

## Special Purpose Eductors

The special-purpose eductors illustrated here are similar in operation to the basic Fig. 264 Eductor described on page 3.

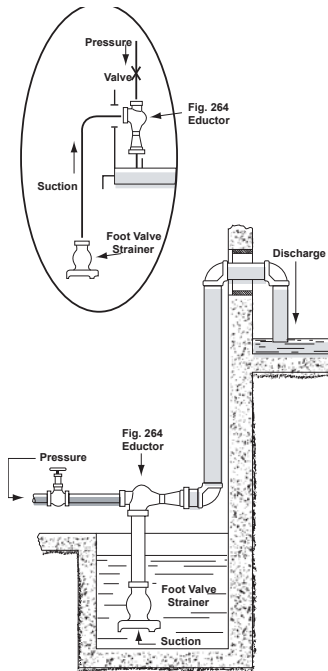


**Fig. 24. FIG. 222 PORTABLE EDUCTOR.**  
Is designed for use as an auxiliary with a pump where the suction lift is too great for the pump alone. Made of anodized aluminum, bronze or other materials as required.



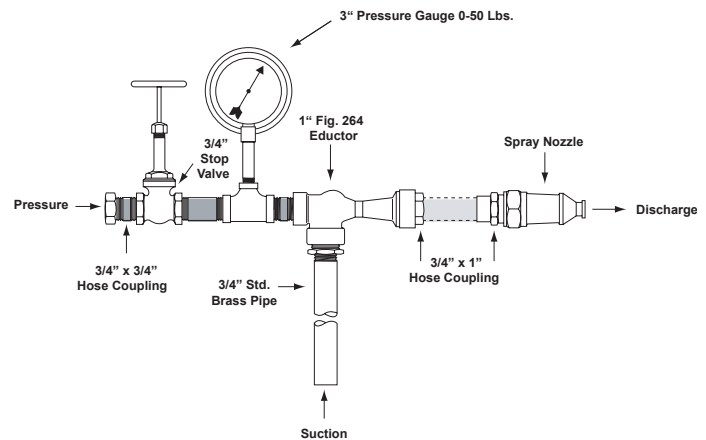
**Fig. 25. FIG. 212 CORROSION RESISTANT EDUCTOR.**  
Is made of Phenolic Fiberglass Reinforced Plastic (FRP). Body is of one-piece construction.

## TYPICAL APPLICATIONS OF S&K WATER JET EDUCTORS



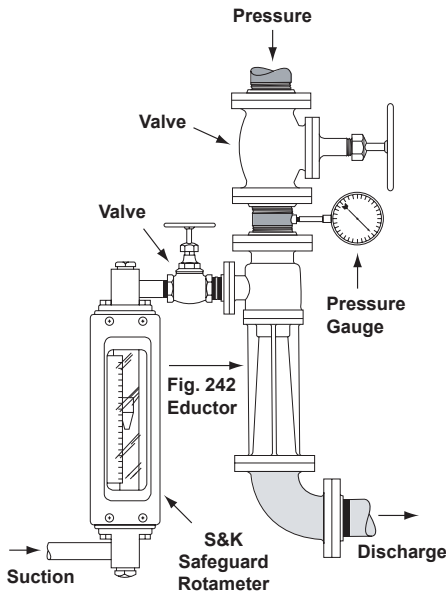
**Fig. 26. FIG. 264 EDUCTOR USED TO EMPTY TANKS.**

Water jet eductors are often used to empty tanks or to pump out sumps, penstocks, cellars, and the like. The pressure line should be fitted with a regulating stop valve and a pressure gauge while the suction line should be provided with an S&K Strainer. Discharge lines should be sealed for a positive pick-up of the liquid by turning the discharge line up or by submerging the end of the discharge line. It is recommended that the eductor be installed a short distance above the liquid to be handled and that short suction lines be used. Eductors will operate with long suction lines, as shown in the line drawing, however, with suction lifts greater than 15', capacities are reduced considerably. When handling hot liquid the eductor must be arranged with a short suction line or must be submerged.



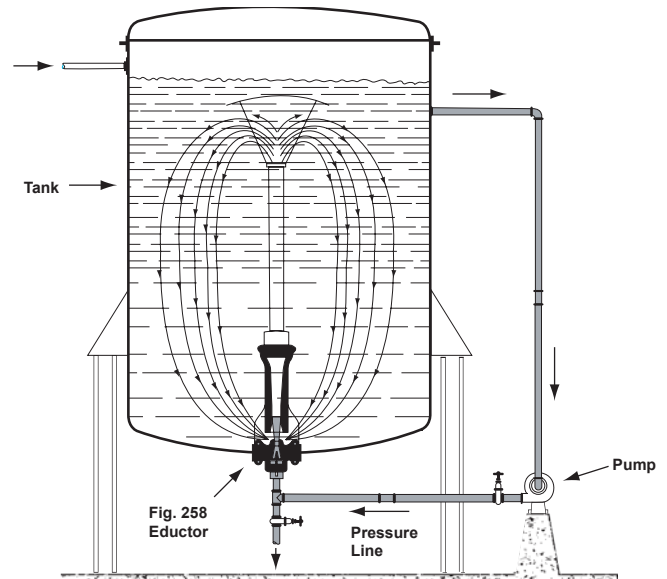
**Fig. 27. FIG. 264 EDUCTOR USED IN MIXING LIQUIDS.**

This illustration shows a typical arrangement used in mixing liquids such as chemicals or fertilizers in proportion for spraying. The solution to be applied is mixed in a container in approximately twice the strength at which it is to be used. The water jet proportioning apparatus is operated by a jet of high pressure water and is controlled by a 3/4" stop valve. A 3" pressure gauge indicates pressure. The jet action of the pressure water draws the solution from the container and the water and solution are mixed in the throat of the eductor and are discharged through a standard 3/4" hose to a spray nozzle. Solids can be handled and sprayed through a non-clogging type spray nozzle.



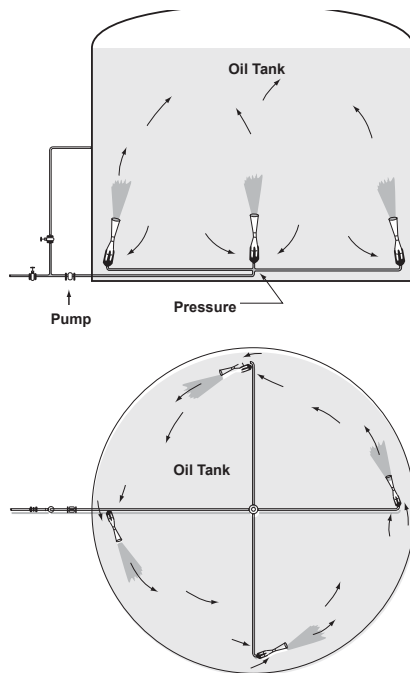
**Fig. 28. FIG. 242  
EDUCTOR USED IN  
TYPICAL  
PROPORTIONING  
SYSTEM.**

This shows a typical proportioning system using a Fig. 242 Eductor. Rate of flow is measured by a Rotameter and is controlled by a valve in the line. A valve in the pressure line and orifice of the eductor nozzle control the flow of the pressure liquid. Fluids are thoroughly mixed in the desired proportions and are then discharged.



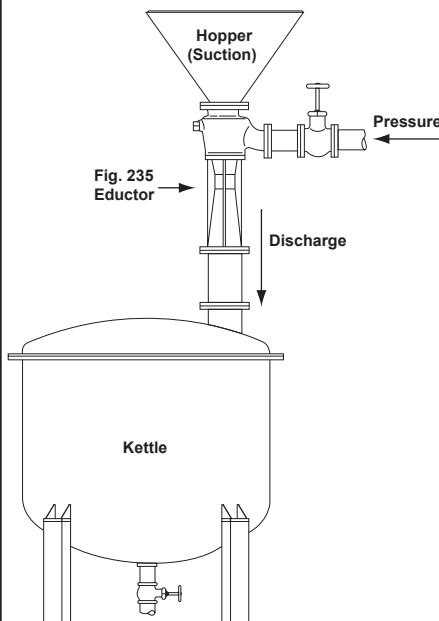
**Fig. 30. FIG. 258 EDUCTOR IN BATCH MIXING APPLICATION.**

This illustrates the batch mixing of two or more liquids with an S&K Fig. 258 Eductor. The pressure liquid, taken from the top of the tank is passed through a pump to the eductor. The jet action of this fluid entrains the liquid at the bottom of the tank and proper mixing results.



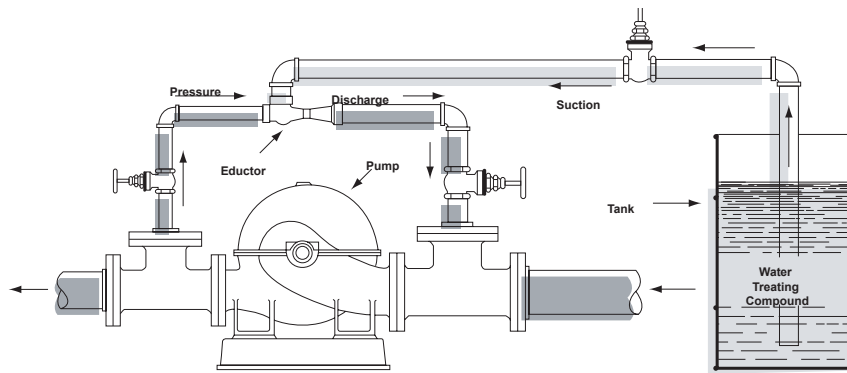
**Fig. 29. FIG. 258  
EDUCTORS FOR TANK  
BLENDING OF OILS.**

For the tank blending of oils, the arrangement shown has proved highly satisfactory. In this particular installation five 8" Fig. 258 Eductors are used in a 100' tank. Initially, the eductors are used to fill the tank during which time they provide continuous agitation. After the tank is filled, the oil is drawn off and recirculated by means of the same pumps. Oil from the top of the tank issues through the eductor nozzle and entrains oil from the bottom of the tank. The two are mixed in the throat of the eductor and are discharged with sufficient force to maintain constant agitation and further blending in the tank.



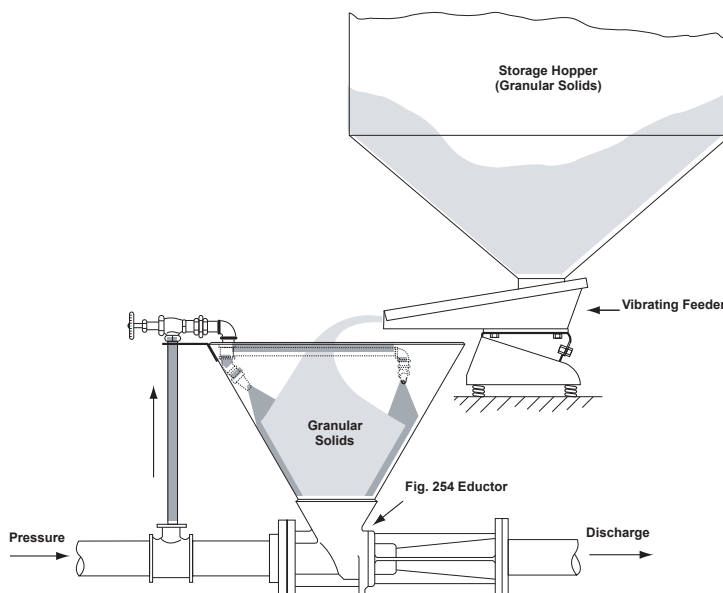
**Fig. 31. FIG. 235  
EDUCTOR USED IN  
MIXING DRY POWDER.**

Mixing dry powder and a liquid prior to discharge into a tank is accomplished through the use of a Fig. 235 Eductor as shown here. Pressure liquid enters the eductor, entrains the powder, mixes the two in the venturi of the eductor and discharges the mixture into a receptacle. The streamline eductor design provides maximum efficiency in this operation.



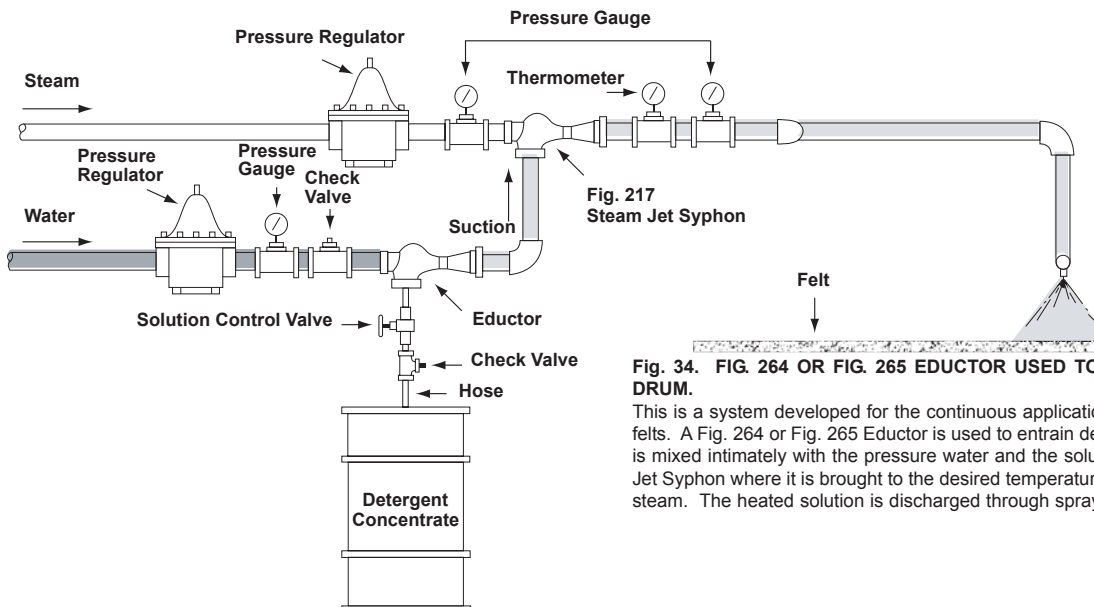
**Fig. 32. FIG. 264 OR FIG. 265 WATER JET EDUCTORS USED TO ENTRAIN ANOTHER LIQUID.**

This illustration shows a Fig. 264 or Fig. 265 Eductor being used to introduce a water treating compound into boiler feed water. A portion of the water issuing from the pump is bypassed into the eductor where it acts as the pressure medium to draw in and entrain the water treating compound.



