 -25…80 °C	-	-	Klübersynth GH 6-460	-	-
	CLP PG 220	ISO VG 220 -25…80 °C	Optigear Synthetic 1300/220	Renolin PG 220	Klübersynth GH 6-220	-	-
Synthetic oil (hydrocarbon)	CLP HC 680	ISO VG 680 -30…80 °C	-	-	Klübersynth GEM 4-680	Mobil SHC 636	-
	CLP HC 460	ISO VG 460 -30…80 °C	-	-	-	Mobil SHC 634	-
	CLP HC 220	ISO VG 220 -40…80 °C	Alphasyn EP 220	Renolin UNISYSN XT 220 Renolin Unisyn CLP 220 Renolin Unisyn Gear 220 VCI	Klübersynth GEM 4-220 N Klübersynth MEG 4-220	Mobil SHC 630 Mobil SHC Gear 630	Omala S4 GX 220
Bio-degradable oil	CLP E 680	ISO VG 680 -5…40 °C	-	Plantogear 680 S	-	-	-
	CLP E 220	ISO VG 220 -5…40 °C	-	Plantogear 220 S	-	-	-
Food grade oil	CLP PG H1 680	ISO VG 680 -5…40 °C	-	-	Klübersynth UH1 6-680	-	-
	CLP PG H1 220	ISO VG 220 -25…40 °C	-	Cassida Fluid WG 220	Klübersynth UH1 6-220	-	-
	CLP HC H1 220	ISO VG 220 -25…40 °C	-	-	-	Mobil SHC Cibus 220	-
Gear unit – fluid grease based on mineral oil	GP 00 K-10	-10 … 60 °C	Spheerol EPL 00	-	-	-	-
	GP 00 K-30	-30 … 60 °C	Tribol GR 100-00 PD	-	-	-	-

Table 13: Gear oils

The required lubricant quantity and the lubricant type are stated on the name plate. The precise quantities vary depending on the exact gear ratio and options OSG and OT, if available. When filling,

always observe the oil level screw hole or, with option OT, the dipstick as an indicator of the precise quantity of oil.

After changing the lubricant, and in particular after the initial filling, the oil level may change during the first few hours of operation, as the oil galleries and the hollow spaces only fill gradually during operation. After a short run-in period, we recommend another check of the oil level.

If the gear unit contains an oil inspection glass, we recommend an adjustment of the oil level after an operating time of approximately 2 hours, so that the oil level is visible in the oil inspection glass when the gear unit is at a standstill and has cooled down. An oil level check via the oil inspection glass is only possible after this time.

Gear unit types SK 11282, SK 11382, SK 11382.1, SK 12382 and SK 9096.1 are usually supplied without oil.

7.3 Screw tightening torques

Screw tightening torques [Nm]							
Dimensions	Screw fastenings in strength classes				Cap screws	Threaded pin on coupling	Screw fastenings on covers
	8.8	10.9	12.9	V2A-70 V4A-70			
M4	3.2	5	6	2.8	-	-	-
M5	6.4	9	11	5.8	-	2	-
M6	11	16	19	10	-	-	6.4
M8	27	39	46	24	11	10	11
M10	53	78	91	48	11	17	27
M12	92	135	155	83	27	40	53
M16	230	335	390	207	35	-	92
M20	460	660	770	414	-	-	230
M24	790	1150	1300	711	80	-	460
M30	1600	2250	2650	1400	170	-	-
M36	2780	3910	4710	2500	-	-	1600
M42	4470	6290	7540	4025	-	-	-
M48	6140	8640	16610	5525	-	-	-
M56	9840	13850	24130	8860	-	-	-
G½	-	-	-	-	75	-	-
G¾	-	-	-	-	110	-	-
G1	-	-	-	-	190	-	-
G1¼	-	-	-	-	240	-	-
G1½	-	-	-	-	300	-	-

Table 14: Screw tightening torques

Installing hose unions

Oil the thread of the union nut, the cutting ring and the thread of the connecting piece. Tighten the union nut with a spanner until the union nut becomes more difficult to turn. Turn the union nut further by approx. 30° to 60° but only to a maximum of 90° while holding the connecting piece with a spanner. Remove excess oil from the union.

7.4 Troubleshooting

NOTICE!

Gear unit damage

- Shut down the gear unit immediately in case of malfunction.

Gear unit malfunctions		
Error	**Possible cause**	**Remedy**
Unusual running noises, vibrations	Oil too low or bearing damage or gear wheel damage	Consult NORD Service department
Oil escaping from gear unit or motor	Defective seal	Consult NORD Service department
Oil escaping from pressure vent	Incorrect oil level	Use oil expansion chamber (Option OA)
	Incorrect, dirty oil	Oil change
	Unfavourable operating conditions	Consult NORD Service department
Gear unit becomes too hot	Unfavourable installation conditions or gear unit damage	Consult NORD Service department
Shock when switching on, vibrations	Motor coupling defective	Replace elastomer ring
	Gear unit fastening loose	Tighten motor and gear unit fastening screws
	Defective rubber element	Replace rubber element
Output shaft does not rotate although motor is running	Breakage in gear unit	Consult NORD Service department
	Motor coupling defective	
	Shrink disc slip	

Table 15: Overview of malfunctions

7.5 Leakage and leak-tightness

Gear units are filled with oil or grease to lubricate the moving parts. Seals prevent the escape of lubricants. Full leak-tightness is technically not possible, as a certain film of moisture, for example on the radial shaft seals is normal and advantageous for a long-term sealing effect. In the region of vents, oil moisture may be visible due to the escape of function-related oil mist. In the case of grease-lubricated labyrinth seals such as Taconite sealing systems, the used grease emerges from the sealing gap. This apparent leak is not a fault.

According to the test conditions as per DIN 3761, the leak is determined by the medium to be sealed. In bench tests, it exceeds the function-related moisture on the sealing edge in a defined test period and results in dripping of the medium to be sealed. The measured quantity which is then collected is designated as leakage.

Definition of leakage according to DIN 3761 and its appropriate use					
Term	**Explanation**	**Location of leakage**			
		Radial shaft seal	**In IEC adapter**	**Housing joint**	**Vent**
Sealed	No moisture apparent	No fault present			
Damp	Moisture film locally restricted (not an area)	No fault present			
Wet	Moisture film beyond the extent of the component	No fault present		Check, if repair is necessary	No fault present
Measurable leakage	Recognisable stream, dripping	Repair recommended			
Temporary leakage	Temporary malfunction of the sealing system or oil leak due to transport *)	No fault present		Check, if repair is necessary	No fault present
Apparent leakage	Apparent leakage, e.g. due to soiling or sealing systems, which can be re-lubricated	No fault present			

Table 16: Definition of leakage according to DIN 3761

*) Previous experience has shown that moist or wet radial shaft seals stop leaking in the further process. Therefore, under no circumstances can replacement be recommended at this stage. The reason for momentary moisture may be e.g. small particles under the sealing lip.

7.6 Repair information

For enquiries to our technical and mechanical service department, please have the exact gear unit type and, if applicable, the order number to hand. You can find this information on the name plate.

7.6.1 Repairs

In case of repair, remove all non-original parts from the gear unit or geared motor. No guarantee can be given for any attached parts, such as rotary encoders or external fans.

Send the device to the following address:

Getriebebau NORD GmbH & Co. KG
Serviceabteilung
Getriebebau-Nord-Straße 1
22941 Bargteheide

Information

If possible, state the reason for returning the component/device. Specify a contact person for queries.

This is important in order to keep repair times as short as possible.

7.6.2 Internet information

In addition, you will find the manuals in the available languages on our website: www.nord.com.

7.7 Warranty

NORD GmbH & Co. KG accepts no liability for damage to persons, materials or assets as a result of failure to observe this operating manual, operating errors or incorrect use. General wearing parts, e.g. radial seals are excluded from the warranty.

7.8 Abbreviations

2D	Dust explosion-proof gear units, Zone 21
2G	Gas explosion-proof gear units, Zone 1
3D	Dust explosion-proof gear units, Zone 22
ATEX	**AT**mosphrères **EX**plosible
B5	Flange fastening with through holes
B14	Flange fastening with threaded holes
CLP	Mineral oil
CLP HC	Synthetic polyalphaolefin oil
CLP PG	Synthetic polyglycol oil
cSt	Centistokes
CW	Clockwise, right rotation
CCW	Counter-clockwise, left rotation
°dH	Water hardness in German hardness degrees 1 dH = 0.1783 mmol/l
DIN	Deutsches Institut für Normung [*German Institute for Standardisation*]
E	Ester oil
EC	European Community
EN	European standard
F_R	Radial force
F_A	Axial force
H1	Lubricant for the food industry
IE1	Standard efficiency motors
IE2	High efficiency motors
IEC	International Electrotechnical Commission
NEMA	National Electrical Manufacturers Association
IP55	International protection
ISO	International standardisation organisation
pH	pH value
PPE	Personal Protective Equipment
DIR	Directive
UKCA	UK Conformity Assessed
VCI	Volatile Corrosion Inhibitor
VG	Viscosity group
WN	Document from Getriebebau NORD

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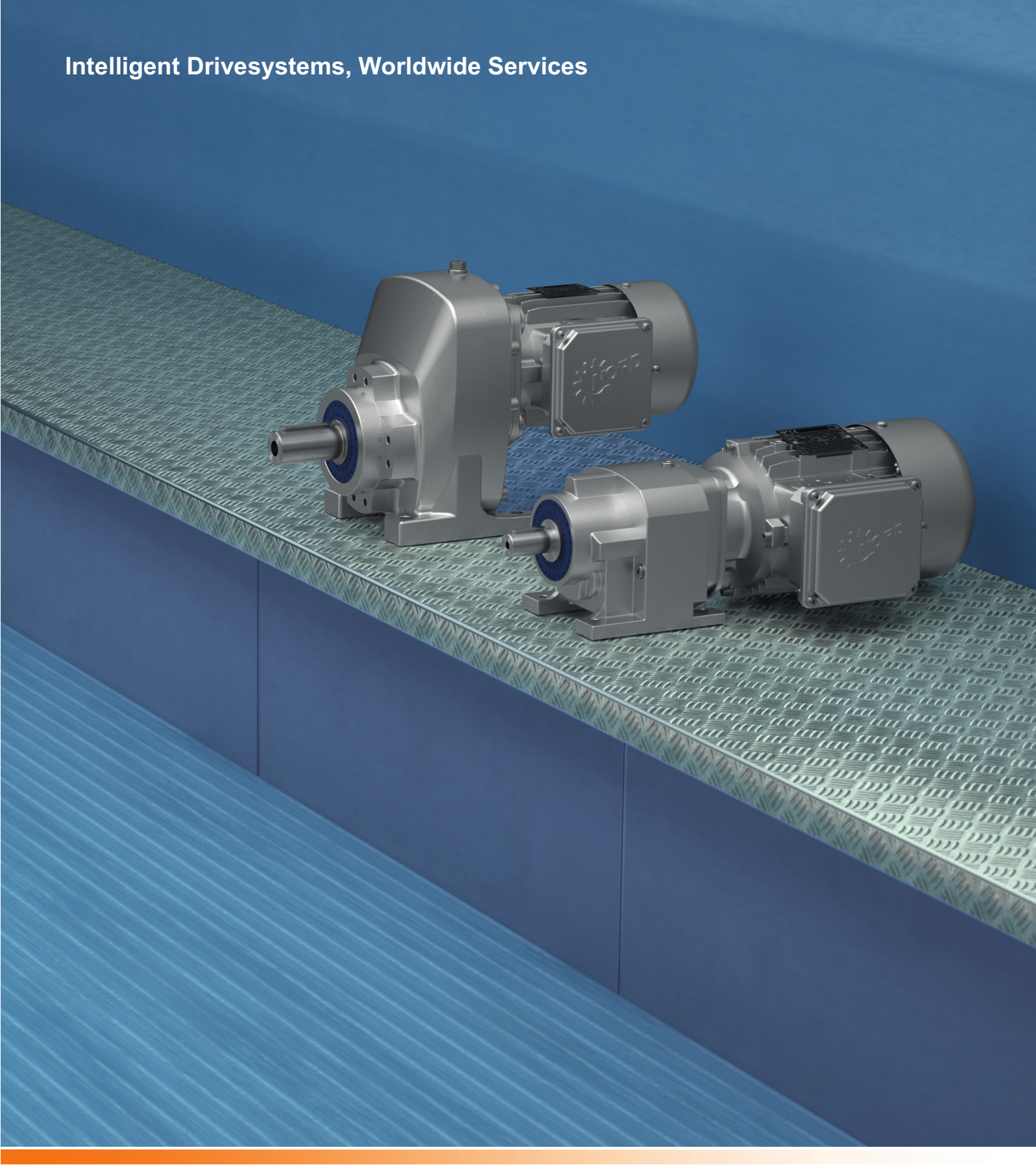
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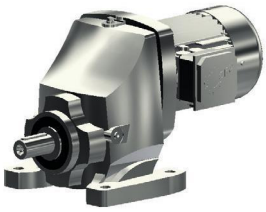
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NORD® DRIVESYSTEMS

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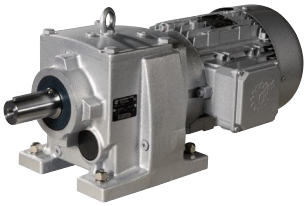


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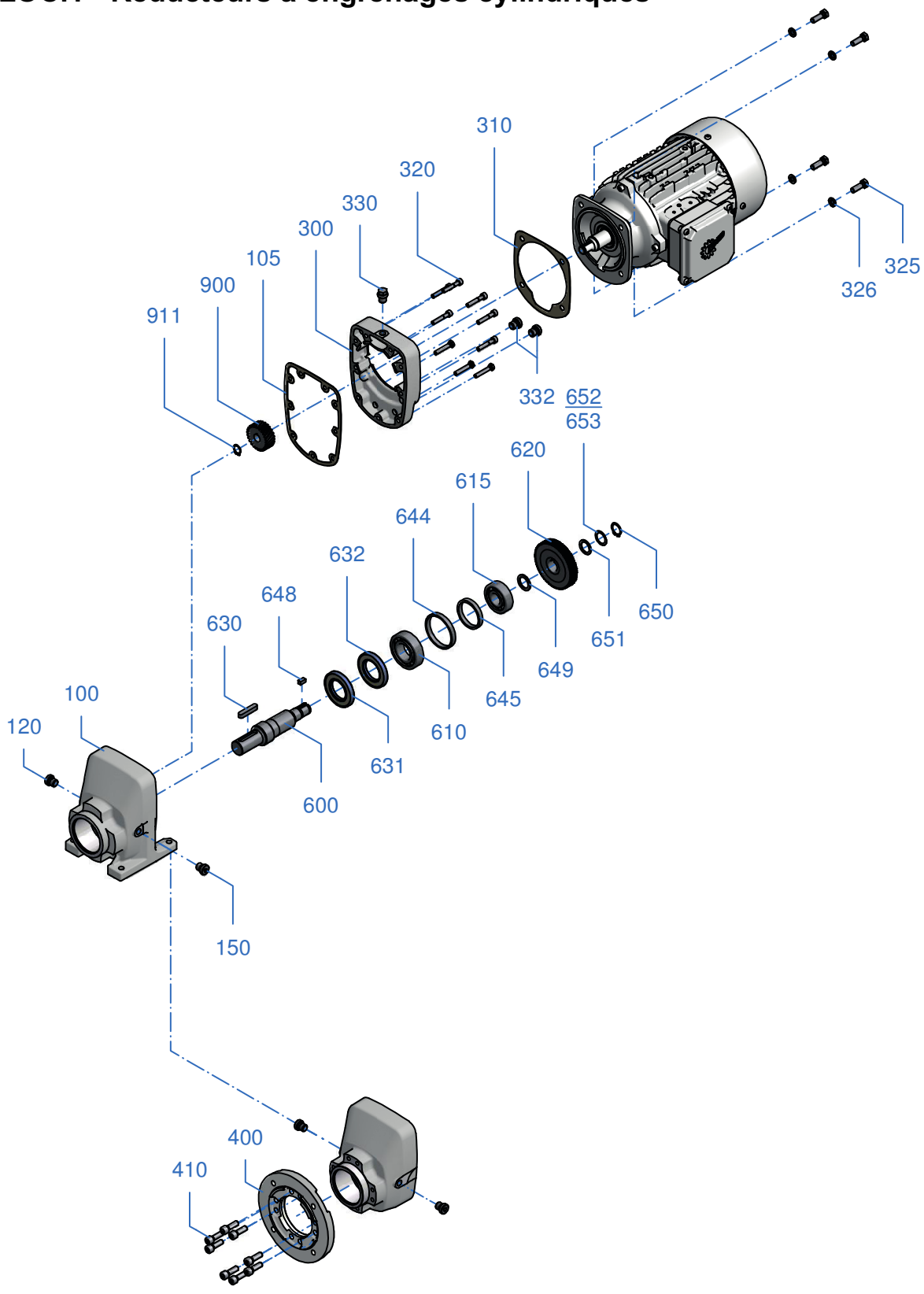




DRIVESYSTEMS

NORDBLOC.1 - Stirnradgetriebe
NORDBLOC.1 - Helical Gear Unit
NORDBLOC.1 - Reducteurs à engrenages cylindriques

EB 553 9000 E3 #1





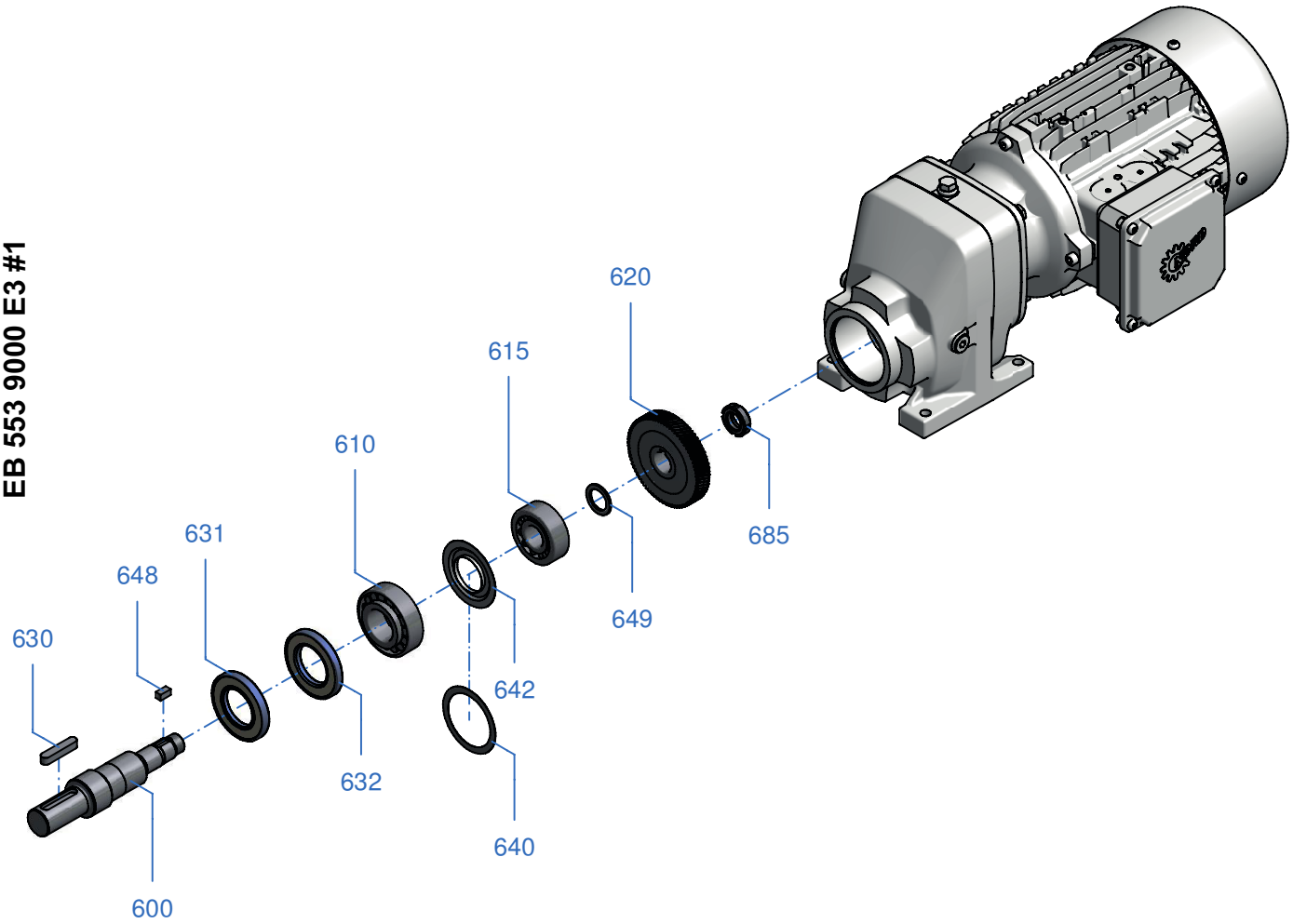
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300	Getriebedeckel	300	Gear unit cover	300	Couvercle du réducteur
310	Dichtung	310	Seal	310	Bague d‘étanchéité
320	Schraube	320	Screw	320	Vis
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326	Federring	326	Lock washer	326	Rondelle élastique
330	Schraube	330	Screw	330	Vis
332	Schraube	332	Screw	332	Vis
400	Flansch	400	Flange	400	Bride
410	Schraube	410	Screw	410	Vis
600	Abtriebswelle	600	Output shaft	600	Arbre de sortie
610	Wälzlager	610	Roller bearing	610	Palier
615	Wälzlager	615	Roller bearing	615	Palier
620	Abtriebsrad	620	Output gear	620	Roue de sortie
630	Passfeder	630	Key	630	Clavette
631	Wellendichtring	631	Radial shaft seal	631	Bague d‘étanchéité de l‘arbre
632	Wellendichtring	632	Radial shaft seal	632	Bague d‘étanchéité de l‘arbre
644	Buchse	644	Socket	644	Douille
645	Buchse	645	Socket	645	Douille
648	Passfeder	648	Key	648	Clavette
649	Buchse	649	Socket	649	Douille
650	Sicherungsring	650	Circlip	650	Circlip
651	Stützscheibe	651	Supporting disc	651	Rondelle support
652	Passscheibe	652	Shim	652	Rondelles d‘ajustage
653	Passscheibe	653	Shim	653	Rondelles d‘ajustage
900	Antriebsritzel	900	Driving pinion	900	Pignon d‘entrée
911	Sicherungsring	911	Circlip	911	Circlip



DRIVESYSTEMS

NORDBLOC.1 - Stirnradgetriebe mit verstärkter Lagerung VL
NORDBLOC.1 - Helical Gear Unit with reinforced bearing VL
NORDBLOC.1 - Reducteurs à engrenages cylindriques avec roulements renforcés VL

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Restliche Getriebeteile siehe Ersatzteilkatalog NORDBLOC Stirnradgetriebe

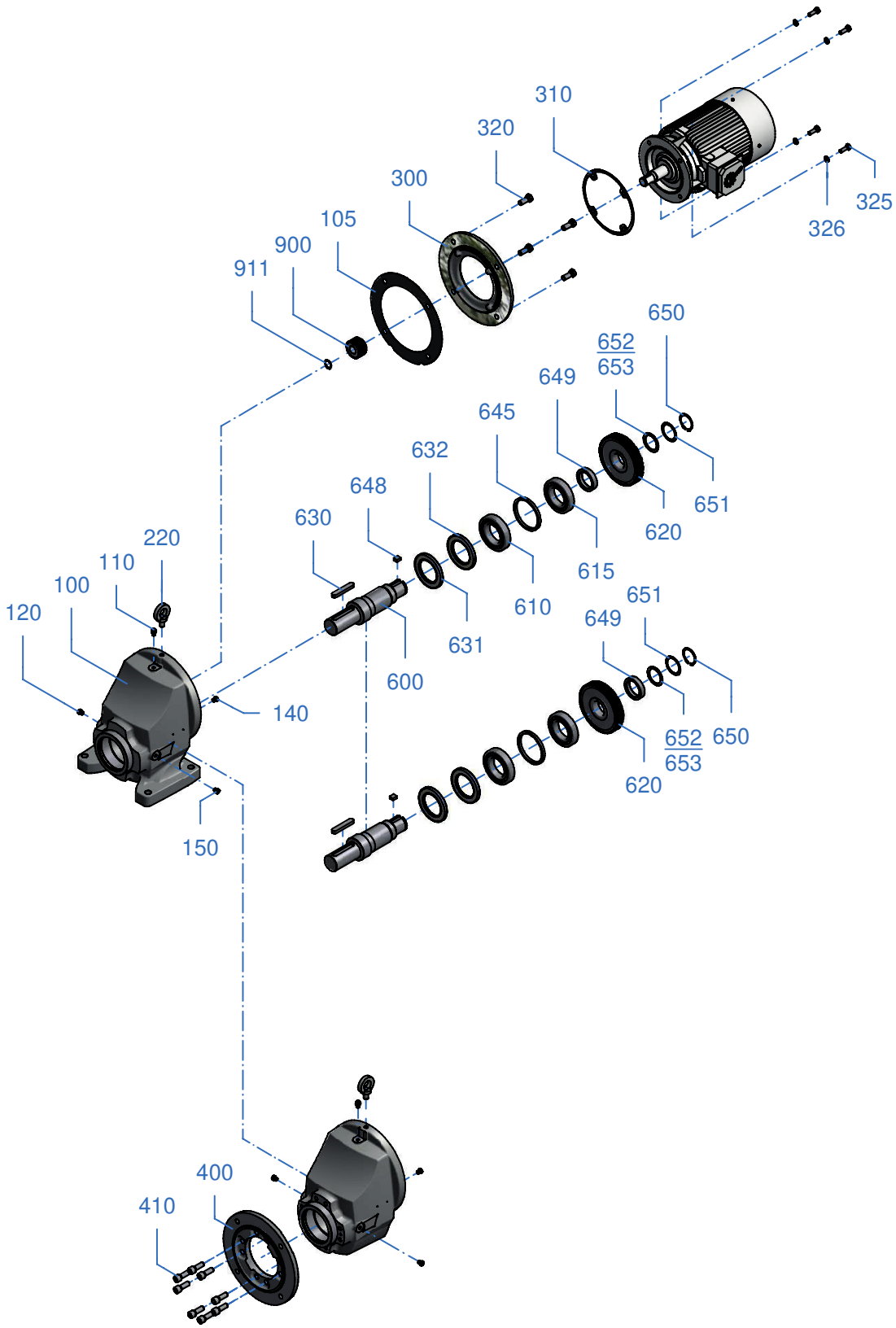
Remaining gear parts see catalogue NORDBLOC Helical Inline Gear Unit



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620	Abtriebsrad	620	Output gear	620	Roue de sortie
630	Passfeder	630	Key	630	Clavette
631	Wellendichtring	631	Radial shaft seal	631	Bague d‘étanchéité de l‘arbre
632	Wellendichtring	632	Radial shaft seal	632	Bague d‘étanchéité de l‘arbre
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642	Nilosring	642	Nilos-ring	642	Bague Nilos
648	Passfeder	648	Key	648	Clavette
649	Buchse	649	Socket	649	Douille
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NORDBLOC.1 - Stirnradgetriebe
NORDBLOC.1 - Helical Gear Unit
NORDBLOC.1 - Reducteurs à engrenages cylindriques

EB 556 9000 E1 #1





SK 871.1 - SK 1071.1

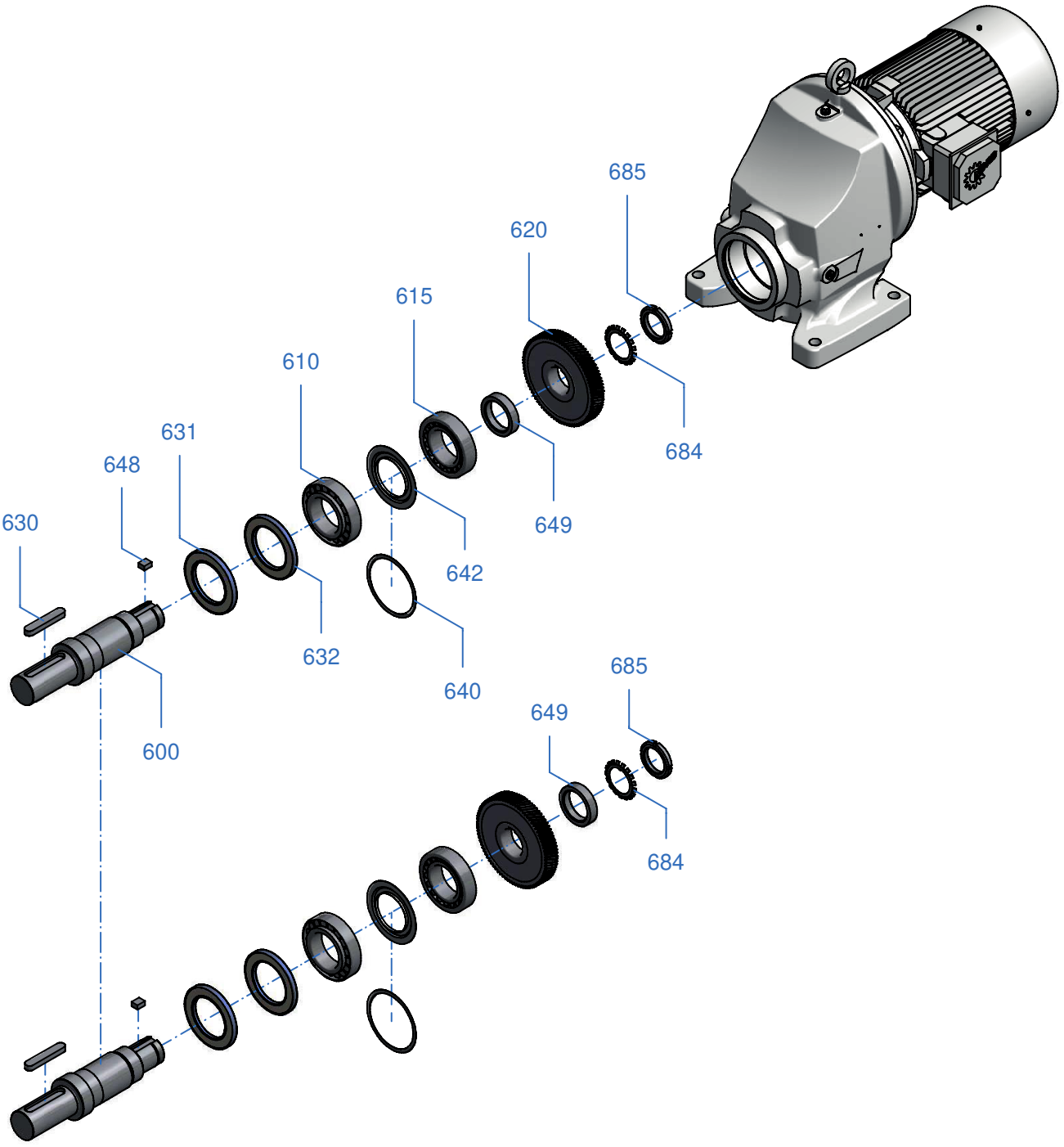
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220	Schraube	120	Screw	120	Vis
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400	Flansch	400	Flange	400	Bride
410	Schraube	410	Screw	410	Vis
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620	Abtriebsrad	620	Output gear	620	Roue de sortie
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652	Passscheibe	652	Shim	652	Rondelles d‘ajustage
653	Passscheibe	653	Shim	653	Rondelles d‘ajustage
900	Antriebsritzel	900	Driving pinion	900	Pignon d‘entrée
911	Sicherungsring	911	Circlip	911	Circlip



DRIVESYSTEMS

NORDBLOC.1 - Stirnradgetriebe mit verstärkter Lagerung VL
NORDBLOC.1 - Helical Gear Unit with reinforced bearing VL
NORDBLOC.1 - Reducteurs à engrenages cylindriques avec roulements renforcés VL

EB 556 9000 E1 #2

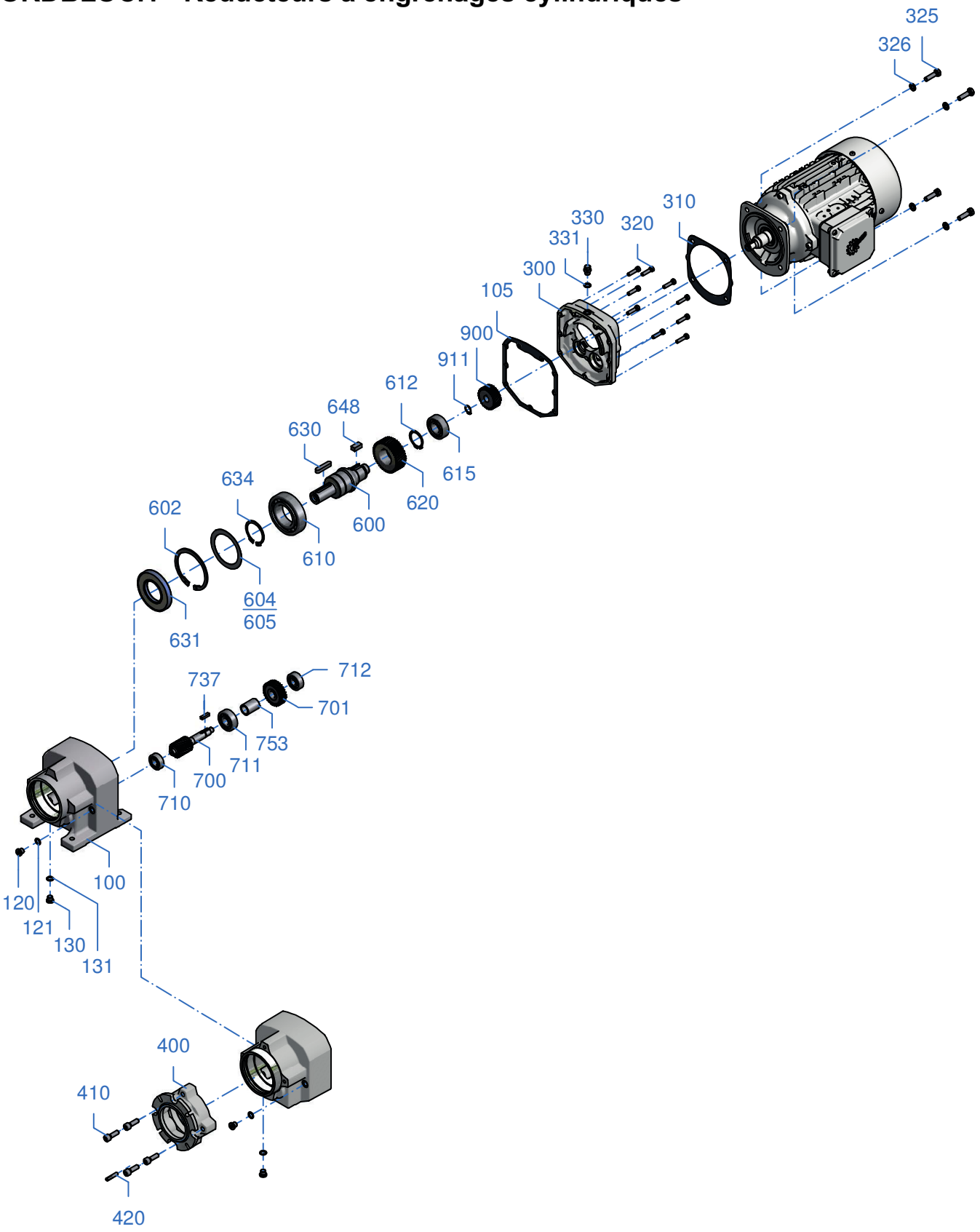




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620	Abtriebsrad	620	Output gear	620	Roue de sortie
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632	Wellendichtring	632	Radial shaft seal	632	Bague d‘étanchéité de l‘arbre
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642	Nilosring	642	Nilos-ring	642	Bague Nilos
648	Passfeder	648	Key	648	Clavette
649	Buchse	649	Socket	649	Douille
684	Sicherungsblech	684	Securing plate	684	Tôle de sécurité
685	Nutmutter	685	Locknut	685	Écrou à encoches

NORDBLOC.1 - Stirnradgetriebe
NORDBLOC.1 - Helical Gear Unit
NORDBLOC.1 - Reducteurs à engrenages cylindriques

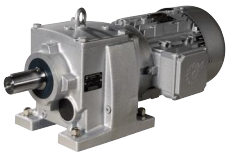
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SK 072.1 - SK 672.1

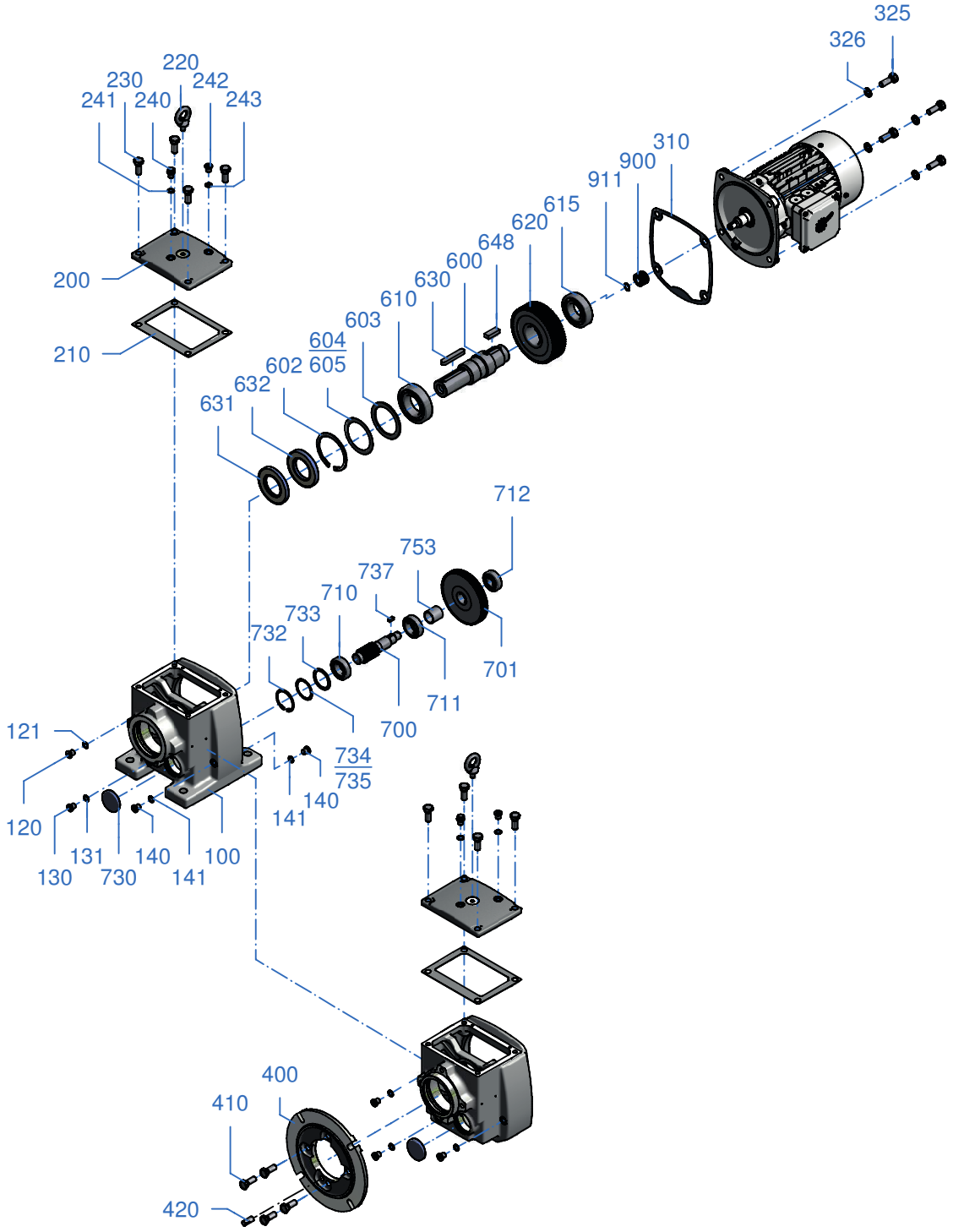
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130	**Schraube**	130	Screw	130	Vis
131	**Dichtung**	131	Seal	131	Bague d‘étanchéité
300	**Getriebedeckel**	300	Gear unit cover	300	Couvercle du réducteur
310	**Dichtung**	310	Seal	310	Bague d‘étanchéité
320	**Schraube**	320	Screw	320	Vis
325	**Schraube**	325	Screw	325	Vis
326	**Federring**	326	Lock washer	326	Rondelle élastique
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400	**Flansch**	400	Flange	400	Bride
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604	**Passscheibe**	604	Shim	604	Rondelles d‘ajustage
605	**Passscheibe**	605	Shim	605	Rondelles d‘ajustage
610	**Wälzlager**	610	Roller bearing	610	Palier
612	**Sicherungsring**	612	Circlip	612	Circlip
615	**Wälzlager**	615	Roller bearing	615	Palier
620	**Abtriebsrad**	620	Output gear	620	Roue de sortie
630	**Passfeder**	630	Key	630	Clavette
631	**Wellendichtring**	631	Radial shaft seal	631	Bague d‘étanchéité de l‘arbre
634	**Sicherungsring**	634	Circlip	634	Circlip
648	**Passfeder**	648	Key	648	Clavette
700	**Ritzelwelle**	700	Pinion shaft	700	Arbre de pignon
701	**Antreibsrad**	701	Drive gear	701	Roue d‘entrée
710	**Wälzlager**	710	Roller bearing	710	Palier
711	**Wälzlager**	711	Roller bearing	711	Palier
712	**Wälzlager**	712	Roller bearing	712	Palier
737	**Passfeder**	737	Key	737	Clavette
753	**Buchse**	753	Socket	753	Douille
900	**Antriebsritzel**	900	Driving pinion	900	Pignon d‘entrée
911	**Sicherungsring**	911	Circlip	911	Circlip

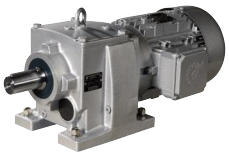


DRIVESYSTEMS

NORDBLOC.1 - Stirnradgetriebe
NORDBLOC.1 - Helical Gear Unit
NORDBLOC.1 - Reducteurs à engrenages cylindriques