**Fig. 33. APPLICATION OF FIG. 254 SOLIDS/LIQUID HOPPER EDUCTOR.**

One arrangement for handling granular solids with the Fig. 254 Eductor is illustrated here. In this installation, granular solids drop from a storage hopper into a vibrating feeder which feeds the solids into the eductor hopper at a controlled rate. Water, bypassed from the pressure line, flows through nozzles located in the hopper and washes the solids into the eductor. There they are entrained by the jet action of the pressure water and are discharged. Although the material can be placed in the hopper manually, this system reduces handling and controls the flow of solids.



**Fig. 34. FIG. 264 OR FIG. 265 EDUCTOR USED TO ENTRAIN DETERGENT FROM A DRUM.**

This is a system developed for the continuous application of detergent solution to paper mill felts. A Fig. 264 or Fig. 265 Eductor is used to entrain detergent from a drum. This detergent is mixed intimately with the pressure water and the solution is in turn, entrained by a Steam Jet Syphon where it is brought to the desired temperature by mixing with the syphon's motive steam. The heated solution is discharged through spray jets into the felt.





MANUFACTURER INSTALLATION OPERATION AND MAINTENANCE MANUAL  
AMARUQ WTP – NUNAVUT  
VEOLIA PROJECT: 5000 218 009

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***SEEPEX***

***SERIES BN 05-12, PROGRESSIVE CAVITY PUMP (CATIONIC POLYMER)  
(P9-621/622/623)***

*LEFT BLANK*

## Operating and Assembly Instruction Progressive Cavity Pump

Commission-no.  
868806 - 868808

Type  
BN 05-12

Read instructions before  
beginning any work!

Always keep instructions  
handy on the worksite.

Original Instructions



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## Subsidiaries



## 1.1 General notes

- Always keep the operating and maintenance instructions close by the machine.
- If problems cannot be solved with reference to the operating and maintenance instructions, please contact the manufacturer.

Observe the following points in addition to these operating and maintenance instructions:

- Prohibition, warning and mandatory signs, warning notes on the machine
- Relevant laws and ordinances
- Statutory provisions on accident prevention
- Corresponding harmonized standards and regulations

## 1.2 Safety and warning notes

- Comply with safety and warning notes for safe and efficient use of the product.

Signal words for specific dangers and (possible) consequences are explained below. These are supplemented by symbols (pictograms) if necessary.

### 1.2.1 Warning notes

|                                                                                                             |                |
|-------------------------------------------------------------------------------------------------------------|----------------|
| <b>NOTICE</b>                                                                                               |                |
| <b>Caution for machine!</b><br>Possible danger.<br>Material damage can occur.                               |                |
|                            | <b>CAUTION</b> |
| <b>Caution for people and machine!</b><br>Possible danger.<br>Minor injury or damage to property can occur. |                |
|                          | <b>WARNING</b> |
| <b>Warning for people!</b><br>Possible danger.<br>Death or serious injury can occur.                        |                |
|                          | <b>DANGER</b>  |
| <b>Danger for people!</b><br>Possible danger.<br>Immediate risk of severe or fatal injury.                  |                |

## 1.2.2 Danger symbols



**Warning:**  
Suspended load.



**Warning:**  
Tipping over.



**Warning:**  
Hand injuries.



**Warning:**  
Dangerous electrical voltage.



**Warning:**  
Pull-in hazard.



**Warning:**  
Excess pressure.



**Warning:**  
Risk to the environment.



**Warning:**  
Hot surfaces.

## 1.2.3 Information symbols

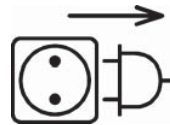
*NOTICE*



**Observe operating and maintenance instructions.**



**Ensure environmental protection.**



**Disconnect power plug before opening.**



**Wear eye protection.**



**Wear gloves.**

- Instruction to act/take measures
- List item

### 1.3 Dangers that can be caused by the machine

SEEPEx machines are built in accordance with the state of the art.

Nevertheless, there is a residual risk, because the machine works with:

- Mechanical movements that pose a danger
- Electrical voltages and currents

We have used design measures and applied safety technology to minimize the risk to the health of people posed by this danger.

### 1.4 Qualification of the personnel

This handbook is intended for:

- Owner
- Operators
- Setters
- Maintenance personnel

### 1.5 Authorized people

People authorized to undertake operation, set up and maintenance are instructed and trained specialists employed by the owner/manufacturer.



Detailed technical knowledge is essential for performing any work on the machine.

The owner is responsible for:

- Personnel training
- Compliance with safety regulations
- Compliance with operating and maintenance instructions

The operator must:

- Have received instruction
- Read and understood the relevant parts of the operating instructions before starting work
- Know the safety devices and regulations

#### 1.5.1 Tasks and information for the owner/operators

- Regularly check and maintain the machine, replacing all parts in good time which no longer guarantee safe operation.
- It is essential to comply with the procedure described in the operating instructions for shutting down the machine.
- On completion of work, attach all safety and protective devices and make sure they are functioning.

#### 1.5.2 Safety notes for maintenance, inspection and assembly work

- Do not work on the machine or system unless it is stationary and depressurised.
- Switch off the master switch and pull out the power plug before starting work on live components.
- Comply with the procedure for shutting down the machine as described in the Shut-down chapter.
- Decontaminate (de-toxify) machines that are used for pumping media that can be harmful to health.
- Refer to the Initial start-up chapter before repeated start-up of the machine.

## 1.6 Personal protective equipment

- Wear personal protective equipment and/or additional equipment for your own safety.
- Avoid/limit risks by the use of collective technical protective equipment or by organisational measures at work.

## 1.7 Safety and protective devices

- Prior to start-up, bolt SEEPEX machines onto a concrete foundation so as to ensure stability.
- Starting and stopping devices must be clearly recognisable. Take appropriate measures to avoid defects.
- No protective device is necessary for checking and/or setting the shaft seal.
- Hot surfaces are identified with a danger symbol on the machine.

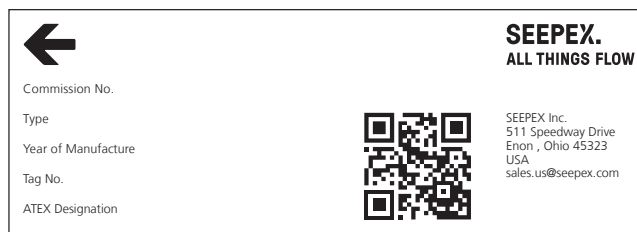
## 1.8 Foreseeable misuse

Serious personal injury and damage to property can be caused by:

- Incorrect use
- Incorrect installation or operation of the machine
- Impermissible removal of necessary protective equipment

## 1.9 Designated use

- Only use SEEPEX machines if they are in perfect condition and in compliance with the operating and maintenance instructions.
- Do not start up the machine unless the system in which the machine is installed is in accordance with the provisions of the applicable guidelines and statutory regulations.
- Equivalent sustained sound pressure level at workplaces of operating personnel C75 dB (A). Cavitation-free operation of the machine and screwed connection to concrete foundation are essential.
- SEEPEX machines are components that are exclusively intended for pumping media in accordance with the technical data (chapter 3.0). Written approval must be obtained from the manufacturer before other media are pumped.
- Refer to the information on the type plate and the operating instructions for technical data (chapter 3.0), and comply with them.
- The operating instructions are assigned to the SEEPEX machine based on the commission number.



*Similar illustration*

## 1.10 Warranty

- Warranty in accordance with our terms and conditions of delivery and order confirmation.
- It is a condition of the machine warranty that the machine must correspond to the listed operating instructions in accordance with the type plate/data sheet.
- All wearing parts are excluded from the warranty.
- These operating instructions are subject to copyright. Reproduction is not permitted and will be punished. Contravention will be pursued through the courts.

## 2.1 General description

seepex pumps are members of the group of rotating displacement pumps.

- Characteristic features
  - Special configuration/arrangement of the rotor and stator pumping elements.
  - Motion sequence

## 2.2 Mode of action and pumping principle of the seepex pump

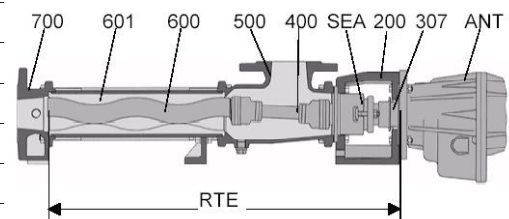
- Seal lines are created by the geometrical configuration/contact between both pumping elements.
- Seal lines provide total separation between the suction and pressure sides.

Result:

- Increased suction lift capability of the pump
- High pressure build-up irrespective of the rotation speed

## 2.3 Constructive design

| No. | Designation     |
|-----|-----------------|
| ANT | Drive           |
| 200 | Lantern         |
| 307 | Plug-in shaft   |
| 400 | Coupling rod    |
| SEA | Shaft seal      |
| 500 | Suction casing  |
| 600 | Rotor           |
| RTE | Rotating unit   |
| 601 | Stator          |
| 700 | Pressure branch |





3.1 Data sheet

3.2 Characteristic Curves



## Progressive cavity pump

### BN 05-12 / A6-J0-J0-F0-LA

U 495 XXX001

#### Application data

|                          |                              |
|--------------------------|------------------------------|
| Conveyed product         | Polymer                      |
| Flowability              | flowable                     |
| Viscosity                | low viscosity (<500 cP/mPas) |
| Solids content           | not specified                |
| Size of solids           | not specified                |
| Specific gravity         | unknown, 1 kg/dm³ assumed    |
| Product temperature      | 32°F - 113°F                 |
| pH value                 | 5-9                          |
| Kind of operation        | continuous                   |
| Operating hours          | 8h/day                       |
| Location                 | indoor, dry atmosphere       |
| Altitude of installation | up to 1000 m assumed         |
| Surrounding temperature  | normal (32-113°F)            |

#### Performance data

|                          | Capacity                       | Pressure | Speed   |     |
|--------------------------|--------------------------------|----------|---------|-----|
|                          | 0.26 USGPM                     | 80 psi   | 41 rpm  | min |
|                          | 3 USGPM                        | 80 psi   | 390 rpm | max |
| Starting torque          | 30 lb.ft                       |          |         |     |
| Req. power at pump shaft | 0.75 HP                        |          |         |     |
| Inlet pressure           | flooded suction (up to 0,5bar) |          |         |     |
| NPSHr                    | 6.23 ft                        |          |         |     |

Tolerances according to SEEPEX standards.