EB 577 9000 E3 #1

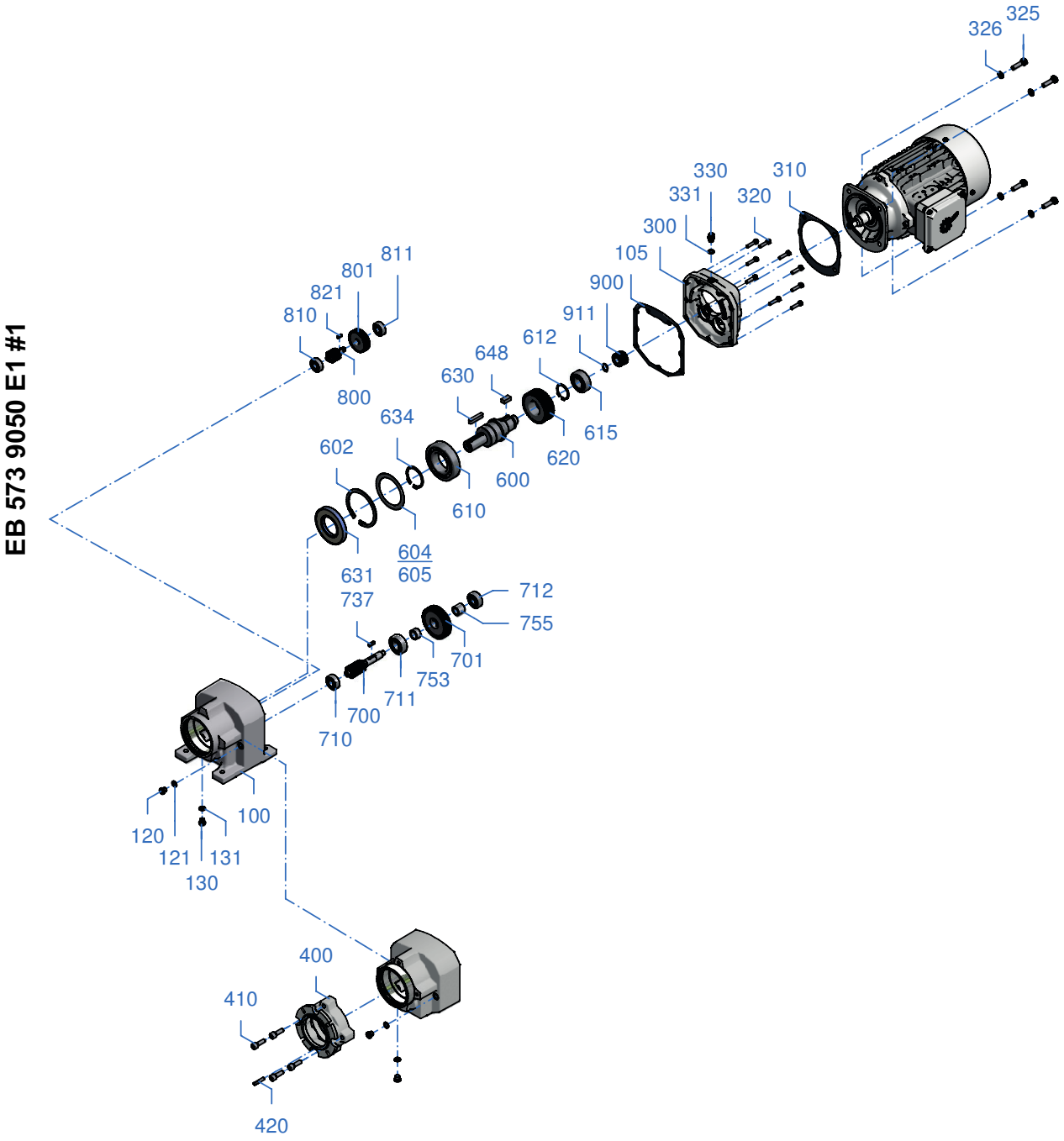




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140	Schraube	140	Screw	140	Vis
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200	Gehäusedeckel	200	Housing cover	200	Couvercle du carter
210	Dichtung	210	Seal	210	Bague d'étanchéité
220	Schraube	220	Screw	220	Vis
230	Schraube	230	Screw	230	Vis
240	Schraube	240	Screw	240	Vis
241	Dichtung	241	Seal	241	Bague d'étanchéité
242	Schraube	242	Screw	242	Vis
243	Dichtung	243	Seal	243	Bague d'étanchéité
310	Dichtung	310	Seal	310	Bague d'étanchéité
325	Schraube	325	Screw	325	Vis
326	Federring	326	Lock washer	326	Rondelle élastique
400	Flansch	400	Flange	400	Bride
410	Schraube	410	Screw	410	Vis
420	Stift	420	Pin	420	Goupille
600	Abtriebswelle	600	Output shaft	600	Arbre de sortie
602	Sicherungsring	602	Circlip	602	Circlip
603	Stützscheibe	603	Supporting disc	603	Rondelle d'appui
604	Passscheibe	604	Shim	604	Rondelles d'ajustage
605	Passscheibe	605	Shim	605	Rondelles d'ajustage
610	Wälzlager	610	Roller bearing	610	Palier
615	Wälzlager	615	Roller bearing	615	Palier
620	Abtriebsrad	620	Output gear	620	Roue de sortie
630	Passfeder	630	Key	630	Clavette
631	Wellendichtring	631	Radial shaft seal	631	Bague d'étanchéité de l'arbre
632	Wellendichtring	632	Radial shaft seal	632	Bague d'étanchéité de l'arbre
648	Passfeder	648	Key	648	Clavette
700	Ritzelwelle	700	Pinion shaft	700	Arbre de pignon
701	Antriebsrad	701	Drive gear	701	Roue d'entrée
710	Wälzlager	710	Roller bearing	710	Palier
711	Wälzlager	711	Roller bearing	711	Palier
712	Wälzlager	712	Roller bearing	712	Palier
730	Verschlusskappe	730	Sealing cap	730	Bouchon
732	Sicherungsring	732	Circlip	732	Circlip
733	Stützscheibe	733	Supporting disc	733	Rondelle support
734	Passscheibe	734	Shim	734	Rondelles d'ajustage
735	Passscheibe	735	Shim	735	Rondelles d'ajustage
737	Passfeder	737	Key	737	Clavette
753	Buchse	753	Socket	753	Douille
900	Antriebsritzel	900	Driving pinion	900	Pignon d'entrée
911	Sicherungsring	911	Circlip	911	Circlip

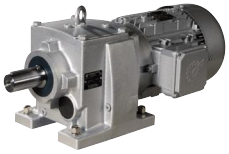
NORDBLOC.1 - Stirnradgetriebe
NORDBLOC.1 - Helical Gear Unit
NORDBLOC.1 - Reducteurs à engrenages cylindriques





SK 373.1 - SK 673.1

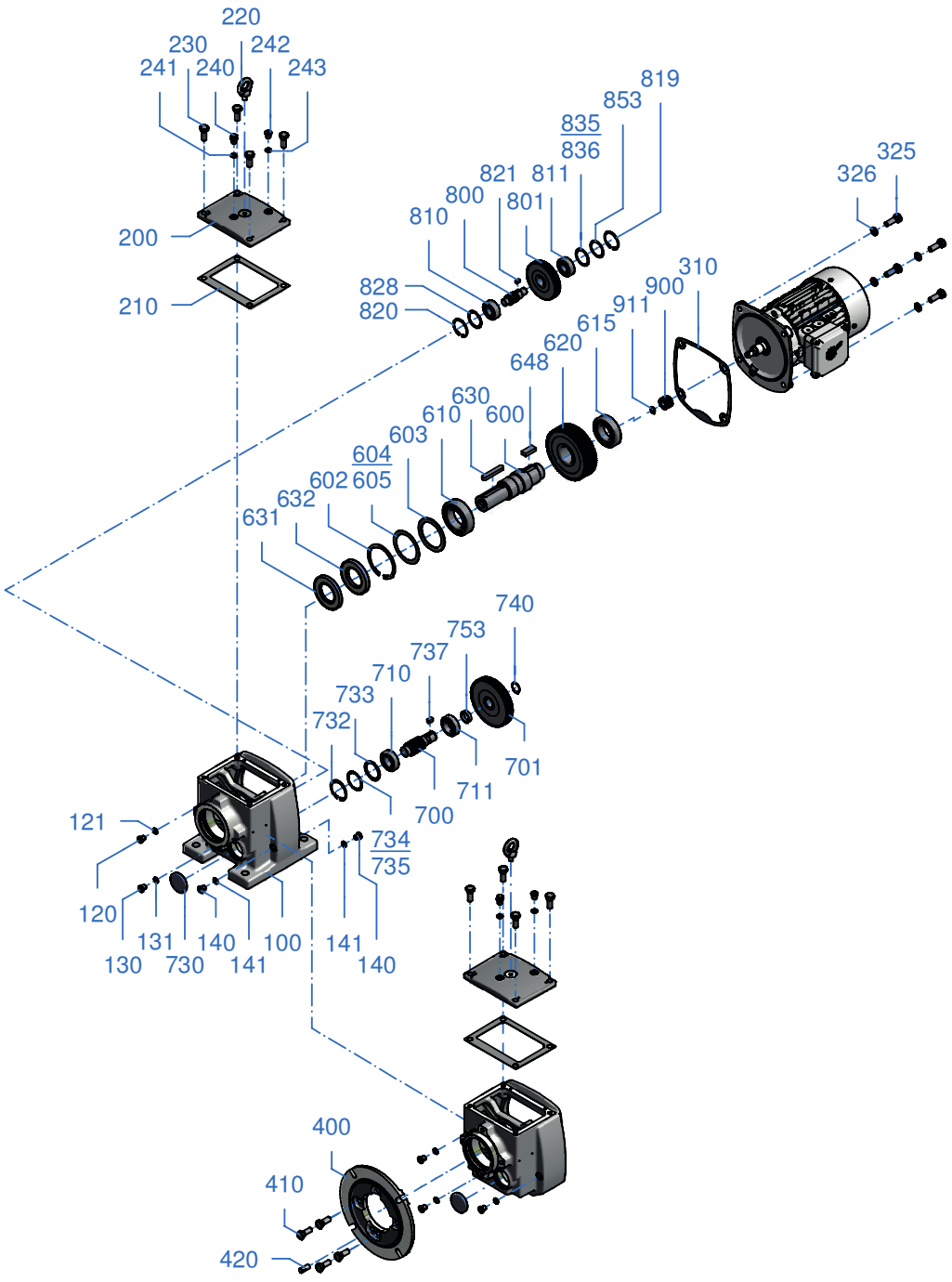
DE		GB		FR	
100	**Gehäuse**	100	Housing	100	Boîtier
105	**Dichtung**	105	Seal	105	Bague d'étanchéité
120	**Schraube**	120	Screw	120	Vis
121	**Dichtung**	121	Seal	121	Bague d'étanchéité
130	**Schraube**	130	Screw	130	Vis
131	**Dichtung**	131	Seal	131	Bague d'étanchéité
300	**Getriebedeckel**	300	Gear unit cover	300	Couvercle du réducteur
310	**Dichtung**	310	Seal	310	Bague d'étanchéité
320	**Schraube**	320	Screw	320	Vis
325	**Schraube**	325	Screw	325	Vis
326	**Federring**	326	Lock washer	326	Rondelle élastique
330	**Schraube**	330	Screw	330	Vis
331	**Dichtung**	331	Seal	331	Bague d'étanchéité
400	**Flansch**	400	Flange	400	Bride
410	**Schraube**	410	Screw	410	Vis
420	**Stift**	420	Pin	420	Goupille
600	**Abtriebswelle**	600	Output shaft	600	Arbre de sortie
602	**Sicherungsring**	602	Circlip	602	Circlip
604	**Passscheibe**	604	Shim	604	Rondelles d'ajustage
605	**Passscheibe**	605	Shim	605	Rondelles d'ajustage
610	**Wälzlager**	610	Roller bearing	610	Palier
612	**Sicherungsring**	612	Circlip	612	Circlip
615	**Wälzlager**	615	Roller bearing	615	Palier
620	**Abtriebsrad**	620	Output gear	620	Roue de sortie
630	**Passfeder**	630	Key	630	Clavette
631	**Wellendichtring**	631	Radial shaft seal	631	Bague d'étanchéité de l'arbre
634	**Sicherungsring**	634	Circlip	634	Circlip
648	**Passfeder**	648	Key	648	Clavette
700	**Ritzelwelle**	700	Pinion shaft	700	Arbre de pignon
701	**Antriebsrad**	701	Drive gear	701	Roue d'entrée
710	**Wälzlager**	710	Roller bearing	710	Palier
711	**Wälzlager**	711	Roller bearing	711	Palier
712	**Wälzlager**	712	Roller bearing	712	Palier
737	**Passfeder**	737	Key	737	Clavette
753	**Buchse**	753	Socket	753	Douille
755	**Buchse**	755	Socket	755	Douille
800	**Ritzelwelle**	800	Pinion shaft	800	Arbre de pignon
801	**Antriebsrad**	801	Drive gear	801	Roue d'entrée
810	**Wälzlager**	810	Roller bearing	810	Palier
811	**Wälzlager**	811	Roller bearing	811	Palier
821	**Passfeder**	821	Key	821	Clavette
900	**Antriebsritzel**	900	Driving pinion	900	Pignon d'entrée
911	**Sicherungsring**	911	Circlip	911	Circlip

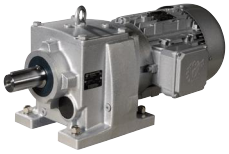


DRIVESYSTEMS

NORDBLOC.1 - Stirnradgetriebe
NORDBLOC.1 - Helical Gear Unit
NORDBLOC.1 - Reducteurs à engrenages cylindriques

EB 577 9050 E4 #1





SK 773.1 - SK 973.1

DE		GB		FR	
100	Gehäuse	1100	Housing	100	Boîtier
120	Schraube	120	Screw	120	Vis
121	Dichtung	121	Seal	121	Bague d‘étanchéité
130	Schraube	130	Screw	130	Vis
131	Dichtung	131	Seal	131	Bague d‘étanchéité
140	Schraube	140	Screw	140	Vis
141	Dichtung	141	Seal	141	Bague d‘étanchéité
200	Gehäusedeckel	200	Housing cover	200	Couvercle du carter
210	Dichtung	210	Seal	210	Bague d‘étanchéité
220	Schraube	220	Screw	220	Vis
230	Schraube	230	Screw	230	Vis
240	Schraube	240	Screw	240	Vis
241	Dichtung	241	Seal	241	Bague d‘étanchéité
242	Schraube	242	Screw	242	Vis
243	Dichtung	243	Seal	243	Bague d‘étanchéité
310	Dichtung	310	Seal	310	Bague d‘étanchéité
325	Schraube	325	Screw	325	Vis
326	Federring	326	Lock washer	326	Rondelle élastique
400	Flansch	400	Flange	400	Bride
410	Schraube	410	Screw	410	Vis
420	Stift	420	Pin	420	Goupille
600	Abtriebswelle	600	Output shaft	600	Arbre de sortie
602	Sicherungsring	602	Circlip	602	Circlip
603	Stützscheibe	603	Supporting disc	603	Rondelle d’appui
604	Passscheibe	604	Shim	604	Rondelles d‘ajustage
605	Passscheibe	605	Shim	605	Rondelles d‘ajustage
610	Wälzlager	610	Roller bearing	610	Palier
615	Wälzlager	615	Roller bearing	615	Palier
620	Abtriebsrad	620	Output gear	620	Roue de sortie
630	Passfeder	630	Key	630	Clavette
631	Wellendichtring	631	Radial shaft seal	631	Bague d‘étanchéité de l‘arbre
632	Wellendichtring	632	Radial shaft seal	632	Bague d‘étanchéité de l‘arbre
648	Passfeder	648	Key	648	Clavette
700	Ritzelwelle	700	Pinion shaft	700	Arbre de pignon
701	Antriebsrad	701	Drive gear	701	Roue d‘entrée
710	Wälzlager	710	Roller bearing	710	Palier
711	Wälzlager	711	Roller bearing	711	Palier
730	Verschlusskappe	730	Sealing cap	730	Bouchon
732	Sicherungsring	732	Circlip	732	Circlip
733	Stützscheibe	733	Supporting disc	733	Rondelle d’appui
734	Passscheibe	734	Shim	734	Rondelles d‘ajustage
735	Passscheibe	735	Shim	735	Rondelles d‘ajustage
737	Passfeder	737	Key	737	Clavette
740	Sicherungsring	740	Circlip	740	Circlip
753	Buchse	753	Socket	753	Douille
800	Ritzelwelle	800	Pinion shaft	800	Arbre de pignon
801	Antriebsrad	801	Drive gear	801	Roue d‘entrée
810	Wälzlager	810	Roller bearing	810	Palier
811	Wälzlager	811	Roller bearing	811	Palier
819	Sicherungsring	819	Circlip	819	Circlip
820	Sicherungsring	820	Circlip	820	Circlip
821	Passfeder	821	Key	821	Clavette
828	Stützscheibe	828	Supporting disc	828	Rondelle support
835	Passscheibe	835	Shim	835	Rondelles d‘ajustage
836	Passscheibe	836	Shim	836	Rondelles d‘ajustage
853	Stützscheibe	853	Supporting disc	853	Rondelle d’appui
900	Antriebsritzel	900	Driving pinion	900	Pignon d‘entrée
911	Sicherungsring	911	Circlip	911	Circlip

Bestellangaben
Order details
Informations de commande

Kontaktdaten / Contact details / Contacts:

Firma / Company / Entreprise:

Straße / Street / Rue

Stadt / Town / Ville:

PLZ / Postcode/
Code postal:

Telefon / Telephone / Téléphone:

Fax:

E-mail:





Getriebebau NORD

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Telefax +49(0)4532/289-2253
E-Mail info@nord.com
www.nord.com

DE

Diese NORD Ersatzteilliste beinhaltet eine standardisierte Darstellung der NORD Getriebe. Um Ihnen das Finden und Nachbestellen von Ersatzteilen zu erleichtern, finden Sie am Ende der Ersatzteilliste ein Bestellformular mit wichtigen Hinweisen zur Bestimmung der richtigen Teile.

Für Rückfragen stehen wir Ihnen gerne zur Verfügung. Ihren lokalen Ansprechpartner finden Sie unter http://locator.nord.com.

EN

This NORD spare parts list contains a standardised depiction of NORD gear units. In order to enable you to find and re-order replacement parts more easily, you can find an order form and important information regarding the identification of the correct components at the end of this spare parts list.

We will be glad to help you if you have any queries: You can find your local contact partner under http://locator.nord.com.

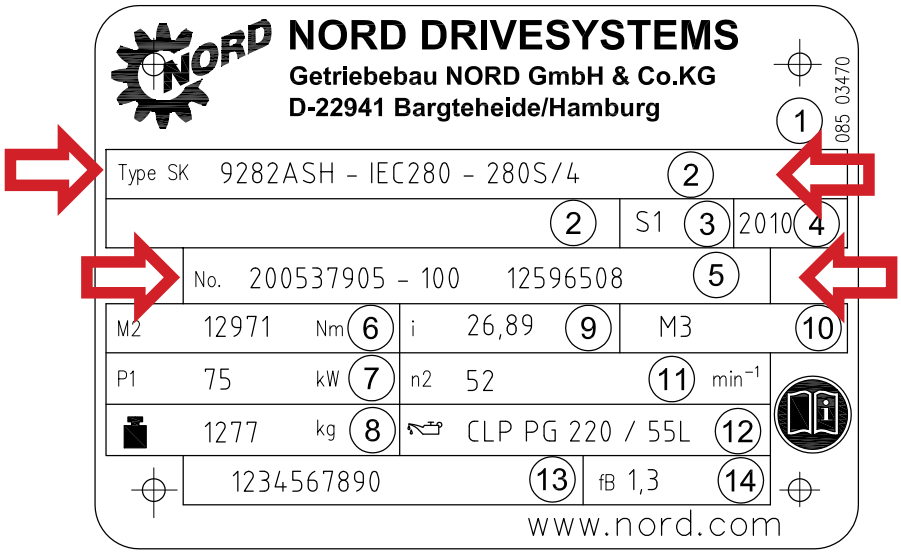
FR

Cette liste de pièces de rechange NORD contient une représentation standard des réducteurs NORD. Pour faciliter la recherche et la commande de pièces de rechange, un formulaire de commande se trouve à la fin de la liste des pièces de rechange et vous donne toutes les informations essentielles pour déterminer les pièces dont vous avez besoin.

En cas de questions, n'hésitez pas à nous contacter. Pour connaître votre interlocuteur local, veuillez consulter le site http://locator.nord.com.

Bestellangaben
Order details
Informations de commande

Erläuterung des Typenschildes
Explanation of the rating plate
Explication de la plaque signalétique



DE

1 Matrix – Barcode
2 NORD - Getriebetyp
3 Betriebsart
4 Herstellungsjahr
5 Fabrikationsnummer
6 Nenndrehmoment der Getriebeabtriebswelle
7 Antriebsleistung
8 Gewicht entsprechend Auftragsausführung
9 Gesamte Getriebeübersetzung
10 Einbaulage
11 Nenndrehzahl der Getriebeabtriebswelle
12 Schmierstoffart, -viskosität und –menge
13 Kundenmaterialnummer
14 Betriebsfaktor

EN

1 Matrix – Barcode
2 NORD gear unit type
3 Operating mode
4 Year of manufacture
5 Serial number
6 Rated torque of gear unit output shaft
7 Drive power
8 Weight according to ordered version
9 Overall gear unit ratio
10 Installation orientation
11 Rated speed of gear unit output shaft
12 Lubricant type, viscosity and quantity
13 Customer's part number
14 Operating factor

FR

1 Code matriciel, à barres
2 Type de réducteur NORD
3 Mode de fonctionnement
4 Année de fabrication
5 Numéro de série
6 Couple nominal de l'arbre de sortie du réducteur
7 Puissance d'entraînement
8 Poids selon l'exécution du contrat
9 Rapport de réduction total
10 Position de montage
11 Vitesse de rotation nominale de l'arbre de sortie du réducteur
12 Type de lubrifiant, viscosité et quantité
13 Numéro d'article client
14 Facteur de service

Ersatzteil-Bestellung / Replacement parts order / Commande de pièces de rechange:

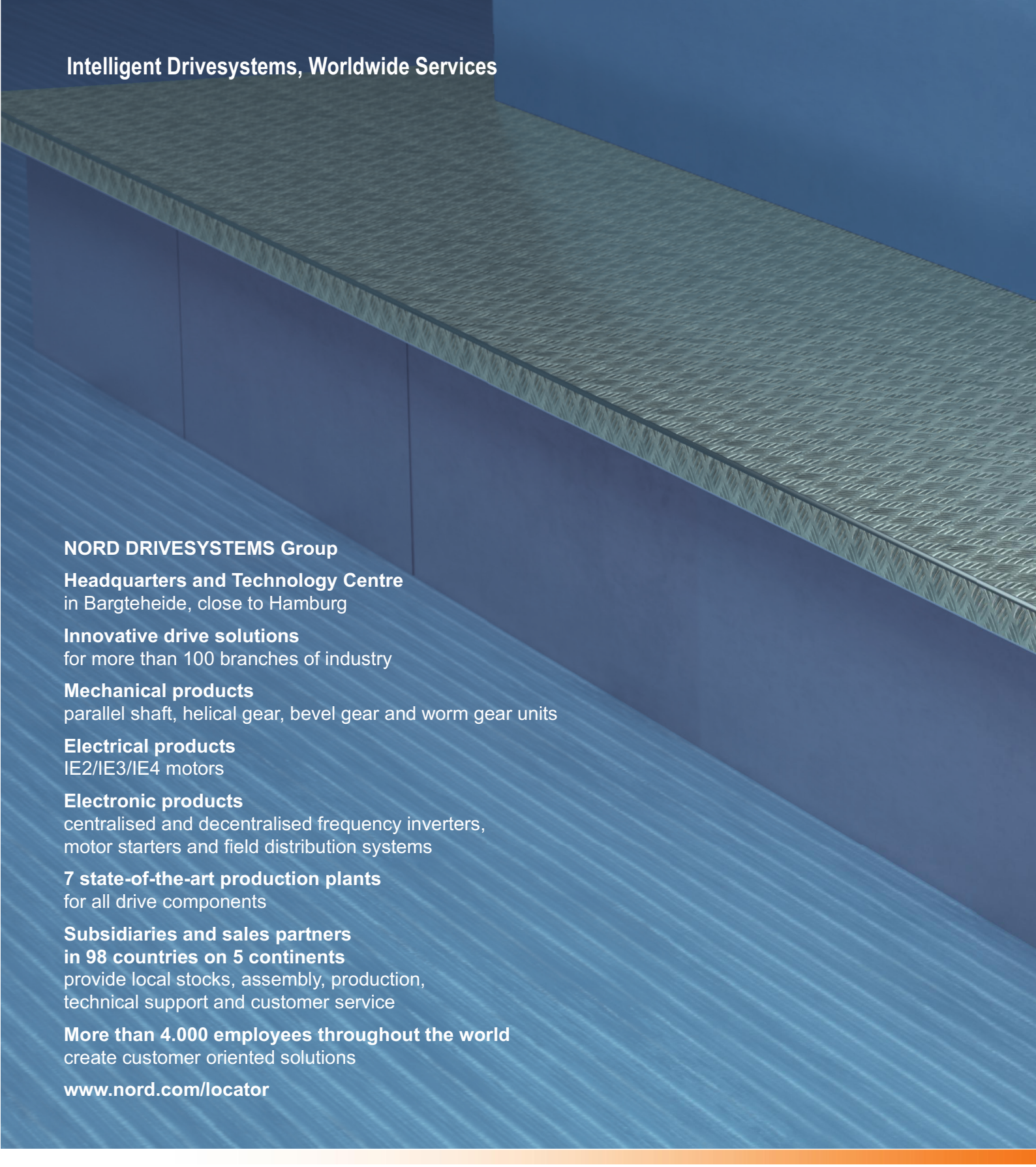
Bezeichnung / Designation / Désignation:

Pos.-Nr. / Item No. / N° pos :

Stückzahl / Pieces / Quantité:

Getriebetyp / Gear unit type / Type de réducteur:

Fabrikationsnummer / Serial No. / Numéro de série:



NORD DRIVESYSTEMS Group

Headquarters and Technology Centre
in Bargteheide, close to Hamburg

Innovative drive solutions
for more than 100 branches of industry

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parallel shaft, helical gear, bevel gear and worm gear units

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Headquarters:

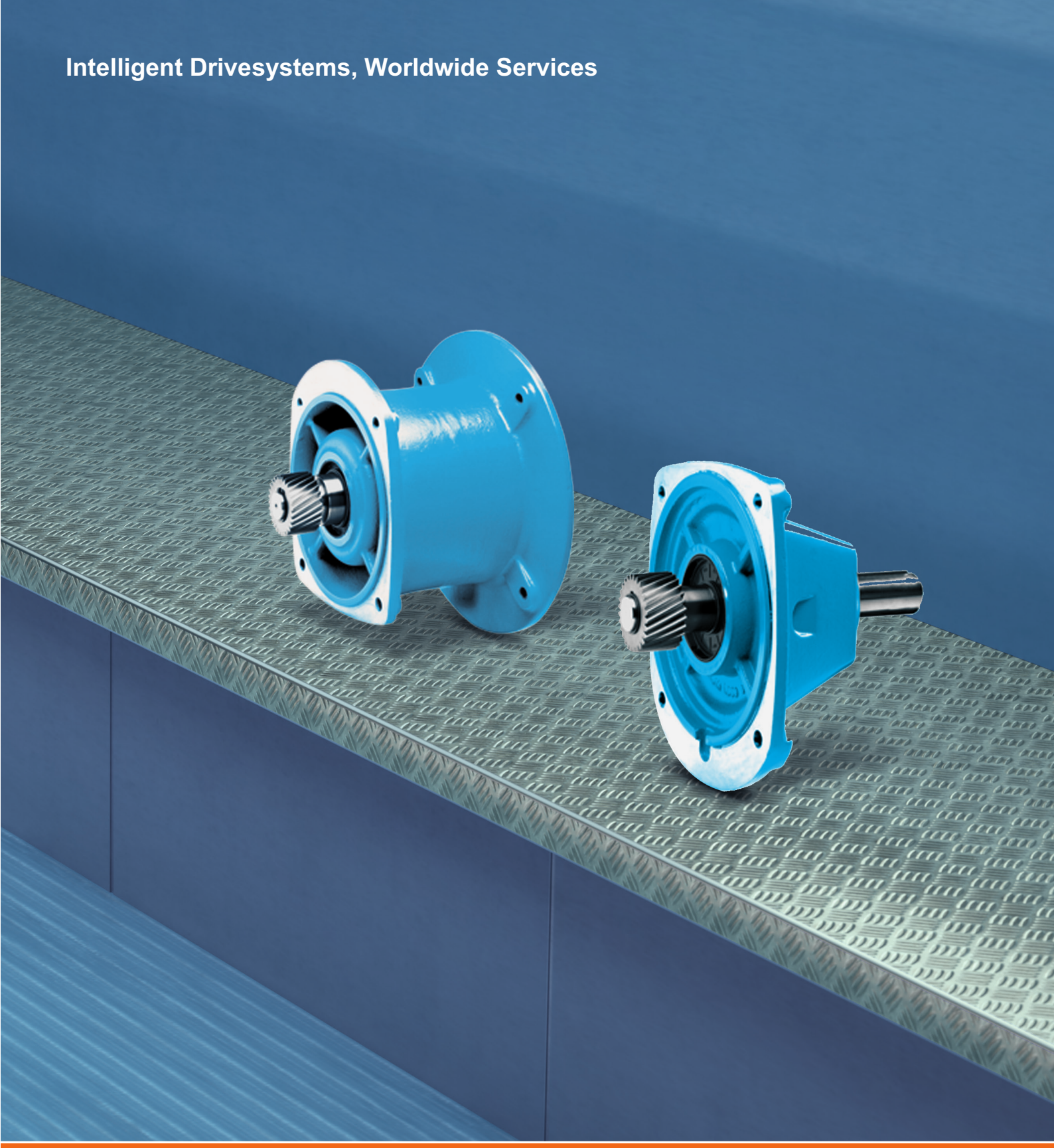
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Getriebebau-Nord-Straße 1
D - 22941 Bargteheide
Fon +49 (0) 4532 / 289-0
Fax +49 (0) 4532 / 289-2253
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Mat.Nr. 6002399 / 1019

Intelligent Drivesystems, Worldwide Services



DE EN FR

PL1080

Ersatzteilkatalog Anbauoptionen
Spare part catalogue for attachment options
Catalogue des pièces de rechange : options de montage

NORD® DRIVESYSTEMS

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General parts list
Vues éclatées et nomenclature





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Motorkonsole . . . . . 14 - 15
Motor bracket
Console moteur

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Vase d’expansion d’huile

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Oil storage tank
Angle de commande d‘huile

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Oil-monitoring elbow
Vase d’expansion d’huile

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Oil control cover
Couvercle de commande huile

Allgemeine Ersatzteile
General parts list
Vues éclatées et nomenclature

Ölkühler . . . . . 22 - 23
Oil cooler
Refroidisseur d‘huile

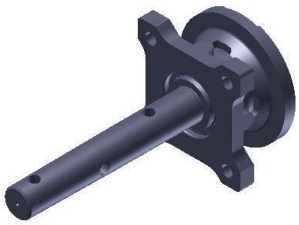
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Order details
Informations de commande



Alu-Anbauten siehe auch Ersatzteilkatalog PL1035 Universal-Schneckengetriebe

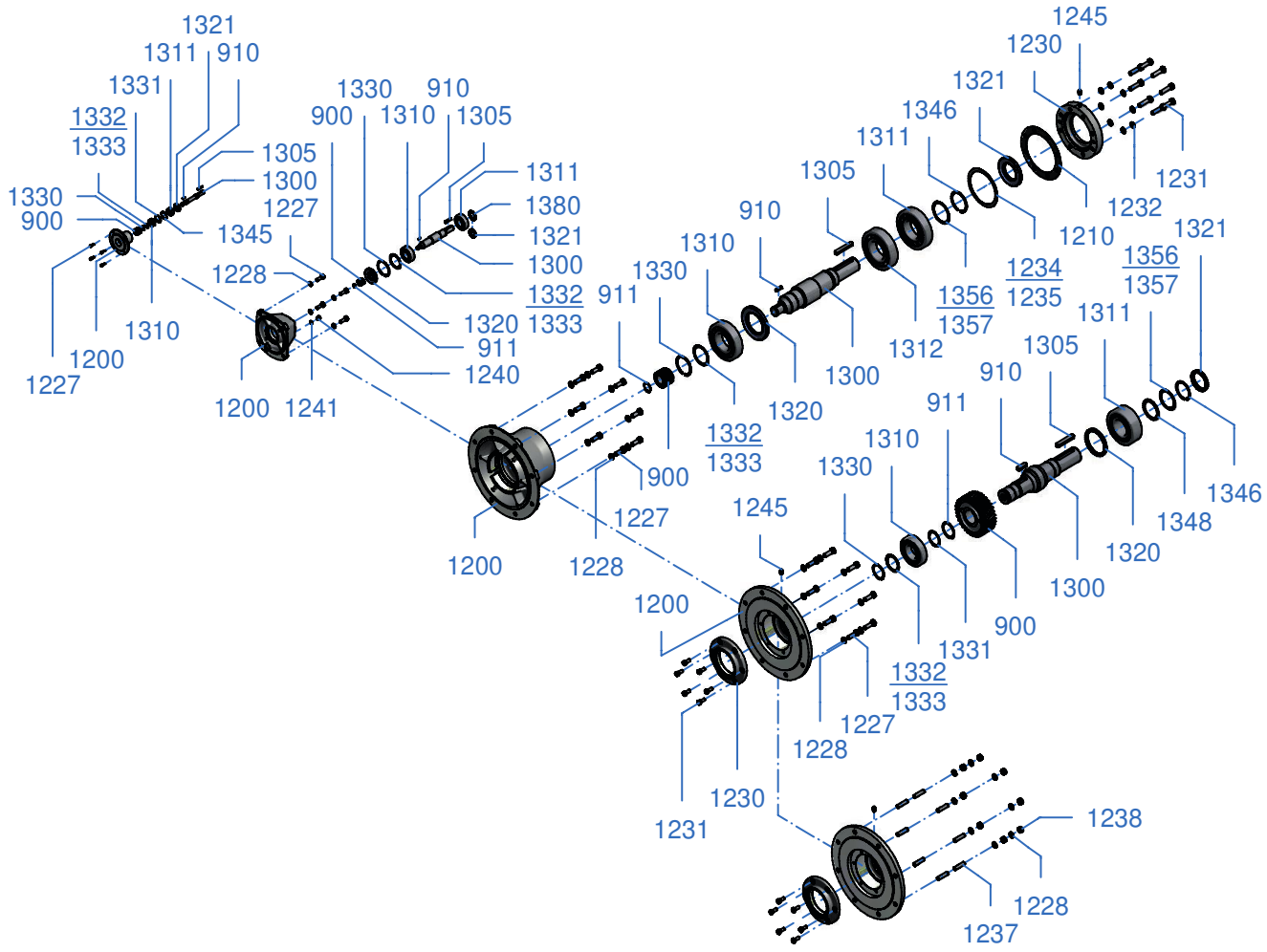
For aluminium attachments see also spare part catalogue PL1035 Universal worm gear units

Pour les montages alu, voir également le catalogue de pièces de rechange du réducteur à vis sans fin Universal PL1035

W-Adapter
W-Adapter
Lanterne W

SK 0, SK 01, SK 20, SK 25, SK 30, SK 33
SK 010, SK 200, SK 250, SK 300, SK 330
SK 11 E - SK 51 E / SK 02 - SK 62 / SK 03 - SK 63
SK 0182 NB - SK 1382 NB / SK 1282 - SK 5282 / SK 2382 - SK 6382
SK 02040 - SK 42125 / SK 13050 - SK 43125
SK 071.1 - SK 972.1 / SK 373.1 - SK 973.1
SK 2S40, SK 2S50, SK 2S63, SK 2S75
SK 62 - SK 72 / SK 73 - SK 93
SK 6282 - SK 7282 / SK 7382 - SK 9382
SK 82 - SK 102 / SK 103
SK 8282 - SK 9282
SK 9072.1 - SK 9092.1 / SK 9096.1
SK 10382.1, SK 11382.1, SK 12382

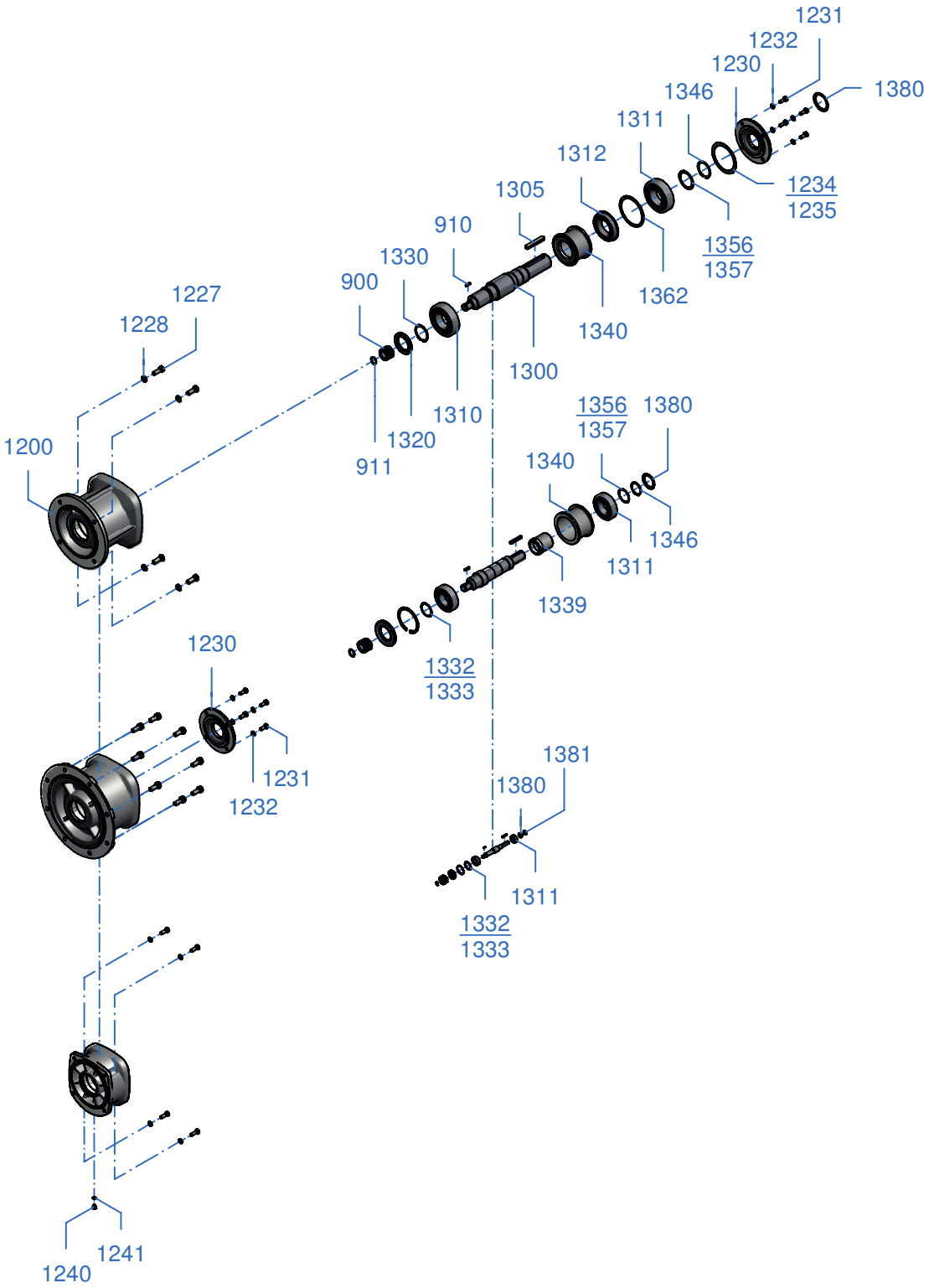
EB 508 9014 E3 #1



DE		GB		FR	
900	Antriebsritzel	900	Drive pinion	900	Pignon d'entrée
910	Passfeder	910	Key	910	Clavette
911	Sicherungsring	911	Circlip	911	Circlip
1200	Gehäuse	1200	Housing	1200	Carter
1210	Dichtung	1210	Gasket	1210	Bague d'étanchéité
1227	Schraube	1227	Screw	1227	Vis
1228	Federring	1228	Lock washer	1228	Rondelle élastique
1230	Deckel	1230	Lid	1230	Couvercle
1231	Schraube	1231	Screw	1231	Vis
1232	Federring	1232	Lock washer	1232	Rondelle élastique
1234	Passscheibe	1234	Shim	1234	Rondelles d'ajustage
1235	Passscheibe	1235	Shim	1235	Rondelles d'ajustage
1237	Schraube	1237	Screw	1237	Vis
1238	Mutter	1238	Nut	1238	mère
1240	Schraube	1240	Screw	1240	Vis
1241	Dichtung	1241	Gasket	1241	Bague d'étanchéité
1245	Schmiernippel	1245	Lubricating nipple	1245	Graisseur
1300	Antriebswelle	1300	Drive shaft	1300	Arbre d'entréé
1305	Passfeder	1305	Key	1305	Clavette
1310	Wälzlager	1310	Roller bearing	1310	Palier
1311	Wälzlager	1311	Roller bearing	1311	Palier
1312	Wälzlager	1312	Roller bearing	1312	Palier
1320	Wellendichtring	1320	Radial shaft seal	1320	Bague d'étanchéité de l'arbre
1321	Wellendichtring	1321	Radial shaft seal	1321	Bague d'étanchéité de l'arbre
1330	Sicherungsring	1330	Circlip	1330	Circlip
1331	Sicherungsring	1331	Circlip	1331	Circlip
1332	Passscheibe	1332	Shim	1332	Rondelles d'ajustage
1333	Passscheibe	1333	Shim	1333	Rondelles d'ajustage
1345	Sicherungsring	1345	Circlip	1345	Circlip
1346	Sicherungsring	1346	Circlip	1346	Circlip
1348	Stützscheibe	1348	Supporting disc	1348	Rondelle support
1356	Passscheibe	1356	Shim	1356	Rondelles d'ajustage
1357	Passscheibe	1357	Shim	1357	Rondelles d'ajustage
1380	Gammaring	1380	Gamma ring	1380	Déflecteur

W0 - WIV

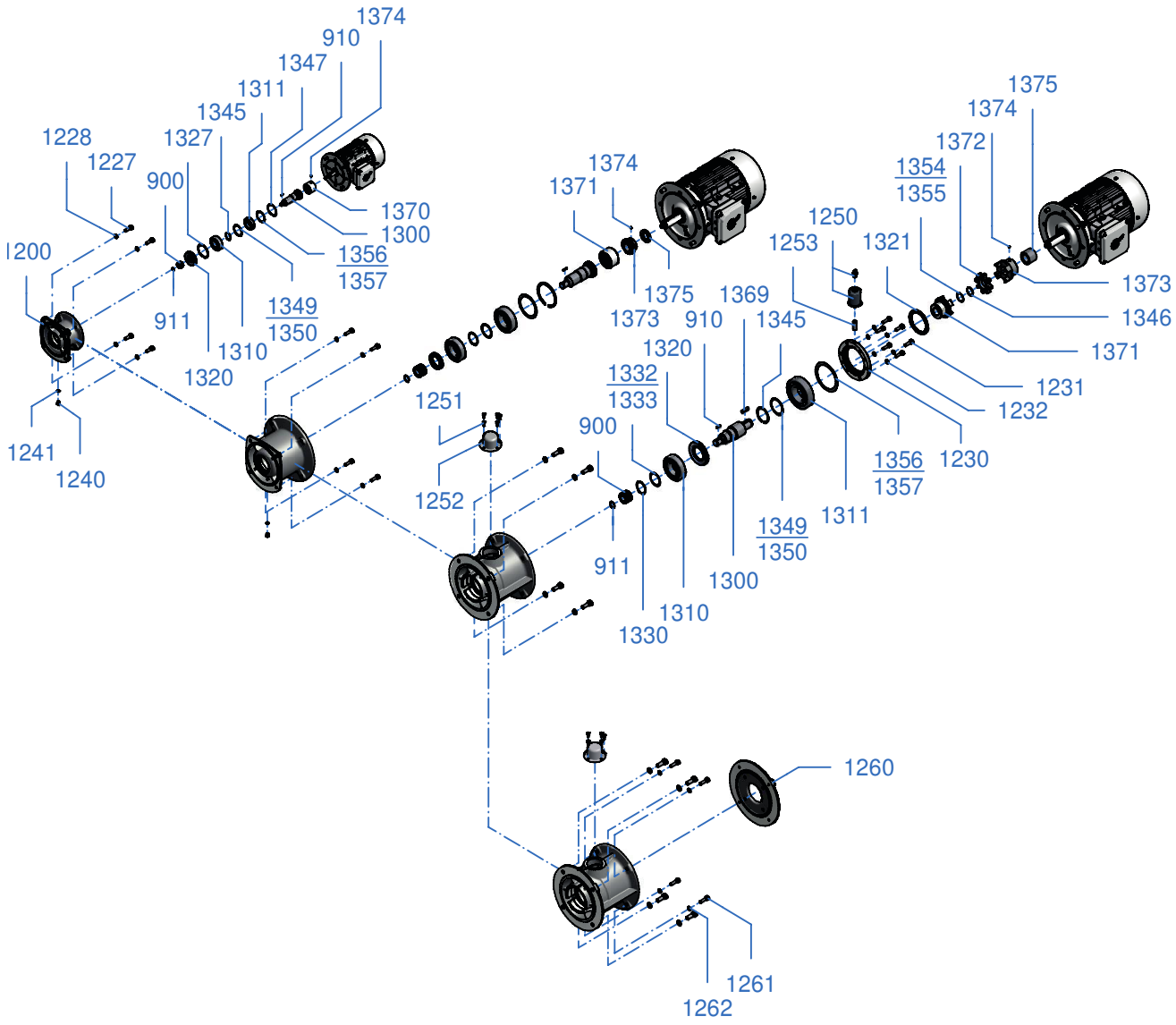
EB 526 9054 E1 #1



DE		GB		FR	
900	Antriebsritzel	900	Drive pinion	900	Pignon d'entrée
910	Passfeder	910	Key	910	Clavette
911	Sicherungsring	911	Circlip	911	Circlip
1200	Gehäuse	1200	Housing	1200	Carter
1227	Schraube	1227	Screw	1227	Vis
1228	Federring	1228	Lock washer	1228	Rondelle élastique
1230	Deckel	1230	Lip	1230	Couvercle
1231	Schraube	1231	Screw	1231	Vis
1232	Federring	1232	Lock washer	1232	Rondelle élastique
1234	Passscheibe	1234	Shim	1234	Rondelles d'ajustage
1235	Passscheibe	1235	Shim	1235	Rondelles d'ajustage
1240	Schraube	1240	Screw	1240	Vis
1241	Dichtung	1241	Gasket	1241	Bague d'étanchéité
1300	Antriebswelle	1300	Drive shaft	1300	Arbre d'entréé
1305	Passfeder	1305	Key	1305	Clavette
1310	Wälzlager	1310	Roller bearing	1310	Palier
1311	Wälzlager	1311	Roller bearing	1311	Palier
1312	Wälzlager	1312	Roller bearing	1312	Palier
1320	Wellendichtring	1320	Radial shaft seal	1320	Bague d'étanchéité de l'arbre
1330	Sicherungsring	1330	Circlip	1330	Circlip
1332	Passscheibe	1332	Shim	1332	Rondelles d'ajustage
1333	Passscheibe	1333	Shim	1333	Rondelles d'ajustage
1339	Abstandshülse	1339	Spacer bush	1339	Douille-entretoise
1340	Abstandshülse	1340	Spacer bush	1340	Douille-entretoise
1346	Sicherungsring	1346	Circlip	1346	Circlip
1356	Passscheibe	1356	Shim	1356	Rondelles d'ajustage
1357	Passscheibe	1357	Shim	1357	Rondelles d'ajustage
1362	Buchse	1362	Socket	1362	Douille
1380	Gammaring	1380	Gamma ring	1380	Déflecteur
1381	Scheibe	1381	Washer	1381	Rondelle

IEC 63 - 112 / IEC 132 - 180 / IEC 160 - 315
NEMA 56C, 140TC, 180TC, 210TC, 250TC, 280TC, 320TC, 360TC, 400TSC

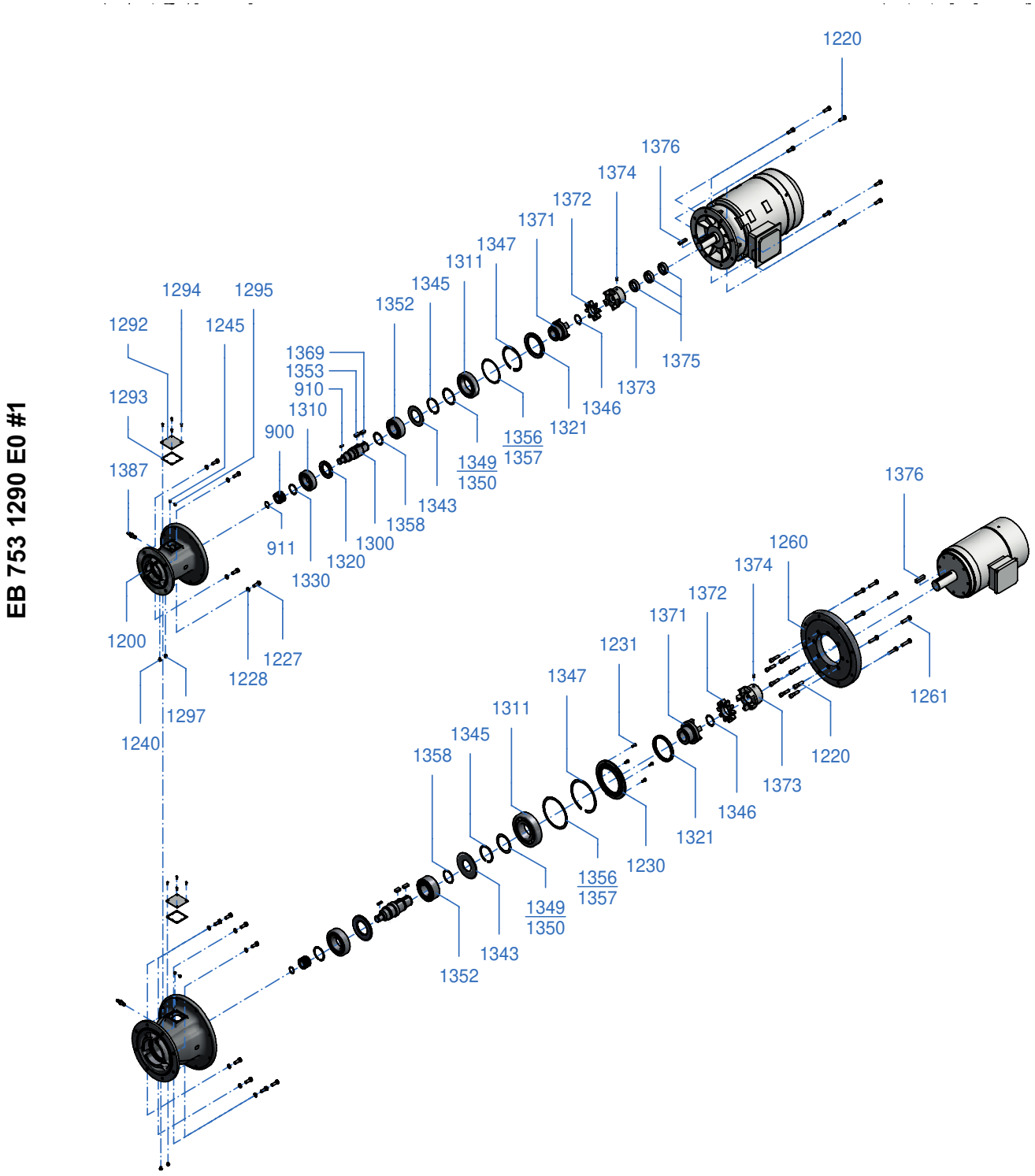
EB 507 9041 E1 #1



DE		GB		FR	
900	Antriebsritzel	900	Drive pinion	900	Pignon d'entrée
910	Passfeder	910	Key	910	Clavette
911	Sicherungsring	911	Circlip	911	Circlip
1200	Gehäuse	1200	Housing	1200	Carter
1227	Schraube	1227	Screw	1227	Vis
1228	Federring	1228	Lock washer	1228	Rondelle élastique
1230	Deckel	1230	Lip	1230	Couvercle
1231	Schraube	1231	Screw	1231	Vis
1232	Federring	1232	Lock washer	1232	Rondelle élastique
1240	Schraube	1240	Screw	1240	Vis
1241	Dichtung	1241	Gasket	1241	Bague d'étanchéité
1250	Schmierstoffkatusche	1250	Lubricant cartridge	1250	Cartouche de lubrifiant
1251	Schraube	1251	Screw	1251	Vis
1252	Abdeckung	1252	Cover	1252	Cache
1253	Verlängerung	1253	Extension	1253	Rallonge
1260	Zwischenflansche	1260	Intermediate flange	1260	Bride intermédiaire
1261	Schraube	1261	Screw	1261	Vis
1262	Federring	1262	Lock washer	1262	Rondelle élastique
1300	Antriebswelle	1300	Drive shaft	1300	Arbre d'entréé
1310	Wälzlager	1310	Roller bearing	1310	Palier
1311	Wälzlager	1311	Roller bearing	1311	Palier
1320	Wellendichtring	1320	Radial shaft seal	1320	Bague d'étanchéité de l'arbre
1321	Wellendichtring	1321	Radial shaft seal	1321	Bague d'étanchéité de l'arbre
1327	Sicherungsring	1327	Circlip	1327	Circlip
1330	Sicherungsring	1330	Circlip	1330	Circlip
1332	Passscheibe	1332	Shim	1332	Rondelles d'ajustage
1333	Passscheibe	1333	Shim	1333	Rondelles d'ajustage
1345	Sicherungsring	1345	Circlip	1345	Circlip
1346	Sicherungsring	1346	Circlip	1346	Circlip
1347	Sicherungsring	1347	Circlip	1347	Circlip
1349	Passscheibe	1349	Shim	1349	Rondelles d'ajustage
1350	Passscheibe	1350	Shim	1350	Rondelles d'ajustage
1354	Passscheibe	1354	Shim	1354	Rondelles d'ajustage
1355	Passscheibe	1355	Shim	1355	Rondelles d'ajustage
1356	Passscheibe	1356	Shim	1356	Rondelles d'ajustage
1357	Passscheibe	1357	Shim	1357	Rondelles d'ajustage
1369	Passfeder	1369	Key	1369	Clavette
1370	Kupplungsgehäuse	1370	Coupling housing	1370	Manchon d'accouplement
1371	Kupplungshälfte	1371	Half-coupling	1371	Demi-raccord
1372	Zahnkranz	1372	Ring gear	1372	Couronne dentée
1373	Kupplungshälfte	1373	Half-coupling	1373	Demi-raccord
1374	Schraube	1374	Screw	1374	Vis
1375	Buchse	1375	Socket	1375	Douille

AI160, AI180, AI200, AI225, AI250, AI280, AI315
AN250TC, AN280TC, AN320TC, AN360TC, AN400TC

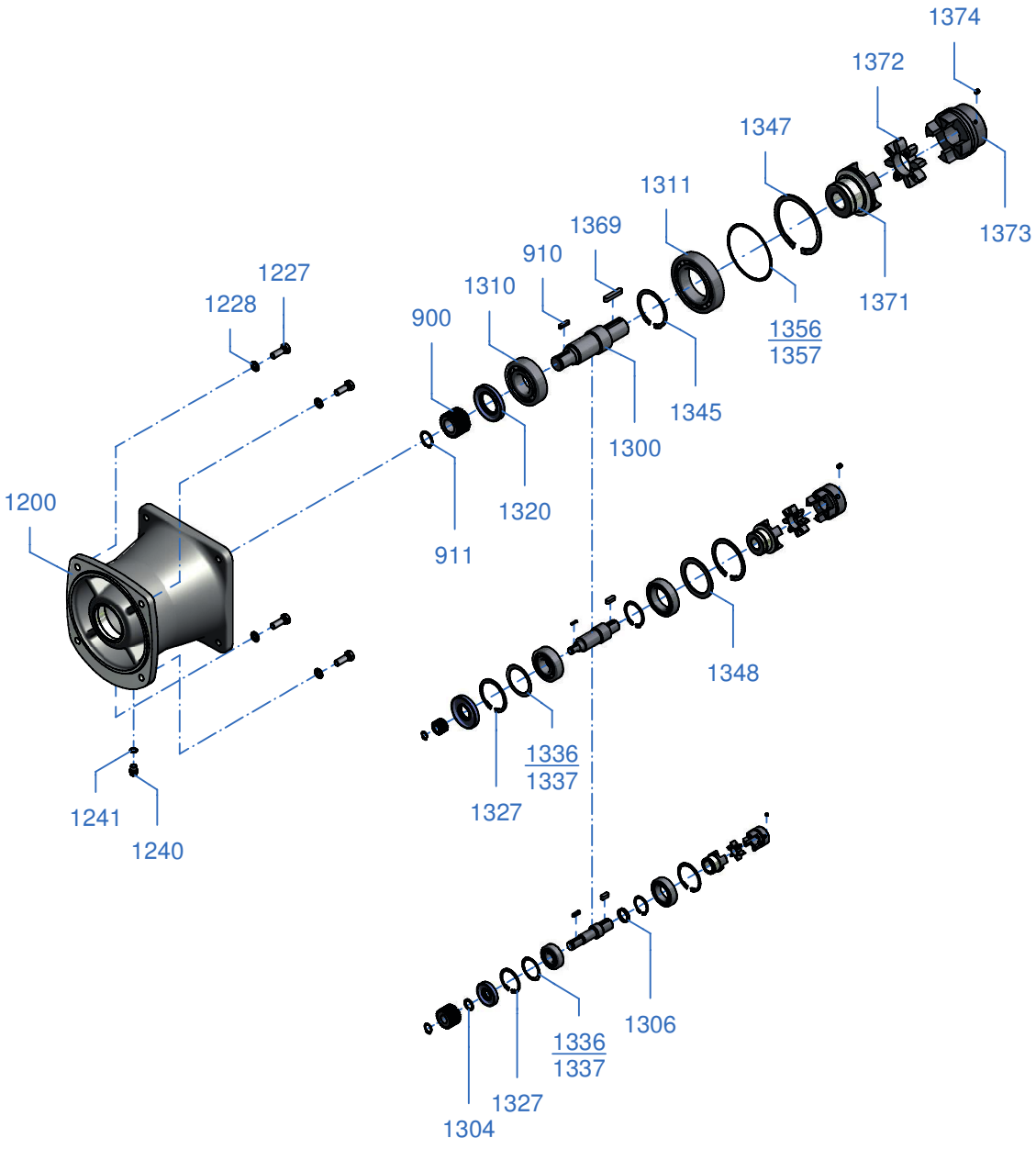
EB 753 1290 E0 #1



DE		GB		FR	
900	Antriebsritzel	900	Drive pinion	900	Pignon d'entrée
910	Passfeder	910	Key	910	Clavette
911	Sicherungsring	911	Circlip	911	Circlip
1200	Gehäuse	1200	Housing	1200	Carter
1220	Schraube	1220	Screw	1220	Vis
1227	Schraube	1227	Screw	1227	Vis
1228	Federring	1228	Lock washer	1228	Rondelle élastique
1230	Deckel	1230	Lip	1230	Couvercle
1231	Schraube	1231	Screw	1231	Vis
1240	Schraube	1240	Screw	1240	Vis
1245	Schmiernippel	1245	Lubricating nipple	1245	Graisseur
1260	Zwischenflansche	1260	Intermediate flange	1260	Bride intermédiaire
1261	Schraube	1261	Screw	1261	Vis
1292	Klemmenkastendeckel	1292	Terminal box lid	1292	Couvercle de la boîte à bornes
1293	Dichtung	1293	Gasket	1293	Bague d'étanchéité
1294	Schraube	1294	Screw	1294	Vis
1295	Ölschraube	1295	oil screw	1295	Vis à huile
1300	Antriebswelle	1300	Drive shaft	1300	Arbre d'entréé
1310	Wälzlager	1310	Roller bearing	1310	Palier
1311	Wälzlager	1311	Roller bearing	1311	Palier
1320	Wellendichtring	1320	Radial shaft seal	1320	Bague d'étanchéité de l'arbre
1321	Wellendichtring	1321	Radial shaft seal	1321	Bague d'étanchéité de l'arbre
1330	Sicherungsring	1330	Circlip	1330	Circlip
1343	Dichtscheibe	1343	Sealing washer	1343	Rondelle d’appui
1345	Sicherungsring	1345	Circlip	1345	Circlip
1346	Sicherungsring	1346	Circlip	1346	Circlip
1347	Sicherungsring	1347	Circlip	1347	Circlip
1349	Passscheibe	1349	Shim	1349	Rondelles d'ajustage
1350	Passscheibe	1350	Shim	1350	Rondelles d'ajustage
1352	Rücklaufsperre	1352	Back stop	1352	Anti-devireur
1353	Passfeder	1353	Key	1353	Clavette
1356	Passscheibe	1356	Shim	1356	Rondelles d'ajustage
1357	Passscheibe	1357	Shim	1357	Rondelles d'ajustage
1358	Sicherungsring	1358	Circlip	1358	Circlip
1369	Passfeder	1369	Key	1369	Clavette
1371	Kupplungshälfte	1371	Half-coupling	1371	Demi-raccord
1372	Zahnkranz	1372	Ring gear	1372	Couronne dentée
1373	Kupplungshälfte	1373	Half-coupling	1373	Demi-raccord
1374	Schraube	1374	Screw	1374	Vis
1375	Buchse	1375	Socket	1375	Douille
1376	Passfeder	1376	Key	1376	Clavette
1387	Schalter/Sensor	1387	Switch/Sensor	1387	Changer/Capteur

Servo 100/160 S, 130/160 S, 130/250 S, 165/160 S, 165/250 S, 215/250 S, 215/300 S, 300/300 S, 300/350

EB 514 9021 E2 #1

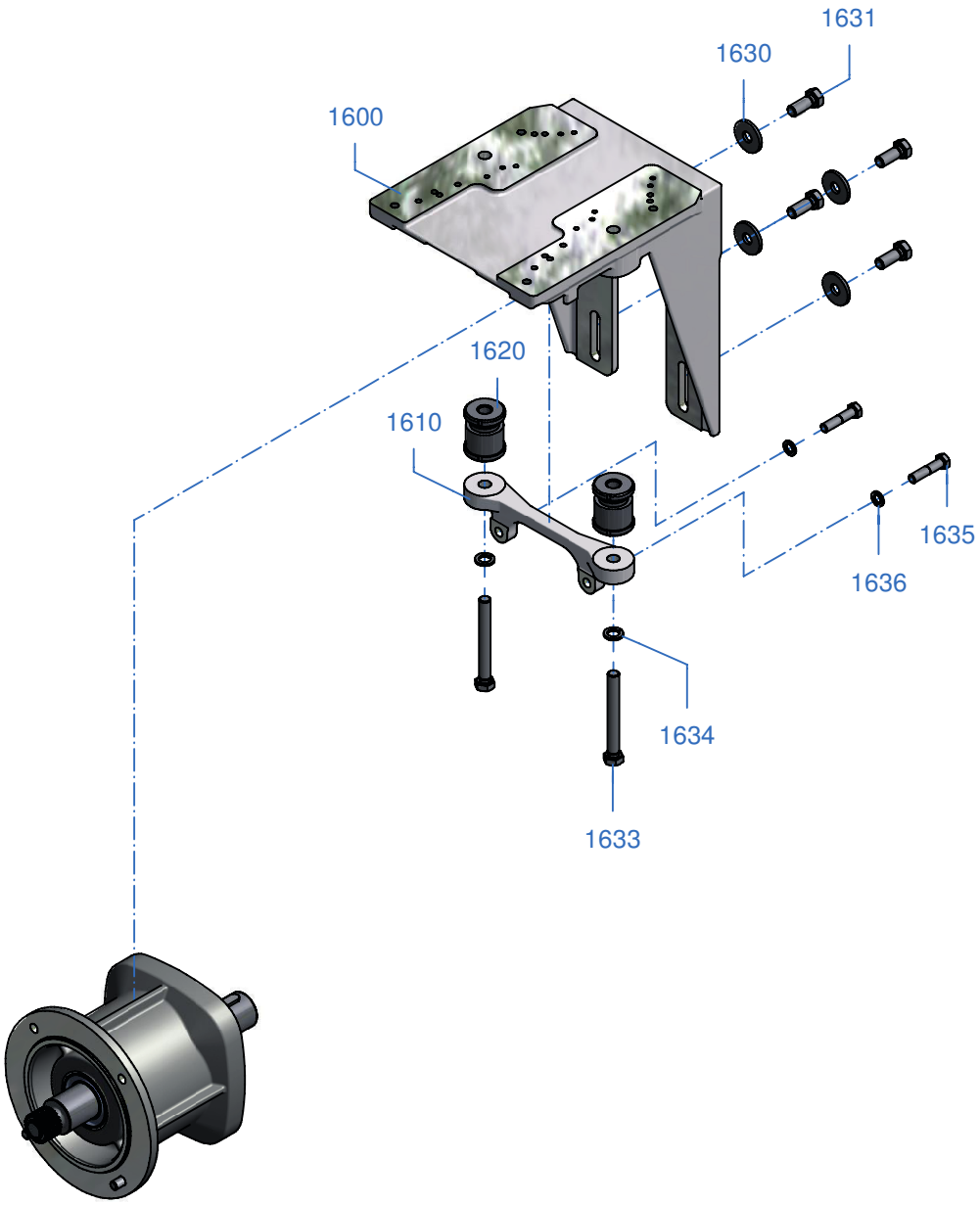


DE		GB		FR	
900	Antriebsritzel	900	Drive pinion	900	Pignon d'entrée
910	Passfeder	910	Key	910	Clavette
911	Sicherungsring	911	Circlip	911	Circlip
1200	Gehäuse	1200	Housing	1200	Carter
1227	Schraube	1227	Screw	1227	Vis
1228	Federring	1228	Lock washer	1228	Rondelle élastique
1240	Schraube	1240	Screw	1240	Vis
1241	Dichtung	1241	Gasket	1241	Bague d'étanchéité
1300	Antriebswelle	1300	Drive shaft	1300	Arbre d'entréé
1304	Stützscheibe	1304	Supporting disc	1304	Rondelle support
1306	Stützscheibe	1306	Supporting disc	1306	Rondelle support
1310	Wälzlager	1310	Roller bearing	1310	Palier
1311	Wälzlager	1311	Roller bearing	1311	Palier
1320	Wellendichtring	1320	Radial shaft seal	1320	Bague d'étanchéité de l'arbre
1327	Sicherungsring	1327	Circlip	1327	Circlip
1336	Passscheibe	1336	Shim	1336	Rondelles d'ajustage
1337	Passscheibe	1337	Shim	1337	Rondelles d'ajustage
1345	Sicherungsring	1345	Circlip	1345	Circlip
1347	Sicherungsring	1347	Circlip	1347	Circlip
1348	Stützscheibe	1348	Supporting disc	1348	Rondelle support
1356	Passscheibe	1356	Shim	1356	Rondelles d'ajustage
1357	Passscheibe	1357	Shim	1357	Rondelles d'ajustage
1369	Passfeder	1369	Key	1369	Clavette
1371	Kupplungshälfte	1371	Half-coupling	1371	Demi-raccord
1372	Zahnkranz	1372	Ring gear	1372	Couronne dentée
1373	Kupplungshälfte	1373	Half-coupling	1373	Demi-raccord
1374	Schraube	1374	Screw	1374	Vis

Motorkonsole
Motor bracket
Console moteur

MK I - MK V
MK I - MK V

EB 526 9052 E1 #1

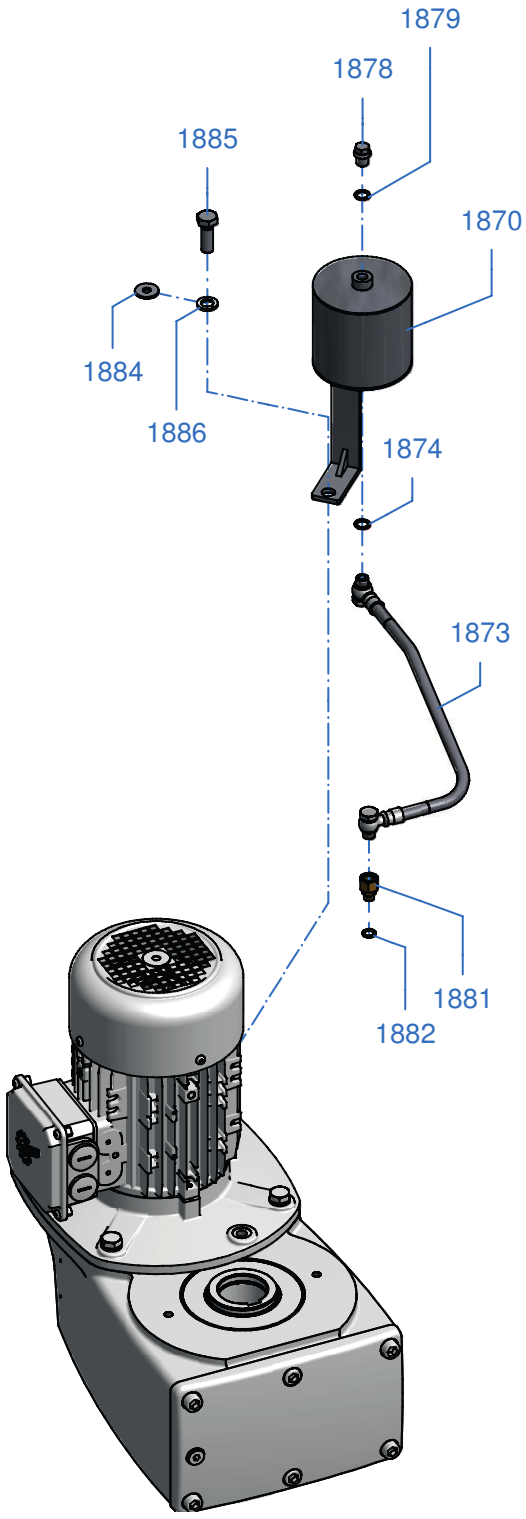


Motorkonsole
Motor bracket
Console moteur

DE		GB		FR	
1600	Motorkonsole	1600	Motor bracket	1600	Console moteur
1610	Halterung	1610	Holder	1610	Support
1620	Schraube	1620	Screw	1620	Vis
1630	Scheibe	1630	Washer	1630	Rondelle
1631	Schraube	1631	Screw	1631	Vis
1633	Schraube	1633	Screw	1633	Vis
1634	Federring	1634	Spring lock washer	1634	Rondelle élastique
1635	Schraube	1635	Screw	1635	Vis
1636	Federring	1636	Spring lock washer	1636	Rondelle élastique

Ölausgleichsbehälter
Oil expansion tank
Réservoir d’expansion d’huile

SK 42, SK 43, SK 52, SK 53, SK 62, SK 63, SK 72, SK 73, SK 82, SK 83, SK 92, SK 93, SK 102, SK 103
SK 4282, SK 4382, SK 5282, SK 5382, SK 6282, SK 638 2, SK 7282, SK 7382, SK 8282, SK8382
SK 9042.1, SK 9043.1, SK 9052.1, SK 9053.1, SK 9072 .1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1



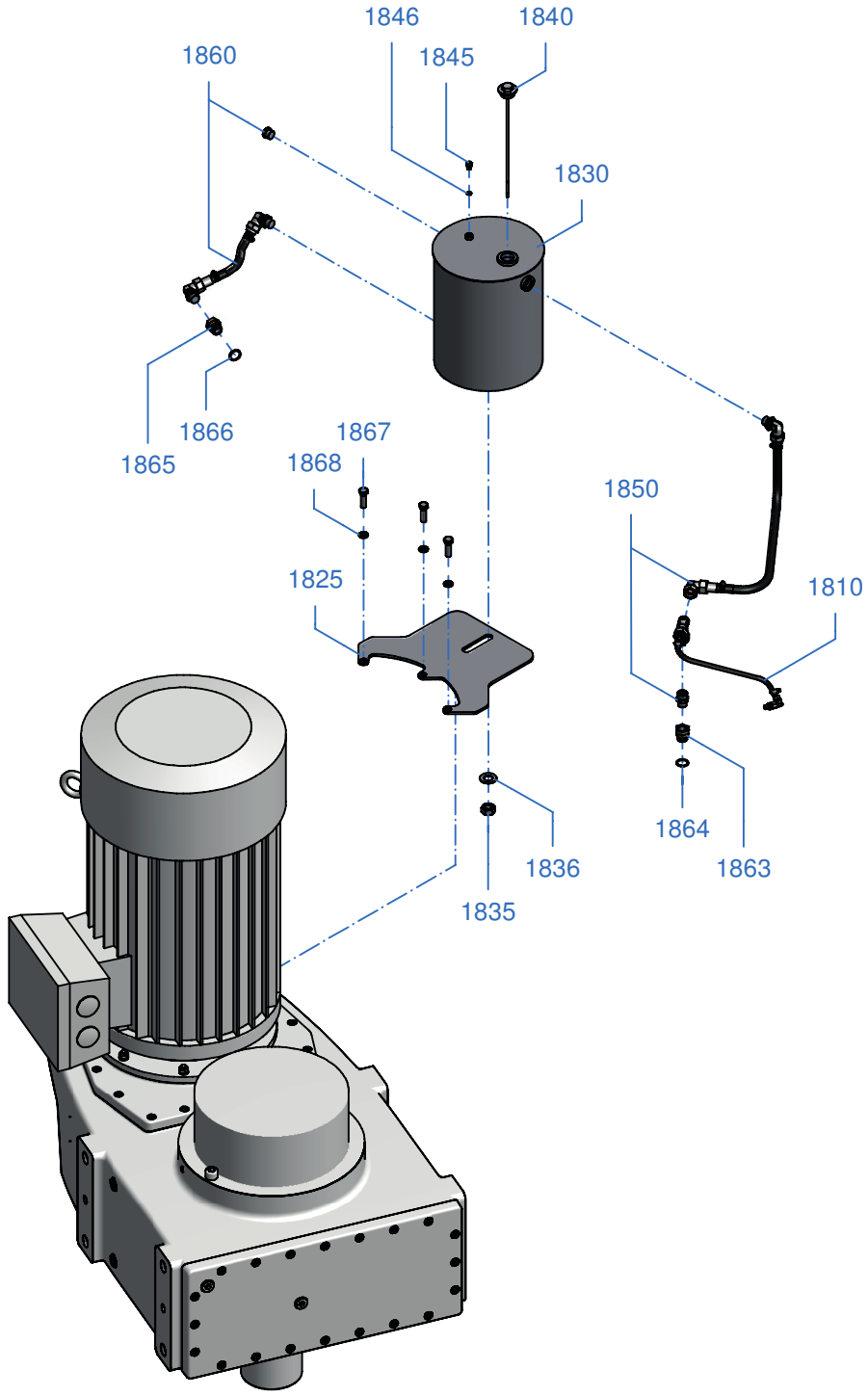
EB 283 9039 E3 #1

Ölausgleichsbehälter
Oil expansion tank
Réservoir d’expansion d’huile

DE		GB		FR	
1870	Ölausgleichsbehälter	1870	Oil expansion chamber	1870	Réservoir d'expansion d'huile
1873	Schlauch	1873	Hose	1873	Tuyau
1874	Dichtung	1874	Seal	1874	Bague d'étanchéité
1878	Entlüftung	1878	Vent	1878	Évent
1879	Dichtung	1879	Seal	1879	Bague d'étanchéité
1881	Reduzierung	1881	Reducer	1881	Réduction
1882	Dichtung	1882	Seal	1882	Bague d'étanchéité
1884	Scheibe	1884	Washer	1884	Rondelle
1885	Schraube	1885	Screw	1885	Vis
1886	Scheibe	1886	Washer	1886	Rondelle

Ölstandsbehälter
Oil storage tank
Réservoir de niveau d’huile

SK 9282, SK 9382, SK 10382.1, SK 11382.1, SK 12382



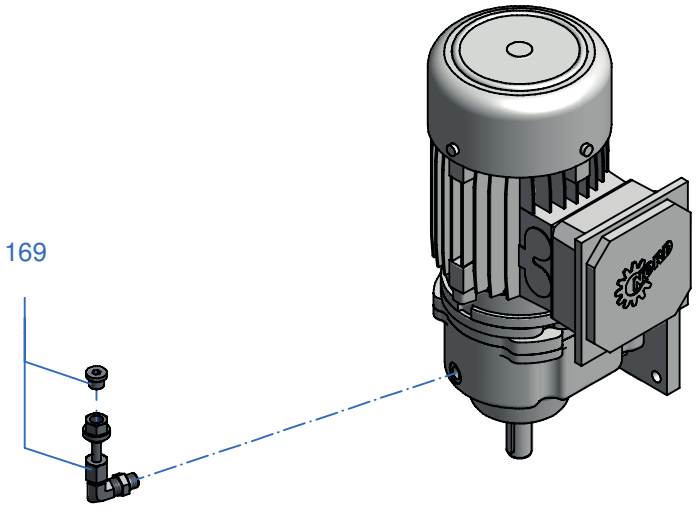
EB 283 9046 E #1

Ölstandsbehälter
Oil storage tank
Réservoir de niveau d’huile

DE		GB		FR	
1810	Gehäuseentlüftung	1810	Housing vent	1810	Évent de carter
1825	Halterung	1825	Holder	1825	Support
1830	Ölstandsbehälter	1830	Oil level vessel	1830	Vase d‘expansion d‘huile
1835	Mutter	1835	Nut	1835	Écrou
1836	Scheibe	1836	Washer	1836	Rondelle
1840	Entlüftungsdeckel	1840	Ventilation cover	1840	Couvercle d‘évent
1845	Entlüftungsschraube	1845	Standard vent plug	1845	Vis d‘évent
1846	Dichtung	1846	Gasket	1846	Bague d’étanchéité
1850	Baugruppe	1850	Module	1850	Module
1860	Baugruppe	1860	Module	1860	Module
1863	Reduzierung	1863	Reducer	1863	Réduction
1864	Dichtung	1864	Gasket	1864	Bague d’étanchéité
1865	Reduzierung	1865	Reducer	1865	Réduction
1866	Dichtung	1866	Gasket	1866	Bague d’étanchéité
1867	Schraube	1867	Screw	1867	Vis
1868	Scheibe	1868	Washer	1868	Rondelle

Ölkontrollwinkel
Oil-monitoring elbow
Angle de commande d‘huile

EB 283 9051 E1 #1

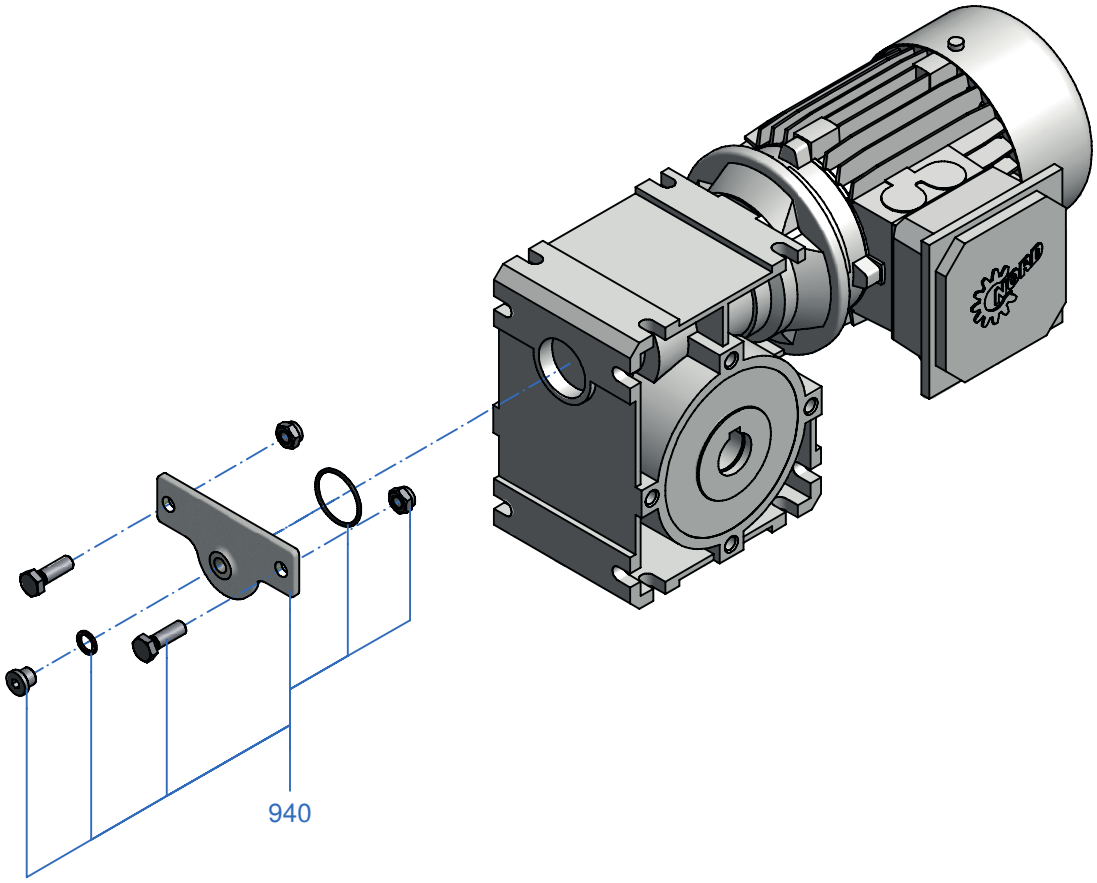


Ölkontrollwinkel
Oil-monitoring elbow
Angle de commande d‘huile

DE		GB		FR	
169	Ölstandsanzeiger	169	Oil level indicator	169	Affichage du niveau d’huile

Ölkontrolldeckel
Oil control cover
Couvercle de commande huile

EB 606 9065 E1 #1

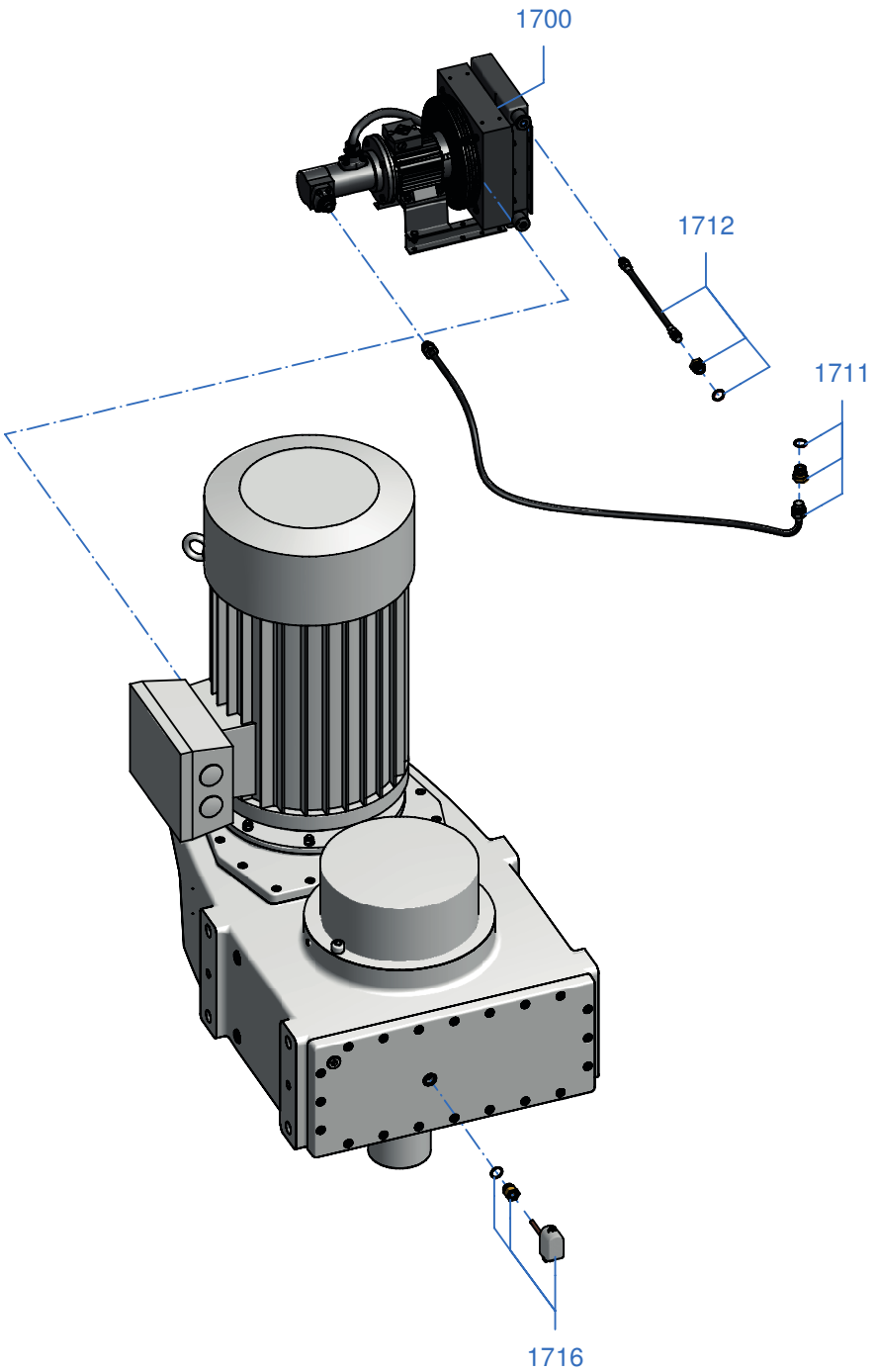


Ölkontrolldeckel
Oil control cover
Couvercle de commande huile

DE		GB		FR	
940	Ölkontrolldeckel	940	Oil contol cover	940	couvercle de commande huile

Ölkühler
Oil cooler
Refroidisseur d‘huile

SK 62, SK 72, SK 82, SK 102, SK 63, SK 73, SK 73, S K 103
SK 6282, SK 7282, SK 8282, SK 11282, SK 6382, SK 73 82, SK 8382, SK 11382 SK 9072.1, SK 9082.1, SK 9086.1, SK 9096.1



EB 280 9249 E3 #1

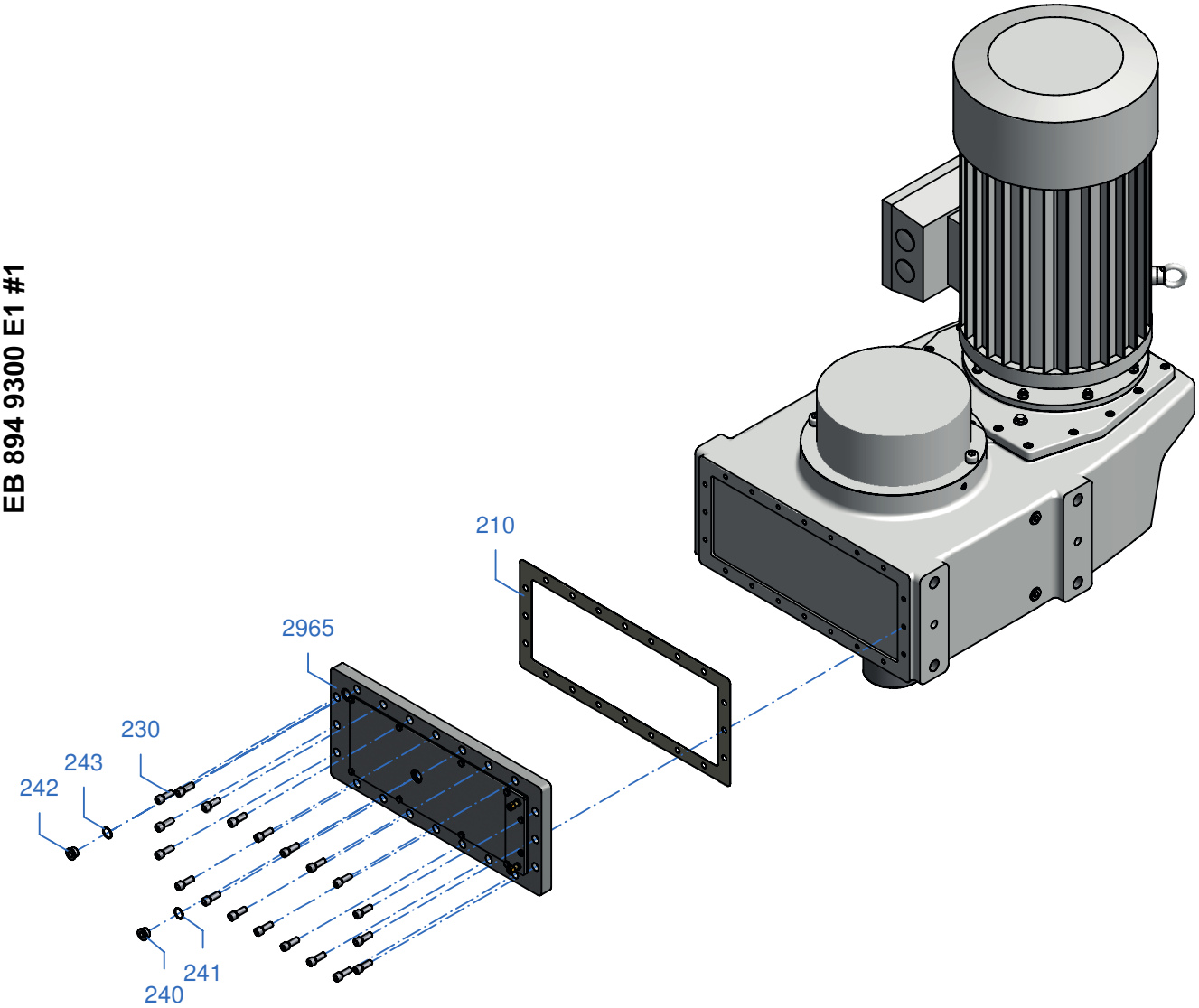
Ölkühler
Oil cooler
Refroidisseur d‘huile

DE		GB		FR	
1700	Ölkühler	1700	Oil cooler	1700	Refroidisseur d‘huile
1711	Schlauchleitung	1711	Hose	1711	Câble souple
1712	Schlauchleitung	1712	Hose	1712	Câble souple
1716	Anschlusskopf Druckschalter	1716	Pressure switch connector head	1716	Extrémité de connexion pressostat

Wasserkühler
Water cooler
Refroidisseur d‘eau

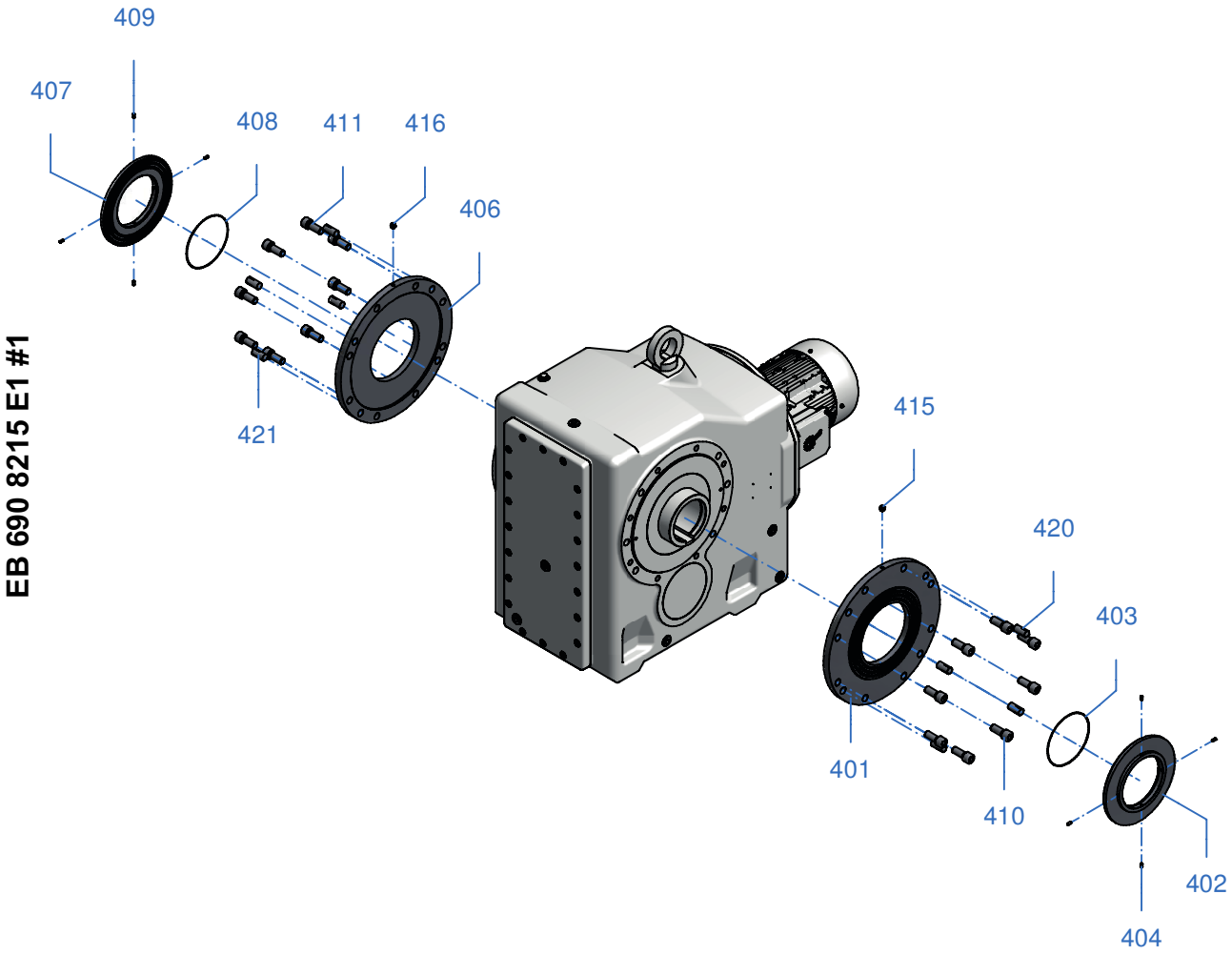
SK 6282, SK 7282, SK 8282, SK 9282, SK 6382, SK 7382, SK 8382, SK9382,
SK 10382.1, SK 11382.1, SK 12382
SK 9072.1, SK 9082.1, SK 9086.1, SK 9092.1, SK 9096.1