#### Materials and executions

|                                          |                                            |
|------------------------------------------|--------------------------------------------|
| Installation                             | vertical, drive on top                     |
| Direction of rotation                    | clockwise (right)                          |
| Lantern - Design                         | with cover plates                          |
| Lantern - Material                       | EN-JL 1040 (gci-25)                        |
| Lantern - Flange diameter                | 160 mm                                     |
| Suction casing - Design                  | standard                                   |
| Suction casing - Material                | 1.4408 / ASTM A351 grade CF8M              |
| Pressure branch - Design                 | standard                                   |
| Pressure branch - Material               | 1.4408 / ASTM A351 grade CF8M              |
| Position of branch                       | position 3                                 |
| Pressure connection                      | 1 1/2" NPT                                 |
| Suction connection                       | 1 1/4" NPT                                 |
| Joint - Design                           | pin joint with joint sleeve, grease filled |
| Joint - Material                         | standard                                   |
| Joint - Universal joint sleeve: material | NBR - Perbunan                             |
| Joint - Joint Grease                     | joint grease SEEPEX 30321                  |
| Coupling rod - Design                    | standard                                   |
| Coupling rod - Material                  | 1.6582 encapsulated                        |
| Rotor - Design                           | standard                                   |
| Rotor - Material                         | 1.4404 / AISI 316L                         |
| Rotor - Coating                          | ductile chromium coating                   |
| Stator - Design                          | standard with TSE, sensor sleeve 1.4404    |
| Stator - Material                        | NBR - Perbunan                             |
| Shaft sealing                            | mechanical seal                            |
| Code                                     | back-to-back GLRD - LA                     |
| Shaft diameter                           | 30 mm                                      |
| Make                                     | Burgmann                                   |
| Type                                     | MG1-G60 Q1Q1 VGG                           |
| Casing - material                        | 1.4404 / AISI 316L                         |
| Casing - connection standard             | NPT                                        |
| Plug-in Shaft - Design                   | standard                                   |
| Plug-in Shaft - Material                 | 1.4404 / AISI 316L                         |
| Plug-in Shaft - Drilling diameter        | 24                                         |
| Plug-in Shaft - Drilling depth           | 45                                         |
| Bolting - Design                         | completely stainless steel                 |
| Painting - Number of colors              | single-colored standard                    |
| Painting - Painted components            | 1 complete combination                     |

---

**Drive**

|                           |                              |            |            |
|---------------------------|------------------------------|------------|------------|
| <b>Drive Type</b>         | Gear & Motor at freq. inv.   |            |            |
| <b>Type</b>               | Gear                         |            |            |
| <b>Make</b>               | Nord                         |            |            |
| <b>Model</b>              | SK02F/56C                    |            |            |
| <b>Mounting position</b>  | M4                           |            |            |
| <b>Ratio (i)</b>          | 4.82                         |            |            |
| <b>Flange diameter</b>    | 160 mm                       |            |            |
| <b>Shaft diameter</b>     | 24 mm                        |            |            |
| <b>Shaft length</b>       | 45 mm                        |            |            |
| <b>Shaft drawing</b>      | 716/M500-003B4               |            |            |
|                           | <b>Norm</b>                  | <b>Min</b> | <b>Max</b> |
| <b>Speed</b>              | 373 rpm                      | 40 rpm     | 389 rpm    |
| <b>Motor speed</b>        | 1800 rpm                     | 195 rpm    | 1880 rpm   |
| <b>Frequency</b>          | 60 Hz                        | 7 Hz       | 65 Hz      |
| <b>Type</b>               | Motor                        |            |            |
| <b>Make</b>               | Marathon Motors              |            |            |
| <b>Model</b>              | 56H17T5312                   |            |            |
| <b>Rated output</b>       | 1 HP                         |            |            |
| <b>Rated speed</b>        | 1800 rpm                     |            |            |
| <b>Mounting position</b>  | V1/V5                        |            |            |
| <b>Starting</b>           | direct on frequency inverter |            |            |
| <b>Explosion proof</b>    | Weatherproof                 |            |            |
| <b>Efficiency class</b>   | IE1                          |            |            |
| <b>Winding protection</b> | Thermostats                  |            |            |
| <b>Voltage</b>            | rated voltage 575V           |            |            |
| <b>Frequency</b>          | 60Hz                         |            |            |
| <b>Thermal class</b>      | F                            |            |            |
| <b>Enclosure</b>          | TENV                         |            |            |

---

**Baseplate**

|                      |                            |
|----------------------|----------------------------|
| <b>Design</b>        | 1/2" thick plate, 10" wide |
| <b>Material</b>      | steel, painted             |
| <b>GPU Type Code</b> | B-ST                       |

---

**TSE**

|                                 |                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Design</b>                   | standard design, complete<br>- sensor sleeve fitted to the stator of the pump with integrated temperature sensor<br>- connection head (IP55)<br>- separate TSE control device suitable for mounting inside a control panel |
| <b>Voltage</b>                  | 110-115V/50-60Hz                                                                                                                                                                                                           |
| <b>Temperature coefficient</b>  | NTC                                                                                                                                                                                                                        |
| <b>Material sensor sleeve</b>   | 1.4404                                                                                                                                                                                                                     |
| <b>Material connection head</b> | aluminium                                                                                                                                                                                                                  |

---

**Packing**

|                        |            |
|------------------------|------------|
| <b>Type of packing</b> | crate (US) |
|------------------------|------------|

---

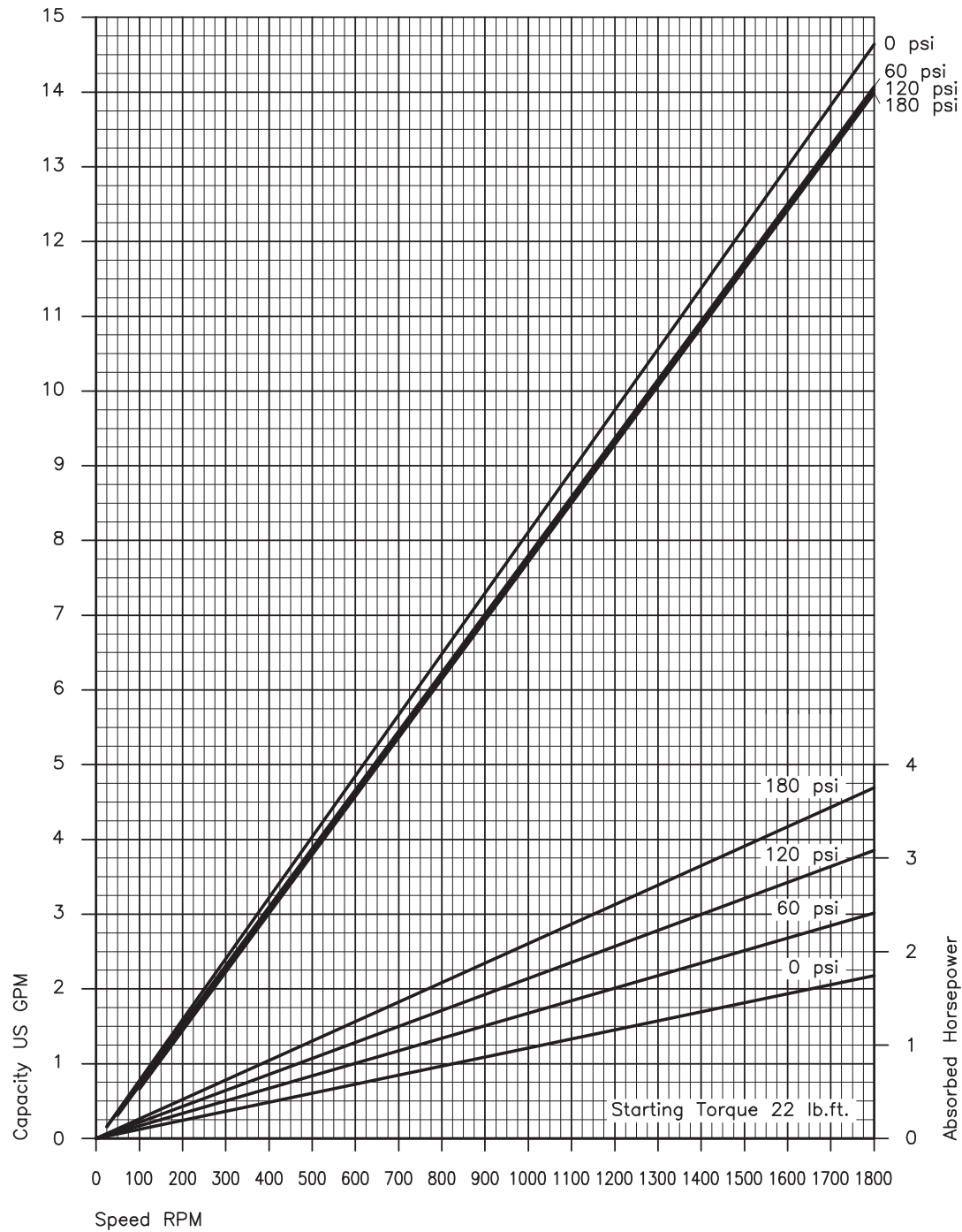
**Miscellaneous**

|               |                                                           |
|---------------|-----------------------------------------------------------|
| <b>Design</b> | Tag each: P9-621, P9-622, P9-623<br>Tag all: PI018, 98345 |
|---------------|-----------------------------------------------------------|

---

**Documentation**

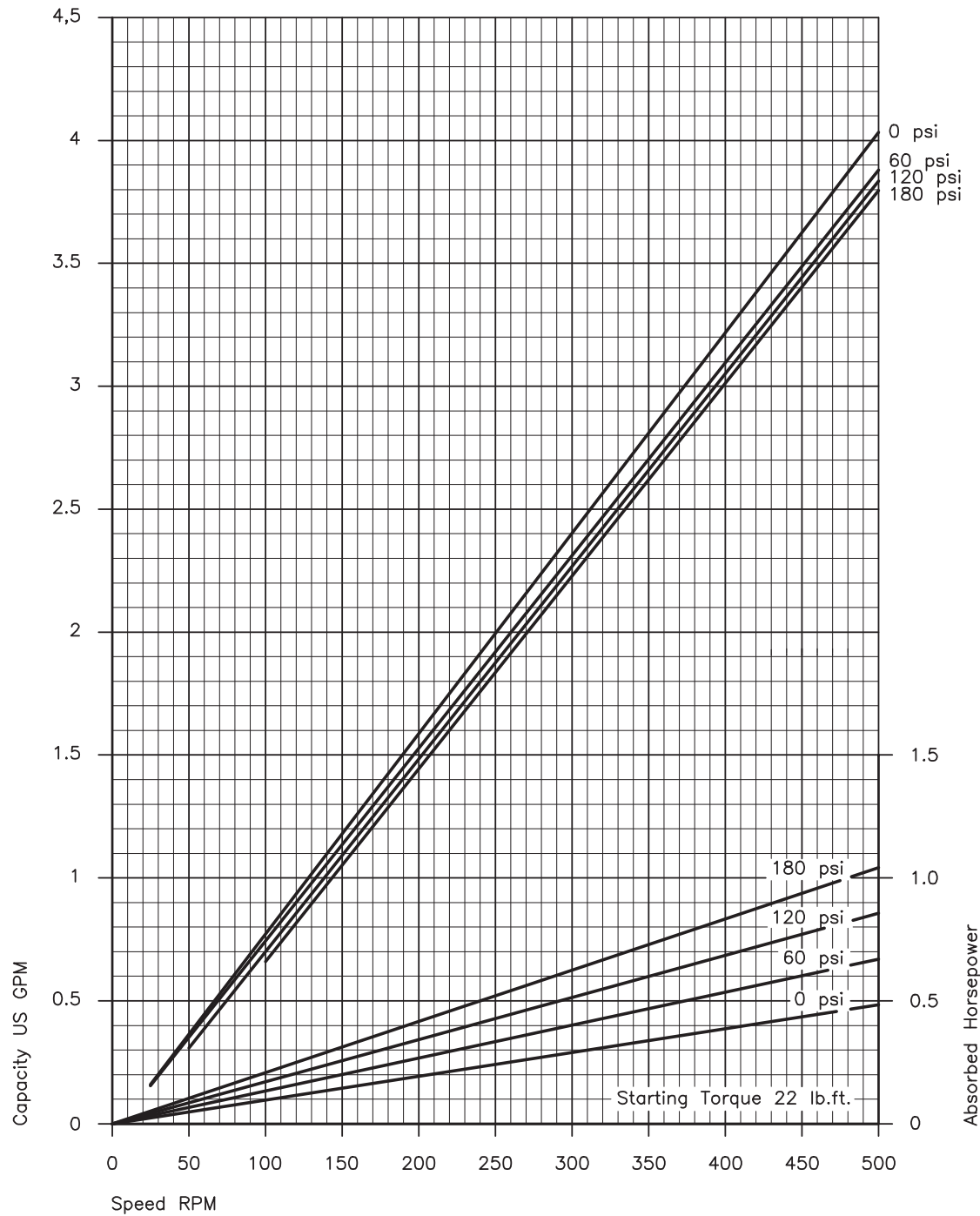
Characteristic Curves  
Size  
05-12



Values based upon water 68°F ; For notes on drive selection refer to PER



Characteristic Curves  
Size  
05-12



Values based upon water 68°F ; For notes on drive selection refer to PER

CHA.05-12.s D 01.14us



## 4.1 Safety

|                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CAUTION</b>                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Damage to property/injuries due to incorrect transport.</b><br/>Slight injury or damage to property can occur.</p> <ul style="list-style-type: none"> <li>➤ Comply with the safety notes and transport notes on the packaging.</li> <li>➤ Use suitable means of transport, lifting devices and tools.</li> <li>➤ Use protective equipment.</li> </ul> |

## 4.2 Transport

### 4.2.1 Dimensions, weight and centre of gravity

- Note the dimensional drawing (chapter 5.6).

### 4.2.2 Symbol

- Meaning of symbol



Top



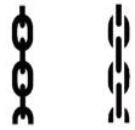
Fragile  
item



Against moisture  
protect



Centre of gravity

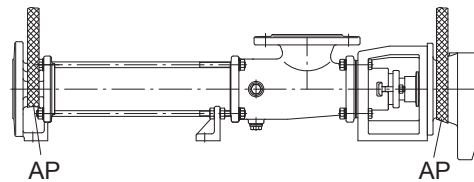


Lashing points

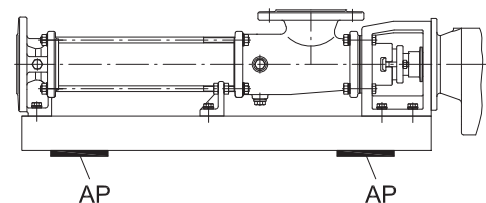
### 4.2.3 Lashing points (AP) for lifting devices

|  |                                                                                                                                                                                                                                                                                                                  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p style="text-align: center;"> <b>WARNING</b></p> <p><b>Warning of suspended load.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Use the lashing points (AP) for lifting devices.</li> <li>➤ Note the centre of gravity (dimensional drawing chapter 5.6).</li> </ul> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Lifting machine



Industrial trucks



### 4.2.4 Unpacking the machine

- Comply with the symbols and notices on the packaging.
- Remove the screwed connection between the machine and packaging.
- Remove the machine with a lifting machine/industrial truck.