EB 894 9300 E1 #1



DE		GB		FR	
210	Dichtung	210	Seal	210	Bague d'étanchéité
230	Schraube	230	Screw	230	Vis
240	Schraube	240	Screw	240	Vis
241	Dichtung	241	Seal	241	Bague d'étanchéité
242	Schraube	242	Screw	242	Vis
243	Dichtung	243	Seal	243	Bague d'étanchéité
2965	Deckel	2965	Lid	2965	Couvercle

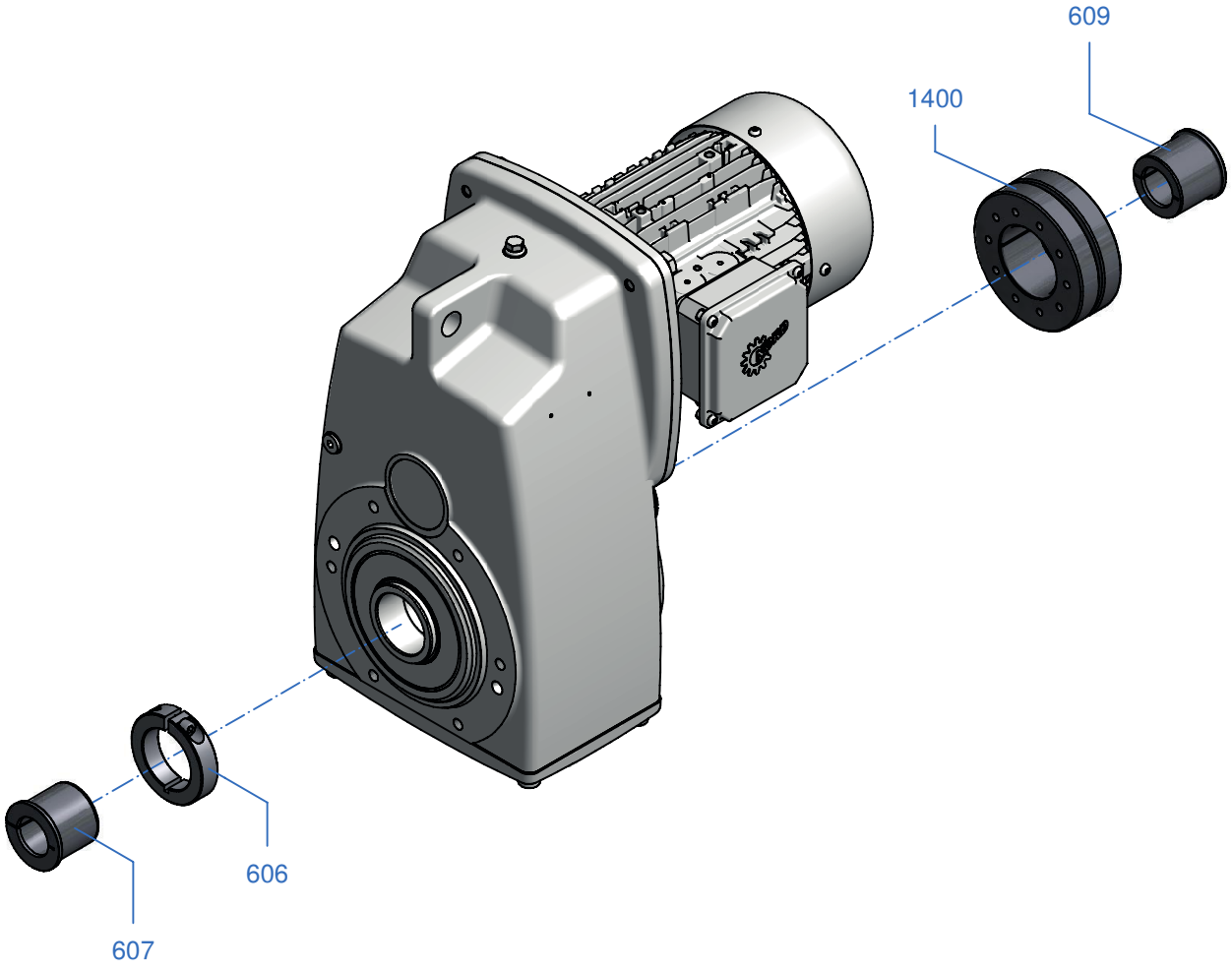
SK 9052.1, SK 9072.1, SK 9082.1, SK 9086.1, SK 9092 .1, SK 9096.1



EB 690 8215 E1 #1

DE		GB		FR	
401	Labyrinthbuchse	401	Labyrinth bush	401	Douille à labyrinthe
402	Labyrinthbuchse	402	Labyrinth bush	402	Douille à labyrinthe
403	O-Ring	403	O-ring	403	Joint torique
404	Gewindestift	404	Screw pin	404	Vis sans tête
406	Labyrinthbuchse	406	Labyrinth bush	406	Douille à labyrinthe
407	Labyrinthbuchse	407	Labyrinth bush	407	Douille à labyrinthe
408	O-Ring	408	O-ring	408	Joint torique
409	Gewindestift	409	Screw pin	409	Vis sans tête
410	Schraube	410	Screw	410	Vis
411	Schraube	411	Screw	411	Vis
415	Schmiernippel	415	Lubricating nipple	415	Graisseur
416	Schmiernippel	416	Lubricating nipple	416	Graisseur
420	Stift	420	Pin	420	Goupille
421	Stift	421	Pin	421	Goupille

EB 842 9009 E1 #1

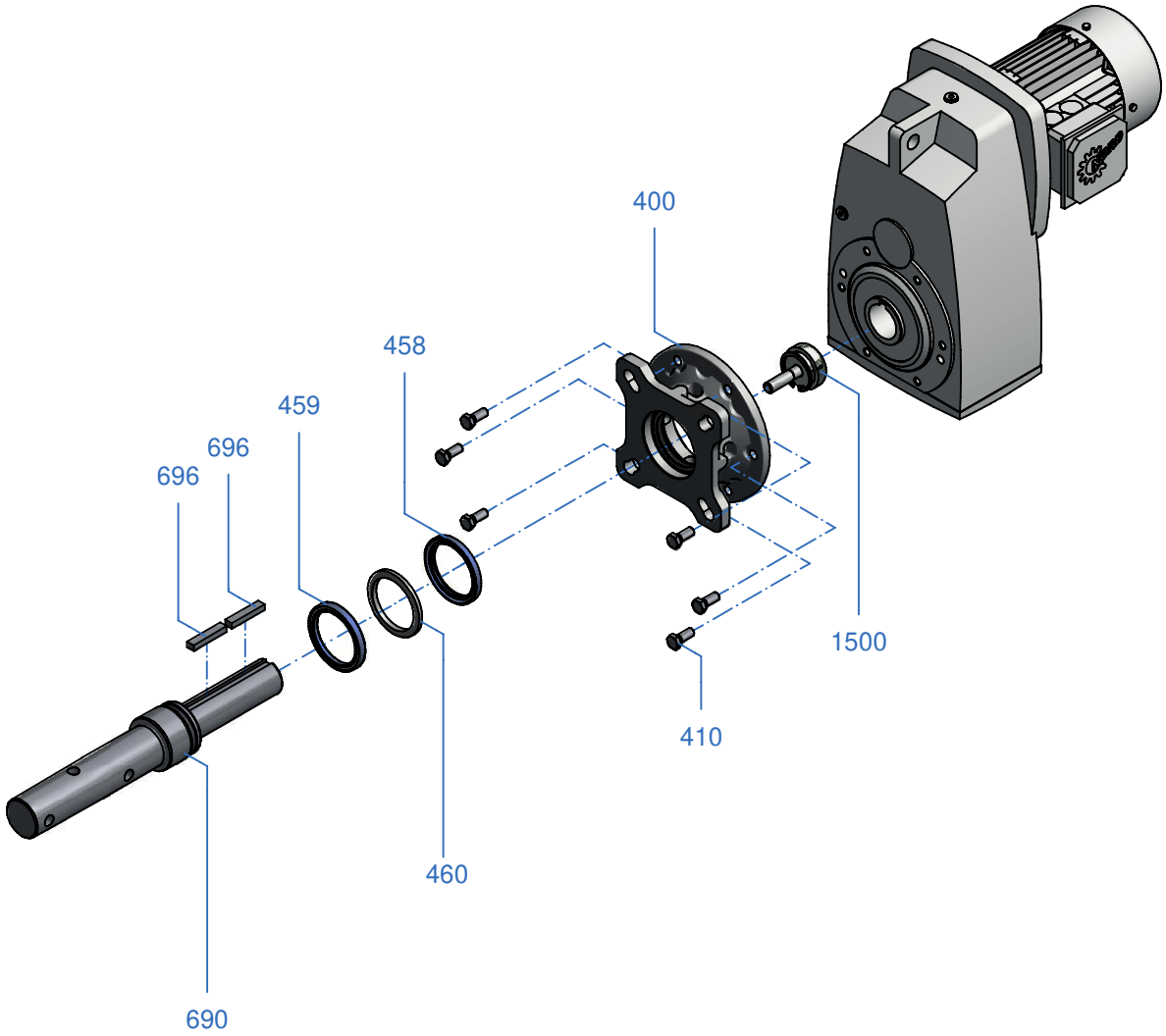


DE		GB		FR	
606	Klemmring	606	Clamping ring	606	Bague de serrage
607	Klemmbuchse	607	Clamping bush	607	Douille de serrage
609	Klemmbuchse	609	Clamping bush	609	Douille de serrage
1400	Schrumpfscheibe	1400	Shrink disc	1400	Frette de serrage

SK 1282 SCP - SK 6282 SCP
SK 1382 SCP - SK 6382 SCP

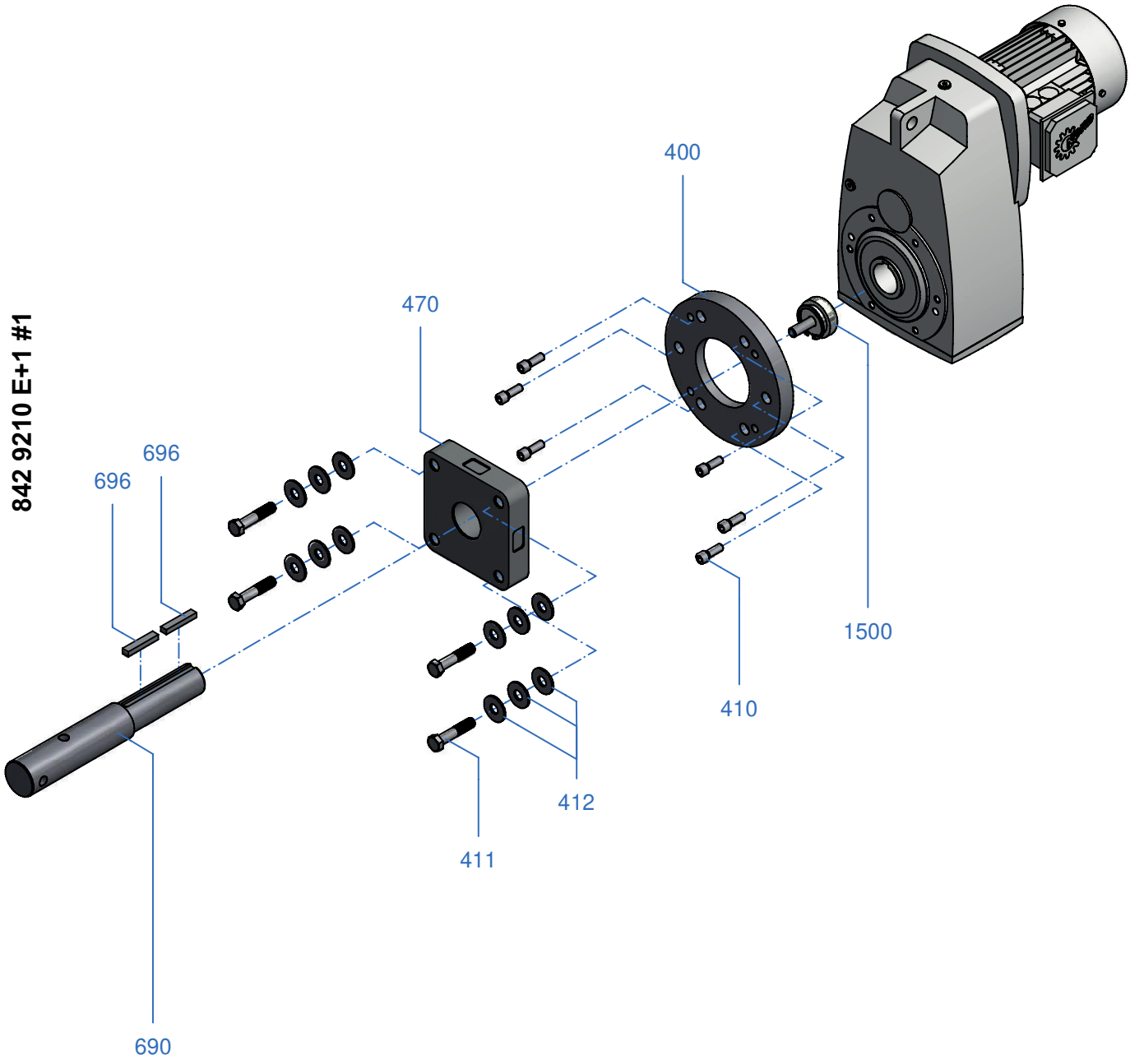
SK 9012.1 SCP - SK 9052.1 SCP
SK 9013.1 SCP - SK 9053.1 SCP

842 9210 E0 #1



DE		GB		FR	
400	Flansch	400	Flange	400	Bride
410	Schraube	410	Screw	410	Vis
458	Wellendichtring	458	Radial shaft seal	458	Bague d‘étanchéité de l‘arbre
459	Wellendichtring	459	Radial shaft seal	459	Bague d‘étanchéité de l‘arbre
460	Filzring	460	Felt ring	460	Bague en feutre
690	Einsteckwelle	690	Plug-in shaft	690	Arbre de sortie plein
696	Passfeder	696	Key	696	Clavette
1500	Baugruppe Befestigungselement	1500	Modul fastening element	1500	Module élément de fixation

SK 1282 SC - SK 9282 SC
SK 1382 SC - SK 9382 SC



DE	
400	Flansch
410	Schraube
411	Schraube
412	Scheibe
470	Dichtungspaket
690	Einsteckwelle
696	Passfeder
1500	Baugruppe Befestigungselement

GB	
400	Flange
410	Screw
411	Screw
412	Washer
470	Seal package
690	Plug-in shaft
696	Key
1500	Modul fastening element

FR	
400	Bride
410	Vis
411	Vis
412	Rondelle
470	Paquet d‘étanchéité
690	Arbre de sortie plein
696	Clavette
1500	Module élément de fixation

Bestellangaben
Order details
Informations de commande

Kontaktdaten / Contact details / Contacts:

Firma / Company / Entreprise:

Straße / Street / Rue

Stadt / Town / Ville:

PLZ / Postcode/
Code postal:

Telefon / Telephone / Téléphone:

Fax:

E-mail:





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Telefax +49(0)4532/289-2253
E-Mail info@nord.com
www.nord.com

DE

Diese NORD Ersatzteilliste beinhaltet eine standardisierte Darstellung der NORD Getriebe. Um Ihnen das Finden und Nachbestellen von Ersatzteilen zu erleichtern, finden Sie am Ende der Ersatzteilliste ein Bestellformular mit wichtigen Hinweisen zur Bestimmung der richtigen Teile.

Für Rückfragen stehen wir Ihnen gerne zur Verfügung. Ihren lokalen Ansprechpartner finden Sie unter http://locator.nord.com.

GB

This NORD spare parts list contains a standardised depiction of NORD gear units. In order to enable you to find and re-order replacement parts more easily, you can find an order form and important information regarding the identification of the correct components at the end of this spare parts list.

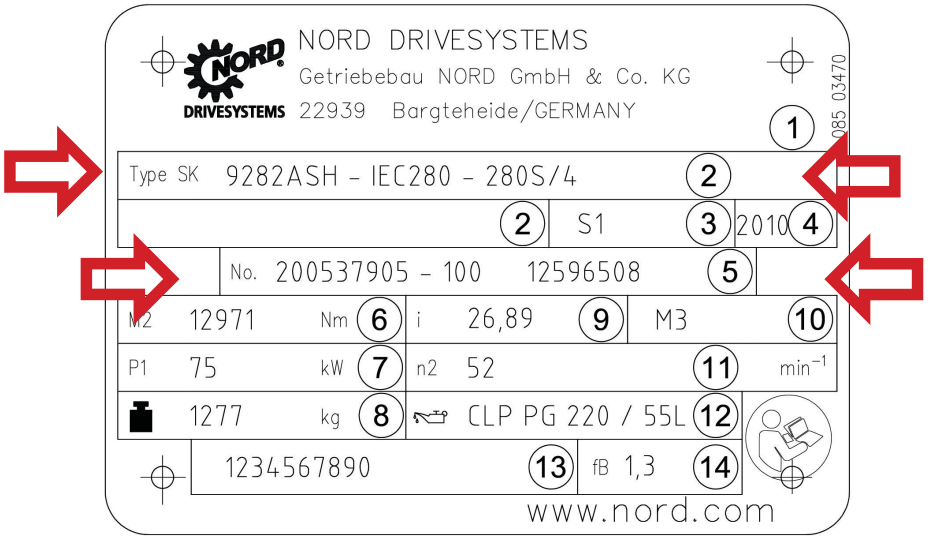
We will be glad to help you if you have any queries: You can find your local contact partner under http://locator.nord.com.

FR

Cette liste de pièces de rechange NORD contient une représentation standard des réducteurs NORD. Pour faciliter la recherche et la commande de pièces de rechange, un formulaire de commande se trouve à la fin de la liste des pièces de rechange et vous donne toutes les informations essentielles pour déterminer les pièces dont vous avez besoin.

En cas de questions, n'hésitez pas à nous contacter. Pour connaître votre interlocuteur local, veuillez consulter le site http://locator.nord.com.

Erläuterung des Typenschildes
Explanation of the rating plate
Explication de la plaque signalétique



DE

1 Matrix – Barcode
2 NORD - Getriebetyp
3 Betriebsart
4 Herstellungsjahr
5 Fabrikationsnummer
6 Nenndrehmoment der Getriebeabtriebswelle
7 Antriebsleistung
8 Gewicht entsprechend Auftragsausführung
9 Gesamte Getriebeübersetzung
10 Einbaulage
11 Nenndrehzahl der Getriebeabtriebswelle
12 Schmierstoffart, -viskosität und –menge
13 Kundenmaterialnummer
14 Betriebsfaktor

GB

1 Matrix – Barcode
2 NORD gear unit type
3 Operating mode
4 Year of manufacture
5 Serial number
6 Rated torque of gear unit output shaft
7 Drive power
8 Weight according to ordered version
9 Overall gear unit ratio
10 Installation orientation
11 Rated speed of gear unit output shaft
12 Lubricant type, viscosity and quantity
13 Customer's part number
14 Operating factor

FR

1 Code matriciel, à barres
2 Type de réducteur NORD
3 Mode de fonctionnement
4 Année de fabrication
5 Numéro de série
6 Couple nominal de l'arbre de sortie du réducteur
7 Puissance d'entraînement
8 Poids selon l'exécution du contrat
9 Rapport de réduction total
10 Position de montage
11 Vitesse de rotation nominale de l'arbre de sortie du réducteur
12 Type de lubrifiant, viscosité et quantité
13 Numéro d'article client
14 Facteur de service

Ersatzteil-Bestellung / Replacement parts order / Commande de pièces de rechange:

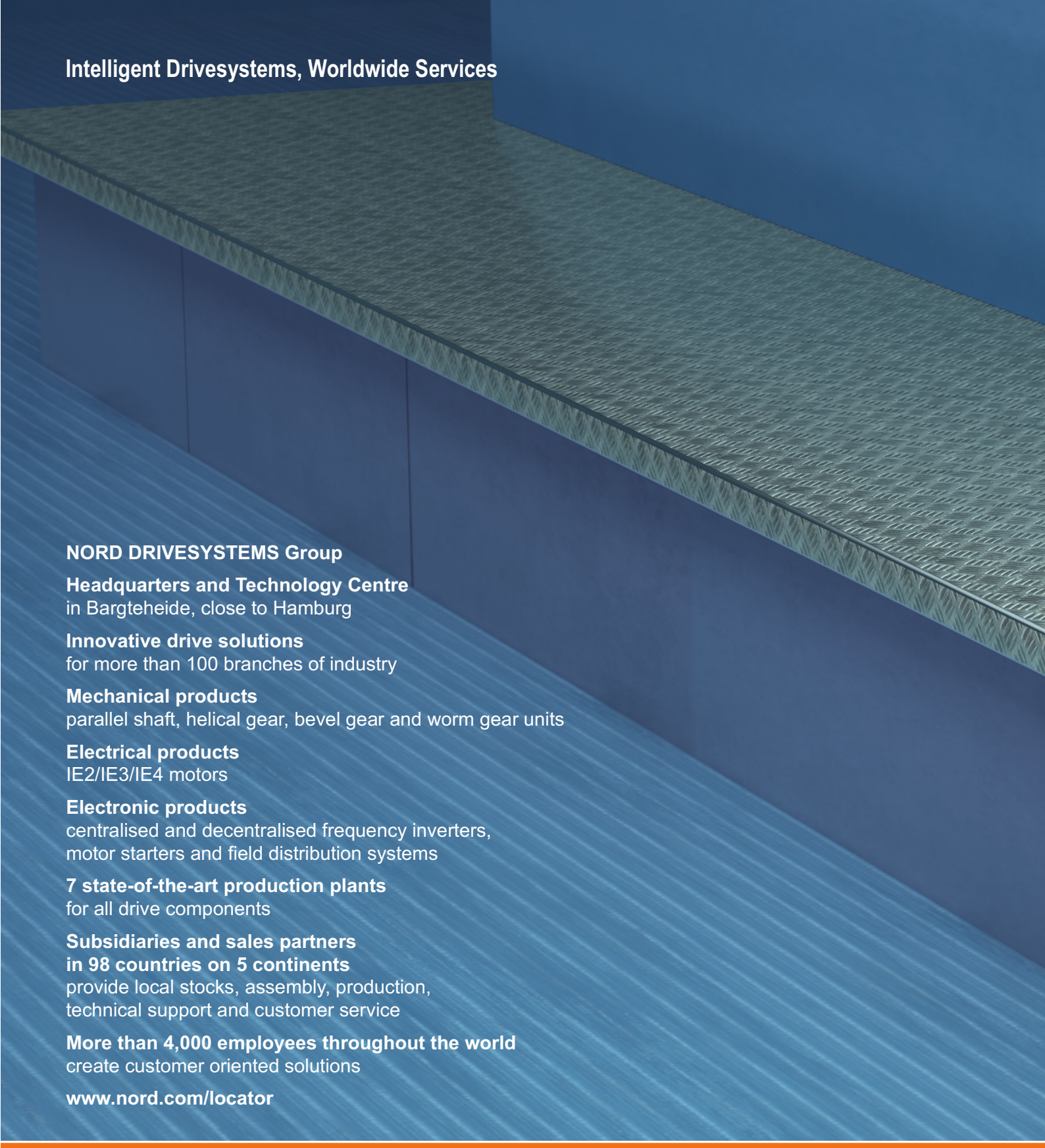
Bezeichnung / Designation / Désignation:

Pos.-Nr. / Item No. / N° pos :

Stückzahl / Pieces / Quantité:

Getriebetyp / Gear unit type / Type de réducteur:

Fabrikationsnummer / Serial No. / Numéro de série:



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in Bargteheide, close to Hamburg

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NORD® DRIVESYSTEMS

Mat.Nr. 6002299 / 3321

Manufacturer's statement

(according to the guideline 2011/65/EU of 08.06.2011)

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The EU Directive 2011/65/EU dated 08.06.2011 is the new version of the EU Directive 2002/95/EU dated 27.01.2003.

The Directive was implemented under national law by the present version of the Electrical and Electronic Appliances Law [Elektro- und Elektronikgerätegesetz] (ElektroG). Devices governed by this directive may not contain more than 0.1 weight percent of lead, mercury, chrome 6, polybrominated biphenyl (PBB) or polybrominated diphenyl ether (PBDE) or 0.01 weight percent cadmium per homogenous material.

Mechanical drive components delivered by Getriebebau Nord are principally not governed by the scope of application of the EU Directive 2011/65/EU. If the drive components are intended to be used in products governed by the scope of application of the EU Directive 2011/65/EU, the manufacturer must ensure that the end product meets the requirements of the EU Directive.

For this case, Getriebebau NORD declares that the following drive components conform with the essential requirements of the electric and electronic act and the guideline 2011/65/EG of 08.06.2011and the guideline 2015/863/EG of 31.03.2015:

Gear units:

Helical gear units:

SK11E, SK21E, ..., SK51E, SK02,SK12, ...SK102, SK03, SK13, ..., SK103
In the versions / options:
F, XZ, XF, VL, IEC, NEMA, AI, AN, RLS, SEK, SEP, W, VI, OA, SO1

Helical gear units NORDBLOC:

SK172, SK272, ..., SK972, SK273, SK373, ..., SK973,
SK071.1, SK171.1, SK371.1, SK571.1, SK771.1, SK871.1, SK971.1, SK1071.1
SK072.1, SK172.1, SK372.1, ..., SK673.1, SK772.1, ..., SK973.1
In the versions / options:
F, XZ, XF, VL, AL, IEC, NEMA, AI, AN, SEK, SEP, W, VI, OA, SO1

Standard helical gear units:

SK0, SK01, SK20, ..., SK33, SK010, SK200, ..., SK330
In the versions / options:
Z, XZ, XF, F, 5, V, AL, IEC, NEMA, W, VI, SO1

Flat gear units:

SK0182NB, SK0282NB, SK0182.1, SK0282.1, SK1282.1, SK1282, ..., SK11282,
SK1382NB, SK1382.1, SK2382, ..., SK11382.1, SK12382
In the versions / options:
A, V, Z, F, X, S, VS, EA, B, G, VG, H, H66, VL, VL2, VL3, IEC, NEMA, AI, AN, RLS, SEK, SEP, W, VI, OA, OT, SO1, SCP

Industrial gear units:
MAXXDRIVE helical gear units SK5207, SK5307...SK15207, SK15307
MAXXDRIVE bevel helical gear units SK5407, SK5507...SK15407, SK15507
MAXXDRIVE XT bevel helical gear units SK5217...SK11217
MAXXDRIVE XD helical gear units SK15319
MAXXDRIVE XJ bevel helical gear units SK5418
MAXXDRIVE XS bevel helical gear units SK49320, SK59320
In the versions / options:
A, AS, B, D, DRY, EA, ED, EV, EW, F, FAN, FK, F1, H/H66, IEC, L, LC, LCX, MC, MD, MF, MFB, MS, MSB, MFK, MFT, MSK, MSKB, MST, MFTB, MSTB, MT, NEMA, OT, R, V, VL, VL2, VL3, VL4, VL5, VL6, W1, W2, W3, WG, WX, SAFOMI
Tac, FV, EF, DB, DR, OSG, OST, PS

Bevel gear units:
SK920072.1, SK92072, SK92172, ..., SK92772, SK92072.1, SK92172.1, ..., SK92772.1,
SK930072.1, SK93072.1, SK93172.1, ..., SK93772.1,
SK9012.1, SK9016.1, SK9022.1, ..., SK9096.1,
SK9013.1, SK9017.1, SK9023.1, ..., SK9053.1
In the versions / options:
A, V, L, Z, F, X, D, K, S, VS, EA, R, G, VG, B, H, H66, VL, VL2, VL3, IEC, NEMA, AI, AN, RLS, SEK, SEP, W, VI, OA, SO1, SCP

Helical worm gear units:
SK02040, SK02040.1, SK02050, ..., SK42125, SK13050, SK13080, ..., SK43125
In the versions / options:
A, V, L, X, Z, F, D, S, B, H, H66, VL, IEC, NEMA, RLS, SEK, SEP, W, VI, OA

Worm gear unit Minibloc:
SK1SM31, SK1SM40, ..., SK1SM63, SK2SM40, ..., SK2SM63
In the versions / options:
A, V, L, Z, F, D, X, B, IEC, NEMA, W, VI

UNIVERSAL worm gear units:
SK1SI31, SK1SI40, ..., SK1SI75, SK1SID31, ..., SK1SID75, SK2SID40, ..., SK2SID63, SK1SIS31, ..., SK1SIS63, SK2SIS40, ..., SK2SIS63, SK1SMI31, ..., SK1SMI75, SK1SMID31, ..., SK1SMID75, SK2SMID40, ..., SK2SMID63
In the versions / options:
V, A, L, X, Z, F, D, H, H10, /31, /40, IEC, NEMA, W, VI

Motor console:
MK I, MK II, MK III, MK IV, MK V

Adjusting gear units:
R080, R100, R196, R210, R250, R280, R300, R350, R375, R400, R500
In the designs: U, Z

Getriebebau NORD
GmbH&Co.KG

Bargteheide, 21.01.2022
Place and Date of Issue

U. Küchenmeister, managing director

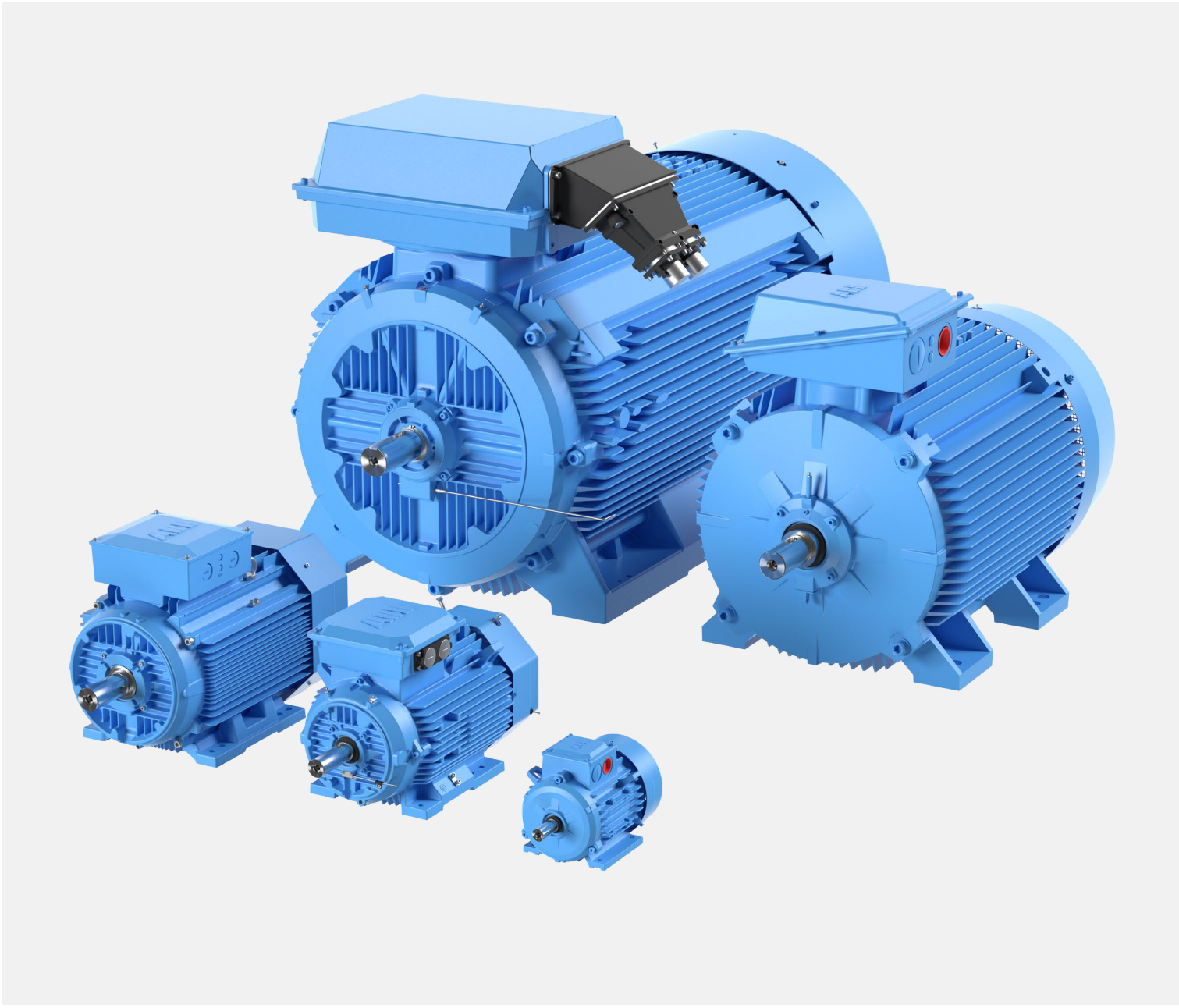
Dr. O. Sadi, technical managing director

7 MOTOR

	Type	Motor tag number (ABB Serial n°)	PCM reference	Manual
ABB	M3BP 132SMF 4	PM-50001A (3G1F2433998068)	DI317873-01	3GZF500730-85 Rev H 06-2022
		PM-50001B (3G1F2434998069)		

INSTALLATION, OPERATION, MAINTENANCE AND SAFETY MANUAL

Low voltage motors
Installation, operation, maintenance and safety manual



—

More languages – please go to:
new.abb.com/motors-generators/iec-low-voltage-motors/manuals

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1 Introduction

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of anyone who installs, operates or maintains the motor or associated equipment. The motor is intended for installation and use by qualified personnel, familiar with health and safety requirements and national legislation. Ignoring these instructions may invalidate all applicable warranties.

1.1 Declaration of Conformity

The conformity of the end product according to Directive 2006/42/EC (Machinery) has to be established by the commissioning party when the motor is fitted to the machinery.

1.2 Validity

These instructions are valid for the following ABB electrical machine types, in both motor and generator operation:

- series MT*, MXMA,
- series M1A*, M2A*/M3A*, M2B*/M3B*, M4B*, M2C*/M3C*, M2F*/M3F*, M2L*/M3L*, M2M*/M3M*, M2Q*, M2R*/M3R*, M2V*/M3V*
- in IEC frame sizes 56-500
- in NEMA frame sizes 58*, 50**

There is a separate manual for e.g. Ex motors ‘Low voltage motors for explosive atmospheres: Installation, operation and maintenance and safety manual (3GZF500730-47).

Additional information is required for some machine types due to special application and/or design considerations.

Additional manual is available for the following motors:

- roller table motors
- water cooled motors
- smoke extraction motors
- brake motors
- motors for high ambient temperatures
- motors in marine applications for mounting on open deck
- of ships or offshore units

2 Safety considerations

The motor is intended for installation and use by qualified personnel, familiar with health and safety requirements and national legislation.

Safety equipment necessary for the prevention of accidents at the installation and operating site must be provided in accordance with local regulations.



WARNING

Emergency stop controls must be equipped with restart lockouts. After emergency stop a new start command can take effect only after the restart lockout has been intentionally reset.

Points to be observed:

1. Do not step on the motor.
2. The temperature of the outer casing of the motor may be hot to the touch during normal operation and especially after shut-down.
3. Some special motor applications may require additional instructions (e.g. when supplied by frequency converter).
4. Observe rotating parts of the motor.
5. Do not open terminal boxes while energized.

3 Handling

3.1 Reception

Immediately upon receipt, check the motor for external damage (e.g. shaft-ends, flanges and painted surfaces) and, if found, inform the forwarding agent without delay.

Check all rating plate data, especially voltage and winding connections (star or delta). The type of bearing is specified on the rating plate of all motors except the smallest frame sizes.

In the case of a variable speed drive application check the maximum loadability allowed according to frequency stamped on the motor's second rating plate.

3.2 Transportation and storage

The motor should always be stored indoors (above –20 °C), in dry, vibration-free and dust-free conditions. During transportation, shocks, falls and humidity should be avoided. In other conditions, please contact ABB.

Unprotected machined surfaces (shaft-ends and flanges) should be treated against corrosion.

It is recommended that shafts are rotated periodically (once per quarter) by hand to prevent grease migration.

Anti-condensation heaters, if fitted, are recommended to be used to avoid water condensing in the motor.

The motor must not be subject to any external vibrations at standstill so as to avoid causing damage to the bearings.

Motors fitted with cylindrical-roller and/or angular contact bearings must be fitted with locking devices during transport.

3.3 Lifting

All ABB motors above 25 kg are equipped with lifting lugs or eyebolts.

Only the main lifting lugs or eyebolts of the motor should be used for lifting the motor. They must not be used to lift the motor when it is attached to other equipment.

Lifting lugs for auxiliaries (e.g. brakes, separate cooling fans) or terminal boxes must not be used for lifting the motor. Because of different output, mounting arrangements and auxiliary equipment, motors with the same frame may have a different center of gravity.

Damaged lifting lugs must not be used. Check that eyebolts or integrated lifting lugs are undamaged before lifting.

Lifting eyebolts must be tightened before lifting. If needed, the position of the eyebolt can be adjusted using suitable washers as spacers.

Ensure that proper lifting equipment is used and that the sizes of the hooks are suitable for the lifting lugs.

Care must be taken not to damage auxiliary equipment and cables connected to the motor.

Remove eventual transport jigs fixing the motor to the pallet.

Specific lifting instructions are available from ABB.



WARNING

During lifting, mounting or maintenance work, all necessary safety considerations shall be in place and special attention to be taken that nobody will be subject to lifted load.

3.4 Motor weight

The total motor weight can vary within the same frame size (center height) depending on different output, mounting arrangement and auxiliaries.

The following table shows estimated maximum weights for machines in their basic versions as a function of frame material.

The actual weight of all ABB's motors, except the smallest frame sizes (56 and 63), is shown on the rating plate.

—

Table 3.1: Minimum cross-sectional area of protective conductors

Frame size	Aluminum, Weight kg	Cast iron, Weight kg	Add. for brake
56	4.5	–	–
63	6	–	–
71	8	13	5
80	14	20	8
90	20	30	10
100	32	40	16
112	36	50	20
132	93	90	30
160	149	130	30
180	162	190	45
200	245	275	55
225	300	360	75
250	386	405	75
280	425	800	–
315	–	1 700	–
355	–	2 700	–
400	–	3 500	–
450	–	4 500	–
5000	–	2 800	–

If the motor is equipped with a separate fan, contact ABB for the weight.

4 Installation and commissioning



WARNING

Disconnect and lock out before working on the motor or the driven equipment.

4.1 General

All rating plate values must be carefully checked to ensure that the motor protection and connection will be properly done.

When starting the motor for the first time or after it has been in storage more than 6 months, apply the specified quantity of grease.

See section “7.2.2 Motors with re-greasable bearings” for more details.

When fitted in a vertical position with the shaft pointing downwards, the motor must have a protective cover to prevent foreign objects and fluid from falling into the ventilation openings. This task can also be achieved by a separate cover not fixed to the motor. In this case, the motor must have a warning label.

4.2 Motors with other than deep groove ball bearings

Remove transport locking if employed. Turn the shaft of the motor by hand to check free rotation, if possible.

Motors equipped with cylindrical roller bearings: Running the motor with no radial force applied to the shaft may damage the roller bearing due to “sliding”,

Motors equipped with angular contact ball bearing: Running the motor with no axial force applied in the right direction in relation to the shaft may damage the angular contact bearing.



WARNING

For motors with angular contact bearings the axial force must not by any means change direction.

The type of bearing is specified on the rating plate.

4.3 Insulation resistance check

Measure insulation resistance (IR) before commissioning, after long periods of standstill or storage when winding dampness may be suspected. IR shall be measured directly on the motor terminals with the supply cables disconnected in order to avoid them affecting the result.

Insulation resistance should be used as a trend indicator to determine changes in the insulation system. In new machines the IR is usually thousands of Mohms and thus following the change of IR is important so as to know the condition of the insulation system. Typically, the IR should not be below 10 MΩ and in no case below 1 MΩ (measured with 500 or 1000 VDC and corrected to 25 °C). The insulation resistance value is halved for each 20 °C increase in temperature.

Figure 1, in chapter 11, can be used for the insulation correction to the desired temperature.

WARNING

To avoid risk of electrical shock, the motor frame must be grounded and the windings should be discharged against the frame immediately after each measurement.

If the reference resistance value is not attained, the winding is too damp and must be oven dried. The oven temperature should be 90 °C for 12-16 hours followed by 105 °C for 6-8 hours.

If fitted drain hole plugs must be removed and closing valves must be opened during heating. After heating, make sure the plugs are refitted. Even if the drain plugs are fitted, it is recommended to disassemble the end shields and terminal box covers for the drying process.

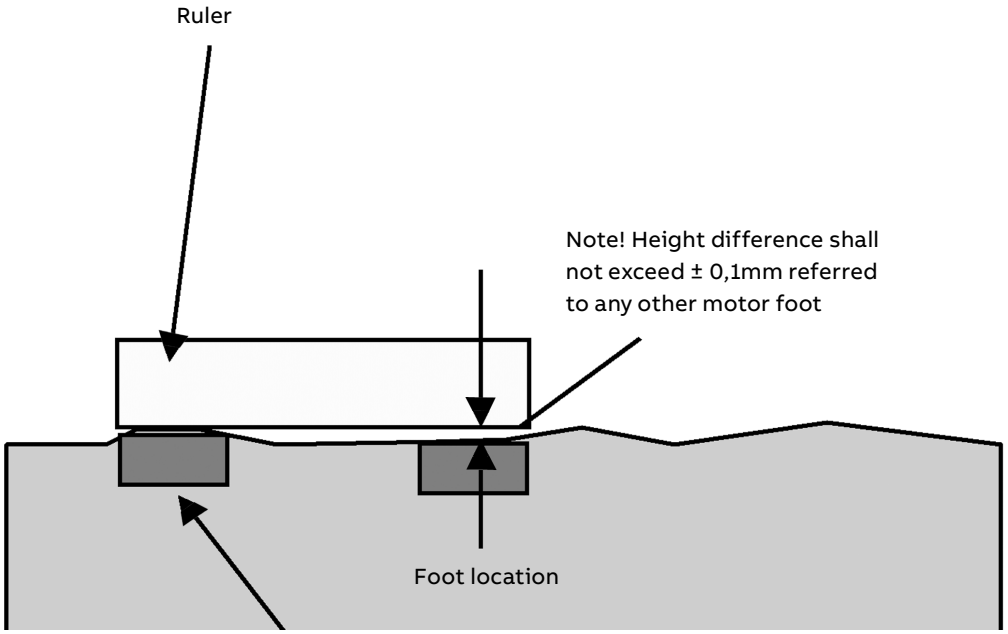
Windings drenched in seawater normally need to be rewound.

4.4 Foundation

The end user has full responsibility for preparation of the foundation.

Metal foundations should be painted to avoid corrosion.

Foundations must be even and sufficiently rigid to withstand possible short circuit forces. They must be designed and dimensioned to avoid the transfer of vibration to the motor and vibration caused by resonance. See figure below.



4.5 Balancing and fitting coupling halves and pulleys

As standard, balancing of the motor has been carried out using half key.

Coupling halves or pulleys must be balanced after machining the keyways. Balancing must be done in accordance with the balancing method specified for the motor.

Coupling halves and pulleys must be fitted on the shaft by using suitable equipment and tools which do not damage the bearings and seals.

Never fit a coupling half or pulley by hammering or removing it by using a lever pressed against the body of the motor.

4.6 Mounting and alignment of the motor

Ensure that there is enough space for free airflow around the motor. It is recommended to have a clearance between the fan cover and the wall etc. of at least ½ of the air intake of the fan cover. Additional information may be found from the product catalog or from the dimension drawings available on our web pages: **www.abb.com/motors&generators.**

Correct alignment is essential to avoid bearing, vibration and possible shaft failures.

Mount the motor on the foundation using the appropriate bolts or studs and place shim plates between the foundation and the feet.

Align the motor using appropriate methods.

If applicable, drill locating holes and fix the locating pins into position.

Mounting accuracy of coupling half: check that clearance b is less than 0.05 mm and that the difference a1 to a2 is also less than 0.05 mm. See figure 2.

Re-check the alignment after final tightening of the bolts or studs.

Do not exceed permissible loading values for bearings as stated in the product catalogs.

Check that the motor has sufficient airflow. Ensure that no nearby objects or direct sunshine radiate additional heat to the motor.

For flange mounted motors (e.g. B5, B35, V1), make sure that the construction allows sufficient air flow on the outer surface of the flange.

4.7 Radial forces and belt drives

Belts must be tightened according to the instructions of the supplier of the driven equipment. However, do not exceed the maximum belt forces (i.e. radial bearing loading) stated in the relevant product catalogs.



WARNING

Excessive belt tension will damage bearings and can cause shaft damage.

4.8 Motors with drain plugs for condensation

Check that drain holes and plugs face downwards. In vertical position mounted motors, the drain plugs may be in horizontal position.

Motors with sealable plastic drain plugs are delivered in an open position. In very dusty environments, all drain holes should be closed.

4.9 Cabling and electrical connections

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal.

In addition to the main winding and earthing terminals, the terminal box can also contain connections for thermistors, heating elements or other auxiliary devices.

Suitable cable lugs must be used for the connection of all main cables. Cables for auxiliaries can be connected into their terminal blocks as such.

Motors are intended for fixed installation only. Unless otherwise specified, cable entry threads are metric. The IP class of the cable gland must be at least the same as those of the terminal boxes.

Certified conduit hub or cable connector has to be used at the time of installation.



Cables should be mechanically protected and clamped close to the terminal box to fulfill the appropriate requirements of IEC/EN 60079-0 and local installation standards.

Unused cable entries must be closed with blanking elements according to the IP class of the terminal box.

The degree of protection and diameter are specified in the documents relating to the cable gland.



WARNING

Use appropriate cable glands and seals in the cable entries according to the type and diameter of the cable.

Earthing must be carried out according to local regulations before the motor is connected to the supply voltage.

The earth terminal on the frame has to be connected to PE (protective earth) with a cable as shown in Table 5 of IEC/EN 60034-1:

Table 4.1: Minimum cross-sectional area of protective conductors

Cross-sectional area of phase conductors of the installation, S, [mm²]	Minimum cross-sectional area of the corresponding protective conductor, S, [mm²]
4	4
6	6
10	10
16	16
25	25
35	25
50	25
70	35
95	50
120	70
150	70
185	95
240	120
300	150
400	185

In addition, earthing or bonding connection facilities on the outside of electrical apparatus must provide effective connection of a conductor with a cross-sectional area of at least 4 mm².

The cable connection between the network and motor terminals must meet the requirements stated in the national standards for installation or in the standard IEC/EN 60204-1 according to the rated current indicated on the rating plate.

> When the ambient temperature exceeds +50 °C, cables having permissible operating temperature of +90 °C as minimum shall be used. Also all other conversion factors depending on the installation conditions shall be taken into account while sizing the cables.

Ensure that the motor protection corresponds to the environment and weather conditions. For example, make sure that water cannot enter the motor or the terminal boxes.

The seals of terminal boxes must be placed correctly in the slots provided to ensure the correct IP class. A leak could lead to penetration of dust or water, creating a risk of flashover to live elements.

4.9.1 Connections for different starting methods

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal. This enables the use of DOL- or Y/D –starting.

For two-speed and special motors, the supply connection must follow the instructions inside the terminal box or in the motor manual.

The voltage and connection are stamped on the rating plate.

Direct-on-line starting (DOL):
Y or D winding connections may be used.

For example, 690 VY, 400 VD indicates Y-connection for 690 V and D-connection for 400 V.

Star/Delta (Wye/Delta) starting (Y/D):
The supply voltage must be equal to the rated voltage of the motor when using a D-connection.

Remove all connection links from the terminal block.

Other starting methods and severe starting conditions:
In cases where other starting methods e.g. converter or soft starter will be used in the duty types of S1 and S2, it is considered that the device is “isolated from the power system when the electrical machine is running” as in the standard IEC 60079-0 and thermal protection is optional.

4.9.2 Connections of auxiliaries

If a motor is equipped with thermistors or other RTDs (Pt100, thermal relays, etc.) and auxiliary devices, it is recommended they be used and connected by appropriate means. For certain applications, it is mandatory to use thermal protection. More detailed information can be found in the documents delivered with the motor. Connection diagrams for auxiliary elements and connection parts can be found inside the terminal box.

The maximum measuring voltage for the thermistors is 2.5 V. The maximum measuring current for Pt100 is 5 mA. Using a higher measuring voltage or current may cause errors in readings or a damaged temperature detector.

The insulation of thermal sensors fulfills the requirements of basic insulation.

4.10 Terminals and direction of rotation

The shaft rotates clockwise when viewing the shaft face at the motor drive end, and the line phase sequence – L1, L2, L3 – is connected to the terminals as shown in figure 3.

To alter the direction of rotation, interchange any two connections on the supply cables.

If the motor has a unidirectional fan, ensure that it rotates in the same direction as the arrow marked on the motor.

5 Operation

5.1 General

The motors are designed for the following conditions unless otherwise stated on the rating plate:

- Motors are to be installed in fixed installations only.
- Normal ambient temperature range is from –20 °C to +40 °C.
- Maximum altitude is 1000 m above sea level.
- The variation of the supply voltage and frequency may not exceed the limits mentioned in relevant standards. Tolerance for supply voltage is ±5 %, and for frequency ±2 % according to the figure 4 (EN / IEC 60034-1, paragraph 7.3, Zone A). Both extreme values are not supposed to occur at the same time.

The motor can only be used in applications for which it is intended. The rated nominal values and operation conditions are shown on the motor rating plates. In addition, all requirements of this manual and other related instructions and standards must be followed.

If these limits are exceeded, motor data and construction data must be checked. Please contact ABB for further information.



WARNING

Ignoring any instructions or maintenance of the apparatus may jeopardize safety and thus prevent the use of the motor.

6 Low voltage motors in variable speed operation

6.1 Introduction

This part of the manual provides additional instructions for motors used in frequency converter supplies. The motor is intended to operate from a single frequency converter supply and not motors running in parallel from one frequency converter. Instructions given by the converter manufacturer shall be followed.

Additional information may be required by ABB to decide on the suitability for some motor types used in special applications or with special design modifications.

6.2 Winding insulation

Variable speed drives create higher voltage stresses than the sinusoidal supply on the winding of the motor. Therefore, the winding insulation of the motor as well as the filter at the converter output must be dimensioned according following instructions.

6.2.1 Selection of winding insulation for ABB converters

In the case of ABB e.g. AC_8_ _-series and AC_5_ _-series single drives with a diode supply unit (uncontrolled DC voltage), the selection of winding insulation and filters can be made according to table 6.1.

6.2.2 Selection of winding insulation with all other converters

The voltage stresses must be limited below accepted limits. Please contact the system supplier to ensure the safety of the application. The influence of possible filters must be taken into account while dimensioning the motor.

6.3 Thermal protection

Most of the motors covered by this manual are equipped with PTC thermistors or other type of RTD's in the stator windings. It is recommended to connect those to the frequency converter. Read more in chapter 4.9.2.

6.4 Bearing currents

Insulated bearings or bearing constructions, common mode filters and suitable cabling and grounding methods must be used according to the following instructions and using table 6.1.

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Table 6.1 Selection of winding insulation for ABB converters

	P_N < 100 kW	P_N ≥ 100 kW or IEC315 ≤ Frame size ≤ IEC355	P_N ≥ 350 kW or IEC400 ≤ Frame size ≤ IEC450
U_N ≤ 500 V	Standard motor	Standard motor + Insulated N-bearing	Standard motor + Insulated N-bearing + Common mode filter
500V > U_N ≤ 600V	Standard motor + dU/dt –filter (reactor) OR Reinforced insulation	Standard motor + dU/dt –filter (reactor) + Insulated N-bearing OR Reinforced insulation + Insulated N-bearing	Standard motor + Insulated N-bearing + dU/dt –filter (reactor) + Common mode filter OR Reinforced insulation + Insulated N-bearing + Common mode filter
500V > U_N ≤ 600V (cable length > 150 m)	Standard motor	Standard motor + Insulated N-bearing	Standard motor + Insulated N-bearing + Common mode filter
600V > U_N ≤ 690V	Reinforced insulation + dU/dt –filter (reactor)	Reinforced insulation + dU/dt –filter (reactor) + Insulated N-bearing	Reinforced insulation + Insulated N-bearing + dU/dt –filter (reactor) + Common mode filter
600V > U_N ≤ 690V (cable length > 150 m)	Reinforced insulation	Reinforced insulation + Insulated N-bearing	Reinforced insulation + Insulated N-bearing + Common mode filter

6.4.1 Elimination of bearing currents with ABB converters

In case of ABB frequency converter e.g. AC_8_ _- and AC_5_ _-series with a diode supply unit, the methods according to table 6.1 must be used to avoid harmful bearing currents in motors.

Insulated bearings which have aluminum oxide coated inner and/or outer bores or ceramic rolling elements are recommended. Aluminum oxide coatings shall also be treated with a sealant to prevent dirt and humidity penetrating into the porous coating. For the exact type of bearing insulation, see the motor's rating plate. Changing the bearing type or insulation method without ABB's permission is prohibited.

6.4.2 Elimination of bearing currents with all other converters

The user is responsible for protecting the motor and driven equipment from harmful bearing currents. Instructions described in chapter 6.4.1 can be used as guideline, but their effectiveness cannot be guaranteed in all cases.

6.5 Cabling, grounding and EMC

To provide proper grounding and to ensure compliance with any applicable EMC requirements, motors above 30 kW shall be cabled by shielded symmetrical cables and EMC glands, i.e. cable glands providing 360° bonding.

Symmetrical and shielded cables are highly recommended also for smaller motors. Make the 360° grounding arrangement at all the cable entries as described in the instructions for the glands. Twist the cable shields into bundles and connect to the nearest ground terminal/bus bar inside the terminal box, converter cabinet, etc.

> **i** Proper cable glands providing 360° bonding must be used at all termination points such as motor, converter, possible safety switch, etc.

For motors of frame size IEC 280 and above, additional potential equalization between the motor frame and the driven equipment is needed, unless both are mounted on a common steel base. In this case, the high frequency conductivity of the connection provided by the steel base should be checked by, for example, measuring the potential difference between the components.

More information about grounding and cabling of variable speed drives can be found in the manual “Grounding and cabling of the drive system” (Code: 3AFY 61201998).

6.6 Operating speed

For speeds higher than the nominal speed stated on the motor’s rating plate or in the respective product catalog, ensure that either the highest permissible rotational speed of the motor or the critical speed of the whole application is not exceeded.

6.7 Motors in variable speed applications

6.7.1 General

With ABB’s frequency converters, the motors can be dimensioned by using ABB’s DriveSize dimensioning program. The tool is downloadable from the ABB website (www.abb.com/motors&generators).

For application supplied by other converters, the motors must be dimensioned manually. For more information, please contact ABB.

The loadability curves (or load capacity curves) are based on nominal supply voltage. Operation in under or over voltage conditions may influence on the performance of the application.

6.7.2 Motor loadability with AC_8_ _ – Series of converters with DTC control

The loadability curves presented in Figures 5a – 5d are valid for ABB AC_8_ _-series converters with uncontrolled DC-voltage and DTC-control. The figures show the approximate maximum continuous output torque of the motors as a function of supply frequency. The output torque is given as a percentage of the nominal torque of the motor. The values are indicative and exact values are available on request.

The maximum speed of the motor and application may not be exceeded!

6.7.3 Motor loadability with AC_5_ _ – series of converter

The loadability curves presented in Figures 6a – 6d are valid for AC_5_ _ -series converters.
The figures show the approximate maximum continuous output torque of the motors as a function of supply frequency. The output torque is given as a percentage of the nominal torque of the motor. The values are indicative and exact values are available on request.

The maximum speed of the motor and application may not be exceeded!

6.7.4 Motor loadability with other voltage source PWM-type converters

For other converters, with uncontrolled DC voltage and minimum switching frequency of 3 kHz (200…500 V), the dimensioning instructions as mentioned in chapter 6.7.3 can be used as guidelines. However, it shall be noted that the actual thermal loadability can also be lower. Please contact the manufacturer of the converter or the system supplier.

The actual thermal loadability of a motor may be lower than shown by guideline curves.

6.7.5 Short time overloads

ABB motors can usually be temporarily overloaded as well as used in intermittent duties. The most convenient method to dimension such applications is to use the DriveSize tool.

6.8 Rating plates

The usage of ABB's motors in variable speed applications do not usually require additional rating plates. The parameters required for commissioning the converter can be found from the main rating plate. In some special applications, however, the motors can be equipped with additional rating plates for variable speed applications.

Those include the following information:
- speed range
- power range
- voltage and current range
- type of torque (constant or quadratic)
- and converter type and required minimum switching frequency.

6.9 Commissioning the variable speed application

The commissioning of the variable speed application must be done according to the instructions of the frequency converter and local laws and regulations. The requirements and limitations set by the application must also be taken into account.

All parameters needed for setting the converter must be taken from the motor rating plates.
The most often needed parameters are:
- nominal voltage
- nominal current
- nominal frequency
- nominal speed
- nominal power

In case of missing or inaccurate information, do not operate the motor before ensuring correct settings!

ABB recommends using all the suitable protective features provided by the converter to improve the safety of the application. Converters usually provide features such as (names and availability of features depend on manufacturer and model of the converter):
- minimum speed
- maximum speed
- acceleration and deceleration times
- maximum current
- maximum torque
- stall protection

7 Maintenance



WARNING

Voltage may be connected at standstill inside the terminal box for heating elements or direct winding heating.

7.1 General inspection

1. Inspect the motor at regular intervals, at least once a year. The frequency of checks depends on, for example, the humidity level of the ambient air and on the local weather conditions. This can initially be determined experimentally and must then be strictly adhered to.
2. Keep the motor clean and ensure free ventilation airflow. If the motor is used in a dusty environment, the ventilation system must be regularly checked and cleaned.
3. Check the condition of shaft seals (e.g. V-ring or radial seal) and replace if necessary.
4. Check the condition of connections and mounting and assembly bolts.
5. Check the bearing condition by listening for any unusual noise, vibration measurement, bearing temperature, inspection of spent grease or SPM bearing monitoring. Pay special attention to bearings when their calculated rated life time is coming to an end.

When signs of wear are noticed, dismantle the motor, check the parts and replace if necessary. When bearings are changed, replacement bearings must be of the same type as those originally fitted. The shaft seals have to be replaced with seals of the same quality and characteristics as the originals when changing bearings.

In the case of the IP 55 motor and when the motor has been delivered with a plug closed, it is advisable to periodically open the drain plugs in order to ensure that the way out for condensation is not blocked and allows condensation to escape from the motor. This operation must be done when the motor is at a standstill and has been made safe to work on.

7.1.1 Standby motors

If the motor is in standby for a longer period of time on a ship or in other vibrating environment the following measures have to be taken:

1. The shaft must be rotated regularly every 2 weeks (to be reported) by means of starting up of the system. In case a start-up is not possible, for any reason, at least the shaft has to be turned by hand in order to achieve a different position once a week. Vibrations caused by other vessel's equipment will cause bearing pitting which should be minimized by regular operation/hand turning.
2. The bearing must be greased while rotating the shaft every year (to be reported). If the motor has been provided with roller bearing at the driven end, the transport lock must be removed before rotating the shaft. The transport locking must be remounted in case of transportation.
3. All vibrations must be avoided to prevent a bearing from failing. All instructions in the motor instruction manual for commissioning and maintenance have to be followed. The warranty will not cover the winding and bearing damages if these instructions have not been followed.

7.2 Lubrication



WARNING

Beware of all rotating parts!



WARNING

Grease can cause skin irritation and eye inflammation. Follow all safety precautions specified by the manufacturer of the grease.

Bearing types are specified in the respective product catalogs and on the rating plate of all motors, except smaller frame sizes.

Reliability is a vital issue for bearing lubrication intervals. ABB uses mainly the L1 -principle (i.e. that 99 % of the motors are certain to make the life time) for lubrication.

7.2.1 Motors with permanently greased bearings

Bearings are usually permanently greased bearings of 1Z, 2Z, 2RS or equivalent.

As a guide, adequate lubrication for sizes up to 250 can be achieved for the following duration, according to L_1. For duties with higher ambient temperatures, please contact ABB. The informative formula to change the L1 values roughly to L_{10} values: $L_{10} = 2.0 \times L_1$.

Duty hours for permanently greased bearings at ambient temperatures of 25 °C and 40 °C are:

—

Table 7.1

Frame size	Poles	Duty hours at 25 °C	Duty hours at 40 °C
56	2	52 000	33 000
56	4–8	65 000	41 000
63	2	49 000	31 000
63	4–8	63 000	40 000
71	2	67 000	42 000
71	4–8	100 000	56 000
80–90	2	100 000	65 000
80–90	4–8	100 000	96 000
100–112	2	89 000	56 000
100–112	4–8	100 000	89 000
132	2	67 000	42 000
132	4–8	100 000	77 000
160	2	60 000	38 000
160	4–8	100 000	74 000
180	2	55 000	34 000
180	4–8	100 000	70 000
200	2	41 000	25 000
200	4–8	95 000	60 000
225	2	36 000	23 000
225	4–8	88 000	56 000
250	2	31 000	20 000
250	4–8	80 000	50 000

Data is valid up to 60 Hz.

7.2.2 Motors with regreasable bearings

Lubrication information plate and general lubrication advice.

If the motor is equipped with a lubrication information plate, follow the given values.

Greasing intervals regarding mounting, ambient temperature and rotational speed are defined on the lubrication information plate.

During the first start or after a bearing lubrication a temporary temperature rise may appear, approximately 10 to 20 hours.

Some motors may be equipped with a collector for old grease. Follow the special instructions given for the equipment.

A. Manual lubrication

Regreasing while the motor is running

- Remove grease outlet plug or open closing valve if fitted.
- Be sure that the lubrication channel is open.
- Inject the specified amount of grease into the bearing.
- Let the motor run for 1-2 hours to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug or closing valve, if fitted.

Regreasing while the motor is at a standstill

If it is not possible to re-grease the bearings while the motors are running, lubrication can be carried out while the motor is at a standstill.

- In this case, use only half the amount of grease and then run the motor for a few minutes at full speed.
- When the motor has stopped, apply the rest of the specified amount of grease to the bearing.
- After 1–2 running hours, close the grease outlet plug or closing valve, if fitted.

B. Automatic lubrication

The grease outlet plug must be removed permanently with automatic lubrication or open closing valve, if fitted.

ABB recommends only the use of electromechanical systems.

The amount of grease per lubrication interval stated in the table should be multiplied by three if a central lubrication system is used. When using a smaller automatic re-grease unit (one or two cartridges per motor) the normal amount of grease can be used.

When 2-pole motors are automatically re-greased, the note concerning lubricant recommendations for 2-pole motors in the Lubricants chapter should be followed.

The used grease should be suitable for automatic lubrication. The automatic lubrication system deliverer and the grease manufacturer's recommendations should check.

Calculation example of amount of grease for automatic lubrication system

Central lubrication system: Motor IEC M3_P 315_ 4-pole in 50 Hz network, re-lubrication interval according to Table is 7600 h/55 g (DE) and 7600 h/40 g (NDE):

(DE) RLI = 55 g/7600 h*3*24 = 0,52 g/day

(NDE) RLI = 40 g/7600 h*3*24 = 0,38 g/day

Calculation example of amount of grease for single automation lubrication unit (cartridge)

(DE) RLI = 55 g/7600 h*24 = 0,17 g/day

(NDE) RLI = 40 g/7600 h*24 = 0,13 g/day

RLI = Re-lubrication interval, DE = Drive end, NDE = Non drive end

7.2.3 Lubrication intervals and amounts

Lubrication intervals for vertical motors are half of the values shown in the table below.

As a guide, adequate lubrication can be achieved for the following duration, according to L_1. For duties with higher ambient temperatures please contact ABB. The informative formula to change the L1 values roughly to L10 values is $L_{10} = 2.0 \times L_1$, with manual lubrication.

The lubrication intervals are based on a bearing operating temperature of 80 °C (ambient temperature +25 °C).



An increase in the ambient temperature raises the temperature of the bearings correspondingly. The interval values should be halved for a 15 °C increase in bearing temperature and may be doubled for a 15 °C decrease in bearing temperature.

Higher speed operation, e.g. in frequency converter applications, or lower speed with heavy load will require shorter lubrication intervals.



WARNING

The maximum operating temperature of the grease and bearings, +110 °C, must not be exceeded. The designed maximum speed of the motor must not be exceeded.

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Table 7.2

Frame size	Amount of grease g/bearing	kW	3600 r/min	3000 r/min	kW	1800 r/min	1500 r/min	kW	1000 r/min	kW	500-900 r/min
					Ball bearings, lubrication intervals in duty hours						
112	10	all	10 000	13 000	all	18 000	21 000	all	2 5 000	all	28 000
132	15	all	9 000	11 000	all	17 000	19 000	all	23 000	all	26 500
160	25	≤ 18,5	9 000	12000	≤ 15	18 000	21 500	≤ 11	24 000	all	24 000
160	25	> 18,5	7 500	1 0000	> 15	15 000	18 000	> 11	22 500	all	24 000
180	30	≤ 22	7 000	9 000	≤ 22	15 500	18 500	≤ 15	24 000	all	24 000
180	30	> 22	6 000	8 500	> 22	14 000	17 000	> 15	21 000	all	24 000
200	40	≤ 37	5 500	8 000	≤ 30	14 500	17 500	≤ 22	23 000	all	24 000
200	40	> 37	3 000	5 500	> 30	10 000	12 000	> 22	16 000	all	20 000
225	50	≤ 45	4 000	6 500	≤ 45	13 000	16 500	≤ 30	22 000	all	24 000
225	50	> 45	1 500	2 500	> 45	5 000	6 000	> 30	8 000	all	10 000
250	60	≤ 55	2 500	4 000	≤ 55	9 000	11 500	≤ 37	15 000	all	18 000
250	60	> 55	1 000	1 500	> 55	3 500	4 500	> 37	6 000	all	7 000
280[1)]	60	all	2 000	3 500	–	–	–	–	–	–	–
280[1)]	60	–	–	–	all	8 000	10 500	all	14 000	all	17 000
280	35	all	1 900	3 200	–	–	–	–	–	–	–
280	40	–	–	–	all	7 800	9 600	all	13 900	all	15 000
315	35	all	1 900	3 200	–	–	–	–	–	–	–
315	55	–	–	–	all	5 900	7 600	all	11 800	all	12 900
355	35	all	1 900	3 200	–	–	–	–	–	–	–
355	70	–	–	–	all	4 000	5 600	all	9 600	all	10 700
400	40	all	1 500	2 700	–	–	–	–	–	–	–
400	85	–	–	–	all	3 200	4 700	all	8 600	all	9 700
450	40	all	1 500	2 700	–	–	–	–	–	–	–
450	95	–	–	–	all	2 500	3 900	all	7 700	all	8 700
5008	40	all	3 000	5 300	–	–	–	–	–	–	–
5008	85	–	–	–	all	6400	9 500	all	17 200	all	19 400
5010	40	all	1 300	2 400	–	–	–	–	–	–	–
5010	85	–	–	–	all	4 900	7 200	all	13 200	all	14 800
5012	85	–	–	–	all	2 700	3 900	all	7 100	all	8 000

Frame size	Amount of grease g/bearing	kW	3600 r/min	3000 r/min	kW	1800 r/min	1500 r/min	kW	1000 r/min	kW	500-900 r/min
				Roller bearings, lubrication intervals in duty hours							
160	25	≤ 18,5	4 500	6 000	≤ 15	9 000	10 500	≤ 11	12 000	all	12 000
160	25	> 18,5	3 500	5 000	> 15	7 500	9 000	> 11	11 000	all	12 000
180	30	≤ 22	3 500	4 500	≤ 22	7 500	9 000	≤ 15	12 000	all	12 000
180	30	> 22	3 000	4 000	> 22	7 000	8 500	> 15	10 500	all	12 000
200	40	≤ 37	2 750	4 000	≤ 30	7 000	8 500	≤ 22	11 500	all	12 000
200	40	> 37	1 500	2 500	> 30	5 000	6 000	> 22	8 000	all	10 000
225	50	≤ 45	2 000	3 000	≤ 45	6 500	8 000	≤ 30	11 000	all	12 000
225	50	> 45	750	1 250	> 45	2 500	3 000	> 30	4 000	all	5 000
250	60	≤ 55	1 000	2 000	≤ 55	4 500	5 500	≤ 37	7 500	all	9 000
250	60	> 55	500	750	> 55	1 500	2 000	> 37	3 000	all	3 500
280[1)]	60	all	1 000	1 750	–	–	–	–	–	–	–
280[1)]	70	–	–	–	all	4 000	5 250	all	7 000	all	8 500
280	35	all	900	1 600	–	–	–	–	–	–	–
280	40	–	–	–	all	4 000	5 300	all	7 000	all	8 500
315	35	all	900	1 600	–	–	–	–	–	–	–
315	55	–	–	–	all	2 900	3 800	all	5 900	all	6 500
355	35	all	900	1 600	–	–	–	–	–	–	–
355	70	–	–	–	all	2 000	2 800	all	4 800	all	5 400
400	40	all	–	1 300	–	–	–	–	–	–	–
400	85	–	–	–	all	1 600	2 400	all	4 300	all	4 800
450	40	all	–	1 300	–	–	–	–	–	–	–
450	95	–	–	–	all	1 300	2 000	all	3 800	all	4 400
5008	40	all	–	2 700	–	–	–	–	–	–	–
5008	85	–	–	–	all	3 200	4 700	all	8 600	all	9 700
5010	40	all	–	1 200	–	–	–	–	–	–	–
5010	85	–	–	–	all	2 500	3 600	all	6 600	all	7 400
5012	85	all	–	–	all	1 300	1 900	all	3 500	all	4 000

[1)] M3AA

7.2.4 Lubricants

WARNING

Do not mix different types of grease. Incompatible lubricants may cause bearing damage.

When re-greasing, use only special ball bearing grease with the following properties:

- good quality grease with lithium complex soap and with mineral- or PAO-oil
- base oil viscosity 100-160 cST at 40 °C
- consistency NLGI grade 1.5 - 3 *)
- temperature range –30 °C - +120 °C, continuously

*) A stiffer end of scale is recommended for vertical mounted motors or in hot conditions.

The above mentioned grease specification is valid if the ambient temperature is above –30 °C or below +55 °C, and the bearing temperature is below 110 °C; otherwise, consult ABB regarding suitable grease.

Grease with the correct properties is available from all major lubricant manufacturers.

Admixtures are recommended, but a written guarantee must be obtained from the lubricant manufacturer, especially concerning EP admixtures, that admixtures do not damage bearings or the properties of lubricants at the operating temperature range.

WARNING

In general, lubricants containing EP admixtures are not recommended. In some cases it can cause harm in the bearing, therefore its use has to be evaluated case by case together with lubricant suppliers.

The following high performance greases can be used:

- **Mobil** **Unirex N2** or **N3** (lithium complex base)
- **Mobil** **Mobilith SHC 100** (lithium complex base)
- **Shell** **Gadus S5 V 100 2** (lithium complex base)
- **Klüber** **Klüberplex BEM 41-132** (special lithium base)
- **FAG** **Arcanol TEMP110** (lithium complex base)
- **Lubcon** **Turmogrease L 802 EP PLUS** (special lithium base)
- **Total** **Multis Complex S2 A** (lithium complex base)

Always use high speed grease for high speed 2-pole motors where the speed factor is higher than 480,000 (calculated as Dm x n where Dm = average bearing diameter, mm; n = rotational speed, r/min).

The following greases can be used for high speed cast iron motors but not mixed with lithium complex greases:

- **Klüber** **Klüber Quiet BQH 72-102** (polyurea base)
- **Lubcon** **Turmogrease PU703** (polyurea base)

If other lubricants are used, check with the manufacturer that the qualities correspond to those of the above mentioned lubricants. The lubrication intervals are based on the listed high performance greases above. Using other greases can reduce the interval.

8 After Sales Support

8.1 Spare parts

Unless otherwise stated, spare parts must be original parts or approved by ABB.

When ordering spare parts, the motor serial number, full type designation and product code, as stated on the rating plate, must be specified.

8.2 Dismantling, re-assembly and rewinding

Rewinding should always be carried out by qualified repair shops.

Smoke venting and other special motors should not be rewound without first contacting ABB.

8.3 Bearings

Special care should be taken with the bearings.

These must be removed using pullers and fitted by heating or using special tools.

Bearing replacement is described in detail in a separate instruction leaflet available from the ABB Sales Office.

Any directions placed on the motor, such as labels, must be followed. The bearing types indicated on the rating plate must not be changed.

9 Environmental requirements

Most of ABB's motors have a sound pressure level not exceeding 82 dB (A) (± 3 dB) at 50 Hz.

Values for specific motors can be found in the relevant product catalogs. At 60 Hz sinusoidal supply, the values are approximately 4 dB(A) higher compared to 50 Hz values stated in the product catalogs.

For sound pressure levels at frequency converter supplies, please contact ABB.

When motor(s) need to be scrapped or recycled, appropriate means, local regulations and laws must be followed.

10 Troubleshooting

These instructions do not cover all details or variations in equipment nor provide information for every possible condition to be met in connection with installation, operation or maintenance. Should additional information be required, please contact the nearest ABB Sales Office.

Motor troubleshooting chart
Your motor service and any troubleshooting must be handled by qualified persons who have the proper tools and equipment.

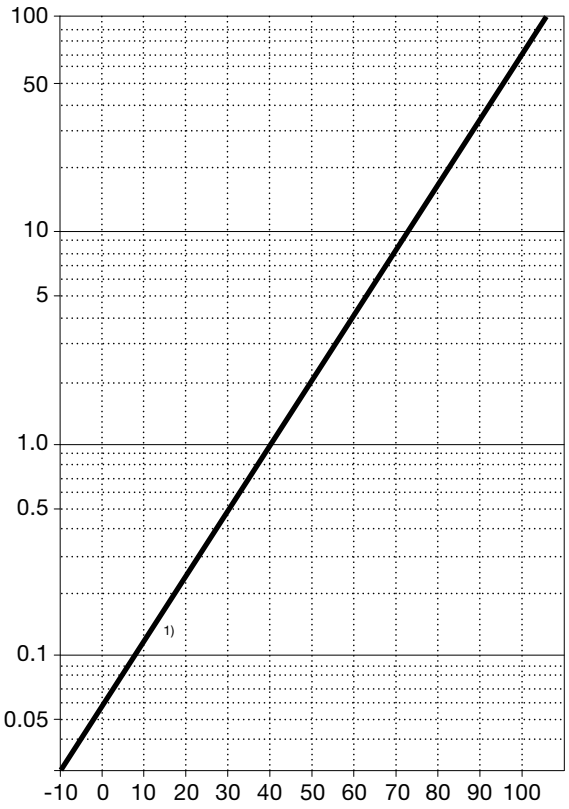
Table 10.1: Troubleshooting

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with proper type and rating.
	Overload trips	Check and reset overload in starter.
	Improper power supply	Check to see that power supplied agrees with motor rating plate and load factor.
	Improper line connections	Check connections against diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections and ensure that all control contacts are closing.
	Mechanical failure	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator	Contact ABB or Ensure that the supply is disconnected and grounding for work done, disconnect the cables and measure the insulation resistance.
	Poor stator coil connection	Indicated by blown fuses. Motor must be rewound. Remove end shields and locate fault.
	Motor may be overloaded	Reduce load.
Motor stalls	One phase may be open	Check lines for open phase.
	Wrong application	Change type or size. Consult equipment supplier.
	Overload	Reduce load.
	Low voltage	Ensure the rating plate voltage is maintained. Check connection.
	Open circuit	Fuses blown. Check overload relay, stator and push buttons.
Motor runs and then dies down	Power failure	Check for loose connections to line, fuses and control.
Motor does not accelerate up to nominal speed	Not applied properly	Consult equipment supplier for proper type.
	Voltage too low at motor terminals because of line drop	Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size.
	Starting load too high	Check the motor's starts against "no load".
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required, as repairs are usually temporary.
	Open primary circuit	Locate fault with testing device and repair.

TROUBLE	CAUSE	WHAT TO DO
Motor takes too long to accelerate and/or draws high current	Excessive load	Reduce load.
	Low voltage during start	Check for high resistance. Make sure that an adequate cable size is used.
	Defective squirrel cage rotor	Replace with new rotor.
	Applied voltage too low	Correct power supply.
Wrong rotation direction	Wrong sequence of phases	Reverse connections at motor or at switchboard.
Motor overheats while running	Overload	Reduce load.
	Frame or ventilation openings may be full of dirt and prevent proper ventilation of motor	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads and cables are well connected.
	Grounded coil	Motor must be rewound.
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen base.
	Coupling out of balance	Balance coupling.
	Driven equipment unbalanced	Rebalance driven equipment.
	Defective bearings	Replace bearings.
	Bearings not in line	Repair motor
	Balancing weights shifted	Rebalance rotor.
	Contradiction between balancing of rotor and coupling (half key - full key)	Rebalance coupling or rotor.
	Poly phase motor running single phase	Check for open circuit.
	Excessive end play	Adjust bearing or add shim.
Scraping noise	Fan rubbing end shield or fan cover	Correct fan mounting.
	Loose on bedplate	Tighten holding bolts.
Noisy operation	Air gap not uniform	Check and correct end shield fits or bearing fits.
	Rotor unbalance	Rebalance rotor.
Hot bearings	Bent or sprung shaft	Straighten or replace shaft.
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away from shaft shoulder	Move pulley closer to motor bearing.
	Pulley diameter too small	Use larger pulleys.
	Misalignment	Correct by realignment of the drive.
	Insufficient grease	Maintain proper quality and amount of grease in bearing.
	Deterioration of grease or lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant	Reduce quantity of grease, bearing should not be more than half full.
	Overloaded bearing	Check alignment, side and end thrust.
	Broken ball or rough races	Replace bearing, clean housing thoroughly first.

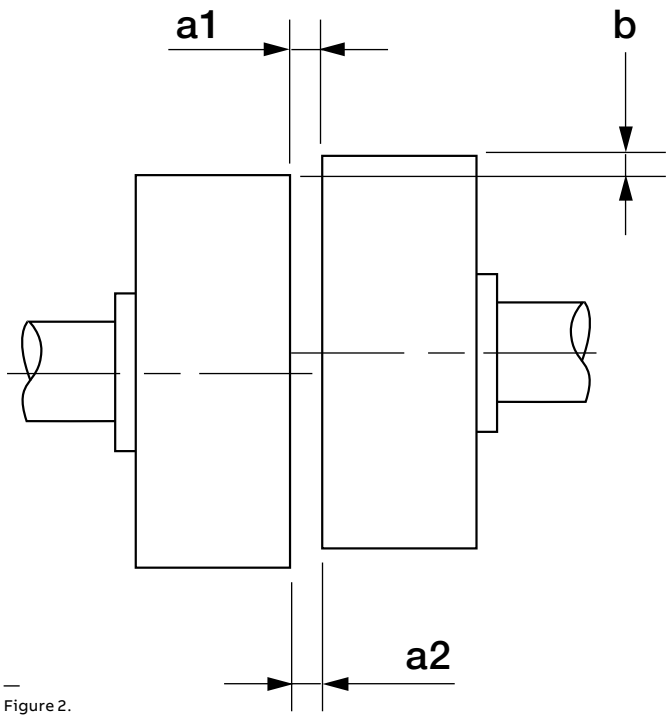
11 Figures

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Figure 1. Diagram illustrating the insulation resistance dependence from the temperature and how to correct the measured insulation resistance to the temperature of 40 °C.
—
Figure 2. Mounting of half-coupling or pulley



—
Figure 1.

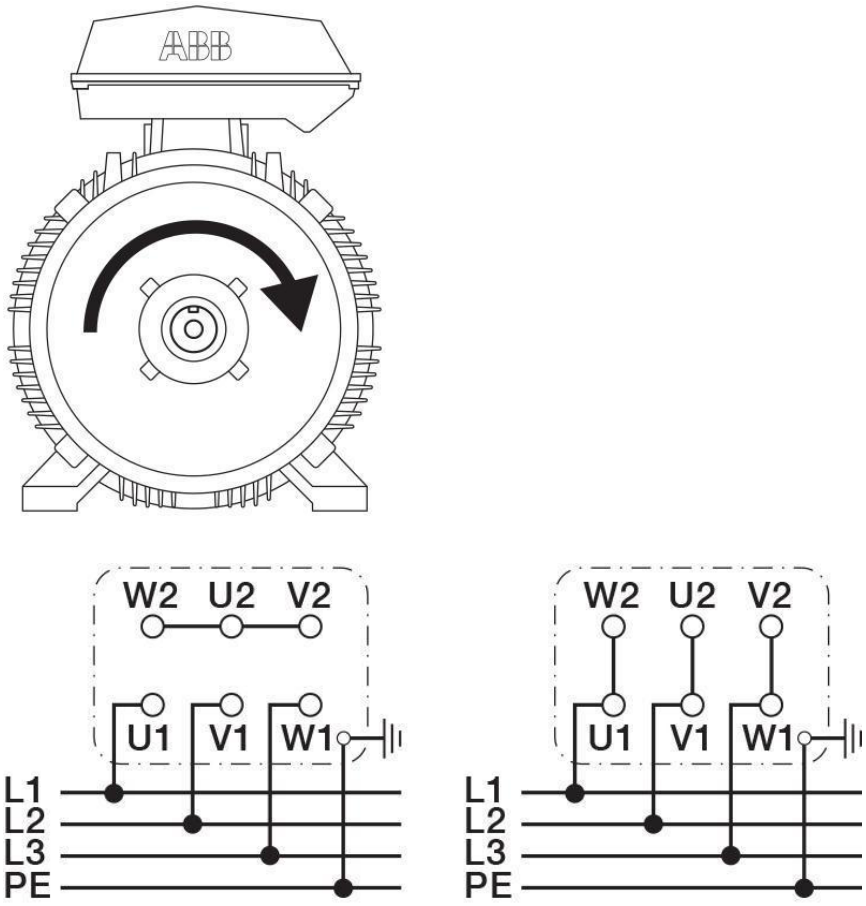
Key	X-axis: Winding temperature, Celsius Degrees Y-axis: Insulation Resistance Temperature Coefficient, ktc 1) To correct observed insulation resistance, R_i, to 40 °C multiply it by the temperature coefficient $k_{tc} \cdot R_{i\,40\,°C} = R_i$ x



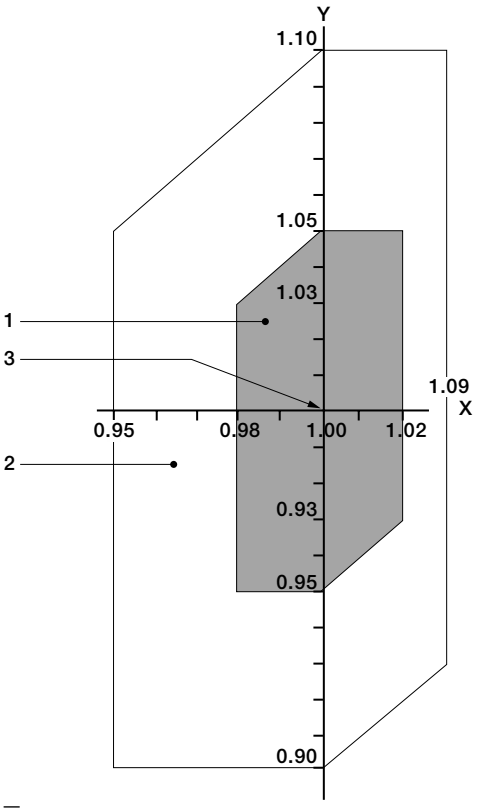
—
Figure 2.

—
Figure 3. Connection of terminals for main supply

—
Figure 4. Voltage and frequency deviation in zones A and B



—
Figure 3.



	X axis	frequency p.u.
	Y axis	voltage p.u.
Key	1	zone A
	2	zone B (outside zone A)
	3	rating point

—
Figure 4.

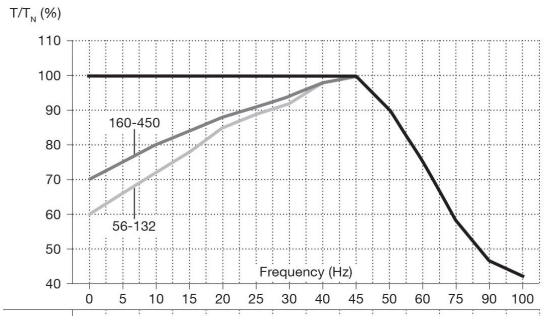
Guideline loadability curves with converters with DTC control

—
Figure 5a. Conventer with DTC control, 50 Hz, temperature rise B

—
Figure 5b. Conventer with DTC control, 60 Hz, temperature rise B

—
Figure 5c. Conventer with DTC control, 50 Hz, temperature rise F

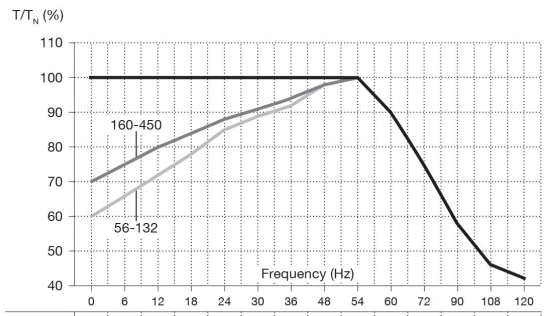
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Figure 5d. Conventer with DTC control, 60 Hz, temperature rise F



Frequency (Hz)	0	5	10	15	20	25	30	40	45	50	60	75	90	100
IC411[1]	60	66	72	78	85	89	92	98	100	90	75	58	46	42
IC411[2]	70	75	80	84	88	91	94	98	100	90	75	58	46	42
IC416[3]	100	100	100	100	100	100	100	100	100	90	75	58	46	42

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

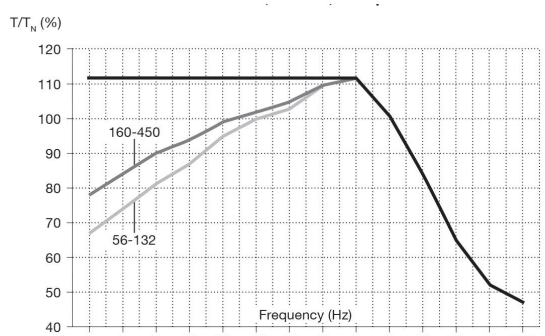
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Figure 5a.



Frequency (Hz)	0	6	12	18	24	30	36	48	54	60	72	90	108	120
IC411[1]	60	66	72	78	85	89	92	98	100	90	75	58	46	42
IC411[2]	70	75	80	84	88	91	94	98	100	90	75	58	46	42
IC416[3]	100	100	100	100	100	100	100	100	100	90	75	58	46	42

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

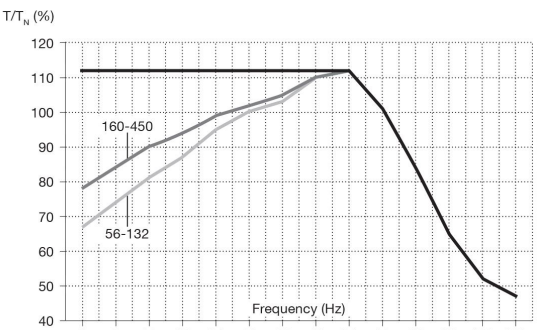
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Figure 5b.



Frequency (Hz)	0	5	10	15	20	25	30	40	45	50	60	75	90	100
IC411[1]	67	74	81	87	95	100	103	110	112	101	84	65	52	47
IC411[2]	78	84	90	94	99	102	105	110	112	101	84	65	52	47
IC416[3]	112	112	112	112	112	112	112	112	112	101	84	65	52	47

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

—
Figure 5c.



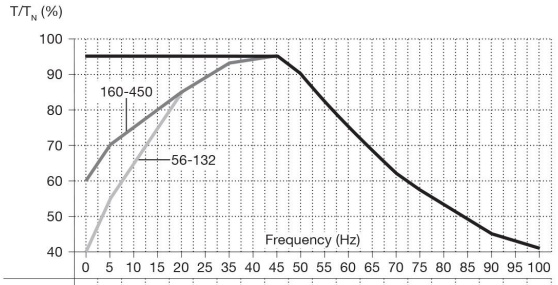
Frequency (Hz)	0	6	12	18	24	30	36	48	54	60	72	90	108	120
IC411[1]	67	74	81	87	95	100	103	110	112	101	84	65	52	47
IC411[2]	78	84	90	94	99	102	105	110	112	101	84	65	52	47
IC416[3]	112	112	112	112	112	112	112	112	112	101	84	65	52	47

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

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Figure 5d.