### 4.3 Temporary storage/corrosion protection

- All SEEPEX machines have corrosion protection applied as standard prior to transport.

| <i>NOTICE</i>                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Damage to property if corrosion protection is missing.</b><br/>Property damage can occur due to corrosion.</p> <ul style="list-style-type: none"> <li>➤ Temporary storage must be in a dry, enclosed, frost-free room in order to provide protection against ambient influences.</li> <li>➤ Contact SEEPEX regarding the necessary corrosion protection for temporary storage.</li> </ul> |

### 4.4 Disposal

| <i>NOTICE</i>                                                                     |                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Environmental protection.</b><br/>Material damage can occur.</p> <ul style="list-style-type: none"> <li>➤ Drain the pumping medium and dispose of it in accordance with the regulations.</li> <li>➤ Dispose of the machine with regard to its composition and existing regulations.</li> </ul> |

### 5.1 Mounting tools / lifting gear

|                                                                                                                                                                                                                                                                                                                                 |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
|                                                                                                                                                                                                                                                | <b>CAUTION</b> |
| <p><b>Pump falling over.</b><br/>Slight injury or damage to property can occur.</p> <ul style="list-style-type: none"> <li>➤ Adhere to the lifting tool's starting point.</li> <li>➤ Pay attention to the dimensions, weight and centre of gravity of the pump.</li> <li>➤ Use suitable mounting tools/lifting gear.</li> </ul> |                |

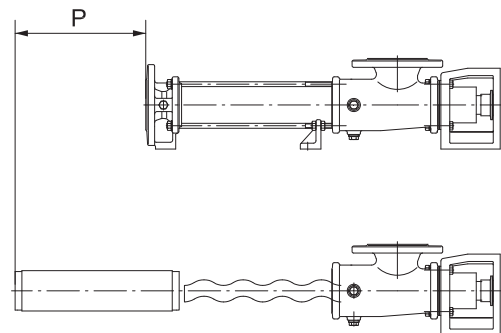
### 5.2 Space requirement

The required space should be determined by considering the following factors:

- Dimensions and weight.
- Requisite transport and lifting equipment.
- Pipe routing – dismantling (dimension for stator replacement).

#### 5.2.1 Dimension for stator replacement (P)

- Refer to the dimensional drawing.



### 5.3 Assembly of the complete mounted pump

- Assemble according to technical data (chapter 3.).
- Note dimensional drawing.

#### Tension-free mounting of the pump

- Balance unevenness with suitable supports.
- Applies to mounting on foundations/load-bearing elements.
- Total areas of all pump bearing areas are resting on the surface.

#### Correct position of the drives

- All drives are set up ready for operation and mounted.
- Correct displacements of the drive during transport/installation of the pump by adjusting/fixing the drive.

|                                                                                                                                                                                                  |                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
|                                                                                                               | <b>CAUTION</b> |
| <p><b>Safety protection devices.</b><br/>Slight injury or damage to property may result.</p> <ul style="list-style-type: none"> <li>➤ Connect safety protection devices and activate.</li> </ul> |                |

#### 5.4 Power supply of the SEEPEX pump

|                                                                                   |                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  <b>DANGER</b>                                                                                                                                                                                             |
|                                                                                   | <p><b>Line voltage and line frequency.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Note type plate on the pump.</li> <li>➤ Pay attention to manufacturer's directions (chapter 13.).</li> <li>➤ Pay attention to safety regulations.</li> </ul> |

#### 5.5 Pipelines

##### 5.5.1 Suction and pressure connection

- Refer to the dimensional drawing for the position, nominal width and standard.
- Note direction of rotation/flow direction.

##### 5.5.2 Pipeline dimensions

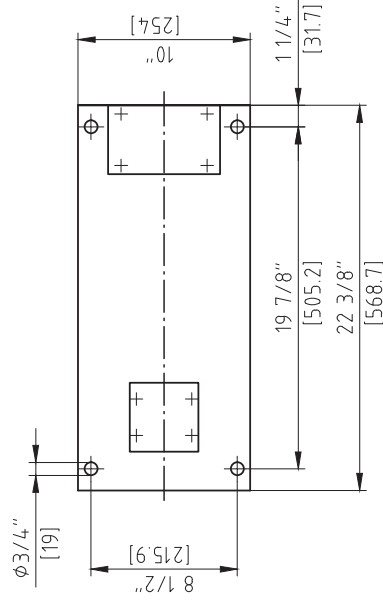
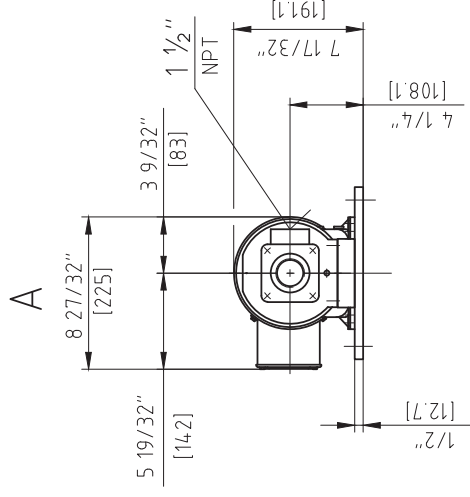
- Adhere to specifications regarding pressure in the pressure respectively suction connection.
- Note technical data (chapter 3.).
- Nominal width of suction pipe = nominal width of suction connection of pumps.

##### 5.5.3 Residue-free pipelines

|                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NOTICE                                                                                                                                                                                                                                                          |
| <p><b>Damage to property through assembly residue.</b><br/>No claims under guarantee if violated.</p> <ul style="list-style-type: none"> <li>➤ Keep all pipelines free of foreign objects.</li> <li>➤ Remove weld spatters, screws, steel chips etc.</li> </ul> |

##### 5.5.4 Tension-free assembly

- Assemble pipelines and other components in a tension-free manner on the pump.



| Quant. | Denomination                     |
|--------|----------------------------------|
| 1      | 1000                             |
| 2      | 500                              |
| 3      | 250                              |
| 4      | 100                              |
| 5      | 50                               |
| 6      | 25                               |
| 7      | 10                               |
| 8      | 5                                |
| 9      | 2                                |
| 10     | 1                                |
| 11     | 0.50                             |
| 12     | 0.25                             |
| 13     | 0.10                             |
| 14     | 0.05                             |
| 15     | 0.02                             |
| 16     | 0.01                             |
| 17     | 0.005                            |
| 18     | 0.002                            |
| 19     | 0.001                            |
| 20     | 0.0005                           |
| 21     | 0.0002                           |
| 22     | 0.0001                           |
| 23     | 0.00005                          |
| 24     | 0.00002                          |
| 25     | 0.00001                          |
| 26     | 0.000005                         |
| 27     | 0.000002                         |
| 28     | 0.000001                         |
| 29     | 0.0000005                        |
| 30     | 0.0000002                        |
| 31     | 0.0000001                        |
| 32     | 0.00000005                       |
| 33     | 0.00000002                       |
| 34     | 0.00000001                       |
| 35     | 0.000000005                      |
| 36     | 0.000000002                      |
| 37     | 0.000000001                      |
| 38     | 0.0000000005                     |
| 39     | 0.0000000002                     |
| 40     | 0.0000000001                     |
| 41     | 0.00000000005                    |
| 42     | 0.00000000002                    |
| 43     | 0.00000000001                    |
| 44     | 0.000000000005                   |
| 45     | 0.000000000002                   |
| 46     | 0.000000000001                   |
| 47     | 0.0000000000005                  |
| 48     | 0.0000000000002                  |
| 49     | 0.0000000000001                  |
| 50     | 0.00000000000005                 |
| 51     | 0.00000000000002                 |
| 52     | 0.00000000000001                 |
| 53     | 0.000000000000005                |
| 54     | 0.000000000000002                |
| 55     | 0.000000000000001                |
| 56     | 0.0000000000000005               |
| 57     | 0.0000000000000002               |
| 58     | 0.0000000000000001               |
| 59     | 0.00000000000000005              |
| 60     | 0.00000000000000002              |
| 61     | 0.00000000000000001              |
| 62     | 0.000000000000000005             |
| 63     | 0.000000000000000002             |
| 64     | 0.000000000000000001             |
| 65     | 0.0000000000000000005            |
| 66     | 0.0000000000000000002            |
| 67     | 0.0000000000000000001            |
| 68     | 0.00000000000000000005           |
| 69     | 0.00000000000000000002           |
| 70     | 0.00000000000000000001           |
| 71     | 0.000000000000000000005          |
| 72     | 0.000000000000000000002          |
| 73     | 0.000000000000000000001          |
| 74     | 0.0000000000000000000005         |
| 75     | 0.0000000000000000000002         |
| 76     | 0.0000000000000000000001         |
| 77     | 0.00000000000000000000005        |
| 78     | 0.00000000000000000000002        |
| 79     | 0.00000000000000000000001        |
| 80     | 0.000000000000000000000005       |
| 81     | 0.000000000000000000000002       |
| 82     | 0.000000000000000000000001       |
| 83     | 0.0000000000000000000000005      |
| 84     | 0.0000000000000000000000002      |
| 85     | 0.0000000000000000000000001      |
| 86     | 0.00000000000000000000000005     |
| 87     | 0.00000000000000000000000002     |
| 88     | 0.00000000000000000000000001     |
| 89     | 0.000000000000000000000000005    |
| 90     | 0.000000000000000000000000002    |
| 91     | 0.000000000000000000000000001    |
| 92     | 0.0000000000000000000000000005   |
| 93     | 0.0000000000000000000000000002   |
| 94     | 0.0000000000000000000000000001   |
| 95     | 0.00000000000000000000000000005  |
| 96     | 0.00000000000000000000000000002  |
| 97     | 0.00000000000000000000000000001  |
| 98     | 0.000000000000000000000000000005 |
| 99     | 0.000000000000000000000000000002 |
| 100    | 0.000000000000000000000000000001 |

Drawing—no.

Checked

General tolerances for dimensions without specified tolerances acc. to DIN ISO 2768-mS



## Master Copy

### 6.1 Commissioning report

Send commissioning report online to  
[www.seepex.com](http://www.seepex.com)

**Must be specified with every order!**

**Commission:**

\_\_\_\_\_

**Model:**

\_\_\_\_\_

**From:**

Contact person: .....

Tel.: .....

Fax: .....

E-mail: .....

**Customer Service:**

SEPEX Inc.

511 Speedway Drive

Enon, Ohio 45323

service@seepex.com

**Address of plant:**

.....  
.....  
.....  
.....  
.....

Delivery date:

Date of installation:

Assembly check carried out on:

Please enter operational data:

Conveying liquid:

Temperature:

Fuse level/motor protection or power  
consumption

Frequency control

☐ no

☐ yes

If yes:

☐ Supplied by SEPEX

☐ Supplied by customer

Frequency:

Speed:

Power  
consumption:

Place, date

Signature / company stamp

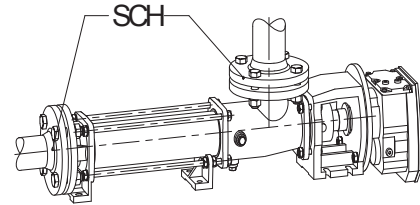


## 6.2 Measures before commissioning

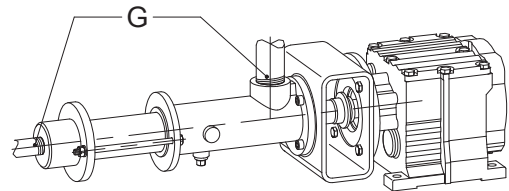
- Note the technical data (chapter 3.).

### 6.2.1 Checking pipelines

- Check flange screwed connections (SCH).



- Check threaded connections (G).



#### NOTICE

**Ensure the liquid can flow through without obstruction.**

Malfunction and/or irreparable damage to the pump.

- Open all shut-off elements before switching on the pump.