Guideline loadability curves with other voltage source PWM type

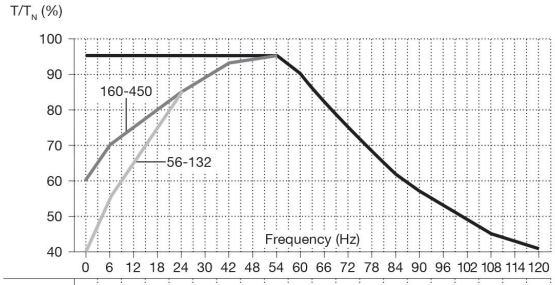
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Figure 6a. Other voltage source PWM type converter, 50 Hz, temperature rise B
—
Figure 6b. Other voltage source PWM type converter, 60 Hz, temperature rise B
—
Figure 6c. Other voltage source PWM type converter, 50 Hz, temperature rise F
—
Figure 6d. Other voltage source PWM type converter, 60 Hz, temperature rise F



Frequency (Hz)	0	5	10	15	20	25	35	40	45	50	55	60	65	70	75	80	85	90	95	100
IC411[1]	40	55	65	75	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC411[2]	60	70	75	80	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC416[3]	95	95	95	95	95	95	95	95	95	90	82	75	68	62	57	53	49	45	43	41

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

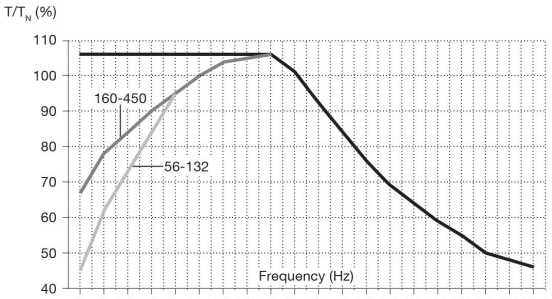
—
Figure 6a.



Frequency (Hz)	0	6	12	18	24	30	42	48	54	60	66	72	78	84	90	96	102	108	114	120
IC411[1]	40	55	65	75	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC411[2]	60	70	75	80	85	89	93	94	95	90	82	75	68	62	57	53	49	45	43	41
IC416[3]	95	95	95	95	95	95	95	95	95	90	82	75	68	62	57	53	49	45	43	41

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

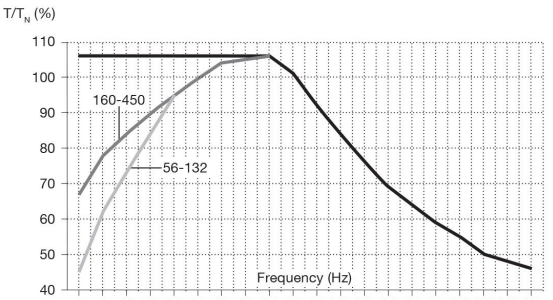
—
Figure 6b.



Frequency (Hz)	0	5	10	15	20	25	35	40	45	50	55	60	65	70	75	80	85	90	95	100
IC411[1]	45	62	73	84	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC411[2]	67	78	84	90	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC416[3]	106	106	106	106	106	106	106	106	106	101	92	84	76	69	64	59	55	50	48	46

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate cooling (force ventilated)

—
Figure 6c.



Frequency (Hz)	0	6	12	18	24	30	42	48	54	60	66	72	78	84	90	96	102	108	114	120
IC411[1]	45	62	73	84	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC411[2]	67	78	84	90	95	100	104	105	106	101	92	84	76	69	64	59	55	50	48	46
IC416[3]	106	106	106	106	106	106	106	106	106	101	92	84	76	69	64	59	55	50	48	46

[1] Self ventilated, IEC frame sizes 56-132
[2] Self ventilated, IEC frame sizes 160-450
[3] Separate motor cooling (force ventilated)

—
Figure 6d.

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Specifikationer kan ændres uden forudgående varsel.

3GZF500730-85 Rev H 06-2022

8 PRESSURE RELIEF VALVE

TAI MILANO S.P.A.	Type	Tag n°	PCM reference	Manual
	24/8637	50-PSV-006 50-PSV-007	DIGIAN-392481-05	08.06IE rev 05

TAI MILANO S.p.A.

ISTRUZIONI PER TARATURA, MONTAGGIO, SMONTAGGIO E MANUTENZIONE

INSTRUCTION FOR SETTING, ASSEMBLY, DISASSEMBLY AND MAINTENANCE

VALVOLE DI SICUREZZA A MOLLA

SPRING LOADED SAFETY VALVES

Serie 3000W

Series 3000W

08.06IE rev 05

TAI MILANO S.p.A.

TAI MILANO S.p.A.

Manuale No. 08.06IE Rev. 5 maggio 2024

Manual No. 08.06IE Rev. 5 May 2024

Istruzioni per messa a punto, montaggio, smontaggio e manutenzione delle valvole di sicurezza a molla serie 3000W.

Instructions for setting, assembly, disassembly and maintenance of series 3000W spring loaded safety valves.

Questo manuale si compone di 48 pagine.

This manual comprises 48 pages.

Le istruzioni in esso contenute si riferiscono a valvole di normale produzione, tuttavia sono generalmente applicabili anche a valvole in esecuzione speciale. Qualora le vostre valvole non fossero illustrate in questo manuale, Vi preghiamo di contattarci.
Di alcuni accessori la TAI fornisce specifiche istruzioni a completamento del presente manuale

The instructions contained herein refer to valves of standard production but are however generally applicable to valves of special design.
Should your valves be not covered by the present instructions, please contact us.
For some accessories TAI provides specific instructions in addition to the present manual

Precauzioni aggiuntive per la sicurezza del personale per apparecchi a pressione soggetti a Direttiva 2014/34/UE (ATEX)

Additional safety precautions for pressure containing equipments subjected to Directive 2014/34/UE (ATEX)

Anche se le valvole di sicurezza non rientrano tra prodotti cui la direttiva 2014/34/UE deve essere applicata, in aggiunta alle “Precauzioni per la sicurezza” di cui al paragrafo 1.3.0, devono essere osservate le seguenti ulteriori precauzioni:

Even if safety valves are not in the scope of the Directive 2014/34/UE, in addition to ”Safety precautions” in par. 1.3.0, the additional precautions below shall be followed:

Per installazione, smontaggio e manutenzione utilizzare utensili in materiali idonei ad evitare scintille.

For installation, removal and maintenance tools in materials able to avoid sparks should be used.

Per la messa a terra della valvola utilizzare l’apposita vite contrassegnata col simbolo della terra.
I tubi che convogliano sfiati e drenaggi, se collegati con guarnizioni in materiale isolante, risultano elettricamente isolati dal corpo/coperchio della valvola.

For connecting the valve to ground, the proper screw marked with ground symbol should be used.
Piping connecting vents and drains, if attached with gaskets in isolating materials, results to be electrically isolated from the valve body/bonnet.

Consigliamo l’uso di Loctite 577 in luogo di nastro PTFE quale materiale sigillante per filettature NPT.

Loctite 577 instead of PTFE tape for sealing NPT threading is recommended.

Prevedere misure protettive se la temperatura massima (indicata sulla targa) può essere pericolosa per il rischio di esplosione.

Provide protective measures if the max temperature (marked on tag) can be dangerous for explosion risk.

SICUREZZA

INTRODUZIONE SULLA SICUREZZA

La TAI MILANO produce Valvole di Sicurezza in vari design e invita i propri Clienti a tenere in considerazione, oltre alle seguenti generiche indicazioni di Sicurezza, tutte le indicazioni, caratteristiche e funzionalità proprie di ciascun designo.
È importante tenere sempre in considerazione le condizioni (fluido, intervallo di temperature ammissibili, intervallo di pressioni operative e di taratura, massima capacità di scarico, massima contropressione ammissibile) per le quali la valvola è stata progettata.
Una valvola utilizzata in condizioni differenti da quelle di progetto potrebbe non funzionare correttamente, con una conseguente mancanza di Sicurezza.
In caso di dubbi vi invitiamo a verificare la documentazione fornita con le valvole o, qualora essa non fosse sufficiente a chiarire tali dubbi, a contattarci direttamente.

USO IMPROPRIO

Le Valvole di Sicurezza sono strumenti delicati ed è necessario non farne un uso improprio.
In caso di uso improprio delle stesse la TAI MILANO non è più responsabile per esse.
In caso di manomissione dei componenti che la compongono, la valvola potrebbe non funzionare più correttamente. Si considera manomissione anche l'applicazione di vernici o strati protettivi su componenti in movimento o funzionalmente importanti.
Si ricorda che la Garanzia si esaurisce una volta rimosso uno qualsiasi dei sigilli di sicurezza presenti sulla valvola.
La valvola di sicurezza non svolge la sua funzione di sicurezza qualora sia installata la vite di blocco; è pertanto necessario rimuovere la vite di blocco per mettere in servizio la valvola (se non diversamente indicato, le valvole TAI vengono sempre spedite con la vite di blocco non installata).

FLUIDI PERICOLOSI

Quando si lavora con fluidi pericolosi e/o dannosi per la salute umana è necessario agire con attenzione e attenersi scrupolosamente alle prescrizioni contenute nelle Normative di riferimento.
A titolo di esempio, sono considerati fluidi pericolosi e/o dannosi per la salute umana:

- Fluidi esplosivi e/o infiammabili
- Fluidi caldi o freddi
- Fluidi tossici e/o irritanti
- Fluidi inquinanti
- Fluidi corrosivi

Quando si lavora con questi fluidi può essere necessario prendere alcune precauzioni come, per esempio:

- Utilizzare protezioni per gli operatori (guanti, maschere, …)
- Utilizzare strumenti dedicati
- Non disperdere tale fluido nell'ambiente

Se viene utilizzato il foro di drenaggio previsto nel corpo valvola, tenere presente che tutti i drenaggi di fluidi infiammabili, tossici o comunque pericolosi devono essere convogliati in un luogo sicuro a pressione minore di quella minima del sistema drenato.
Analogamente, se il fluido è infiammabile, tossico o comunque pericoloso, il foro di sfiato del coperchio per le valvole a molla o del coperchio del pilota per le valvole pilotate deve essere collegato con un luogo sicuro a pressione atmosferica.

SICUREZZA DURANTE L'INSTALLAZIONE E LA RIMOZIONE

È necessario che il personale incaricato all'installazione e alla rimozione della valvola sia qualificato e che rispetti, oltre alle indicazioni contenute in questo manuale, le norme di riferimento per la tipologia di valvola di sicurezza in questione.
Prima di mettere in esercizio la valvola assicurarsi che il dispositivo di blocco sia stato rimosso.
Durante la rimozione della valvola prestare attenzione alla temperatura della stessa e alla possibilità che nella valvola sia ancora presente (sia all'ingresso che all'uscita) fluido in pressione e/o pericoloso.
Per le valvole pilotate, prestare particolare attenzione nell'operazione di rimozione ad eventuale liquido presente nel duomo della valvola principale che deve essere adeguatamente drenato (per il drenaggio è necessario rimuovere il pilota e far uscire il liquido dal collegamento tra valvola e pilota).
Per eseguire la rimozione della valvola con l'impianto in funzione è necessario intercettare la valvola a monte (anche eventuale presa remota della pressione per il pilota) e, se ha scarico convogliato, anche a valle.
Attenzione: durante tale operazione la valvola non svolge più la sua azione di sicurezza.

SICUREZZA DURANTE L'UTILIZZO

Assumere sempre che l'intera valvola, compresa la flangia di uscita, possa essere alla temperatura del fluido in ingresso alla stessa. Attenzione: durante l'apertura/chiusura la valvola di sicurezza è soggetta a repentini cambi di temperatura.
La valvola di sicurezza potrebbe generare rumore durante la sua apertura. Il produttore potrà fornire, su richiesta, una stima dell'intensità del rumore.
In caso di scarico libero è necessario non sostare/transitare in prossimità dello stesso per evitare di entrare in contatto con il fluido scaricato in fase di apertura.
La stessa raccomandazione è applicabile alle valvole con coperchio aperto (utilizzabili solamente su aria e vapore) per le quali il fluido, durante l'apertura della valvola, può uscire anche attraverso il coperchio.

SICUREZZA DURANTE LA MANUTENZIONE

È necessario che il personale incaricato alla manutenzione della valvola sia qualificato e che rispetti, oltre alle indicazioni di questo manuale, le norme di riferimento per la valvola di sicurezza in questione.
La manutenzione è un processo molto delicato nella vita della Valvola di Sicurezza e può essere causa di danni irreparabili e di problemi di funzionamento per la valvola.
Quando si effettua manutenzione su valvole che hanno esercito con fluidi pericolosi è necessario prestare maggiore attenzione in quanto parte del fluido potrebbe ancora essere nella valvola.
Per le valvole pilotate, prestare particolare attenzione nell'operazione di rimozione di eventuale liquido presente nel duomo della valvola principale.
La TAI non si assume alcuna responsabilità a riguardo.
Vi invitiamo a utilizzare solamente ricambi originali TAI MILANO e a non manomettere i componenti della valvola per alcun motivo. Non sono considerate manomissioni solamente le operazioni indicate nella sezione relativa alla Manutenzione di questo manuale.
Consigliamo di sostituire sempre le parti soffici della valvola quando si effettua la manutenzione.

La TAI MILANO non assume alcuna responsabilità per problemi legati ad un'erronea manutenzione eseguita da personale non alle proprie dipendenze.

PRECAUZIONI DI IMPIEGO

Seguono alcuni esempi di pericoli e precauzioni da prendere quando si lavora con una valvola di sicurezza:

- Fluido e/o superfici calde: pericolo di ustione.
  Indossare indumenti protettivi e termicamente isolanti.
  Assumere che tutta la valvola sia alla stessa temperatura del fluido.

- Fluido e/o superfici fredde: pericolo di ustione da freddo.
  Indossare indumenti protettivi e termicamente isolanti.
  Assumere che tutta la valvola sia alla stessa temperatura del fluido.

- Fluidi corrosivi e/o irritanti: pericolo di ferite e/o irritazioni.
  Indossare indumenti protettivi.

- Fluidi infiammabili e/o esplosivi: pericolo di incendio e/o esplosione.
  Utilizzare utensili in materiali idonei ad evitare scintille.
  Per la messa a terra della valvola utilizzare l'apposita vite contrassegnata col simbolo della terra. I tubi che convogliano sfiati e drenaggi, se collegati con guarnizioni in materiale isolante, risultano elettricamente isolati dal corpo/coperchio della valvola.
  Consigliamo l'uso di Loctite 577 in luogo di nastro PTFE quale materiale sigillante per filettature NPT. Prevedere misure protettive se la temperatura massima (indicata sulla targa) può essere pericolosa per il rischio di esplosione.

- Fluidi tossici e/o inquinanti: pericolo di intossicazione e/o inquinamento ambientale.
  Indossare adeguate protezioni e prendere precauzioni particolari per non disperdere il fluido nell'ambiente.

- Valvola che perde: pericolo di inquinamento ambientale, intossicazione, incendio.
  Assicurarsi che il fluido disperso non sia pericoloso e mantenere un'adeguata distanza. Se necessario disinstallare la valvola per eseguire la manutenzione indossando gli adeguati indumenti protettivi.

- Valvola che apre: improvviso e forte rumore.
  L'apertura della valvola genera un rumore forte e improvviso, indossare tappi per le orecchie.

- Coperchio aperto: pericolo di blocco delle parti mobili.
  Installare adeguate protezioni e assicurarsi che la valvola non possa essere bloccata.

- Bordi e spigoli taglienti: pericolo di ferite.
  Indossare guanti da lavoro e maneggiare la valvola con cautela.

AMBIENTE

RISPETTO DELL'AMBIENTE

La TAI MILANO lavora nel rispetto dell'Ambiente ed è certificata UNI ISO 14001:2015.

INQUINAMENTO

Eventuali problemi di funzionamento e/o installazione della valvola di sicurezza possono essere causa di inquinamento ambientale se del fluido pericoloso viene disperso nell'ambiente.
Per evitare questo problema è necessario operare in accordo a questo manuale durante l'installazione, l'utilizzo, la rimozione, la manutenzione e lo smaltimento della valvola.
La TAI MILANO non si assume alcuna responsabilità su problemi di inquinamento ambientali legati ad un errato utilizzo delle sue valvole di sicurezza.

SMALTIMENTO

Le Valvole di Sicurezza devono essere smaltite in accordo ai regolamenti Locali in materia di smaltimento dei rifiuti.
Prestare attenzione alla possibile presenza di fluido di processo (soprattutto se esso è un fluido pericoloso) all'interno della valvola da smaltire.
Qualora la valvola sia stata in contatto con un fluido pericoloso è, inoltre, necessario eseguire una bonifica della stessa prima dello smaltimento.
I materiali che compongono la valvola sono indicati sul disegno di assieme della stessa.
Tali materiali possono essere: metalli (componente principale della maggior parte delle valvole), grafite, polimeri e altro materiale plastico.

ASSISTENZA

La persona di riferimento per l'assistenza e il servizio post-vendita è il Project Manager dell'ordine della valvola.
In ogni caso, qualsiasi mail inviata a tai@taimilano.it o qualsiasi telefonata al numero +390229525941 riceverà risposta.
È importante fornire il Numero di Serie della valvola al momento della richiesta per dare al produttore un riferimento univoco della valvola in questione

SAFETY

INTRODUCTION TO SAFETY

TAI MILANO produces Safety Valves in various designs and invites its Customers to take into consideration, in addition to the following generic Safety indications, all the indications, characteristics and functionalities of each design.
It is important to always consider the conditions (fluid, permissible temperature range, operating and calibration pressure range, maximum discharge capacity, maximum allowable back pressure. . .) for which the valve has been designed. A valve used in conditions other than those of design may not function properly, resulting in a lack of safety.
If you have any doubts, please check the documentation supplied with the valves or, if it is not sufficient to clarify these doubts, contact us directly.

IMPROPER USE

Safety Valves are delicate instruments and must not be misused. In case of improper use of the same TAI MILANO is no longer responsible for them.
If the valve components are manumitted, the valve may no longer work properly. The application of paint or protective layers on moving or functionally important components is also considered tampering.
Please note that the Warranty expires once any of the safety seals on the valve are removed.
The safety valve does not perform its safety function if the test gag is installed; it is therefore necessary to remove the test gag to put the valve into service (unless otherwise indicated, TAI valves are always shipped with the locking screw not installed).

DANGEROUS MEDIA

When working with fluids that are dangerous and/or harmful to human health, it is necessary to act with care and scrupulously follow the prescriptions contained in the reference standards.
By way of example, they are considered dangerous and/or harmful to human health:

- Explosive and/or flammable fluids
- Hot or cold fluids
- Toxic and/or irritant fluids
- Polluting fluids
- Corrosive fluids

When working with these fluids it may be necessary to take certain precautions such as, for example:

- Use protection for operators (gloves, masks, . . .)
- Use dedicated tools
- Do not disperse this fluid in the environment

If the drain hole of the body of the valve is used, it it is important to consider that in case of dangerous media it is important to convoy the drain in a safety place with a lower pressure that the body of the valve.
In the same way, if the valve is working with a dangerous media, the bonnet vent hole for spring operated valves and the pilot bonnet vent hole for pilot operated valves must be connected to a safe place with ambient pressure.

SAFETY DURING INSTALLATION AND REMOVAL

It is necessary that the personnel in charge of installing and removing the valve is qualified and that it comply, in addition to the indications contained in this manual, with the reference standards for the type of safety valve in question.
Before putting the valve into operation, make sure that the locking device has been removed.
When removing the valve, pay attention to the valve temperature and the possibility that there is still a pressurized and/or dangerous fluid in the valve (both inlet and outlet).
For pilot operated valves, during the dismantling pay particular attention to the liquid that could be in the pressure chamber of the main valve that should be drained (draining consist in removing the pilot and drain the liquid from the connection between the main valve and the pilot).
To dismantle the valve with the system in operation, it is necessary to intercept the valve upstream (also the eventual remote pressure pick-up of the pilot) and, if it has conveyed discharge, also downstream.
Attention: during this operation the valve no longer carries out its safety action.

SAFETY DURING USE

Always assume that the entire valve, including the outlet flange, can be at the inlet fluid temperature. Attention: during opening/closing the safety valve is subject to sudden temperature changes.
The safety valve may generate noise when it is opened. The manufacturer can provide, on request, an estimate of the noise intensity.
In case of free discharge it is necessary not to stop/transit near it to avoid coming into contact with the fluid discharged during the opening phase.
The same recommendation is applicable to valves with open bonnet (usable only on air and steam) for which the fluid can also escape through the bonnet when the valve is opened.

SAFETY DURING MAINTENANCE

It is necessary that the personnel responsible for the maintenance of the valve is qualified and that it comply, in addition to the instructions in this manual, with the reference standards for the safety valve in question.
Maintenance is a very delicate process in the life of the Safety Valve and can cause irreparable damage and functional problems for the valve.
When carrying out maintenance on valves that have operated with dangerous fluids you need to be more careful as part of the fluid may still be in the valve.
For pilot operated safety valves, pay particular attention in the operation of removing the eventual liquid contained in the pressure chamber of the main valve.
TAI accepts no liability regarding this.
Please use only original TAI MILANO spare parts and do not tamper with the valve components for any reason. Only the operations indicated in the Maintenance section of this manual are not considered tampering.
We recommend always replacing soft valve parts when performing maintenance.
TAI MILANO assumes no responsibility for problems related to incorrect maintenance carried out by personnel not employed by it.

PRECAUTIONS FOR USE

The following are some examples of hazards and precautions to be taken when working with a safety valve:

- Fluid and/or hot surfaces: burns.
  Wear protective and thermal insulating clothing.

- Fluid and/or cold surfaces: danger of cold burn.
  Wear protective and thermal insulating clothing.

- Corrosive and/or irritant fluids: danger of injury and/or irritation.
  Wear protective clothing.

- Flammable and/or explosive fluids: fire and/or explosion hazard.
  Use tools made of suitable materials to avoid sparks.
  Use the appropriate screw marked with the earth symbol to ground the valve.
  Pipes conveying vents and drains, when connected with insulating material seals, are electrically insulated from the body/caps of the valve.
  We recommend the use of Loctite 577 instead of PTFE tape as NPT thread sealant.
  Take protective measures if the maximum temperature (indicated on the nameplate) can be dangerous due to the risk of explosion.

- Toxic and/or polluting fluids: danger of intoxication and/or environmental pollution. Wear suitable protection and take special precautions to avoid dispersal of the fluid into the environment.

- Leaking valve: danger of environmental pollution, intoxication, fire, . . .
  Make sure that the dispersed fluid is not dangerous and maintain an adequate distance. If necessary, uninstall the valve to perform maintenance wearing the appropriate protective clothing.

- Opening of the valve: sudden and high noise.
  The opening of the valve could cause sudden and high noise, wear the proper ears protections.

- Open bonnet: danger of blocking moving parts.
  Install appropriate guards and ensure that the valve cannot be blocked.

- Sharp edges: danger of injury.
  Wear work gloves and handle the valve with care.

ENVIRONMENT

RESPECT FOR THE ENVIRONMENT

TAI MILANO works in respect of the Environment and is certified UNI ISO 14001:2015

POLLUTION

Safety Valves must be disposed of in accordance with local waste disposal regulations.
Pay attention to the possible presence of process medium (especially if it is a dangerous medium) inside the valve to be disposed of.
If the valve has been in contact with a hazardous medium, it is also necessary to clean it before disposal.
The materials that make up the valve are indicated on the valve assembly drawing. These materials can be: metals (main component of most valves), graphite, polymers and other plastics.

DISPOSAL

Safety Valves must be disposed of in accordance with local waste disposal regulations.
Pay attention to the possible presence of process medium (especially if it is a dangerous medium) inside the valve to be disposed of.
If the valve has been in contact with a hazardous medium, it is also necessary to clean it before disposal.
The materials that make up the valve are indicated on the valve assembly drawing. These materials can be: metals (main component of most valves), graphite, polymers and other plastics.

ASSISTANCE

The contact person for service and after-sales service is the Project Manager of the valve order.
In any case, any email sent to tai@taimilano.it or any phone call to +390229525941 will be answered.
It is important to provide the Valve Serial Number at the time of request to give the manufacturer a unique reference for the valve in question.

TAI MILANO S.p.A. garantisce esclusivamente difetti di materiale o malfunzionamenti sorti, durante il periodo di garanzia, in normali condizioni d'uso. La garanzia decade automaticamente in caso di manomissione (rottura dei sigilli), alterazione o riparazione del prodotto effettuate da persone non autorizzate o con l'impiego di parti di scorta non di costruzione originale TAI.
In particolare, non può essere oggetto di garanzia la tenuta tra monte e valle della valvola qualora il fluido scaricato trascini particelle solide (sporcizia) o il suo stato fisico differisca da quello per il quale la valvola è dichiarata idonea.

Se la Vs. valvola è speciale o, per qualunque ragione, non è qui indicata, Vi preghiamo di contattarci.

TAI MILANO S.p.A. guarantees exclusively material failures or malfunctions occurring, within the warranty period, under normal operating conditions. The warranty is void in case of tampering (breakage of the seals), alteration or repair of the product carried out by unauthorized persons or with the use of spare parts other than those supplied by TAI.
In particular, the tightness between the upstream and downstream sides of the valve can't be subject to guarantee, if the discharged fluid drags solid particles (dirt) or its physical state differs from that for which the valve is declared suitable.

Should your valves be of special design or for any reason not covered by the present instructions, please contact us.

DEFINIZIONI

Pressione di taratura: la pressione prestabilita alla quale la valvola comincia ad aprirsi nelle condizioni di esercizio. Essa è la pressione relativa, misurata all'ingresso della valvola, alla quale le forze che tendono ad aprire la valvola sono in equilibrio con le forze che spingono l'otturatore contro la sede nelle specifiche condizioni di servizio.

Sovrappressione: incremento di pressione al di sopra della pressione di taratura necessaria perché l'otturatore compia l'alzata dichiarata, espresso di solito come percentuale della pressione di taratura.

Pressione differenziale di prova a freddo: la pressione relativa alla quale la valvola comincia ad aprirsi al banco con contropressione atmosferica. Essa include correzioni per tenere conto delle condizioni di esercizio, ad esempio contropressione e temperatura.

Pressione di richiusura: valore della pressione relativa di ingresso a cui l'otturatore ristabilisce il contatto con la sede.

Blowdown: differenza tra pressione di taratura e pressione di richiusura, solitamente espressa in percentuale della pressione di taratura.

Pressione di scarico P_1: la pressione totale usata per dimensionare la valvola, comunque non minore della pressione di taratura più sovrappressione più pressione atmosferica.

Contropressione generata: la pressione statica esistente all'uscita della valvola causata dal flusso del fluido attraverso la valvola ed il sistema di scarico.

Contropressione imposta: la pressione statica, generata da altre fonti, esistente all'uscita della valvola nel momento in cui la stessa deve intervenire.

DEFINITIONS

***Set pressure**: The predetermined pressure at which the safety valve begins to open, i.e. the gauge pressure measured at the valve inlet at which the pressure forces that tend to open the valve for the specific service conditions are in equilibrium with the forces that retain the valve disc on its seat.*

***Overpressure**: A pressure increase over the set pressure at which the safety valve attains the lift specified by the manufacturer, usually expressed as a percentage of the set pressure.*

***Cold differential test pressure**: The pressure at which the valve is set to begin to open on the test bench with atmospheric back pressure. This test pressure includes corrections for service conditions, such as back pressure and temperature.*

***Reseating pressure**: The inlet gauge pressure at which the disc re-establishes contact with the seat.*

***Blowdown**: The difference between set and re-seating pressures, normally stated as a percentage of set pressure.*

***Relieving pressure P_1**: The total pressure at valve inlet at which the capacity is calculated. This cannot be lower than set pressure plus overpressure plus atmospheric pressure.*

***Built-up backpressure**: The static pressure present at the valve outlet caused by flow through the valve and the discharge system.*

***Superimposed backpressure**: The static pressure present at the valve outlet at the time when the device is required to operate. It is the result of pressure in the discharge system from other sources.*

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1.0.0 ISTRUZIONI PER LA CONSERVAZIONE E L'INSTALLAZIONE DELLE VALVOLE

1.1.0 Protezione prima della spedizione

Le valvole e/o parti, prima della spedizione, sono protette dalla corrosione nel modo sotto indicato:

- Le parti esterne in acciaio al carbonio delle valvole sono verniciate con primer ricco di zinco; la bulloneria in acciaio al carbonio è zincata.
- Le superfici esterne lavorate sono protette con una pellicola protettiva di tipo spellabile.
- Le parti interne in acciaio al carbonio delle valvole, grezze di fusione o lavorate, sono protette con olio inibitore di corrosione (tipo Valvoline - Tectyl 506) che, dopo evaporazione del solvente, lascia sulla superficie un rivestimento protettivo e non ha bisogno di solventi per la rimozione.
- Gli accoppiamenti mobili sono lubrificati con lacca o lubrificanti a film secco "Molykote". Le parti filettate sono lubrificate con "Never Seez - Nickel Grade", che assicura, in aggiunta alla lubrificazione, la protezione dagli agenti atmosferici.
- Gli imbocchi sono protetti con tappi di polietilene per impedire l'ingresso di polvere, sporco e sostanze estranee nei corpi valvola.
- Le parti di ricambio sono preimballate in tessuto impregnato con cera microcristallina.

1.2.0 Conservazione delle valvole prima del montaggio

1.2.1 Purché lo stoccaggio venga effettuato al coperto in ambiente ragionevolmente asciutto e in atmosfera esente da agenti contaminanti, gli accorgimenti adottati sono sufficienti a proteggere valvole e/o parti di ricambio per un periodo di tempo valutabile in:

- 5 anni per le parti in acciaio al carbonio verniciate, zincate o lubrificate
- 3 anni per le parti ricoperte con vernice spellabile
- 18 mesi max per le parti protette con olio inibitore di corrosione
- 5 anni per le parti di ricambio avvolte in tessuto impregnato, purché venga mantenuto il preimballo originale.

1.0.0 INSTRUCTIONS FOR CONSERVATION AND INSTALLATION OF THE VALVES

1.1.0 Protection before shipment

Before shipment, the valves and/or spare parts, are protected from corrosion in the following manner:

- the external surface of carbon steel valves is painted with a primer rich in zinc; the carbon steel bolting is zinc coated (galvanized).
- the unpainted external machined surfaces are protected with a protective film (stripping type).
- the inside of carbon steel valve is protected with a corrosion inhibitor oil (type Valvoline - Tectyl 506) which, after evaporation of the solvent, leaves a protective film on the surface which requires no solvent for removal.
- the sliding parts are lubricated with lubricant lacquer or dry film lubricant "Molykote".
The threaded parts are lubricated with "Never Seez – Nickel Grade", which ensure, in addition to the lubrication, protection from atmospheric agents.
- the valve inlet/outlet are protected by poliethylene plugs to prevent entry of dust, dirt or other foreign matter in the valve body.
- the spare parts are pre-packed in micro-crystalline wax impregnated cloth.

1.2.0 Conservation of the valves before installation

1.2.1 As long as storage takes place indoors in reasonably dry conditions and free from atmospheric contaminants, the above measures are sufficient to protect the valves and/or spare parts for an estimated period of:

- 5 years for parts in painted carbon steel, zinc coated or lubricated
- 3 years for parts protected with a stripping type film
- 18 months maximum for parts protected with a corrosion inhibitor oil
- 5 years for the spare parts wrapped in the original microcrystalline max impregnated cloth.

1.2.2 Viceversa, qualora le valvole vengano conservate all'aperto, oppure installate con notevole anticipo sulla data di messa in servizio dell'impianto, la durata della protezione diminuisce (non supera i 12 mesi per le parti trattate con olio inibitore) e le valvole vanno soggette a un deterioramento inevitabile, la cui rapidità dipende dalle condizioni ambientali (in particolare modo dall'umidità, atmosfera marina o industriale) e dall'entità di contatti accidentali con pioggia, liquidi, sporco, sabbia o sostanze estranee in genere.

1.2.2 Vice versa, if the valves are stored outdoors or installed earlier than the plant start up, the duration of the protection diminishes (it does not go over 12 months for parts treated with corrosion inhibitory oil) and the valves are subject to an inevitable deterioration, the rapidity depending on the environmental conditions (particularly humidity, marine or industrial atmospheres) and the entity of accidental contacts with rain, liquids, dirt, sand or foreign substances in general.

1.2.3 Si raccomanda pertanto di conservare le valvole nel loro imballo originale in ambiente coperto, asciutto e pulito fino al momento della installazione. Ciò consente, anche al cessare dell'effetto delle sostanze protettive, di mantenere a lungo le valvole in condizioni tali da non pregiudicarne l'impiego.

1.2.3 It is advisable therefore that before the installation the valves be stored indoors in their original packing in clean and dry environment. In this way, and even in the case that the protective measures taken cease to be effective, the valves may be maintained for long periods without adverse effect on their operation.

1.3.0 Precauzioni per la sicurezza del personale

Non avvicinarsi allo scarico della valvola di sicurezza.
Quando la valvola apre, se scarica gas o vapore, si genera un rumore improvviso molto forte.
Installare le valvole in modo da consentire un facile e sicuro accesso a tutti i lati e spazio sufficiente per lo smontaggio e la manutenzione.
Assumere che i tubi di ingresso e uscita dalla valvola siano alla stessa temperatura del fluido.
Se viene utilizzato il foro di drenaggio previsto nel corpo valvola, tenere presente che tutti i drenaggi di fluidi infiammabili, tossici o comunque pericolosi devono essere convogliati in un luogo sicuro a pressione minore di quella minima del sistema drenato.
Analogamente, se il fluido è infiammabile, tossico o comunque pericoloso, il foro di sfiato del coperchio delle valvole con soffietto deve essere collegato con un luogo sicuro a pressione atmosferica.
Se il fluido è infiammabile, tossico o comunque pericoloso, usare le opportune protezioni personali (indumenti protettivi, maschera antigas) prima di smontare la valvola e lavare, con i prodotti idonei per il fluido specifico, tutte le parti prima di ogni lavorazione.
Onde evitare rischi, eseguire tutte le operazioni di smontaggio, montaggio e manutenzione seguendo le istruzioni di questo manuale. In particolare, prima di separare la valvola dal processo e di separare le parti fra di loro, assicurarsi che non vi sia pressione.

1.3.0 Personnel safety precautions

Keep clear of the safety valve discharge.
When the valve opens, if it discharges gas or vapour, a sudden, very strong noise is generated.
In installing the valve sufficient surrounding space should be left to ensure safe and easy access for removal and maintenance.
Assume that the valve inlet and outlet piping is at the same temperature as the medium.
The valve body drain hole is plugged by factory before delivery. If it is unplugged at site to make use of it, it must be connected to a safe location at lower pressure than the drained system.
The threaded hole in the bonnet of bellows valves is protected by factory with a plastic tap. If the medium which may escape from it is toxic, flammable or in any way dangerous, it shall be disposed to a safe place at atmosphere or atmospheric pressure.
If medium is toxic, flammable or in any way dangerous suitable protective clothing (including the use of a gas mask) should be worn when disassembling the valve and all parts shall be washed with specific suitable products before handling or machining.
To avoid taking any risks, carry out disassembly, assembly and all maintenance operations following the instructions contained in this manual. In particular, before removing the valve from the process and separating the parts form each other, make sure that there is no pressure.

1.4.0 Caratteristiche principali

Le valvole di sicurezza delle serie 3000W, sono progettate per la protezione contro la sovrappressione di apparecchi a pressione contenenti liquidi, gas e/o vapori, a pressione maggiore di 0.4 bar.

Esse non sono idonee alla protezione contro aumenti di pressione estremamente rapidi come, ad esempio, quelli dovuti a reazioni esplosive.

Esse sono del tipo ad angolo, con attacchi flangiati, a pieno boccaglio, ad azione diretta, caricate a molla. Le valvole possono essere accessoriate con soffietto e pistone di bilanciamento.

1.4.0 Main features

Series 3000W, safety valves are designed for the protection against overpressure of vessels/pipes containing liquids, gases and/or vapours, at a pressure higher than 0.4 bar.

They are not suitable for the protection against extremely fast pressure surges such as explosive reactions, etc.

They are flanged, angle pattern, direct acting, spring loaded, removable full nozzle design. Valves can also be equipped with balancing bellows and auxiliary piston.

1.5.0 Principio di funzionamento

La valvola di sicurezza è un dispositivo di limitazione della pressione automatico, auto-azionato, caricato a molla, sensibile alla pressione a monte della valvola stessa. La valvola, comincia ad aprirsi alla pressione a cui è stata tarata (la forza dovuta alla pressione che agisce sull'otturatore è uguale al carico iniziale della molla); di conseguenza si genera pressione anche nella camera compresa fra sede di boccaglio e di otturatore, otturatore, anello di regolazione del blowdown. L'aumento della pressione agente sulla superficie inferiore dell'otturatore fornisce la spinta aggiuntiva necessaria a provocare la rapida apertura della valvola. (Quando scarica gas o vapore, si dice che la valvola "scoppia".) La pressione sale al di sopra della pressione di taratura e l'alzata aumenta. La massima portata è ottenuta alla sovrappressione dichiarata. La distanza fra l'anello di regolazione e l'otturatore, oltre a controllare il "blowdown", determina l'incremento di pressione, sopra il valore di taratura, in corrispondenza del quale si ottiene lo "scoppio".

1.5.0 How the valve works

Safety valves are automatic, spring loaded, pressure-relieving devices actuated by the upstream pressure without any energy other than that of the fluid.

A valve begins to open at the pressure for which it is set (the force resulting from the pressure acting on the disc is equal to the initial spring load); as a consequence pressure is generated in the chamber bounded by the nozzle/disc seat, the disc, and the blowdown adjusting ring. The increase of pressure acting on the lower surface of the disc, outside the seat, grants the additional thrust necessary to rapidly lift the disc. (When a compressible fluid is relieved, the valve is said to "pop".) Pressure accumulates above the set pressure and the lift increases. Maximum capacity is obtained at the stated overpressure.

The distance between the adjusting ring and the disc, besides controlling the blowdown, determines the difference between popping and set pressure.

1.6.0 Istruzioni per l'installazione

1.6.1- Evitare urti o scosse nell'installazione, per prevenire danni.
- Pulire le connessioni delle valvole e l'interno del boccaglio; le impurità nel boccaglio possono danneggiare la sede della valvola in fase di apertura.
- Installare le valvole in posizione verticale con il cappello verso l'alto.
- Installare i tiranti con i dadi. Stringere tutti i dadi a mano prima di usare la chiave. Applicare in croce la stessa coppia ai tiranti.
- L'attacco al serbatoio deve essere diretto e il più corto possibile. Il bocchello sul quale la valvola va installata deve essere, possibilmente, arrotondato all'ingresso.
- Le tubazioni di ingresso e uscita devono avere, come minimo, la stessa dimensione nominale delle connessioni della valvola ed essere libere da ostruzioni. Esse devono essere autodrenanti, rispettivamente verso il serbatoio e il collettore degli scarichi (se lo scarico è convogliato).
- La tubazione di scarico deve essere conformata in modo da impedire l'accumulo di sporcizia, condense o acqua meteorica (nel caso di scarico all'atmosfera) nel corpo valvola.
- Se si interpone una valvola di intercettazione, questa deve essere del tipo a pieno passaggio.
- Gli scarichi liberi devono essere supportati per impedire che le forze generate dal fluido allo scarico si trasmettano al tronchetto di ingresso.
- In nessun caso gli scarichi devono trasmettere al corpo valvola forze dovute a montaggio forzato o espansione termica.

1.6.2 Collocazione delle valvole.
- Le valvole devono essere installate in modo da consentire la accessibilità e lo smontaggio; intorno ad esse deve essere lasciato sufficiente spazio.
- E' possibile installare la valvola senza valvole di intercettazione. In questo caso eventuali operazioni di manutenzione devono essere effettuate quando l'impianto è fuori servizio. Per poter effettuare operazioni di manutenzione con l'impianto in servizio occorre che la valvola sia intercettata a monte e, se lo scarico è convogliato in un sistema in pressione, anche a valle.

1.6.0 Instructions for installation

1.6.1- During installation avoid knocking or jolting of the valve to prevent damages.
- Clean thoroughly the valve connections and the nozzle; inside impurities on the nozzle may damage the valve seat during opening.
- Install the valve in a vertical position with the cap pointing upwards.
- Install studs with nuts. Tighten all nuts finger tight before torquing. Evenly torque the studs applying torque crosswise.
- Connection with the vessel should be direct and as short as possible. The nozzle on which the valve is mounted should have a rounded entrance if possible.
- The inlet and outlet piping should have the same size as or larger than the size of the valve connections and be free from obstructions. They shall be self draining respectively to the protected vessel and to the relief header (if any).
- The discharge piping must have an internal diameter at least equal to that of the outlet of the valve and must be designed to avoid accumulation of dirt, rain or condensates in the valve body.
- If a shut-off valve is installed, same must be the full passage type.
- Open discharge piping must be supported to avoid force generated by the medium at discharge being transmitted to the inlet pipe.
- In no case whatsoever any force due to forced alignment and thermal expansion should be transmitted from the discharge piping to the valve body.

1.6.2 Valve location.
- Sufficient space for easy access and removal should be provided around the valve.
- It is possible to install the valve without shut-off valves. In this case any maintenance activity must be whilst the plant is out of service. To be able to service the safety valve with plant in operation it is necessary that the valve inlet and, if the discharge is to a closed system under pressure, also the outlet be shut off.

- Le valvole devono essere installate il più vicino possibile all'apparecchio protetto; tuttavia, per processi che implichino fluttuazioni di pressione, le valvole devono essere poste lontano dall'origine di queste in una zona di pressioni più stabili.
Il montaggio delle valvole su apparecchi soggetti a vibrazioni, con frequenza e ampiezza tali da eccitare il movimento di otturatore e molla delle valvole, dovrebbero essere evitato. La precisione della pressione di taratura e la tenuta della valvola potrebbero essere influenzate.
- Ogni volta che una valvola di sicurezza è posta a valle di organi capaci di creare turbolenza (valvole riduttrici, diaframmi, boccagli, altre valvole e raccordi) è necessario che tra tali organi e la valvola stessa vi sia una tubazione dritta di adeguata lunghezza (almeno 8-10 diametri).

- Valves should be placed as close as possible to the protected equipment; however, on installations that have pulsating pressure the valve should be located far from the source of pulsations in a more stable pressure region. Locating valves an equipment subjected to vibrations, with frequency and amplitude able to excite valve disc and spring movement, should be avoided valve set pressure accurancy and seat tightness could be affected.
- Each time that a safety valve is positioned downstream of fittings and valves capable of creating turbulence (pressure reducing valves, orifice plates and flow nozzles, other valves and fittings) it is necessary for an adequate length (at least 8 to 10 diameters) of straight pipe to be provided between these pieces of equipment and the valve itself.

1.6.3 I coperchi di valvole con soffietto sono muniti di foro di sfiato filettato e tappato per la spedizione; per assicurare il corretto funzionamento della valvola, il tappo va rimosso ed il coperchio va sfiatato in luogo sicuro a pressione atmosferica.
Ghiaccio, insetti o sporcizia non devono poter ostruire il tubo di sfiato.
Il rischio di congelamento dell'umidità atmosferica entro il coperchio, per effetto di bassi valori della temperatura del fluido di processo e/o dell'ambiente, deve essere attentamente valutato. (Vedere le note dedicate a pag. 33).

1.6.3 The bonnets of bellows valves are equipped with a threaded vent hole closed by a plug for shipping; to ensure the proper functioning of the valve, the plug should be removed and the bonnet vent should be disposed to a safe location at atmospheric pressure.
Ice, insects or dirt must be not able to clog the vent pipe hole.
The risk of freezing of atmospheric moisture inside the bonnet, as consequence of the low temperature of the process medium and/or ambient conditions needs to be carefully evaluated.
(Refer to the specific notes on page 33).

1.7.0 Conservazione delle valvole dopo la installazione

1.7.0 Conservation of the valves after installation

1.7.1 Quando le valvole sono installate, e prima che vengano messe in esercizio, occorre evitare che sporco, pioggia, liquidi, sabbia ed altre sostanze estranee in genere penetrino all'interno della valvola, danneggiandone o ostruendone le parti.
Occorre anche evitare che le parti interne delle valvole vengano danneggiate da operazioni preliminari alla messa in servizio, quali:
- pulizia delle tubazioni, che può dare origine a fenomeni di corrosione per incompatibilità tra i materiali della valvola e i fluidi usati per la pulizia, o introdurre scaglie, scorie e sostanze estranee nella valvola con conseguente danneggiamento delle sedi alla prima apertura.

1.7.1 Once the valves are installed, and before they go into operation, it must be avoided that dirt rain, liquids, sand, or other foreign matters penetrate to the inside of the valve, damaging and obstructing their parts.
Also, avoid damage to the internal parts of same which could be caused through operations carried out prior to start-up, such as:
- cleaning of the piping, which could give rise to corrosion phenomena through incompatibility between the materials of the valve and the medium used for cleaning, or which could introduce foreign substances such as scales, slag etc. into the valve with consequent damage to the seats at the first opening.

- Prova idraulica, che richiede il blocco della valvola, con possibilità di danneggiare le sedi e lo stelo a seguito di un uso non corretto del dispositivo di blocco. Inoltre, in caso di prova idraulica delle tubazioni di scarico i soffietti possono essere irrimediabilmente danneggiati.
Pertanto si raccomanda di effettuare tali operazioni installando flange cieche al posto della valvola.