### 6.2.2 Protective devices on the pump

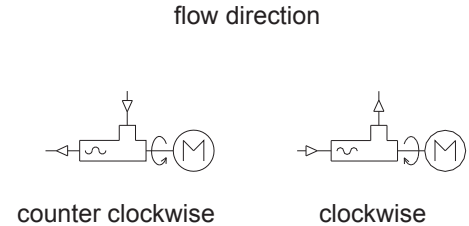
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: red; color: white; padding: 5px; text-align: center;"> <b>DANGER</b> </div> <p><b>Missing protective device.</b><br/>Danger of pulling in and crushing.</p> <ul style="list-style-type: none"> <li>➤ Equip the pump with a protective device. Protective devices provided for preventing contact with surfaces or moving parts must be regarded as suitable if contact is not possible in a test involving a test finger, with regard to the penetration possibility, strength and shock resistance.</li> <li>➤ Comply with national protection regulations.</li> <li>➤ In pumps with an open suction flange/feed hopper, attach touch protection. These safety clearances protect those persons who are attempting to reach danger areas without additional help and under the conditions defined for various situations of reaching up, reaching under or reaching through</li> </ul> <p>In shaft seals, touch protection is only necessary if there are components on the rotating shaft.</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 6.2.3 Electrical/hydraulic connections

|  |                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <div style="background-color: red; color: white; padding: 5px; text-align: center;"> <b>DANGER</b> </div> <p><b>Dangerous voltage.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Observe safety regulations.</li> <li>➤ Disconnect the pump from all sources of energy.</li> <li>➤ Prevent electrical connections from being switched on again.</li> </ul> |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

#### 6.2.4 Direction of rotation check

- The pump direction of rotation determines the flow direction of the pumping medium.
- Note the direction of rotation arrow on the type plate.



#### 6.2.5 Additional devices - optional

- Refer to additional devices (chapter 12.1).

#### 6.3 Initial commissioning/repeated commissioning

- Start up the pump.

| <i>NOTICE</i>                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Dry running of the pump.</b><br/>Malfunction and/or irreparable damage to the pump.</p> <ul style="list-style-type: none"> <li>➤ Fill the suction casing with liquid in order to lubricate the pumping elements.</li> </ul> |

##### 6.3.1 Avoid dry running of the pump

| <i>NOTICE</i>                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>High temperature between rotor and stator.</b><br/>Stator material burned.<br/>Complete failure of the pump</p> <ul style="list-style-type: none"> <li>➤ Make sure that the suction-side conveying capacity does not cavitate.</li> <li>➤ If this cannot be guaranteed on the machine side, assemble a SEEPEX dry running protection (DRP).</li> </ul> |

##### 6.3.2 Pressure in the suction and pressure connection

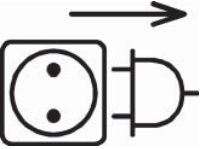
|                                                                                     |  <b>CAUTION</b>                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>High pressure.</b><br/>Malfunction and/or irreparable damage to the shaft seal or pump.</p> <ul style="list-style-type: none"> <li>➤ Maintain pressure in the suction connection in accordance with the technical data (chapter 3.).</li> <li>➤ Assemble an oil-filled contact pressure gauge to monitor and deactivate the pump.</li> </ul> |

#### 6.4 De-commissioning

Protect the pump and additional devices against the following:

- Frost
- Deposit of solids
- Sedimentation from the liquid
- Corrosion of parts that come into contact with the medium

#### 6.4.1 Switching off the pump

|                                                                                                                                                                                                                                                                                            |                 |                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|
|                                                                                                                                                                                                           | <b>! DANGER</b> |  |
| <p><b>Dangerous voltage.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Observe safety regulations.</li> <li>➤ Disconnect the pump from all sources of energy.</li> <li>➤ Prevent electrical connections from being switched on again.</li> </ul> |                 |                                                                                     |

#### 6.4.2 Emptying the pump

|                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>! CAUTION</b>                                                                                                                                                                                                                                                                         |
| <p><b>Liquid draining out.</b><br/>Minor injury or damage to property can occur.</p> <ul style="list-style-type: none"> <li>➤ Wear suitable protective clothing.</li> <li>➤ Refer to the technical data (chapter 3.) for the corresponding configuration of the pump housing.</li> </ul> |

To drain the pump:

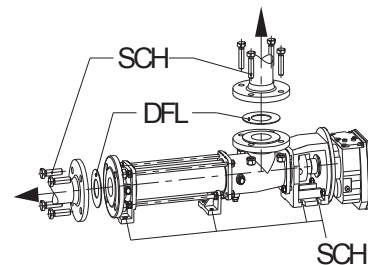
- If the pump housing has screwed plugs, remove the screwed plugs.
- Drain using a connection branch (suction casing, pressure branch) if the pump housing is coated or the housing does not have screwed plugs.
- Drain the residual liquid from the pump housing.
- Drain the pipelines on the suction and pressure sides, or shut off behind the pump connections.

#### 6.4.3 Removing the pump

|                                                                                                                                                                                          |                  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--|
|                                                                                                       | <b>! WARNING</b> |  |
| <p><b>Risk of pump tipping or falling.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Support the drive unit to guarantee stability.</li> </ul> |                  |  |

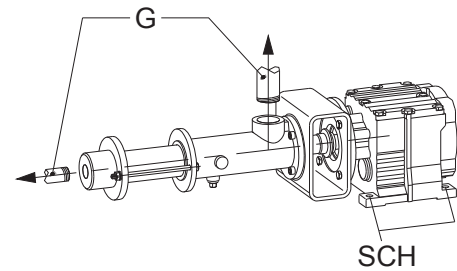
##### Pipeline dismantling

- Remove flange bolts (SCH) and flange seals (DFL).
- with/without base plate
- Remove bolts (SCH) from the pump feet.



#### Pipeline dismantling

- Remove threaded connections (G).  
with/without base plate
- Remove bolts (SCH) from the pump feet.



#### 6.4.4 Preservation/storage of the pump

##### NOTICE

**Damage to property due to lack of corrosion protection.**

Property damage can occur due to corrosion.

- Contact SEEPEX to discuss suitable preservation measures.
  - State the commission number of the pump.

## 7.1 Preventive measures



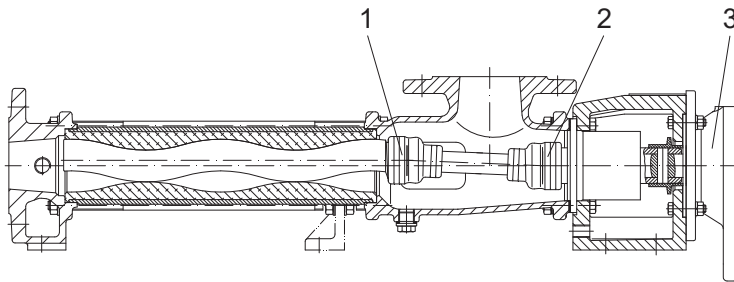
The maintenance personnel must have these operating instructions, follow them and also require corresponding qualifications.

|  |                                                                                                                                                                                                                                                                                            |  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <b>⚠ DANGER</b>                                                                                                                                                                                                                                                                            |  |
|  | <p><b>Dangerous voltage.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Observe safety regulations.</li> <li>➤ Disconnect the pump from all sources of energy.</li> <li>➤ Prevent electrical connections from being switched on again.</li> </ul> |  |

### 7.1.1 Pump down-time

|                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>NOTICE</i>                                                                                                                                                                     |
| <p><b>Pump down-time.</b><br/>Production failure due to wear.</p> <ul style="list-style-type: none"> <li>➤ Acquisition of a set of wearing parts and a set of gaskets.</li> </ul> |

## 7.2 Lubrication



| No.          | Denomination | Lubricant                                            | Lubricant change in operating hours | Fill volume       |
|--------------|--------------|------------------------------------------------------|-------------------------------------|-------------------|
| 1            | Pin joint    | SEEPEX special grease (30321)                        | 10,000 h                            | 7 cm <sup>3</sup> |
| 2            | Pin joint    | SEEPEX special grease (30321)                        | 10,000 h                            | 7 cm <sup>3</sup> |
| 3            | Drive        | Refer to manufacturer's documentation (chapter 13._) |                                     |                   |
| Rotor/stator |              | Conveying medium                                     | ---                                 | ---               |
| Shaft seal   |              | Conveying medium                                     | ---                                 | ---               |

### 7.2.1 Joint grease

|                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>NOTICE</i>                                                                                                                                                                                     |
| <p><b>Other grease types.</b><br/>Malfunction and/or irreparable damage to the joints or the pump.</p> <ul style="list-style-type: none"> <li>➤ Exclusively use SEEPEX special grease.</li> </ul> |

### 7.3 Inspection

| Component  | Interval                                                | Action                                      |
|------------|---------------------------------------------------------|---------------------------------------------|
| Joints     | Every 10,000 operating hours                            | Renew joint grease                          |
| Shaft seal | Every week                                              | Visual check for leaks                      |
| Drive unit | Every 3,000 operating hours,<br>at least every 6 months | Comply with manufacturer's<br>documentation |

Refer to technical data (chapter 3.) for application range of the pump.

| Malfunction         |                       |                                    |                              |                        |                                  |                           |                    |                       |                     | Causes                                          | Rectification                                                                                                                                |
|---------------------|-----------------------|------------------------------------|------------------------------|------------------------|----------------------------------|---------------------------|--------------------|-----------------------|---------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Pump is not sucking | Pump pumping unevenly | Conveying capacity is not achieved | Pressure head is not reached | Pump does not start up | Pump seized / pump does not pump | Pump is loud when running | Motor gets too hot | Premature stator wear | Shaft seal is leaky |                                                 |                                                                                                                                              |
|                     |                       |                                    | X                            |                        |                                  |                           | X                  |                       | X                   | Static friction between stator/rotor too great. | Apply lubricant (liquid soap) between stator and rotor.                                                                                      |
| X                   |                       |                                    |                              |                        |                                  |                           |                    |                       |                     | Incorrect direction of rotation.                | Check direction of rotation and swap over motor connections if necessary.                                                                    |
| X                   | X                     | X                                  |                              |                        | X                                | X                         |                    |                       |                     | Suction pipe or shaft seal leaking.             | Eliminate leaks.                                                                                                                             |
| X                   | X                     | X                                  |                              |                        |                                  | X                         |                    |                       |                     | Suction head too great.                         | Check the suction head, if necessary increase pipe cross section on suction pipe and use a larger filter, open suction-side valve fully.     |
| X                   | X                     | X                                  |                              |                        |                                  |                           |                    |                       |                     | Viscosity of conveying product too great.       | Check/adapt (data sheet).                                                                                                                    |
|                     |                       | X                                  |                              | X                      |                                  |                           | X                  |                       |                     | Pump rotation speed incorrect.                  | Correct rotation speed (data sheet).                                                                                                         |
|                     | X                     | X                                  |                              |                        |                                  |                           |                    |                       |                     |                                                 | Avoid air bubbles in the conveying product.                                                                                                  |
|                     |                       | X                                  |                              | X                      | X                                |                           | X                  | X                     |                     | Pressure head too great.                        | Check pressure head with pressure gauge, reduce pressure head by using larger pressure pipe crossed section or shortening the pressure pipe. |
| X                   | X                     | X                                  |                              |                        | X                                |                           |                    |                       | X                   | Pump running partially/ completely dry.         | Check there is adequate conveying product available on the suction side. Dry running protection DRP.                                         |
|                     |                       |                                    |                              |                        |                                  | X                         | X                  |                       |                     | Check coupling.                                 | If necessary, move pump in relation to drive, check wear on coupling gear, re-adjust coupling if necessary.                                  |
| X                   |                       | X                                  |                              |                        |                                  |                           |                    |                       |                     | Rotation speed too low.                         | Increase rotation speed for low-viscosity media/large suction volume.                                                                        |

| Malfunction         |                       |                                    |                              |                        |                                  |                           |                    |                       | Causes                                                                      | Rectification                                                                            |
|---------------------|-----------------------|------------------------------------|------------------------------|------------------------|----------------------------------|---------------------------|--------------------|-----------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Pump is not sucking | Pump pumping unevenly | Conveying capacity is not achieved | Pressure head is not reached | Pump does not start up | Pump seized / pump does not pump | Pump is loud when running | Motor gets too hot | Premature stator wear |                                                                             |                                                                                          |
| X                   | X                     |                                    |                              |                        | X                                |                           |                    |                       | Rotation speed too high.                                                    | Reduce rotation speed for high-viscosity media, risk of cavitation.                      |
|                     |                       |                                    |                              |                        | X                                |                           |                    |                       | Joint play too large.                                                       | Check mounting of coupling rod bushing.                                                  |
| X                   | X                     | X                                  | X                            | X                      |                                  |                           |                    | X                     | Foreign objects in pump.                                                    | Dismantle pump, remove foreign bodies, replace defective parts.                          |
| X                   | X                     | X                                  |                              | X                      |                                  |                           |                    |                       | Stator/rotor worn.                                                          | Dismantle pump and renew defective parts.                                                |
| X                   | X                     |                                    |                              | X                      | X                                |                           |                    |                       | Joint parts worn.                                                           | Renew joint parts, use SEEPEX pin joint grease.                                          |
| X                   | X                     |                                    |                              | X                      |                                  |                           |                    | X                     | Suction pipe blocked.                                                       | Clean the suction pipe.                                                                  |
| X                   |                       |                                    | X                            | X                      |                                  | X                         | X                  |                       | Temperature of pumping liquid too high.                                     | Check temperature, use an undersize rotor.                                               |
| X                   | X                     | X                                  |                              |                        |                                  | X                         |                    | X                     | Gland packing too firm/worn.                                                | Loosen packing gland or tighten. Renew unusable packing rings.                           |
| X                   |                       |                                    | X                            | X                      |                                  |                           |                    | X                     | Solid content and/or grain size too great.                                  | Reduce pump speed, install screen with permitted mesh width. Increase liquid proportion. |
| X                   |                       |                                    | X                            |                        |                                  |                           | X                  | X                     | Sedimentation/gumming of solids when pump stationary.                       | Rinse through and clean the pump immediately.                                            |
| X                   |                       |                                    | X                            | X                      |                                  |                           | X                  | X                     | Conveying product hardens when the temperature drops below a certain limit. | Heat the pump.                                                                           |
|                     |                       |                                    | X                            | X                      |                                  | X                         | X                  |                       | Stator swollen and unable to withstand conveying product.                   | Select a suitable stator material, use an under-size rotor.                              |
|                     |                       |                                    |                              |                        | X                                |                           |                    | X                     | Bearings in pump drive housing or drive unit defective.                     | Renew bearings.                                                                          |
|                     |                       |                                    |                              |                        |                                  |                           |                    | X                     | Mechanical seal defective.                                                  | Check sliprings and O-rings for wear/resistance, renew if necessary.                     |

## 9.1 Pump Dismantling/Reassembly

Range: BN

Size: 025-12 up to 1-6L

### 9.1.1 Preparing the pump for dismantling

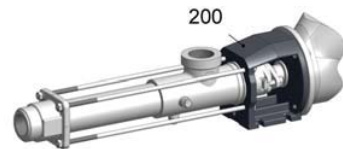
|                                                                                   |                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p style="text-align: center;"><b>! DANGER</b></p> <p><b>Dangerous voltage.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Note safety regulations.</li> <li>➤ Disconnect motor from all sources of energy.</li> <li>➤ Secure electrical connections against restarting.</li> </ul> |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- Empty pipelines.
- Allow pipelines to cool down.
- Remove pipeline connections (suction side/pressure side).
- Note decommissioning (→ chapter 6.4).