- hydrostatic test, which requires blocking the valve, with the possibility of damage to seats and spindle as a result of incorrect use of the test gag. Furthermore, in the case of hydrostatic testing of the discharge pipes, bellows could suffer irreparable damage.
Therefore to carry out the above operations it is advisable to install blind flanges in place of the valve.

1.7.2 Prima della spedizione, tutte le valvole sono tarate alla pressione di scatto richiesta dal Cliente. Non dovrebbe, pertanto, essere necessaria alcuna regolazione in loco. Prima dell'installazione è necessario un accurato controllo visivo delle valvole. Tuttavia, in caso sussistano dubbi di danneggiamenti o manipolazioni durante il trasporto o la movimentazione, è consigliabile controllare la pressione di taratura e la posizione dell'anello di blowdown al banco prova in accordo alle indicazioni del Manuale.

1.7.2 Before shipment, all valves are adjusted to the set pressure requested by the Customer. Therefore, no further adjustments should be required at the job-site. Before installation an accurate visual check of the valve is necessary. However, should there be suspicion that the valve has been damaged or altered during handling or transport, it is advisable to check set pressure and blowdown ring position at the test bench in accordance with the indications provided in the Manual.

1.8.0 Uso delle valvole dopo l'installazione

1.8.0 Operation of the valves after installation

1.8.1 Istruzioni per l'avviamento
Prima dell'avviamento tutte le valvole di sicurezza devono essere oggetto di ispezione visiva, al fine di accertare che:
- Sia stata installata la valvola di sicurezza giusta.
- La targhetta della valvola indichi un valore della pressione di taratura compatibile con la protezione dell'apparecchiatura su cui è installata.
- Non vi siano flangie cieche, valvole chiuse od ostruzioni delle tubazioni
- I sigilli, posti in fabbrica per evitare manomissioni delle regolazioni, siano integri.

1.8.1 Start-up instructions
Before start-up a visual inspection should be carried out. It should also be checked that:
- The correct safety valve is installed.
- The tag shows the proper set pressure for the equipment to be protected.
- There are no blind flanges, closed valves or piping obstructions.
- Seals, applied in our factory to avoid unauthorized adjustments, are unbroken.

1.8.2 Ispezioni periodiche
E' necessario controllare periodicamente la pressione di taratura, la libertà di movimento dello stelo e le tenute di sede e verso ambiente, al fine di verificare l'efficienza della valvola.

1.8.2 Periodic inspection
Set pressure, as well as seat tightness and tightness to atmosphere and freedom of movement of the spindle, should be checked in order to ensure the efficiency of the valve.
After the safety valve has opened, it is recommended to check that the disc has properly re-established contact with the seat of the nozzle and tightness has been restored.

Dopo ogni intervento della valvola, è opportuno controllare che l'otturatore sia tornato correttamente a contatto con la sede del boccaglio, ripristinando la tenuta. Eventuali perdite possono essere rilevate a orecchio e, nel caso di fluidi caldi o freddi, controllando le variazioni di temperatura prodotte nel corpo valvola. In caso di primo esercizio dell'impianto, consigliamo di controllare l'efficienza della valvola entro i primi 2 anni; l'intervallo di tempo programmato per i successivi controlli potrà essere modificato, sulla base dei risultati ottenuti e, comunque, nel rispetto dei regolamenti vigenti.

Seat leakage, if any, can be detached by hearing and, if the fluid is cold or hot, checking the changes of the temperature of the valve body.
We recommend to check the valve efficiency within 2 years, since the start-up of the plant; the time interval fixed for the next scheduled inspections could be different, on the base of the first results or according to the applicable Code requirements.

2.0.0 ISTRUZIONI PER LA REGOLAZIONE, MONTAGGIO E SMONTAGGIO DELLE VALVOLE FLANGIATE SERIE 3000W

2.0.0 INSTRUCTIONS FOR SETTING, DISASSEMBLY, ASSEMBLY OF SERIES 3000W (FLANGED VALVES)

2.1.0 Regolazione delle valvole senza leva

Qualora risultasse necessario modificare la pressione di taratura stabilita oppure la pressione di richiusura della valvola ("blowdown") si dovrà procedere come segue:

2.1.0 Adjustment of valves without lever

If it should be necessary to alter the established set pressure or the valve blowdown, the instructions below should be followed:

2.1.1 Togliere il cappello (3) e la spina di fissaggio (8). Alzare l'anello di regolazione (7) agendo con un cacciavite sui denti dell'anello stesso, verso destra, fino a toccare l'otturatore, staccandosi poi di 2 denti verso sinistra assicurandosi che l'otturatore batta sul boccaglio e non sull'anello.

2.1.1 Remove cap (3) and the adjusting ring pin (8). Raise the blowdown ring (7) by moving the teeth of the ring to the right with a screwdriver until the disc is touched and then move 2 teeth to the left, making sure that the disc touches the nozzle and not the ring.

2.1.2 Controllare la pressione differenziale di prova su banco prova, a temperatura ambiente e contropressione atmosferica, con aria o acqua, come indicato sul certificato di'identità e collaudo della valvola.

Nota. La presenza di acqua all'interno della valvola può essere incompatibile con le condizioni di servizio. In particolare, devono essere considerati i rischi di formazione di idrati e/o di ghiaccio.

Per evitarli, la valvola deve essere asciugata completate, dopo le prove di taratura e tenuta, anche facendola aprire più volte e flussandola con aria secca o azoto, al fine di eliminare ogni traccia di acqua dalle sedi.

La pressione di prova viene elevata fino a quando la valvola si apre (con l'aria, "scoppia"; con acqua, si stabilisce un modesto flusso continuo).

Allentare il controdado (18) e:

- avvitare la vite di regolazione (17) se si deve aumentare la pressione di taratura
- svitare la vite di regolazione se si deve diminuire la pressione di taratura.

2.1.2 *The adjustment of the cold differential test pressure is carried out on a test bench, at ambient temperature and atmospheric back pressure, with air or water, as indicate in the "Identity and Test Certificate".*

Note. The presence of water inside the valve could be incompatible with the operating conditions. Risks of icing and/or hydrate formation have mainly to be evaluated. In order to avoid these risks, the valve has to be dried after set pressure adjustment and seat tightness test, also by opening and flowing it with air or nitrogen to remove any trace of water from the seats

The test pressure is increased until the valve opens ("pops," with air; a small continuous flow take place, with water).

Loosen the adjusting screw lock nut (18) and tighten the spring adjusting screw (17) if the set pressure is to be increased, loosen it if the set pressure is to be lowered.

2.1.3 Per ogni valvola, il campo entro cui è possibile variare la taratura è indicato nel "Certificato di Identità e di Collaudo".

2.1.3 For all valves, the range within which it is possible to vary the spring setting is shown in the "Test and Identification Certificate".

2.1.4 La regolazione della pressione differenziale di prova viene eseguita con contropressione atmosferica.
Se esiste contropressione imposta, la valvola deve essere regolata ad una pressione uguale alla differenza fra la pressione di taratura richiesta e la contropressione. Quanto sopra, ovviamente, non si riferisce alle valvole con soffietto di bilanciamento. Se esiste contropressione generata, di questa, usualmente, non si tiene conto.

2.1.4 The safety valve differential test pressure is adjusted with atmospheric back pressure. If there is a superimposed back pressure, the valve must be adjusted at a pressure equal to the difference between the required set pressure and the back pressure. This, of course, does not apply to valves with balancing bellows. If there is a built-up back pressure, this is not usually taken into account.

Esempio:
Pressione di taratura: 10 bar
Contropressione imposta: 2 bar
Pressione differenziale di prova a freddo:
10 -2 = 8 bar

Example:
Desired set pressure: 10 bar
Superimposed back pressure: 2 bar
Cold differential test pressure:
10 - 2 = 8 bar

2.1.5 La pressione a cui la valvola si apre cambia con la temperatura della molla; la taratura al banco, a temperatura ambiente, dovrebbe tenere conto della temperatura di esercizio. È perciò buona pratica, quando la legge ed i regolamenti lo permettano, correggere il valore della pressione differenziale di prova a freddo delle valvole con coperchio chiuso, in funzione della temperatura di scarico della valvola, come da tabella.

2.1.5 The set pressure of the valve is affected by the temperature of the spring; the pressure adjustment, at the test bench, at ambient temperature, should consider the operating temperature.
It is therefore good practice, if the rules and the regulations do not forbid it, to correct the cold differential test pressure of valves with closed bonnet, according to the relieving temperature, as shown in the table below.

Temperatura di scarico [°C] *Relieving temperature [°C]*		Correzione della pressione differenziale di prova a freddo *Correction of the cold differential test pressure*
da (incluso) *from (inclused)*	a (escluso) *to (esclused)*	
-196	-140	-3%
-140	-90	-2%
-90	267	Nessuno / None
267	350	+2%
350	420	+3%
420	540	+4%

Nota bene: Le correzioni, proposte dalla tabella, si riferiscono a valvole non coibentate.

Note: Corrections, proposed in the table, refer to valves not insulated.

2.1.6 Stabilita la pressione di scatto desiderata, posizionare l'anello di regolazione del blow-down (7) come indicato qui di seguito.
Come detto al paragrafo 2.1.1, durante la taratura della molla l'anello di regolazione del blowdown viene portato a toccare l'otturatore e poi arretrato di 2 denti.
Se l'anello viene lasciato in questa posizione, la valvola, quando scarica in esercizio la sua piena portata, ha un blowdown molto elevato (pressione di richiusura molto bassa). È perciò necessario abbassare l'anello di regolazione, spostandolo verso sinistra del numero indicativo di denti dato dalla tabella riportata nella pagina seguente.
Il blowdown delle valvole installate può variare in funzione della composizione, pressione e temperatura del fluido e del tipo di installazione, e può essere regolato in sito posizionando opportunamente l'apposito anello di regolazione.

2.1.6 Once the desired set pressure is established, position the blowdown adjusting ring (7) as indicated herebelow.
As said in paragraph 2.1.1, during the spring setting the blowdown adjusting ring should touch the disc and then be turned back 2 teeth.
If the ring is left in this position, when in operation the valve discharges its full capacity, it will have a very long blowdown (very low reclosing pressure). Therefore, the adjusting ring must be lowered, moving it to the left by the number of teeth indicated in the table on the next page.
The blowdown of installed valves can vary, depending on the analysis, pressure and temperature of the medium and on the type of installation, and can be adjusted on the spot by suitably positioning the adjusting ring.

2.1.7 Regolata la valvola, rimettere la spina di fissaggio (8), assicurandosi che la spina della vite stessa si innesti in una delle cave dell'anello (7). Bloccare il controdado (18) quindi rimettere il cappello (3).

2.1.7 When the valve is adjusted, put back in place the adjusting ring pin (8), making sure that the pin is engaged in one of the slots in the blowdown ring (7). Fix the adjusting screw lock nut (18) and put the cap (3) in place again.

Serie 3000W – Posizione del'anello di regolazione
Series 3000W _ Blowdown adjusting ring position

Pressione [bar] da a Pressure [bar] *from to*		0,4 1	1,1 1,5	1,6 2	2,1 3,5	3,6 5	5,1 9	> 9			
Orifizio *Orifice*	*Area* cm^2	No. di denti da arretrare *No. of teeth to be turned back*									
C	0,502	2	2	2	2	2	2	3			
D	0,785	2	2	2	2	2	2	3			
E	1,43	2	2	2	2	2	2	3			
F	2,54	3	3	3	3	3	4	4			
G	3,8	3	3	3	3	4	4	4			
H	5,94	3	3	3	4	5	5	5			
J	9,08	5	5	6	7	8	8	8			
K	13,2	5	6	7	8	8	8	8			
K_2	16,6	7	8	9	9	9	9	9			
L	21,2	9	10	11	11	11	11	11			
M	25,5	13	14	15	15	15	15	15			
N	31,1	12	13	13	13	13	13	13			
P	45,3	16	16	16	16	16	16	16			
P_3	63,6	22	22	22	22	22	22	22			
Q	78,5	25	25	25	25	25	25	25			
R_1	103,2	18	18	18	18	18	18	18			
T_1	167,7	30	30	30	30	30	30	30			

Nota bene: quando impiegate con liquido, in presenza di contropressioni imposte superiori al 20-25% della pressione di taratura, l'anello di regolazione delle valvole della Serie 3000W, con orifizi C, D, E, F, G, è opportuno sia posizionato a 2 denti, quale che sia il valore della pressione di taratura.

Note: in service with liquid, when the superimposed back pressure exceeds 20-25% of set pressure, the blowdown adjusting ring of Series 3000W valves with orifices C, D, E, F, G, should be adjusted at 2 teeth, whatsoever the set pressure value.

2.2.0 Regolazione delle valvole con leva di sollevamento semplice, con o senza premistoppa L2

2.2.1 Dopo aver rimosso le viti del coperchio (22 – fig. 7), spingere verso il basso la leva (3-2); la forcella della leva (3-6) ruoterà consentendo al cappello (3-1) di essere rimosso.

2.2.2 Per la regolazione, eseguire le stesse operazioni descritte per le valvole senza leva.

2.2.3 Regolata la valvola, riposizionare il cappello (3-1) e le viti del coperchio (22 – fig. 7); poi sollevare la leva (3-2) ed assicurarsi che esista il gioco tra la forcella della leva (3-6) ed il piatto leva (3-9).

No.	Denominazione *Part name*	Acciaio carbonio *Carbon steel*	Acciaio inox *Stainless steel*
3-1	Cappello *Cap*	A216-WCB	A351-CF8M
3-2	Leva *Lever*	Acciaio al carbonio (·) *Carbon steel (·)*	Acciaio al carbonio (·) *Carbon steel (·)*
3-3	Premistoppa *Gland*	AISI 316	AISI 316
3-4	Baderne *Packing ring*	PTFE	PTFE
3-5	Albero *Lever shaft*	AISI 316	AISI 316
3-6	Forcella *Lever fork*	AISI 316	AISI 316
3-7	Bussola *Bushing*	Teflon	Teflon
3-8	Bussola *Bushing*	AISI 316	AISI 316
3-9	Piatto leva *Lever head*	AISI 316	AISI 316
3-10	Dado *Lock nut*	AISI 316	AISI 316
3-11	Spina *Pin*	AISI 316	AISI 316
3-15	Tappo *Plug*	Acciaio al carbonio (·) *Carbon steel (·)*	AISI 316
19	Guarnizione *Gasket*	PTFE	PTFE

(·) Zincato
(·) Zinc coated

2.2.0 Adjustment of valves with packed or plain single acting lifting lever L2

2.2.1 After removing the bonnet bolts (22 – fig 7), push down the lever (3-2); the lever fork (3-6) will rotate, allowing the cap (3-1) to be disassembled.

2.2.2 The adjustment is carried out following the same operations described for valves without lever.

2.2.3 Once the valve is adjusted, put in place the cap (3-1) and the bonnet bolts (22 – fig. 7); then pull the lever (3-2) in vertical position and make sure that a clearance exists between the lever fork (3-6) and the lever head (3-9).

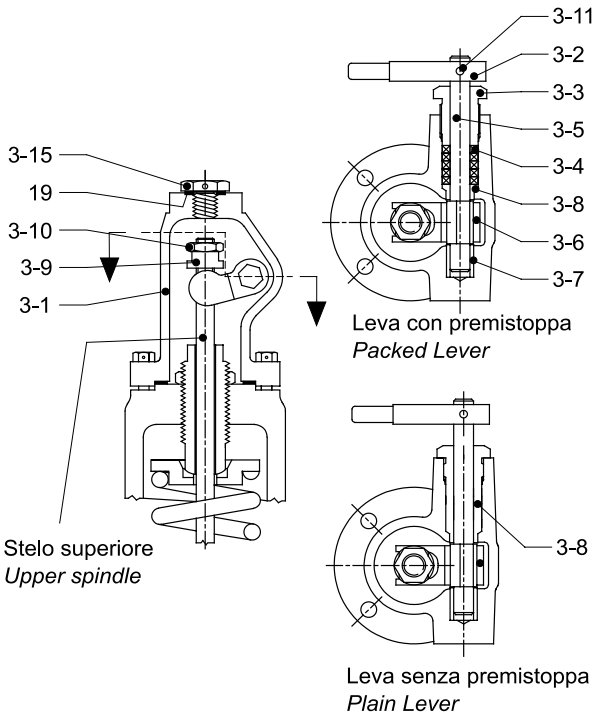


Fig. 1

2.3.0 Smontaggio e montaggio

2.3.1 Tutte le filettature delle valvole sono destrorse.

2.3.2 Smontaggio

Per lo smontaggio della valvola eseguire progressivamente le seguenti operazioni:

Togliere le viti (22), il cappello (3-1) e la guarnizione (19-4). Allentare il controdado (18) e svitare la vite di taratura (17) fino a scaricare completamente la molla (14). Togliere i dadi (21), il coperchio (2), poi la molla con i guidamolla (15) e la guarnizione (19-3).

ATTENZIONE - Prima di allentare completamente i dadi (21) del corpo-coperchio, assicurarsi che la molla (14) sia totalmente scaricata.

2.3.2.1.0 **Valvole aventi classe della flangia d'ingresso minore o uguale ad ASME 600**

2.3.2.1.1 Valvole con orifizi da H a T1.

(rif. Figg. 7, 8, 9)

L'otturatore è filettato sullo stelo.

Tirando verso l'alto lo stelo (10) si sfileranno dal corpo (1) anche la guida (9), l'otturatore (6) e gli accessori "soffietto (12) + protezione (13)", se presenti. Assieme a questi componenti accessori verrà sfilata anche la guarnizione (19-2) (*).

Qualora la guida risultasse bloccata entro il corpo, è possibile estrarla facendo leva con un cacciavite dopo averlo impegnato entro la cava circonferenziale praticata sulla guida stessa.

Tenere fermo l'otturatore e ruotare lo stelo in senso antiorario, esercitando contemporaneamente una trazione affinché la sua filettatura si impegni entro quella dell'otturatore; quindi svitarlo completamente.

Per separare il soffietto dall'otturatore, bloccare quest'ultimo e svitare il soffietto, impegnando una chiave a settore entro uno dei fori radiali presenti nella ghiera del soffietto. Non cercare di svitare il soffietto applicando la coppia torcente alla sua flangia superiore; le onde potrebbero venire irrimediabilmente danneggiate.

(*) Il diametro interno della protezione soffietto di alcune valvole ha diametro interno maggiore di quello esterno dell'otturatore; perciò la protezione rimarrà posizionata entro il corpo assieme alla guarnizione (19-2).

2.3.0 Disassembly and assembly

2.3.1 All the valve threads are right-hand.

2.3.2 Disassemble

To disassemble the valve, carry out the following operations:

Remove the screws (22), the cap (3-1), and the gasket (19-4). Loosen the lock nut (18) and unscrew the spring adjusting screw (17), until to completely unload the spring (14).

Remove the nuts (21), the bonnet (2) and then the spring with its buttons (15) and the gasket (19-3).

WARNING - Before loosening the body nuts (21) completely, make sure that the spring (14) is totally released.

2.3.2.1.0 ***Valves with ASME class of the inlet flange up to 600***

2.3.2.1.1 Valves with orifices from H to T1.

(refer to figures 7, 8, 9)

The disc is screwed to the spindle.

Pulling the spindle (10) upwards, guide (9), disc (6) and accessories "bellows (12) + protector (13), if any, will be extracted from the body (1). The gasket (19-2) will be also slipped out together with the accessory parts (*).

If the guide gets stuck in the body, it can be extracted by levering with a screwdriver inserted in the circumferential groove in the guide itself.

Lock the disc and rotate the spindle in a counter clockwise direction, pulling at the same time. When the threading becomes engaged in that of the disc, unscrew completely.

To separate the bellows from the disc, lock the last one and unscrew the bellows, engaging a pin wrench into one of the radial hole of the bellows ring nut. Don't apply any torque to the bellows upper flange; bellows convolutions could be damaged, irreparably.

(*) The internal diameter of the bellows protector of some valves is larger than the outer diameter of the disc; therefore the protector will stay in the body together with the gasket (19-2).

2.3.2.1.2 Valvole con orifizi da C a G.

(rif. Figg. 11,12)

L'otturatore (6) è unito allo stelo (10) o, se presente, al soffietto (12), con un anello elastico (6-4).

Lo stelo delle valvole con soffietto è semplicemente infilato entro la bussola "a ditale", saldata al soffietto.

L'otturatore degli orifizi C, D ed E è in due pezzi. L'inserto otturatore (6-1) è solo alloggiato entro il porta-otturatore (6-2).

Estrarre la guida (9) dal corpo (1) facendo leva con un cacciavite entro la cava circonferenziale della guida stessa.

Nel caso di valvole senza soffietto, tirare verso l'alto lo stelo per sfilare dal corpo anche la guida e l'otturatore. Per separare questi componenti, serrare in morsa lo stelo e spingere la guida contro l'otturatore.

Nel caso di valvole con soffietto, prima sfilare lo stelo dalla guida, poi togliere dal corpo la guida, facendo leva con un cacciavite entro la sua cava circonferenziale, e il soffietto, con attaccato l'otturatore.

Per separare il soffietto dall'otturatore, bloccare quest'ultimo e tirare la bussola cieca "a ditale" del soffietto; se insufficiente, fare leva sull'otturatore, con 2 cacciaviti contrapposti, inseriti tra otturatore e bussola "a ditale".

L'inserto otturatore degli orifizi C, D ed E può rimanere appoggiato alla sede del boccaglio oppure accoppiato al porta-otturatore. Attenzione a non perderlo.

2.3.2.2 **Valvole aventi classe della flangia d'ingresso ASME 900 e 1500**

Le possibili varianti esecutive dei componenti e le modalità di smontaggio sono analoghe a quelle descritte ai punti precedenti. Si introducono le seguenti varianti costruttive:

Lo stelo delle valvole con orifizi da C a J è solo infilato entro l'otturatore (il porta-otturatore, per C, D ed E).

Il soffietto delle valvole con orifizio C, D o E è saldato al porta-otturatore, che diviene così parte integrante del soffietto (rif. Fig. 13).

2.3.2.1.2 Valves with orifices from C to G.

(refer to figures 11, 12)

The disc (6) is coupled to the spindle (10) or to the bellows (12), if any, by a retaining ring (6-4).

The spindle of valves with bellows is simply inserted into the thimble shaped bushing, welded to the bellows.

The disc is in two parts for orifices C, D and E. The disc insert (6-1) is simply fitted in the disc-holder (6-2).

Extract the guide (9) from the body (1) by levering with a screwdriver inserted in the circumferential groove in the guide itself.

If the valve isn't equipped with bellows, pull the spindle upwards to extract guide and disc from the body. To withdraw these parts, lock the spindle in a vice and push the guide against the disc/disc-holder.

If the valve is equipped with bellows, first withdraw the spindle from the guide, then remove from the body the guide, by levering with a screwdriver inserted in its circumferential groove, and the bellows, with the disc coupled to.

To separate bellows and disc/disc-holder, lock this and pull the thimble shaped bushing of the bellows; if not sufficient, insert two screwdrivers, in opposite positions, into the gap between disc/disc holder and bushing and lever.

C, D or E disc insert could stay on the nozzle seat or fitted in the disc-holder. Pay attention to avoid loosing it.

2.3.2.2 ***Valves with ASME class of the inlet flange 900 and 1500***

The part variations and assembling procedures are similar to those described in the previous points. The following manufacturing variations applies:

The spindle of valves with orifices from C to J is simply inserted into the disc (disc-holder for C, D and E orifices).

The bellows of valves with C, D and E orifices is welded to the disc-holder that is so integrated in the bellows (refer to figure 13).

2.3.2.3 **Valvole aventi classe della flangia d'ingresso ASME 2500**

Sono disponibili solo valvole in esecuzione senza soffietto con orifizi: C, D, E, F, G.

Le valvole con orifizio G hanno disegno identico a quello delle valvole con classe d'ingresso 900 o 1500.

Il trim delle valvole con orifizi C, D, E, F è mostrato in figura 14.

Il gruppo otturatore (6-1, 6-2, 6-3, 6-4) è vincolato allo stelo (10) attraverso la filettatura del nipplo (6-3).

Per separare queste parti, tenere fermo lo stelo e ruotare il porta-otturatore (6-2), esercitando contemporaneamente una trazione, per trascinare in rotazione il nipplo, la cui filettatura deve prima impegnare e poi disimpegnare quella dello stelo.

Una volta separato il gruppo otturatore dallo stelo, togliere le due metà dell'anello (6-4) dal porta-otturatore, poi sfilare nipplo e inserto otturatore (6-1).

Togliere la spina di fermo (8), filettata entro il corpo, e poi l'anello di regolazione (7), filettato sul boccaglio (5).

Per togliere il boccaglio, impegnare una chiave a settore entro uno dei fori radiali presenti sulla sua parte inferiore e svitare.

I fori non sono praticati quando incompatibili con il tipo di accoppiamento/guarnizione previsto - per esempio RJ. In questo caso si deve bloccare la parte inferiore del boccaglio entro una morsa a agire sul corpo per svitare le due parti.

2.3.3 Montaggio

Per il montaggio, eseguire l'operazione inversa a quella dello smontaggio; bloccando per primo il boccaglio della valvola.

Gli orifizi C, D ed E, che hanno l'inserto otturatore alloggiato, ma non bloccato, entro il porta-otturatore (figura 11). Consigliamo di applicare in poco di grasso sui piani di contatto tra le due parti, per tenerle unite durante l'assemblaggio.

Valvole con classi d'ingresso ASME 2500 e orifizi C, D, E, F, (figura 14). Controllare che le due metà dell'anello (6-4) siano infilate fino a battuta, entro la cava del porta-otturatore (6-2), per consentire il disimpegno della filettatura del nipplo (6-3) da quella dello stelo e, all'estremità di quest'ultimo, di posizionarsi all'interno dell'anello in due metà.

2.3.2.3 ***Valves with ASME class of the inlet flange 2500***

Valves without bellows and orifices from C to G are only available.

Orifice G valves are similar to the ones with inlet flange class ASME 900 and 1500.

The trim of C, D, E, F orifices is shown in figure 14.

The disc assembly (6-1, 6-2, 6-3, 6-4) is coupled to the spindle (10) through the thread of the nipple (6-3).

To disassembly, lock the spindle and turn the disc-holder (6-2), in counter clockwise direction, pulling at the same time, to drug the nipple, which thread must fist engage and then disengage the spindle one.

Ones the disc assembly has been separated from he spindle, to disassemble, extract the two parts of the ring (6-4) from the disc-holder (6-2) groove, then withdraw the nipple and the disc insert (6-1).

Remove the adjusting ring pin (8), threaded in the body, and then the blowdown ring (7), threaded on the nozzle (5).

To remove the nozzle, engage a pin wrench into one of the radial holes in the lower part of the nozzle and unscrew. However there is no hole if the facing/gasket of the flange - e.g. RJ - is incompatible with it. In such case use a vice to hold firm the lower part of the nozzle and loosen the nozzle-body threaded coupling acting on the valve body.

2.3.3 Assemble

To assemble the valve, reverse the operation for disassembly, first fixing the valve nozzle.

C, D and E orifices use a disc insert that isn't locked in the disc-holder (figure 11 refers). We suggest to apply a thin layer of grease on the contact surfaces between these parts, to keep them coupled, while assembling.

Valves with inlet pressure class ASME 2500 and orifices C, D, E, F (figure 14 refers). Check that the two parts of the ring (6-4) are completely inserted in the groove of the disc-holder (6-2) to allow for the nipple thread to disengage the spindle one and, for the spindle end, to enter the ring (6-4).

Prima di caricare la molla (14), assicurarsi che l'otturatore (6) appoggi sulla sede del boccaglio (5) e non sull'anello di regolazione (7).

Before loading the spring (14), make sure that the disc (6) rests on the nozzle seat (5) and not on the blowdown ring (7).

2.3.4 Prove di tenuta della sede

Dopo aver regolato la pressione di taratura, e riposizionato l'anello di regolazione del blowdown, deve essere controllata la tenuta tra monte e valle della sede della valvola.

La prova di tenuta della sede è eseguita in accordo allo standard API 527.

Il fluido da impiegare e il valore della pressione di prova sono indicati sul certificato d'identità e collaudo (tipicamente 90% della pressione di taratura o 0.3 bar sotto la stessa se minore di 3 bar).

La perdita deve essere determinata immediatamente dopo aver fatto aprire la valvola.

2.3.4 Seat tightness test

After set pressure and blowdown have been adjusted, the tightness between inlet and outlet of the valve shall be checked.

The seat tightness test complies with the prevision of API Std 527.

Test medium and pressure value are reported in the "Identity and Test Certificate" (usually 90% of the set pressure or 0.3 bar less than set pressure when lower than 3 bar).

The leakage rate shall be determined immediately after valve opening.

2.3.4.1 Prova con aria

La figura 2 mostra lo schema di prova, con aria sotto acqua, e la perdita ammessa, in bolle per minuto, per valvole con sede metallica, in conformità ad API Std. 527 nel caso di valvole con coperchio aperto si sigilla mediante grasso il gioco fra stelo e guida).

Per valvole con sede soffice non è consentita alcuna perdita.

Le bolle devono essere contate non appena assumono una frequenza costante.

La pressione di prova deve essere applicata per un minimo di 1 minuto per valvole con dimensioni di ingresso fino a 2" (DN 50); 2 minuti per dimensioni di ingresso da 2,5" (DN 65) a 4" (DN 100); 5 minuti per dimensioni di ingresso di 6" (DN 150) o maggiori.

2.3.4.1 Testing with air

Figure 2 shows the test sketch and the allowable leakage rate, in bubbles per minute, for valves with metal seat, in accordance with API Std 527 (in the case of open bonnet valves, the clearance between guide and spindle shall be sealed with grease).

No leakage is allowed for valves with soft seat.

Count bubbles after they appear at uniform rate.

The test pressure shall be applied for a minimum of 1 minute for valves of inlet size through 2" (DN 50); 2 minutes for inlet sizes from 2,5" (DN 65) to 4" (DN 100); 5 minutes for inlet sizes 6" (DN 150) and larger.

2.3.4.2 Prova con acqua

Togliere il tappo dal foro di drenaggio del corpo e versare acqua nel corpo valvola fino a stabilire un flusso attraverso il foro di drenaggio. Solo quando il livello dell'acqua entro il corpo è stabile, la valvola deve essere osservata per il tempo necessario a definire la portata di perdita (1 minuto almeno per le valvole con sede soffice).

Per le valvole con sede metallica, la perdita ammessa è pari a 10 centimetri cubici all'ora per pollice di dimensione nominale d'ingresso.

Per valvole con sede soffice non è consentita alcuna perdita.

2.3.4.2 Testing with water

Remove the body drain hole plug and pour water into the body until water overflows through the drain hole. When the water level inside the body is stable, the valve shall be observed for the time necessary to define the leakage flow rate (1 minute minimum, for valve with soft seat).

For valves with metal-to-metal seats, the allowable leakage rate is 10 cubic centimetres per hour per inch of nominal inlet size.

No leakage is allowed for valves with soft seat.

2.3.5 Prova di tenuta delle guarnizioni soggette alla contropressione

(riferirsi alle figure 3 e 4)

La tenuta delle guarnizioni indicate dalle frecce deve essere controllata con acqua e sapone.

Fluido di prova: aria

Pressioni di prova:

6 bar, per valvole senza soffietto (fig. 3)

3 bar, per valvole con soffietto (fig. 4)

2.3.5 Tightness test of seals subject to back pressure (refer to figures 3 and 4)

The tightness of seals indicated by an arrow shall be checked for leakage with soap and water.

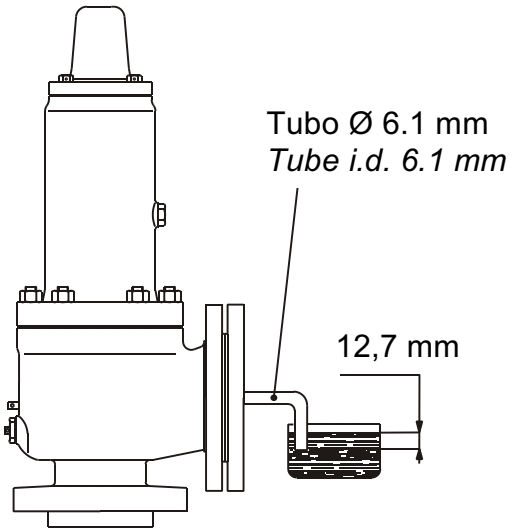
Test medium: air

Test pressures:

6 bar for valves without bellows (fig. 3)

3 bar for valves with bellows (fig. 4)

Fig. 2



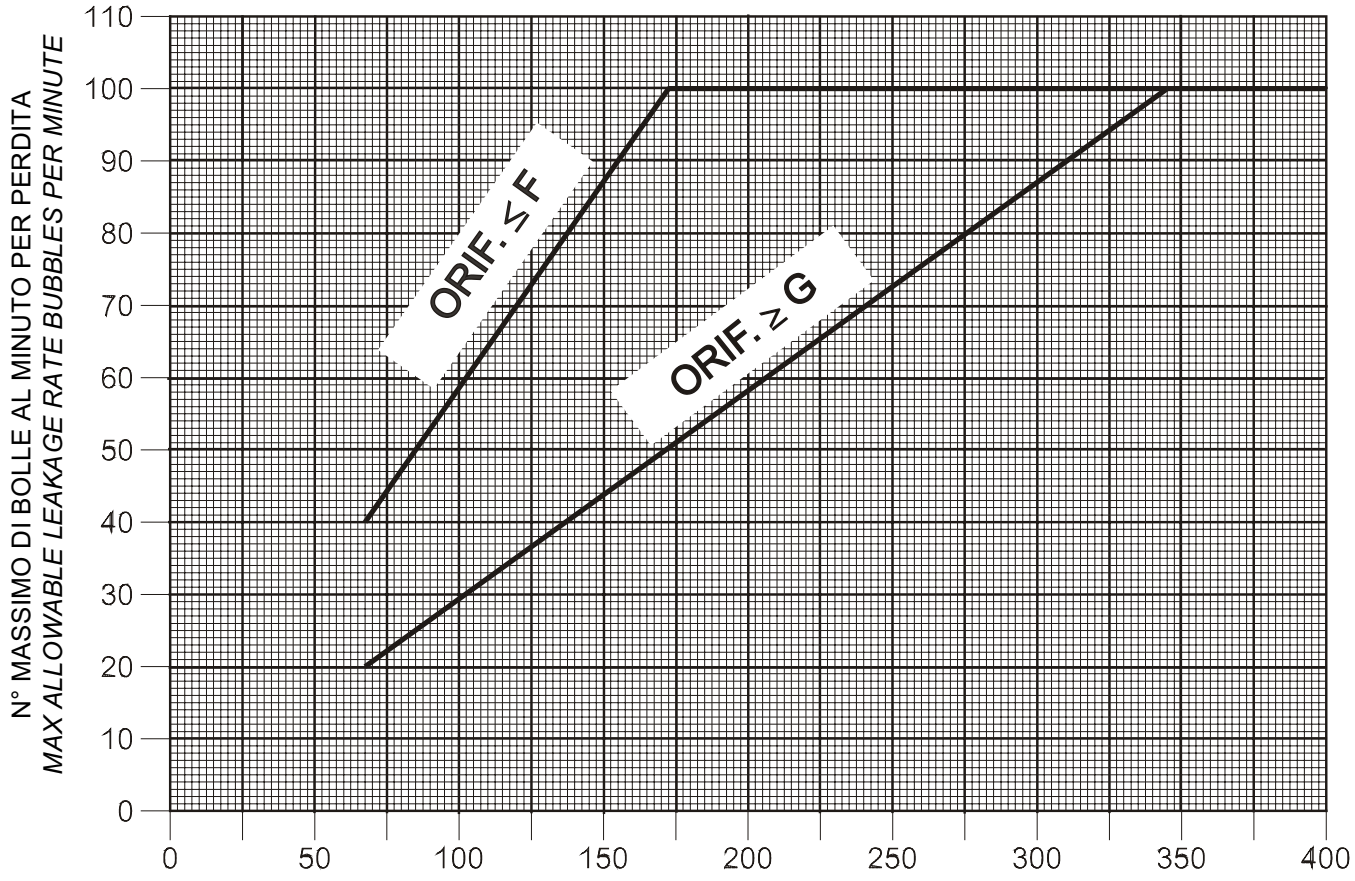


Fig. 3

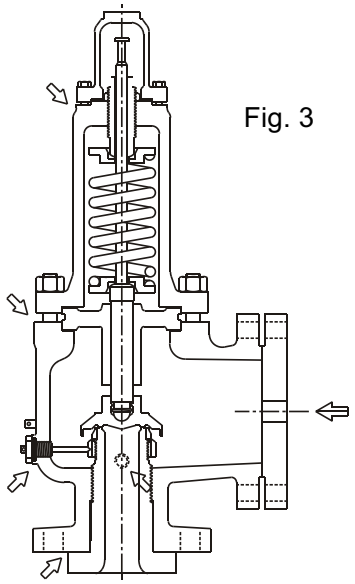
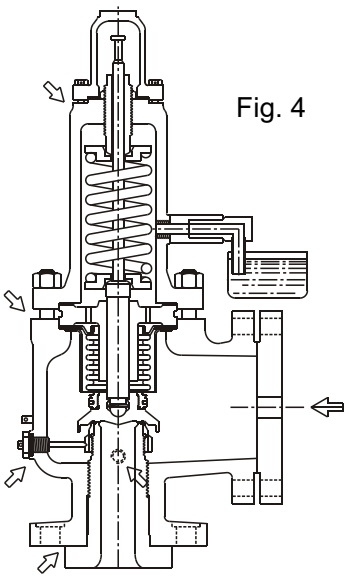


Fig. 4



VALVOLA CON SOFFIETTO
BELLOWS VALVE

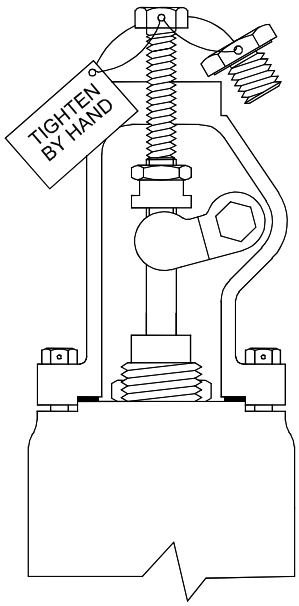
2.4.0 Dispositivo di blocco G_2 per valvole con coperchio chiuso e leva

Per bloccare la valvola, rimuovere dal cappello (3-1) il tappo (3-15) ed avvitare a mano la vite di blocco.

2.4.0 Test gag G_2 for valves with closed bonnet and lever

To block the valve, remove plug (3-15) from cap (3-1) and hand tighten the blocking screw.

Fig. 5



2.5.0 Golfare per il sollevamento della valvola – Accessorio Y6

2.5.1 Il materiale del golfare (3-14) è acciaio al carbonio, quale che siano i materiali delle altre parti della valvola. Per evitare problemi di corrosione si consiglia perciò di togliere il golfare, dopo l'installazione della valvola. (Allentare i grani di sicurezza (3-13) e svitare il golfare dal cappello (3-1), nel caso di valvole senza leva, dal nipplo (3-12), nel caso di valvole con leva.)

2.5.2 Nel caso di valvole senza leva, viene fornito un tappo in plastica per la protezione della filettatura di ancoraggio del golfare.
Nel caso di valvole con leva, viene fornito un tappo filettato (3-15), che può sostituire il nipplo, qualora si ritenga opportuno.
Il materiale del nipplo (3-12) è comunque scelto in funzione del materiale del cappello (3-1), per evitare problemi di corrosione galvanica, e può perciò rimanere avvitato al cappello anche in esercizio, svolgendo la funzione di tappo.

ATTENZIONE - Prima di mettere in esercizio la valvola assicurarsi che il nipplo (3-12) (o il tappo (3-15)) sia serrato al cappello in modo da garantire la tenuta della guarnizione (19-5).

2.5.0 Valve lifting eye. – Accessory Y6

2.5.1 Lifting eye material is carbon steel, whatever the materials of other valve parts. To avoid corrosion, we suggest removing the lifting eye, after the installation of the valve on the protected equipment. (Unscrew the lock set screws (3-13) and then the lifting eye from the cap (3-1), in case of valve without lever, from the nipple (3-12), if the lever is present.)

2.5.2 In case of valve without lever, a plastic plug is supplied for the protection of the threaded hole drilled in the cap for the lifting eyebolt coupling.
In case of valve with lever, a threaded plug (3-15) is supplied, to replace the nipple, if this option is preferred, as nipple material has been chosen to avoid galvanic corrosion when coupled to the cap (3-1) and, therefore, it needs not to be removed before valve operation.

WARNING - Before putting the valve into operation, make sure that the nipple (3-12) (or the plug (3-15)) has been tightened enough to ensure the gasket (19-5) sealing.