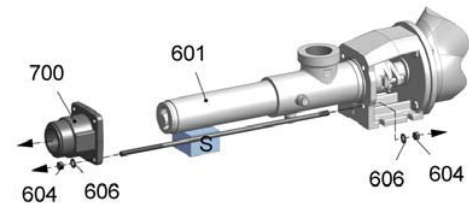
### 9.1.2 Dismantling

|                                                                                   |                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p style="text-align: center;"><b>WARNING</b></p> <p><b>Risk of pump tipping or falling.</b><br/>Death or serious injury can occur.</p> <ul style="list-style-type: none"> <li>➤ Fasten the lantern (<b>200</b>) to secure the pump.</li> </ul> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



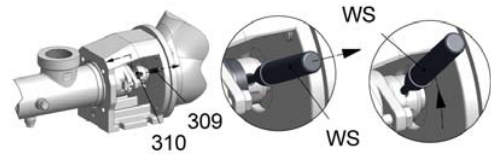
#### 9.1.2.1 Pressure branch (700) - Dismantling

- Prop up stator (**601**) with a support (**S**).
- Remove screw fitting (**604**, **606**).
- Remove pressure branch (**700**).
- Remove tie bolt (**602**).



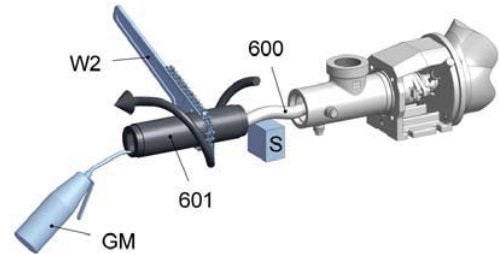
### 9.1.2.2 Stator (601) - Dismantling

- Raise/move splash ring (310).
- Remove the plug-in shaft pins (309).
- Insert tool (WS).
- Turn tool (WS) upwards.



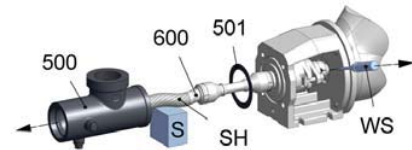
Tool (W2/chain wrench)

- Add lubricant (GM) to the opening on pressure branch side between the rotor (600) and the stator (601).
- Turn the stator (601) in the "left" rotating direction and remove.
  - Use tool (W2).
- Prop up the rotor (600) with support (S).



### 9.1.2.3 Suction casing (500) - Dismantling

- Provide rotor (600) with protective cover (SH).
- Prop up rotor (600) with support (S).
- Dismantle the suction casing (500).
- Remove tool (WS).



### 9.1.2.4 Rotating unit (RTE) - Dismantling



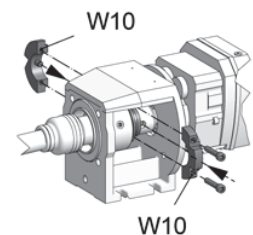
Tool (W10/dismantling tool)



Tool (W9/mounting lever)

#### with flush connection

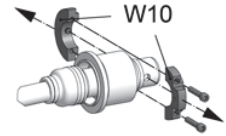
- Remove the flush connection (SSÜ) on the shaft seal casing (SEA).
- Assemble tool (W10/dismantling tool).



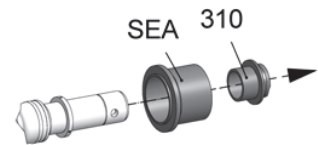
- Pull the rotating unit (**RTE**) with shaft seal (**SEA**) off from the output shaft of the drive (**ANT**).
  - Use tool (**W9**/mounting lever).



- Dismantle tool (**W10**/dismantling tool).

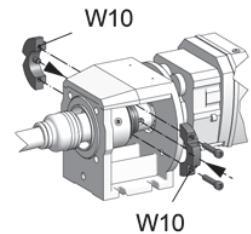


- Pull off the splash ring (**310**).
- Pull off the shaft seal casing (**SEA**).
  - Note dismantling shaft seal (→ chapter 9.4).



#### without flush connection

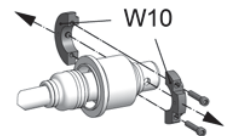
- Assemble tool (**W10**/dismantling tool).



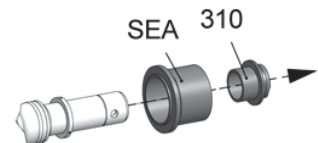
- Pull the rotating unit (**RTE**) with shaft seal (**SEA**) off from the output shaft of the drive (**ANT**).
  - Use tool (**W9**/mounting lever).



- Dismantle tool (**W10**/dismantling tool).

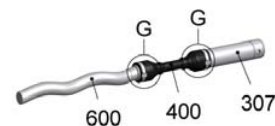


- Pull off the splash ring (**310**).
- Pull off the shaft seal casing (**SEA**).
  - Note dismantling shaft seal (→ chapter 9.4).



#### 9.1.2.5 Rotor (600), coupling rod (400), plug-in shaft (307) - Dismantling

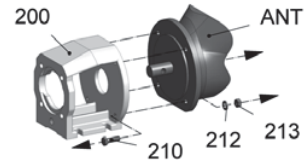
- Joint (**G**) dismantling note rotating unit - individual parts (→ chapter 9.2).



### 9.1.2.6 Lantern (200)/drive (ANT) - Dismantling

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
| <b>CAUTION</b>                                                                                               |
| <p><b>Falling or tilting drive.</b><br/>Slight injury can occur.</p> <p>➤ Secure the drive <b>(ANT)</b>.</p> |

- Remove the screw fitting **(210, 212, 213)**.
- Remove the drive **(ANT)**.

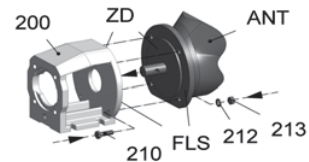


### 9.1.3 Reassembly

|                                                                                                                                                    |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>WARNING</b>                                                                                                                                     |  |
| <p><b>Risk of pump tipping or falling.</b><br/>Death or serious injury can occur.</p> <p>➤ Fasten the lantern <b>(200)</b> to secure the pump.</p> |  |

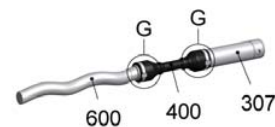
#### 9.1.3.1 Lantern (200)/drive (ANT) - Reassembly

- Clean the flange bearing surfaces **(FLS)**, bolt circle **(ZD)** and the output shaft of the drive unit **(ANT)**.
- Mount the drive **(ANT)** to the lantern **(200)** with screw fittings **(210, 212, 213)**.



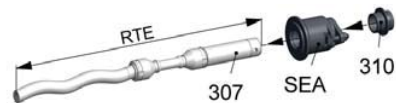
#### 9.1.3.2 Rotor (600), coupling rod (400), plug-in shaft (307) - Reassembly

- Joint **(G)** reassembly note rotating unit - individual parts (→ chapter 9.2).



#### 9.1.3.3 Rotating unit (RTE) - Reassembly

- Slide on shaft seal casing **(SEA)**.
  - Note reassembly shaft seal (→ chapter 9.4).
- Moisten splash ring **(310)** and plug-in shaft **(307)** with antiseize graphite petroleum.
- Slide splash ring **(310)** onto plug-in shaft **(307)**.
  - Observe fitting position of splash ring (see lettering).



- Apply antiseize graphite petroleum to the output shaft of drive (**ANT**).
- Slide on rotating unit (**RTE**).



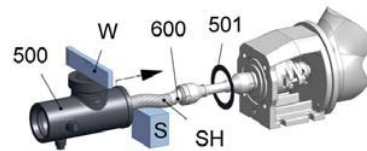
#### with flush connection

- Mount the flush connection (**SSÜ**).



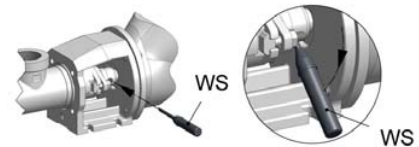
#### 9.1.3.4 Suction casing (500) - Reassembly

- Provide rotor (**600**) with protective cover (**SH**).
- Prop up rotor (**600**) with support (**S**).
- Slide on casing gasket (**501**).
- Assemble suction casing (**500**) and adjust.
  - Use spirit level (**W**).
- Remove protective cover (**SH**).



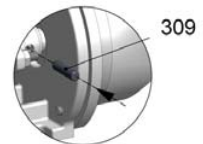
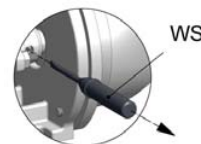
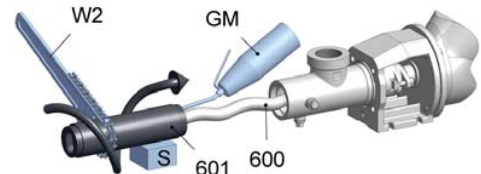
#### 9.1.3.5 Stator (601) - Reassembly

- Insert tool (**WS**).
- Turn tool (**WS**) down.

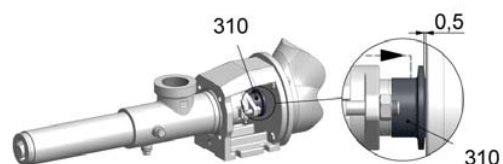


Tool (**W2**/chain wrench)

- Moisten outer surface of the rotor (**600**) with lubricant (**GM**).
- Moisten inner surface of the stator (**601**) with lubricant (**GM**).
- Prop up stator (**601**) with support (**S**).
- Turn stator (**601**) in the "right" rotating direction and slide onto rotor (**600**).
  - Use tool (**W2**).
- Remove tool (**WS**).
- Slide in plug-in shaft pin (**309**).

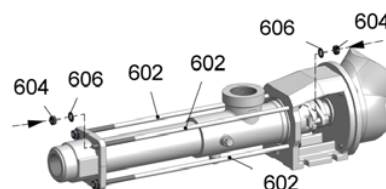
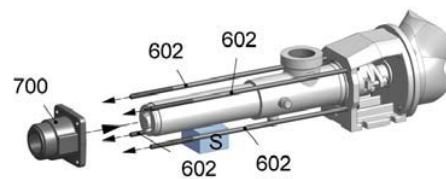
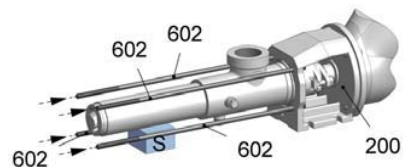


- Pay attention to the position of the splash ring (310).
- Insert the splash ring collar at a distance of 0.5 mm from the lantern (200).



#### 9.1.3.6 Pressure branch (700) - Reassembly

- Prop up stator (601) with a support (S).
- Insert tie bolts (602) loosely into the lantern (200).
- Push pressure branch (700) on to the stator (601).
- Insert tie bolts (602) loosely in the pressure branch (700).
- Remove the support (S).
- Mount screw fitting (604, 606).
- Tighten tie bolts (602) equally.



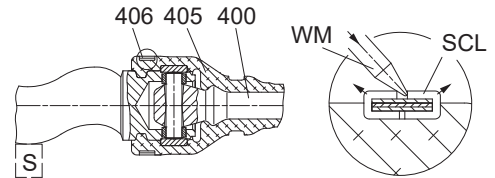
## 9.2 Rotating unit individual parts

### 9.2.1 Dismantling

#### 9.2.1.1 Holding band (406) - dismantling

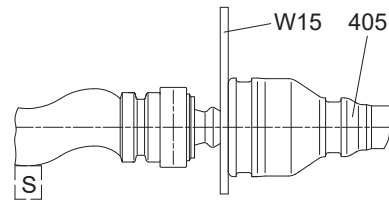
|                                                                                                                                                   |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
|                                                                  | <b>CAUTION</b> |
| <p><b>Risk of injury.</b><br/>Possibility of parts spinning out.</p> <ul style="list-style-type: none"> <li>➤ Wear protective goggles.</li> </ul> |                |

- Detach holding band loop (SCL).
  - Use suitable tool (WM).
- Push out parts of holding band loop (SCL).
- Remove holding band (406).



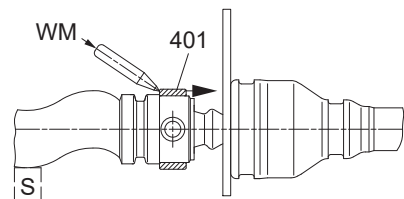
Tool (W15/mounting plate)

- Pull back universal joint sleeve (405).
- Secure tool (W15).



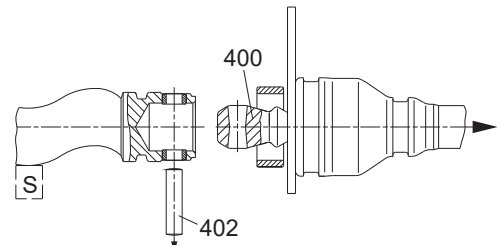
#### 9.2.1.2 Retaining sleeve (401) - dismantling

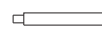
- Knock back retaining sleeve (401).
  - Use suitable tool (WM).



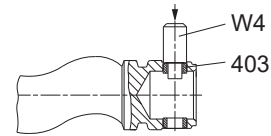
### 9.2.1.3 Detach joint

- Eject coupling rod pin (402)
- Remove coupling rod (400).



 Tool (W4/assembly mandrel)

- Knock out guide bushings (403) using tool (W4).



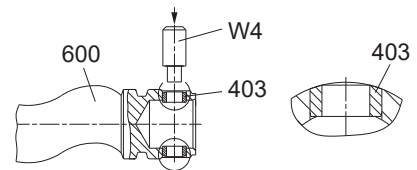
## 9.2.2 Rotating unit (RTE) - prepare individual parts for reassembly

### 9.2.2.1 Rotor (600)

- Remove any damage.
- Clean rotor (600).

 Tool (W4/assembly mandrel)

- Press in guide bushings (403) (depth = 2/3).
  - Use tool (W4).



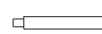
### 9.2.2.2 Coupling rod (400)

- Clean coupling rod (400).
- Check bore head for wear.
  - If wearing is detected on the bore head, renew coupling rod (400).

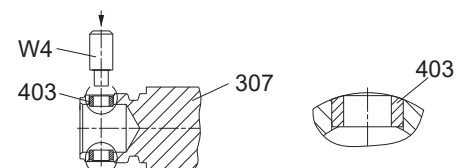


### 9.2.2.3 Plug-in shaft (307)

- Remove any damage.
- Clean plug-in shaft (307).

 Tool (W4/assembly mandrel)

- Press in guide bushings (403) (depth = 2/3).
  - Use tool (W4).



### 9.2.3 Rotating unit (RTE) - individual parts - reassembly

#### NOTICE

##### **Malfunction of the joints.**

Malfunction and/or destruction of joints.

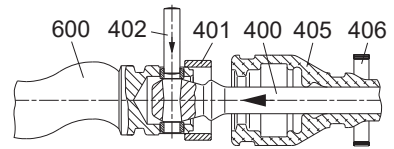
- Replace coupling rod pins (402) and guide bushings (403) jointly.

#### 9.2.3.1 Coupling rod (400) - reassembly

- Slide the universal joint sleeve (405) and holding bands (406) onto coupling rod (400).
- Adapt diameter and width of the holding band to the universal joint sleeve.
- Fill the joint head with SEEPEX joint grease.

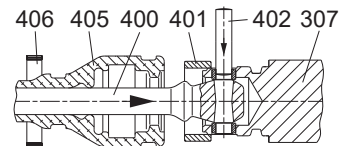
##### **Rotor (600)**

- Insert coupling rod pins (402).
- Slide on retaining sleeve (401).
- Connect rotor/coupling rod.
- Slide in coupling rod pins (402).

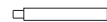


##### **Plug-in shaft (307)**

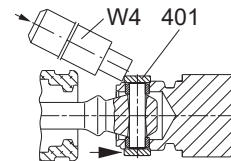
- Insert coupling rod pins (402).
- Slide on retaining sleeve (401).
- Connect plug-in shaft/coupling rod.
- Slide in coupling rod pins (402).



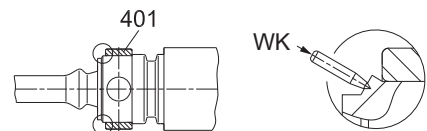
#### 9.2.3.2 Retaining sleeve (401) - reassembly

 Tool (W4/assembly mandrel)

- Knock back retaining sleeve (401).
  - Use tool (W4).

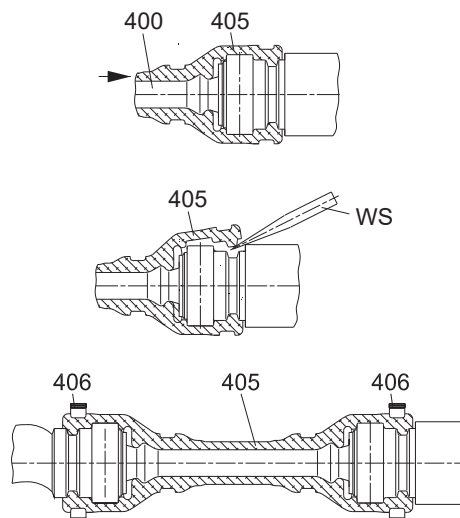


- Secure retaining sleeve (401) in a displaced manner (2x180°).
  - Use suitable tool (WK).



### 9.2.3.3 Universal joint sleeve (405) - reassembly

- Moisten the surface of coupling rod (400) / inner surface of universal joint sleeve (405) with joint grease (maintenance chapter 7.).
- Slide on universal joint sleeve (405).
- Vent the interior of the joint.
  - Use suitable tool (WS).
- Assemble the holding band.
  - Holding band assembly (chapter 9.\_).



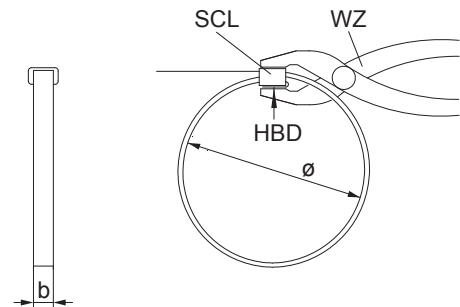
### 9.3 Holding band - assembly

#### 9.3.1 Prepare the holding band

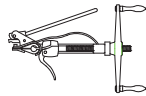
- Only use prefabricated double-band holding bands.

#### 9.3.2 Check the holding band

- Bent-over holding band (HBD) is in contact with holding band loop (SCL) to avoid damaging universal joint sleeve.
- Press on holding band (HBD) using tool (WZ) if necessary.

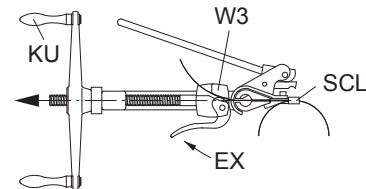


#### 9.3.3 Assemble the holding band



- Use tool (W3/mounting tool)

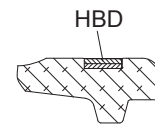
- Feed holding band into tool (W3).
- Hold ends of holding band with the eccentric lever (EX).
- Turn the crank (KU) until the holding band is strained and lies against the holding band loop (SCL).
- Carefully pull the holding band together until it is in contact with the circular groove of universal joint sleeve.



#### 9.3.4 Correct tension of the holding band (HBD)

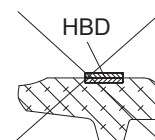
##### Correct

The holding band (HBD) has drawn in the out shape of the universal joint sleeve and is firmly seated.



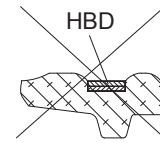
##### Incorrect

The holding band (HBD) is too loose, can slip off.



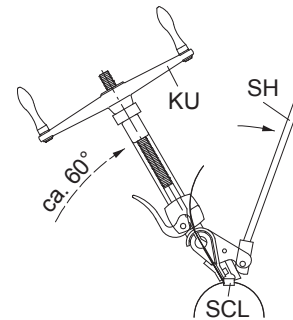
### Incorrect

The holding band (HBD) is too tight, universal joint sleeve will be damaged/sheared off.



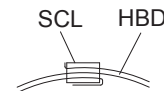
#### 9.3.5 Cant up the holding band

- Swivel mounting tool (W3) approx. 60° upwards.
- Loosen crank (KU) by a half turn.
- Swivel cutting lever (SH) forward until the pressure piece is lying behind the holding band loop (SCL).



#### 9.3.6 Shear the holding band (material: 1.4301; 1.4571)

- Hit the cutting lever (SH) with the inside of your hand.
  - Cant up and shear the end of the holding band behind the loop (SCL).
  - Carefully straighten up the holding band if it rises up on the sheared side.



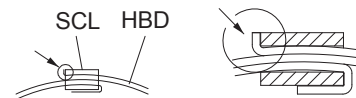
#### NOTICE

**Universal joint sleeve damage.**  
Pin joint grease can emerge.

- Avoid hammering or knocking.

#### 9.3.7 Check the holding band after assembly

- The holding band must lie in the groove of the universal joint sleeve.
- Replace the holding band if the holding band slips back through the loop.



## 9.4 Mechanical seal general

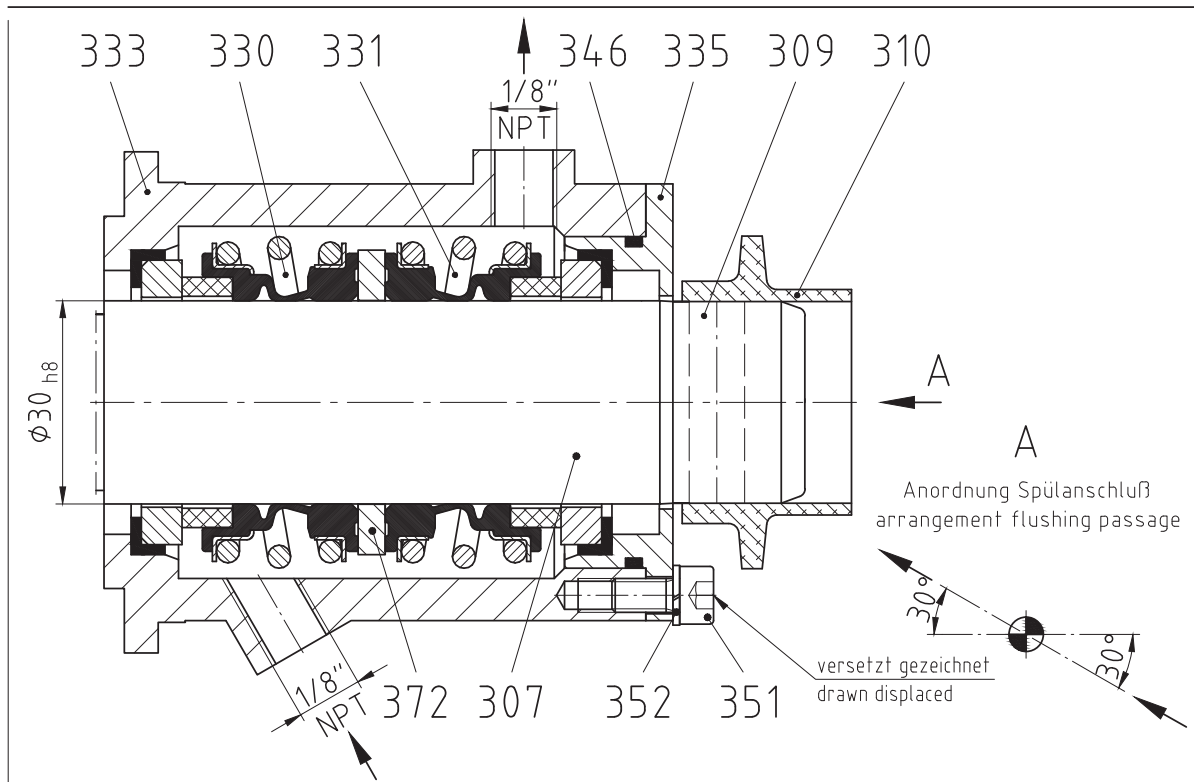
### 9.4.1 Safety

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  <b>WARNING</b>                                                                                                                                                                                                                                                                      |
|                                                                                   | <p><b>Shaft seal is leaky.</b><br/>Leakage may escape into the atmosphere.</p> <ul style="list-style-type: none"> <li>➤ Take safety measures to protect persons and the environment.</li> <li>➤ Wear suitable protective clothing.</li> <li>➤ Dispose of leakage appropriately.</li> <li>➤ Note applicable regulations when handling hazardous substances.</li> </ul> |