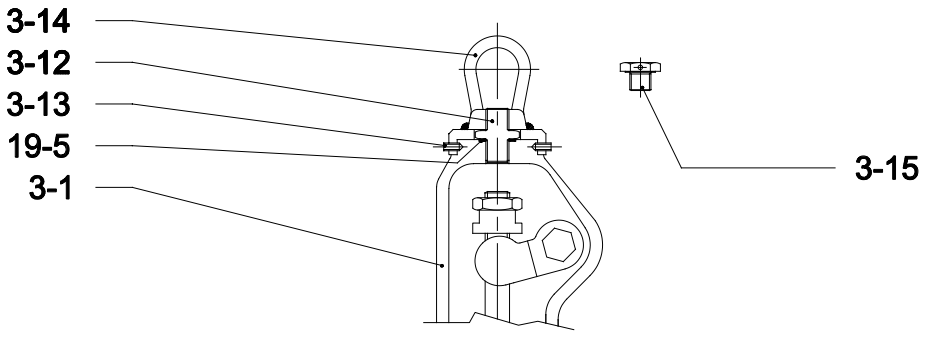
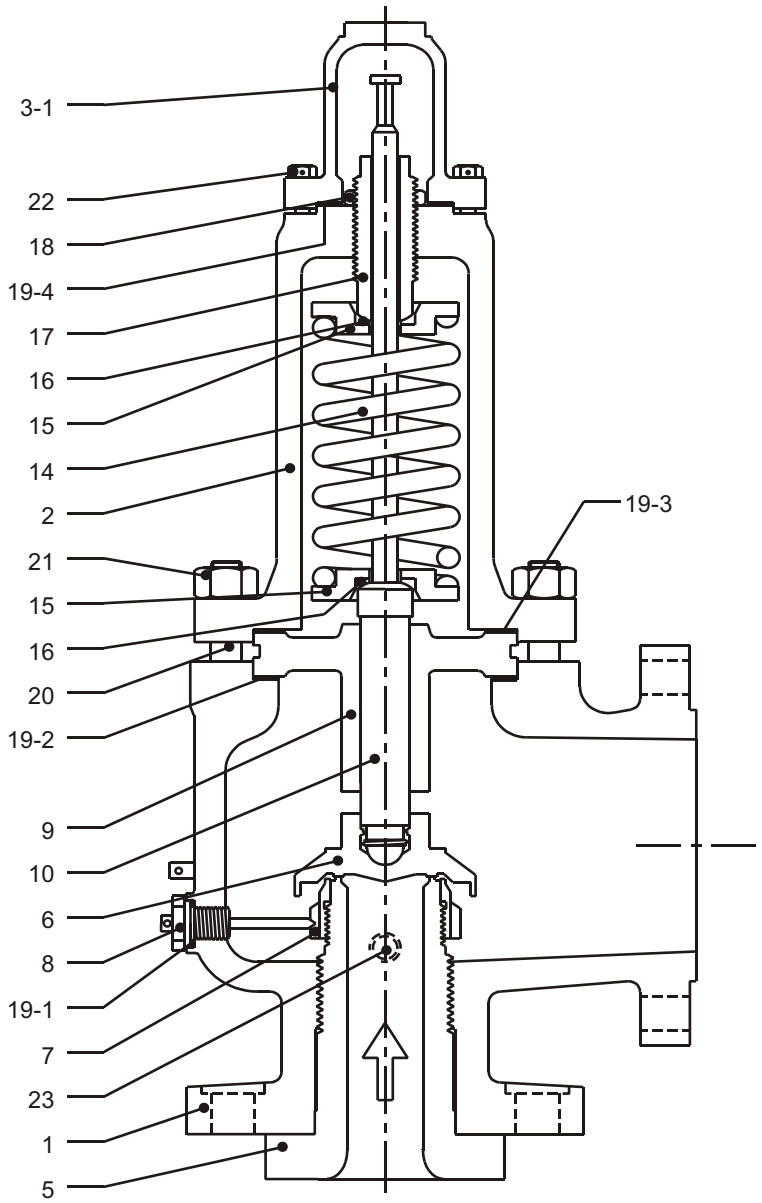


Fig. 6

VALVOLA SERIE 3000W
CON COPERCHIO CHIUSO

SERIES 3000W SAFETY VALVE
WITH CLOSED BONNET

Fig. 7



No.	Denominazione / *Part name*	No.	Denominazione / *Part name*
1	Corpo / *Body*	15	Guidamolla / *Spring button*
2	Coperchio / *Bonnet*	16	Cuscinetto / *Bearing*
3-1	Cappello / *Cap*	17	Vite di regolazione della taratura / *Spring adj. screw*
5 (*)	Boccaglio / *Nozzle*	18	Dado di fermo / *Lock nut*
6 (*)	Otturatore / *Disc*	19 (*)	Guarnizioni / *Gaskets*
7	Anello regolazione blowdown / *Blowdown adj. ring*	20	Prigionieri del corpo / *Body studs*
8	Spina ferma anello di regolazione / *Adj. ring pin*	21	Dadi del corpo / *Body nuts*
9	Guida / *Guide*	22	Viti del coperchio / *Bonnet bolts*
10	Stelo / *Spindle*	23	Tappo drenaggio ½" NPT / *½" NPT body drain plug*
14 (*)	Molla / *Spring*		

(*) Parti di scorta raccomandate

(*) Recommendend spare parts

VALVOLA SERIE 3000W
CON SOFFIETTO (B)

SERIES 3000W SAFETY VALVE
WITH BELLOWS (B)

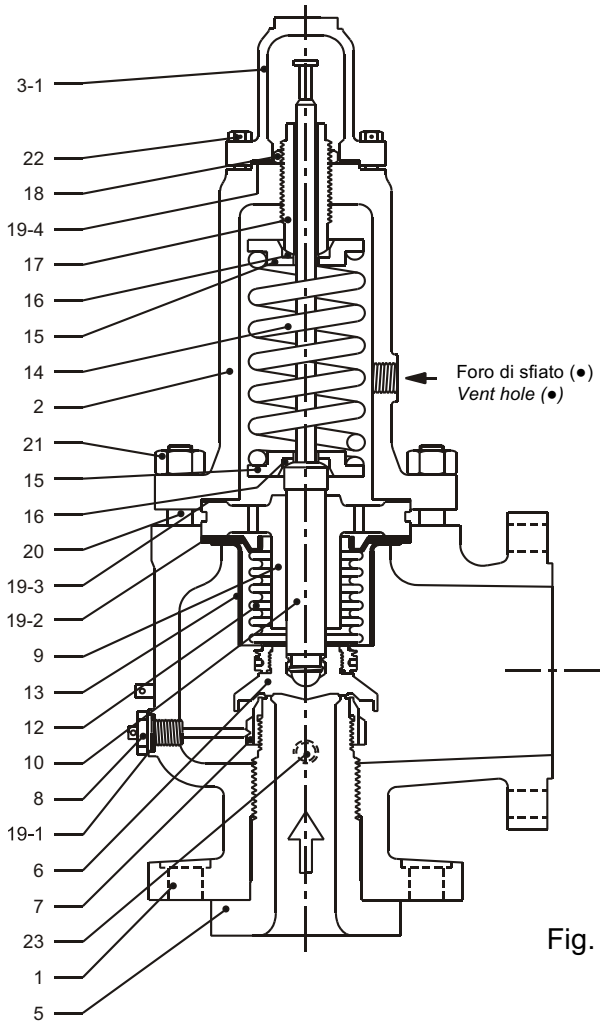


Fig. 8

(·) Dimens. Valvola / *Valve size* — Foro sfiato /*Vent hole*

1x2, 1½x2, 1½x3, 2x3, 3x4	½" NPT
4L6 (300), 4M6 (150-300)	½" NPT
Altre dimensioni / *Other sizes*	1" NPT

VALVOLA SERIE 3000W
CON SOFFIETTO (B) E PISTONE (P)

SERIES 3000W SAFETY VALVE
WITH BELLOWS (B) AND PISTON (P)

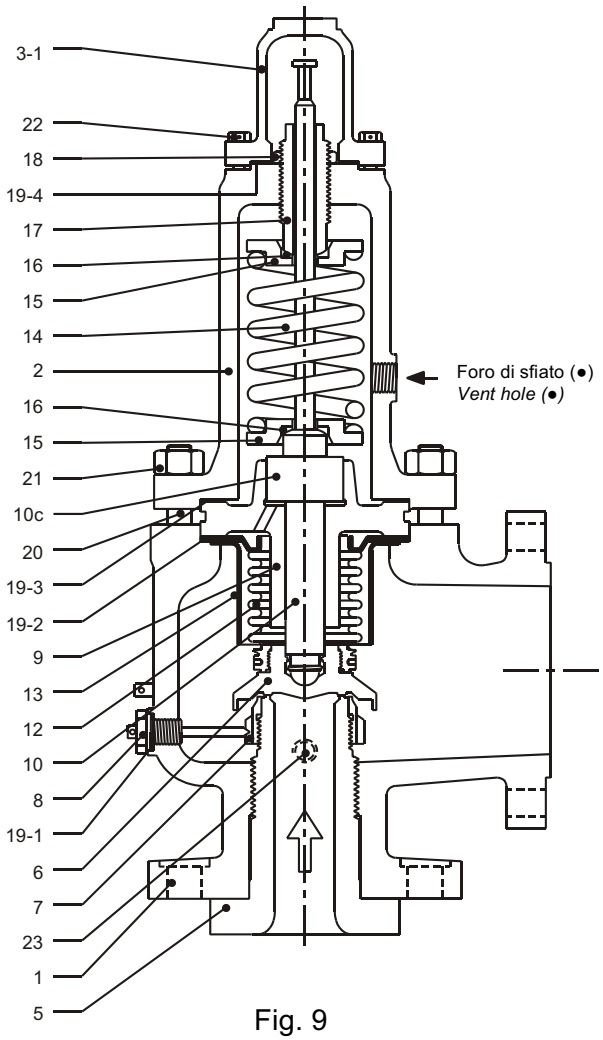


Fig. 9

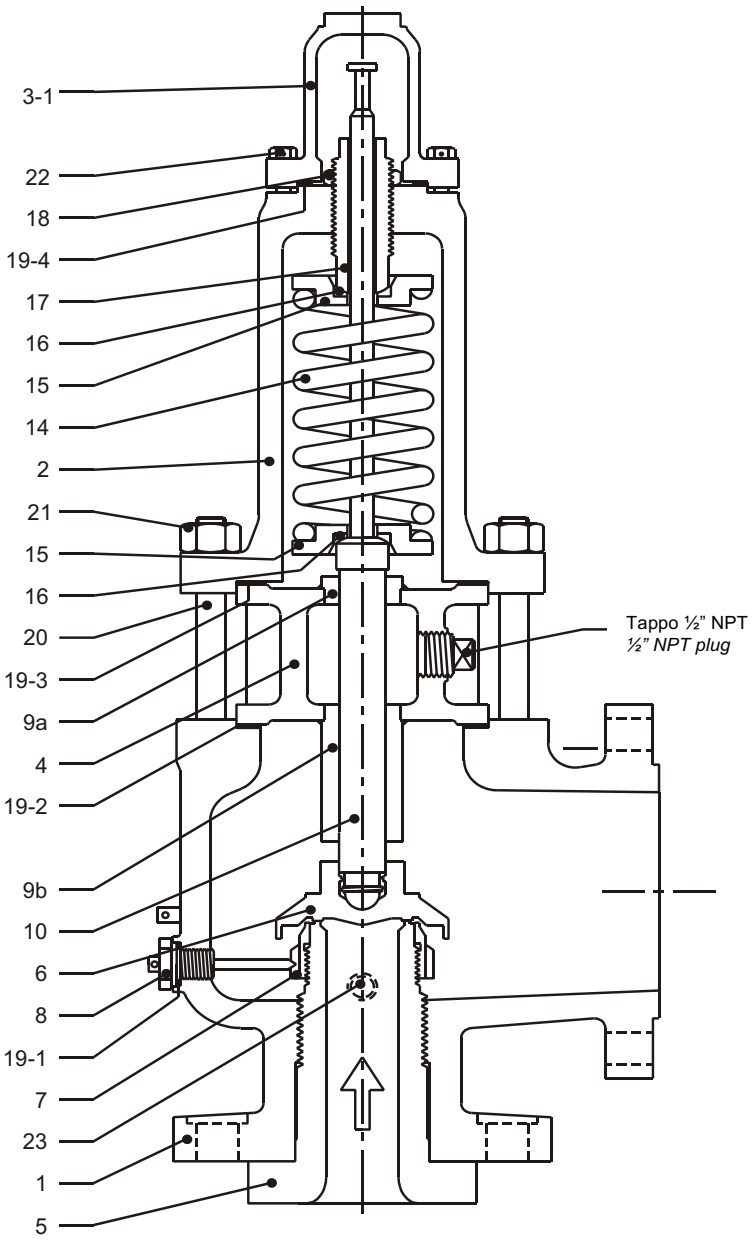
No.	Denominazione / *Part name*	No.	Denominazione / *Part name*
1	Corpo / *Body*	13	Protezione soffietto / *Bellows protector*
2	Coperchio / *Bonnet*	14 (*)	Molla / *Spring*
3-1	Cappello / *Cap*	15	Guidamolla / *Spring button*
5 (*)	Boccaglio / *Nozzle*	16	Cuscinetto / *Bearing*
6 (*)	Otturatore / *Disc*	17	Vite di regolazione della taratura / *Spring adj. screw*
7	Anello regolazione blowdown / *Blowdown adj. ring*	18	Dado di fermo / *Lock nut*
8	Spina ferma anello di regolazione / *Adj. ring pin*	19 (*)	Guarnizioni / *Gaskets*
9	Guida / *Guide*	20	Prigionieri del corpo / *Body studs*
10	Stelo / Spindle	21	Dadi del corpo / *Body nuts*
10c	Pistone / *Piston*	22	Viti del coperchio / *Bonnet bolts*
12 (*)	Soffietto / *Bellows*	23	Tappo drenaggio ½" NPT / *½" NPT body drain plug*

(*) Parti di scorta raccomandate — *(*) Recommendend spare parts*

VALVOLA SERIE 3000W
CON ESTENSIONE (E) E COPERCHIO CHIUSO

SERIES 3000W SAFETY VALVE
WITH EXTENSION (E) AND CLOSED BONNET

Fig. 10



No.	Denominazione / *Part name*	No.	Denominazione / *Part name*
1	Corpo / *Body*	14 (*)	Molla / *Spring*
2	Coperchio / *Bonnet*	15	Guidamolla / *Spring button*
3-1	Cappello / *Cap*	16	Cuscinetto / *Bearing*
4	Estensione / *Extension*	17	Vite di regolazione della taratura / *Spring adj. screw*
5 (*)	Boccaglio / *Nozzle*	18	Dado di fermo / *Lock nut*
6 (*)	Otturatore / *Disc*	19 (*)	Guarnizioni / *Gaskets*
7	Anello regolazione blowdown / *Blowdown adj. ring*	20	Prigionieri del corpo / *Body studs*
8	Spina ferma anello di regolazione / *Adj. ring pin*	21	Dadi del corpo / *Body nuts*
9a	Bussola di guida superiore / *Upper guide bushing*	22	Viti del coperchio / *Bonnet bolts*
9b	Bussola di guida inferiore / *Lower guide bushing*	23	Tappo drenaggio ½" NPT / *½" NPT body drain plug*
10	Stelo / *Spindle*		

(*) Parti di scorta raccomandate

(*) Recommendend spare parts

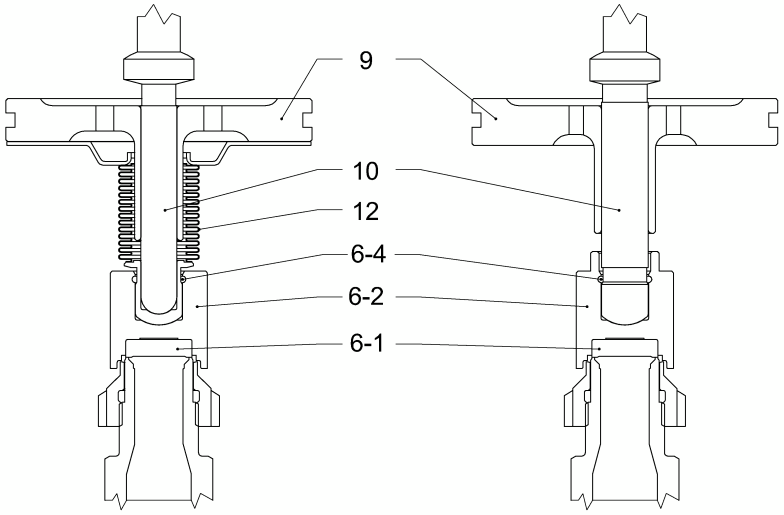


Fig. 11

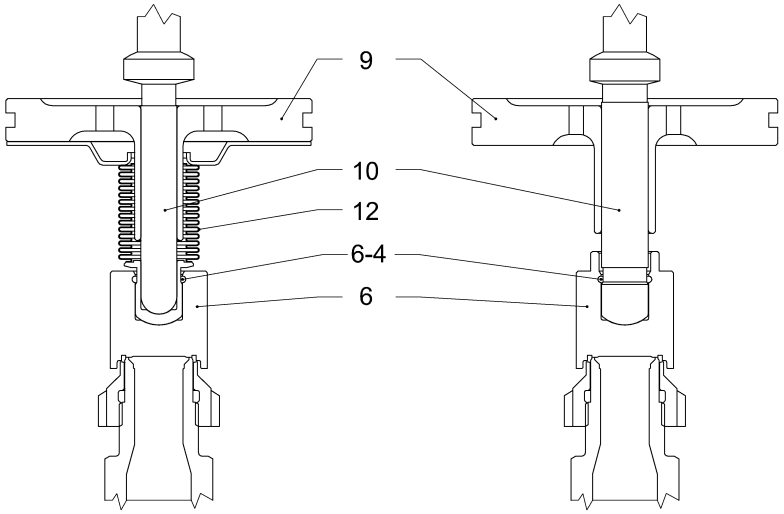


Fig. 12

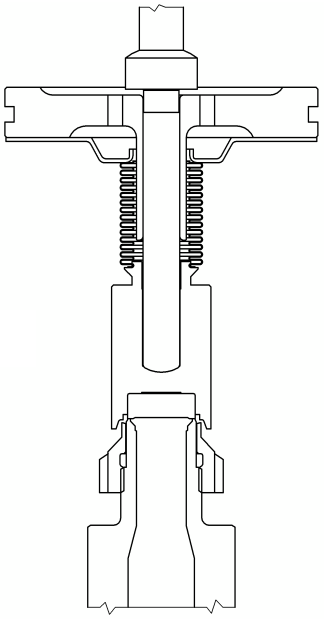


Fig. 13

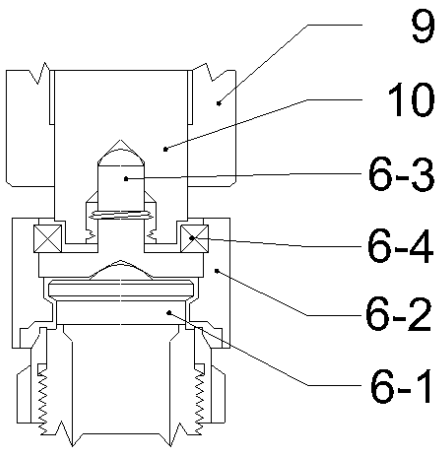


Fig. 14

3.0.0 ISTRUZIONI PER LA MANUTENZIONE

3.1.0 Lubrificazione

Tutte le filettature e la superficie di accoppiamento vite di taratura-guidamolla superiore devono essere protette con composto antigrippante lubrificante Never Seez Nickel grade della Bostick Emhart o prodotto equivalente; le superfici dello stelo inferiore a contatto con la guida devono essere protette con lubrificante a film secco (es.: Dow Corning Molykote 321R).

Prima di procedere all'applicazione dei lubrificanti, tutte le superfici dovranno essere pulite e sgrassate.

Ovviamente il lubrificante non va applicato quando esso sia incompatibile con il fluido di processo o quando esso possa contaminare fluidi purissimi che vengano recuperati anziché sfiatati all'atmosfera.

3.2.0 Ripristino delle sedi del boccaglio e dell'otturatore

3.2.1 Qualora le sedi dell'otturatore e del boccaglio risultassero intaccate o segnate, è bene rilavorare i piani di tenuta, asportando meno materiale possibile. Rispettare la larghezza dei piani di tenuta originali e l'ortogonalità con le filettature e i piani di appoggio.

3.2.2 L'operazione di smerigliatura manuale dovrebbe essere eseguita sotto controllo di una persona specializzata.

A pag. 30 è illustrato l'uso degli appositi anelli e piastre in ghisa o acciai speciali per la smerigliatura dell'otturatore e del boccaglio.

Gli abrasivi consigliati sono quelli a base di carburo di silicio o carborundum e olio.

3.2.3 Le figure 15 e 16 rappresentano piastre di lappatura di grosso spessore in ghisa dura o acciaio indeformabile con una superficie scanalata (per trattenere la pasta abrasiva) e rettificata. Detta piastra serve per smerigliare la sede dei boccagli.

3.0.0 INSTRUCTIONS FOR MAINTENANCE

3.1.0 Lubrication

All threadings and the contact surface between the spring adjusting screw and the upper button must be protected with an anti-seizing lubricating compound, type Bostick Emhart's "Never Seez Nickel Grade" or equivalent. The lower spindle surface in contact with the guide must be coated with a dry film lubricant (e.g. Dow Corning's "Molykote 321R").

Before applying the lubricant, degrease and thoroughly clean all surfaces.

Lubricating compound should not, of course, be used when it is incompatible with the process fluid or when it might contaminate extremely pure fluids which are recovered instead of being discharged to the atmosphere

3.2.0 Repair of nozzle and disc seats

3.2.1 If the seating surfaces of the disc and nozzle are dented or marked, it is advisable to remachine the seating surfaces, taking away as little material as possible. Keep to the width of the original seating surfaces and the squareness between the threading and seating surfaces.

3.2.2 Manual grinding should be done under the supervision of a qualified person.

Correct use of the proper cast iron or special steel rings and plates for grinding the disc and seat is illustrated on page 30. Abrasives with a silicon carbide or carborundum and oil base are recommended.

3.2.3 Figures 15 and 16 show a lapping plate in cast iron or indeformable steel with a surface grooved to hold the lapping compound and ground. The above plate is used to grind the nozzle seat.

Una buona smerigliatura si ottiene girando 4-5 volte il pezzo nel senso indicato in fig. 16; quindi alzarlo e girarlo di 30° continuando fino ad ottenere la finitura superficiale desiderata.
E' consigliabile servirsi di due piastre; la prima per una smerigliatura grossolana con abrasivo di grana 400 circa, la seconda per una smerigliatura finale servendosi di una pasta abrasiva di grana 800 circa.
La figura 15 indica come impiegare il blocchetto lappatore per ripristinare la planarità della piastra dopo che questa è stata usata più volte per la lappatura dei boccagli. E' consigliabile rettificare periodicamente la superficie della piastra su macchina utensile.

A good grinding is obtained by rotating the piece 4 or 5 times as indicated in fig. 16; then lifting it and turning it 30° and then continuing to grind until the desired surface finish is obtained.
It is advisable to use 2 plates; the first for a coarse grinding (about grade 400 lapping compound), the second for a final grinding (about grade 800 lapping compound).
Fig. 15 shows how to use a small lapping block for the manual reconditioning of the plate after it has been used a few times for the lapping of the nozzles. It is advisable to machine grind the surface of the plate periodically.

3.2.4 La figura 17 rappresenta un anello lappatore per otturatori in ghisa dura o acciaio indeformabile con una superficie scanalata e rettificata.
Una buona smerigliatura si ottiene girando 5-6 volte di 30° l'anello lappatore; quindi alzarlo e girarlo di 30° continuando fino ad ottenere la finitura superficiale desiderata.
Prima di procedere alla smerigliatura della sede dell'otturatore si consiglia di ripassare il piano rettificato dell'anello lappatore sulla piastra come indicato in fig. 16.

3.2.4 Figure 17. shows a lapping ring for the disc, in cast iron or indeformable steel, with a grooved and ground surface.
A good grinding is obtained by rotating the lapping ring 5 to 6 times by 30° each time; then lifting and rotating 30° and then continuing to grind until the desired surface finish is obtained.
Before proceeding to grind the disc it is advisable to recondition the surface of the lapping ring over the plate, as shown in fig. 16.

Fig. 15

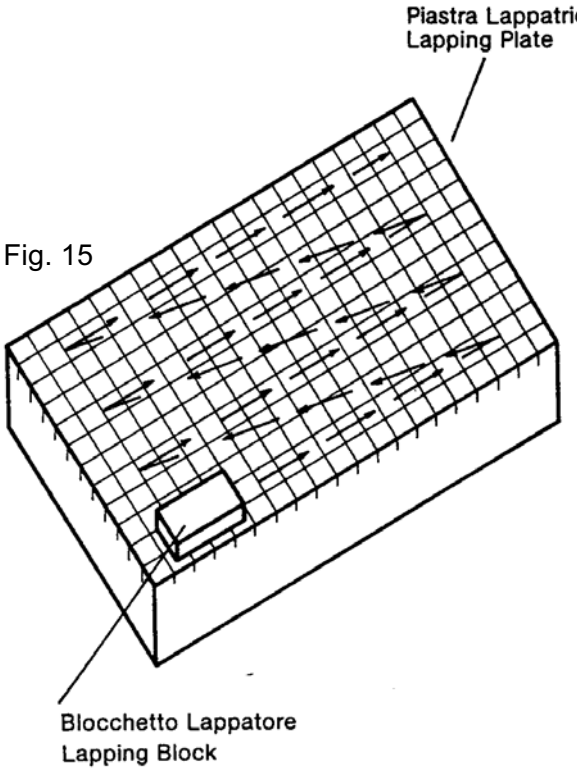
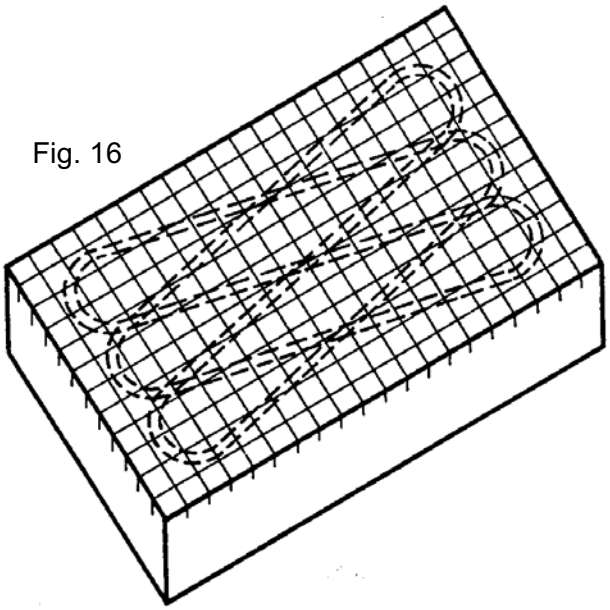


Fig. 16



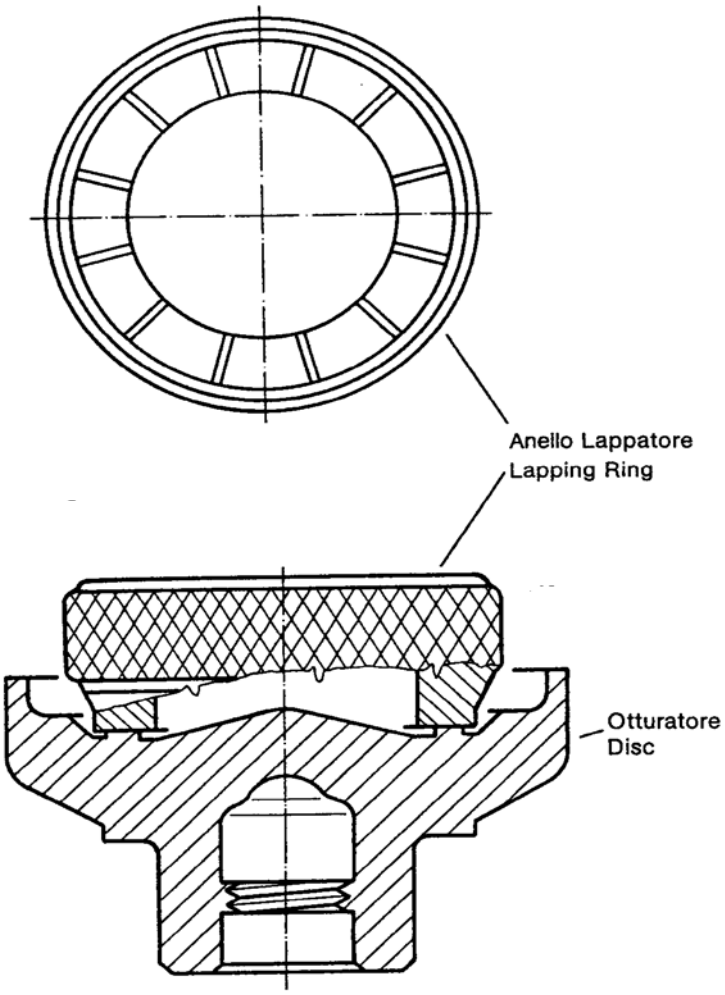


Fig. 17

3.3.0 Superfinitura

E' un'operazione supplementare che può essere eseguita dopo la lappatura per rendere ancora più lisci i piani di tenuta, fino a conferire loro l'aspetto speculare. La superfinitura migliora la tenuta. Si esegue con diamante in sospensione liquida. Su un anello lappatore liscio si fissa uno speciale panno

lucidatore adesivo (Pellon) tagliato secondo la forma dell'anello. Con l'uso di un pennello si bagna il panno con il liquido e quindi si opera come per la lappatura, insistendo solo per pochi secondi.

3.3.0 Super finish

This supplementary operation, which can be carried out after lapping, will polish the seat surfaces to a mirror-like appearance, thus improving the seating tightness. Diamond bort in liquid suspension is used in this operation, which is carried out as follows: use a special adhesive polishing pad (Pellon); cut it to size; fix it to a smooth lapping ring; using a brush, wet the pad with the liquid and proceed as for lapping, continuing no longer than a few seconds.

3.4.0 Istruzioni aggiuntive per valvole con otturatore in due pezzi D_2 per vapore

3.4.0 Added instructions for valves with two piece discs type D_2 for steam service

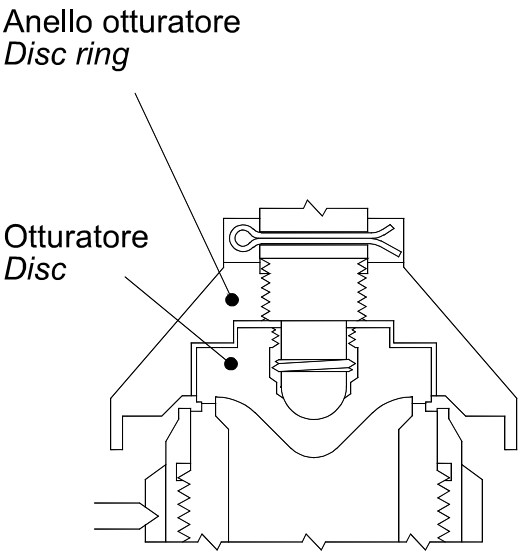


Fig. 18

Prima di assemblare la valvola controllare lo stato dell'accoppiamento tra punta dello stelo e otturatore.

In particolare, se si sostituisce l'otturatore, occorre lappare in accoppiamento le due parti per ottenere l'adattamento reciproco delle superfici W di appoggio.

Usare abrasivo a grana 800 circa e agire con l'otturatore, come se si trattasse di un anello lappatore. Lappare fino a che il contatto non si estende su una fascia sufficientemente larga Wmin, come indicato in fig. 19.

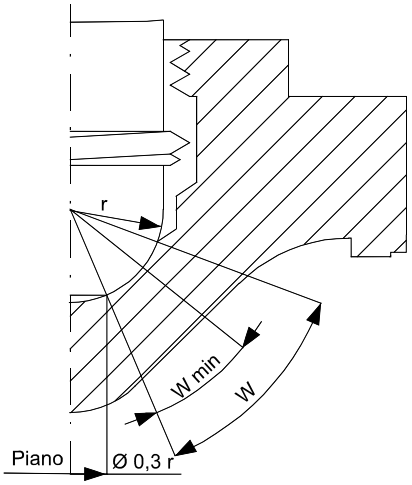
Se l'otturatore tocca lo stelo solo in corrispondenza del centro della superficie semi-sferica non insistere nel lappare, ma ricreare prima un piano, all'estremità dello stelo, di diametro pari circa il 30% del raggio della sfera (fig. 19).

Before assembling, check the condition of the contact surfaces between the tip of the spindle and disc. In particular, if the disc is replaced, the two parts must both be ground together to obtain perfectly matching contact surfaces W. Use 800 approximately grain lapping compound and work with the disc as though it were a lapping ring. Lap until contact has extended over a sufficiently wide surface Wmin, as indicated in fig. 19.

If the disc touches the spindle only in correspondence to the centre of the semi-spherical tip, do not persist in lapping, but first create a plane surface at the end of the spindle, the diameter of which should be about 30% of the radius of the sphere (fig. 19).

Per regolare il gioco “a” tra otturatore e anello otturatore portare quest’ultimo contro l’otturatore fino ad annullare la luce tra i due pezzi; quindi, prendendo per riferimento il foro dello stelo per la copiglia di fissaggio, ruotare in senso antiorario l’anello otturatore di un numero di fresature pari a quello riportato, per ogni orifizio, nella tabella di fig. 20.
Avvitare l’anello di regolazione del blowdown completamente, o quasi, sul boccaglio per essere certi che lo stesso non vada poi a toccare l’anello otturatore, impedendo il contatto tra otturatore e boccaglio. Quando la valvola è rimontata, sistemare l’anello di regolazione nella posizione originale.

To adjust the clearance ”a” between disc and disc ring, move the latter against the disc until the gap between the two pieces disappears; then, using as a reference point the spindle hole for the cotter pin, rotate in an anticlockwise direction the disc ring back by the number of grooves equal to that indicated for each orifice in the table in fig. 20.
Screw the blowdown adjustment ring completely or almost completely down on the nozzle to ensure that same does not touch the disc ring preventing contact between disc and nozzle seating surfaces.
When the valve is re-assembled, adjust the disc ring to the original position.



$$W\,min = \frac{2}{3}W$$

Fig. 19

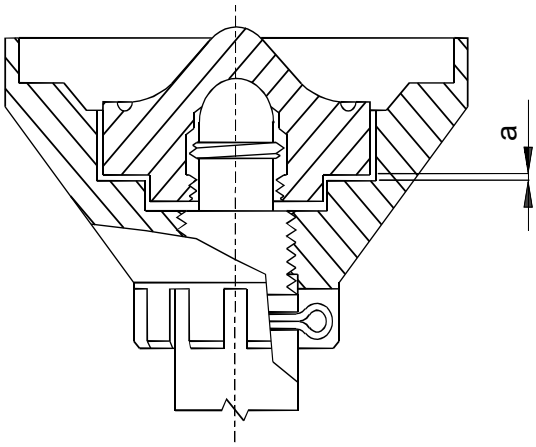


Fig. 20

Orifizio *Orifice*	No. fresature *No. of grooves*
G	4
H	4
J	4
K	4 ÷ 5
K_2	4 ÷ 5
L	5
M	5
N (51 bar)	5
N (147 bar)	7
P	8
P_3	7
Q	8

4.0.0 ISTRUZIONI PARTICOLARI PER VALVOLE DESTINATE AL SERVIZIO CON OSSIGENO O CON FLUIDO A TEMPERATURE DI ESERCIZIO CRIOGENICHE (INFERIORI A -46°C)

Queste valvole sono assemblate in fabbrica, secondo particolari procedure atte a garantire:
-un elevato grado di pulizia
-l'uso di lubrificanti compatibili con le condizioni di esercizio
-l'assenza di umidità/condense e olio entro la valvola e, in particolare, tra le sedi di tenuta.

Si raccomanda il rispetto delle seguenti regole:

Pulizia
Pulire accuratamente, con solvente non infiammabile ad alta volatilità, le superfici di tutti le parti che sono a contatto con il fluido, a valvola aperta.
Asciugare tutte le parti. L'eventuale soffiatura deve utilizzare aria compressa secca e priva di tracce d'olio. In alternativa,usare azoto.

Lubrificazione
Per le valvole per servizio con ossigeno, non applicare alcun lubrificante su stelo guida e otturatore. Applicare sono un grasso compatibile con l'ossigeno, come il Fomblin Vac3, sulla superficie del gradino di battuta e tenuta del boccaglio con il corpo.
Per le valvole per servizio criogenico, le parti filettate possono essere protette con composto anti-grippante in pasta, tipo Never Seez Ns 165; le superfici di scorrimento e snodo dello stelo devono essere spruzzate con una quantità minima di lubrificante a film secco, compatibile con la temperatura operativa. Si consiglia l'impiego di PTFE spray, come il Chesterton 82808.

4.0.0 SPECIAL INSTRUCTIONS FOR VALVES FOR SERVICE WITH OXYGEN OR AT CRYOGENIC TEMPERATURE (BELOW -46°C)

These valves are assembled, at the factory, according to dedicated procedures to guarantee:
-a high degree of cleanness
-the application of lubricants suitable for the operating conditions.
-that no moisture and lubricant traces are closed inside the valve, specially, between nozzle and disc seats

We recommend operating according to the following instructions:

Cleanness
Accurately clean, with a high volatility non-flammable solvent, the surfaces of all parts in contact with the fluid, at valve open.
Dry all parts. Blow them, if necessary, with dry and clean compressed air or nitrogen from bottles.

Lubrication
No lubricant has to be applied to spindle, guide and disc of valves for oxygen service. Only the surface of the byte of the nozzle, byte that seals against the body, can be greased with an oxygen suitable lubricant, as "Fomblin Vac3".
The threads of valve for cryogenic service can be protected with anti-seizing lubricating compound, type Never seez Ns 165; the sliding and bearing surfaces of the spindle must be coated with a thin film of dry lubricant, compatible with the operating temperature. We suggest the use of PTFE dry film lubricant, as Chesterton 82808.

Taratura

È necessario che anche il circuito di prova abbia lo stesso grado di pulizia delle valvole da tarare. Per la taratura, si consiglia l'uso di azoto, da bombola, in luogo dell'aria compressa, se questa non è adeguatamente essiccata e priva di tracce d'olio.

Le valvole sono tarate in fabbrica con azoto, con la sola eccezione delle valvole per servizio con liquidi marcate UV, poiché, in conformità alle regole di ASME VIII, in questo caso, la pressione di taratura deve essere stabilita con acqua (o altro liquido).

Il fluido di prova è indicato sul certificato d'identità e collaudo.

In questi casi, una volta ultimate le prove, è assolutamente necessario asciugare internamente la valvola, farla aprire più volte e flussandola con aria secca o azoto, al fine di eliminare ogni traccia di acqua dalle sedi.

Set pressure adjustment

The test ring must be as clean as the valve to set is. We suggest the use of nitrogen as test medium, instead of compressed air, unless it isn't thoroughly dried and cleaned.

Valves are set with nitrogen, in our factory, exception of valves for liquid service UV stamp comply with ASME VIII rules, the set pressure adjusted with water (or other liquid).

The test medium is indicated in the "Identity and Test Certificate".

In these cases, it is mandatory to internally dry the valve after testing and opening and flowing it with air or nitrogen to remove any trace of water from the seats.

Montaggio e prova di tenuta alla contropressione di valvole per servizio ossigeno

Per assicurare la tenuta sulle filettature coniche dei tappi di corpo e coperchio, applicare nastro di PTFE, lasciando scoperti i primi 2 filetti, per prevenire la lacerazione del nastro.

Per controllare la tenuta verso ambiente delle giunzioni indicate delle frecce in figura 2, utilizzare il fluido indicatore Snoop della Nupro Company.

Assembly and backpressure tightness test of valves for oxygen service.

Apply PTFE tape on the NPT threads of the plugs of body and bonnet (if any), leaving the first two threads uncovered, to prevent tape tearing.

Use the leakage detector Snoop by Nupro Company, to check the tightness of seals indicated by an arrow in figure 2.

Conservazione

Una volta tarata la molla e controllate le tenute, tappare l'ingresso e l'uscita della valvola per evitare l'ingresso di sporcizia.

Nel caso di valvole per servizio ossigeno, può essere opportuno inserire la valvola in un sacco di polietilene e sigillarlo con nastro adesivo.

Conservation

Once the spring has been adjusted and the tightness of seat and seals checked, close the valve inlet and outlet with plastic plugs, to prevent the inlet of dirty.

Enclosing the valve in a polyethylene bag and seal the bag with adhesive tape is a preferred procedure for valves for oxygen service.

Installazione delle valvole per servizio criogenico

La valvola non dovrebbe essere coibentata, al fine di mantenere la temperatura della molla vicino a quella dell'ambiente e, quindi, di minimizzare l'influenza della temperatura del fluido sulla pressione di taratura.

Si consiglia di non coibentare neppure la parte terminale del tronchetto su cui è istallata la valvola, per una lunghezza di almeno 2,5 diametri.

Per le valvole con soffietto, devono essere presi gli accorgimenti necessari a impedire che l'umidità atmosferica possa condensare e ghiacciare entro il coperchio (il soffietto, in particolare), bloccando così lo stelo entro la guida.

Accorgimenti possibili sono:

- Convogliare lo sfiato del coperchio a un ambiente mantenuto a pressione quasi atmosferica e privo di umidità.
- Applicare al foro di sfiato del coperchio una valvola di non ritorno in modo da consentire il flusso solo dal coperchio all'atmosfera. Questa valvola deve essere idonea all'impiego in bassa temperatura, avere minima pressione di apertura, grande sezione di passaggio e assicurare una tenuta pressoché perfetta.
- Applicare al foro di sfiato del coperchio un trasmettitore di pressione e controllare che il coperchio non venga pressurizzato.
- Applicare al foro di sfiato del coperchio un tappo in plastica che possa essere espulso dalla pressione, in caso di rottura del soffietto.

Gli ultimi due accorgimenti richiedono una costante sorveglianza delle condizioni della valvola.

Consigliamo di adottare una delle altre due soluzioni proposte, quando possibile.

TAI può fornire la valvola di non ritorno, su richiesta.

Installation of valves for cryogenic service.

The valve should be not insulated, in order to keep the spring temperature close to the ambient one and, therefore, to minimize the influence of the medium temperature on the valve set pressure

We suggest not insulating the ending part of the nozzle on which the valve is installed, for a length of 2.5 diameters.

In case of valves with bellows, suitable solutions need to be actuated in order to avoid condensation and freezing of atmospheric moisture inside the bonnet (especially inside the bellows), thus blocking the spindle in the guide.

Suitable solutions are:

- *To pipe the bonnet vent hole to an environment free of moisture, kept at atmospheric pressure, or close to it.*
- *To couple, to the bonnet vent hole, a check valve, which only allows the flow from the bonnet to atmosphere. The check valve shall be suitable for the low temperature service condition. Other characteristics shall be: minimum opening pressure, large flow area, perfect tightness against reverse flow.*
- *To couple, to the bonnet vent hole, a pressure transmitter for checking the pressure inside the bonnet.*
- *To couple, to the bonnet vent hole, a plastic plug that could be ejected by the pressure, in case of bellows failure.*

The last two solutions need a continuous monitoring of the valve condition.

We suggest the application of one of the other two proposed solutions, if possible.

TAI can supply the check valve, on request.

ACCESSORI PER LA LAPPATURA FORNITI DALLA TAI

TAI è in grado di fornire tutto il materiale necessario per la manutenzione delle proprie valvole; TAI può inoltre fornire attrezzature di prova utilizzabili con valvole di sicurezza flangiate, secondo norme ASME/ANSI, UNI, DIN ecc, di qualsiasi costruttore. In particolare:

- Banchi prova per taratura con aria o azoto
- Unità per la prova idrostatica di corpi valvola
- Dispositivi pneumatici per la verifica della pressione di taratura di valvole di sicurezza in esercizio con vapore d'acqua e gas non tossici o pericolosi.

LAPPING ACCESSORIES SUPPLIED BY TAI

TAI can furnish all equipment and expendable materials necessary for service its valves; TAI can also supply test equipments suitable for flanged safety valves, according to ASME/ANSI, UNI, DIN codes, whatsoever the manufacturer, among which:

- Safety valve test benches for setting set pressure with air or nitrogen
- Units for the hydrostatic testing of valve bodies
- Pneumatic setting devices to allow the checking of set pressure of safety valves in operation with steam or non-tossic or dangerous gases.

Cassetta contenente piastra lappatrice e cassetta contenente anelli lappatori

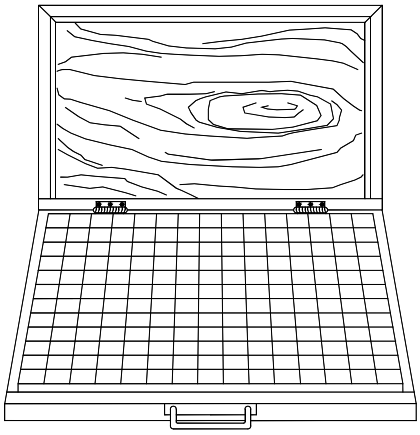


Fig. 21

Box containing lapping plate and box containing lapping rings

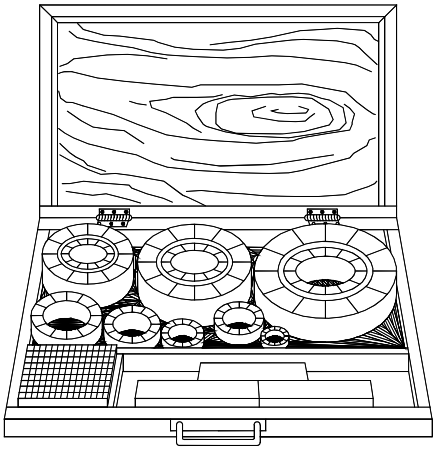


Fig.22

BANCO PROVA VALVOLE DI SICUREZZA

SAFETY VALVE TEST BENCH SUPPLIED TAI

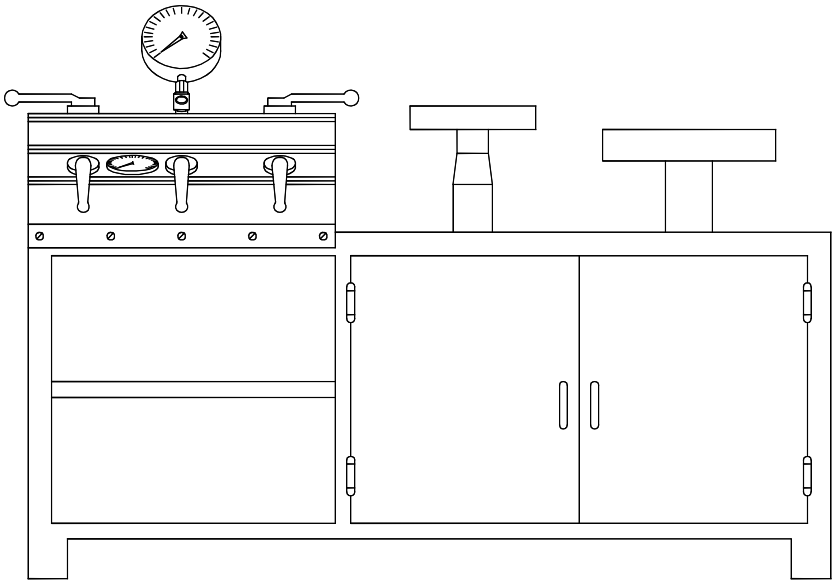


Fig. 23

APPENDICE A
COPPIE DI SERRAGGIO DELLA BULLONERIA

Per il serraggio della bulloneria di corpo/coperchio delle valvole a molla Serie 3000, 3000A, 3000B e 3000W si richiede l'uso di chiave dinamometrica e l'applicazione dei valori di coppia sotto indicati, in funzione del diametro di filettatura e del materiale delle guarnizioni. La filettatura del prigioniero e il piano di appoggio del dado sulla flangia dovrebbero essere lubrificati con Never Seez NS 165.
Qualora non sia consentita l'applicazione di alcun lubrificante, e quindi si avviti a "secco", raddoppiare i valori di coppia dati in tabella, per ottenete circa lo stesso carico assiale nel prigioniero.
Serrare i dadi a croce; cominciare dal punto dove maggiore appare la distanza tra flangia e corpo. Precaricare la bulloneria procedendo passo a passo; applicare inizialmente una coppia non superiore al 30% del valore finale (di tabella).

ANNEX A
BOLT PRELOADING BY TORQUE

Series 3000 - 3000A - 3000B - 3000W valves body-bonnet bolts have to be preloaded by applying to the nuts the torque values given in the following table, using a torque wrench.
Stud threads and nut bearing surfaces (the ones facing the flange) should be lubricated with Never Seez NS 165.
If no lubrication is allowed, torque values, twice the ones given in the table, have to applied to the nuts to obtain approx. the same axial stud preloads.
Tighten bolts in a diagonal sequence starting with the bolt where there is the largest gap between flange and body. The bolt preload shall be applied in suitable steps; in the first one, apply a torque not greater than 30% of the final value (value given in table).

	Guarnizione. in PTFE *PTFE gaskets*		Guarnizione. in grafite *Graphite gaskets*	
Filettatura *Stud bold size*	Coppia *Applied torque*		Coppia *Applied torque*	
	[N m]	[kgf m]	[N m]	[kgf m]
M 12	22 ±10%	2.2 ±10%	27 ±10%	2.7 ±10%
M 16	55 ±10%	5.5 ±10%	69 ±10%	6.9 ±10%
M 20	110 ±10%	11 ±10%	138 ±10%	13.8 ±10%
M 24	188 ±10%	18.8 ±10%	235 ±10%	23.5 ±10%