### 9.4.2 Operating conditions and material combination

- Adjust to the relevant application
  - Refer to technical data (chapter 3).



|                                                                                   |                  |                                                               |                                                            |                    |                   |                         |
|-----------------------------------------------------------------------------------|------------------|---------------------------------------------------------------|------------------------------------------------------------|--------------------|-------------------|-------------------------|
|  |                  |                                                               |                                                            |                    |                   |                         |
| 1                                                                                 | 372              | Stützring / support ring<br>062-372/M500-0-040_4              |                                                            |                    |                   |                         |
| 2                                                                                 | 352              | Federring / spring washer                                     |                                                            |                    | B5                |                         |
| 2                                                                                 | 351              | Zylinderschraube / socket screw                               |                                                            |                    | M5 x 10           |                         |
| 1                                                                                 | 346              | O-Ring / o-ring                                               |                                                            |                    | Ø42 x 2           |                         |
| 1                                                                                 | 335              | Gehäusedeckel / casing cover<br>262-335/M500-0-001_4          |                                                            |                    |                   |                         |
| 1                                                                                 | 333              | GLRD-Gehäuse / mechanical seal casing<br>262-333/M500-0-011_4 |                                                            |                    |                   |                         |
| 1                                                                                 | 331              | GLRD / mechanical seal<br>MG1-Ø30-G60                         |                                                            |                    | Fabrikat / make : |                         |
| 1                                                                                 | 330              | GLRD / mechanical seal<br>MG1-Ø30-G60                         |                                                            |                    | Fabrikat / make : |                         |
| 1                                                                                 | 310              | Spritzring / splash ring<br>062-310/M500-0-002_4              |                                                            |                    | Burgmann          |                         |
| 1                                                                                 | 309              | Steckwellenbolzen / plug-in shaft pin<br>062-309/M500-0-001_4 |                                                            |                    | gekürzt / shorted |                         |
| 1                                                                                 | 307              | Steckwelle / plug-in shaft<br>262-307/M500-0-030_3            |                                                            |                    |                   |                         |
| Stück<br>Unit                                                                     | Norm<br>Standard | Pos./Item                                                     | Benennung/Denomination<br>Zeichnungs-Nummer/Drawing-Number | Werkstoff/Material | Bemerkung/Remark  | Gewicht<br>Weight<br>kg |

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|                                                                                                 |                       |                          |              |               |                                                                                                    |                    |                |
|-------------------------------------------------------------------------------------------------|-----------------------|--------------------------|--------------|---------------|----------------------------------------------------------------------------------------------------|--------------------|----------------|
| Allgemeintoleranzen<br>für Maße ohne<br>einzelne<br>Toleranzeintragung<br>DIN ISO 2768-mittel   | Aus-<br>gabe<br>Issue | Änderung<br>Modification | Name<br>Name | Datum<br>Date | Maßstab/Scale<br>1:1                                                                               | Werkstoff/Material | Gewicht/Weight |
| General tolerances<br>for mass without<br>individual tolerance<br>entry<br>DIN ISO 2768-average |                       |                          |              |               | Bezeichnung/Denomination                                                                           |                    |                |
| Rauheit für<br>Oberflächenzeichen<br>DIN ISO 1302<br>Reihe 2                                    |                       |                          | Name<br>Name | Datum<br>Date | GLRD-Schnittzeichnung<br>mechanical seal sectional drawing                                         |                    |                |
| Roughness for<br>surface finish<br>indication<br>DIN ISO 1302<br>Reihe 2                        | Bearbeitet/Drawn      | hgg                      | 27.03.2000   |               | Burgmann MG1-Ø30-G60<br>Ausführung/design back-to-back, Spülanschlüsse/flushing connection 1/8"NPT |                    |                |
|                                                                                                 | Geprüft/Checked       | kno                      | 27.03.2000   |               | Zeichnungs-Nummer/Drawing-Number<br>262-0GB/M500-0-091A4                                           |                    |                |
|                                                                                                 | Normiert/Standard     |                          |              |               | EDV-Nr./EDP-No. 38256.dwg                                                                          |                    |                |
|                                                                                                 | Gedruckt/Printed      |                          |              |               | Ersatz für/Replacement for: Ersetzt durch/Replacement by:                                          |                    |                |

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10.1 Spare parts list

10.2 Sectional drawing and parts list



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## 10.1 Spare parts list

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511 Speedway Drive

Enon, Ohio 45323

service.us@seepex.com

**Delivery address:**

.....  
 .....  
 .....  
 .....  
 .....

| No.                               | Quantity | Component                               | Material                 | Comment                               |
|-----------------------------------|----------|-----------------------------------------|--------------------------|---------------------------------------|
| <b>Minor set of wearing parts</b> |          |                                         | <input type="checkbox"/> |                                       |
| 301                               | 1        | Set of packing rings                    |                          | according to data sheet (chapter 3.1) |
| 330                               | 1        | Mechanical seal                         |                          | according to data sheet (chapter 3.1) |
| 601                               | 1        | Stator                                  |                          |                                       |
| <b>Major set of wearing parts</b> |          |                                         | <input type="checkbox"/> |                                       |
| 301                               | 1        | Set of packing rings                    |                          | according to data sheet (chapter 3.1) |
| 307                               | 1        | Plug-in shaft                           |                          |                                       |
| 330                               | 1        | Mechanical seal                         |                          | according to data sheet (chapter 3.1) |
| 400                               | 1        | Coupling rod with coupling rod bushings |                          |                                       |
| 402                               | 2        | Coupling rod pin                        |                          |                                       |
| 403                               | 4        | Guide bushing                           |                          |                                       |
| 405                               | 2        | Universal joint sleeve                  |                          |                                       |
| 406                               | 2        | Holding band, large                     |                          |                                       |
| 600                               | 1        | Rotor                                   |                          |                                       |
| 601                               | 1        | Stator                                  |                          |                                       |

Place, date

Signature / company stamp

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| No.                                   | Quantity | Component                               | Material                 | Comment                                                                                         |
|---------------------------------------|----------|-----------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------|
| <b>Set of gaskets</b>                 |          |                                         | <input type="checkbox"/> |                                                                                                 |
| 301                                   | 1        | Set of packing rings                    |                          | according to data sheet (chapter 3.1)                                                           |
| 310                                   | 1        | Splash ring                             |                          | according to data sheet (chapter 3.1)                                                           |
| 330                                   | 1        | Mechanical seal                         |                          |                                                                                                 |
| 501                                   | 1        | Casing gasket                           |                          |                                                                                                 |
| 503                                   | 3        | Sealing ring                            |                          |                                                                                                 |
| <b>Plug-in shaft &amp; shaft seal</b> |          |                                         | <input type="checkbox"/> |                                                                                                 |
| 301                                   |          | Set of packing rings                    |                          | according to data sheet (chapter 3.1)                                                           |
| 307                                   |          | Plug-in shaft                           |                          |                                                                                                 |
| 309                                   |          | Plug-in shaft pin                       |                          |                                                                                                 |
| 310                                   |          | Splash ring                             |                          | according to data sheet (chapter 3.1)                                                           |
| 330                                   |          | Mechanical seal                         |                          | according to data sheet (chapter 3.1)                                                           |
| <b>Coupling rod &amp; joint parts</b> |          |                                         | <input type="checkbox"/> |                                                                                                 |
| 400                                   |          | Coupling rod with coupling rod bushings |                          |                                                                                                 |
| 401                                   |          | Retaining sleeve                        |                          |                                                                                                 |
| 402                                   |          | Coupling rod pin                        |                          |                                                                                                 |
| 403                                   |          | Guide bushing                           |                          |                                                                                                 |
| 405                                   |          | Universal joint sleeve                  |                          |                                                                                                 |
| 406                                   |          | Holding band, large                     |                          |                                                                                                 |
| 401-406                               |          | Complete set of joint parts             |                          |                                                                                                 |
| <b>Conveying elements</b>             |          |                                         | <input type="checkbox"/> |                                                                                                 |
| 600                                   |          | Rotor                                   |                          |                                                                                                 |
| 601                                   |          | Stator                                  |                          |                                                                                                 |
| <b>Miscellaneous parts</b>            |          |                                         | <input type="checkbox"/> |                                                                                                 |
| 501                                   |          | Casing gasket                           |                          |                                                                                                 |
| 098                                   |          | Pin joint grease                        |                          | 1 cartridge = 300 g (approx. 315 cm³)<br>Grease quantity according to maintenance (chapter 7.0) |

Place, date

Signature / company stamp





| Stck. | Pos. | DE                                                                                     | EN                                                                                             | FR                                                                                                                         |
|-------|------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
|       |      | Baureihe BN                                                                            | range BN                                                                                       | série BN                                                                                                                   |
|       |      | Schnittzeichnung Nr.<br>062-013A1                                                      | sectional drawing no.<br>062-013A1                                                             | plan no.<br>062-013A1                                                                                                      |
|       |      | Benennung<br>Stck. / Pos.                                                              | denomination<br>Qty. / Item                                                                    | désignation<br>Qté. / Poste                                                                                                |
| 1     | 200  | Laterne                                                                                | lantern                                                                                        | lanterne                                                                                                                   |
| 1     | 202  | Typenschild                                                                            | type plate                                                                                     | plaque signalitique                                                                                                        |
| 4     | 210  | 6kt-Schraube                                                                           | hexagon bolt                                                                                   | vis                                                                                                                        |
|       | 211  | 6kt-Schraube                                                                           | hexagon bolt                                                                                   | vis                                                                                                                        |
| 4     | 212  | Federring                                                                              | spring washer                                                                                  | rondelle frein                                                                                                             |
| 4     | 213  | 6kt-Mutter                                                                             | hexagon nut                                                                                    | écrou                                                                                                                      |
| 1     | 307  | Steckwelle                                                                             | plug-in shaft                                                                                  | arbre à broche                                                                                                             |
| 1     | 309  | Steckwellenbolzen                                                                      | plug-in shaft pin                                                                              | cheville pour arbre à broche                                                                                               |
| 1     | 310  | Spritzring                                                                             | splash ring                                                                                    | bague de projection                                                                                                        |
| 1     | 400  | Kuppelstange                                                                           | coupling rod                                                                                   | barre d'accouplement                                                                                                       |
| 2     | 401  | Gelenkhülse                                                                            | retaining sleeve                                                                               | douille d'articulation                                                                                                     |
| 2     | 402  | Kuppelstangenbolzen                                                                    | coupling rod pin                                                                               | axe d'articulation                                                                                                         |
| 4     | 403  | Führungsbuchse                                                                         | guide bushing                                                                                  | douille de guidage                                                                                                         |
| 1     | 405  | Manschette                                                                             | universal joint sleeve                                                                         | manchette                                                                                                                  |
| 2     | 406  | Halteband                                                                              | holding band                                                                                   | collier de serrage                                                                                                         |
| 1     | 500  | Sauggehäuse                                                                            | suction casing                                                                                 | carter d'aspiration                                                                                                        |
| 1     | 501  | Sauggehäusedichtung                                                                    | casing gasket                                                                                  | étanchéité du carter d'aspiration                                                                                          |
| 3     | 502  | Verschlussschraube                                                                     | screwed plug                                                                                   | bouchon de vidange                                                                                                         |
| 3     | 503  | Dichtring                                                                              | sealing ring                                                                                   | joint d'étanchéité                                                                                                         |
| 1     | 600  | Rotor                                                                                  | rotor                                                                                          | rotor                                                                                                                      |
| 1     | 601  | Stator                                                                                 | stator                                                                                         | stator                                                                                                                     |
| 4     | 602  | Spannschraube                                                                          | tie bolt                                                                                       | tirant                                                                                                                     |
| 8     | 604  | 6kt-Mutter                                                                             | hexagon nut                                                                                    | écrou                                                                                                                      |
| 8     | 606  | Scheibe                                                                                | washer                                                                                         | rondelle                                                                                                                   |
| 1     | 700  | Druckstutzen                                                                           | pressure branch                                                                                | bride de refoulement                                                                                                       |
|       | 098  | SEEPEX Gelenkfett<br>Typ und Füllmenge:<br>Betriebs- und<br>Montageanleitung entnehmen | SEEPEX joint grease<br>type and filling quantity:<br>see Operating and Assembly<br>Instruction | SEEPEX graisse d' articulations<br>sommaire pour type et quantité:<br>voir instructions de montage et<br>de fonctionnement |
|       |      | Verschleißteile und Dichtungen:<br>Betriebs- und<br>Montageanleitung entnehmen         | Wearing parts and sealings:<br>see Operating and Assembly<br>Instruction                       | pièces d'usure et étanchéités:<br>voir instructions de montage et<br>de fonctionnement                                     |
|       |      | Werkzeuge:<br>Betriebs- und<br>Montageanleitung entnehmen                              | Tools:<br>see Operating and Assembly<br>Instruction                                            | Outils:<br>voir instructions de montage et<br>de fonctionnement                                                            |
|       |      | Wellenabdichtung<br>siehe Schnittzeichnung<br>Gleitringdichtung                        | shaft sealing<br>see sectional drawing<br>mechanical seal                                      | dispositif d' etanchéité<br>voir vue éclatée<br>garniture mécanique                                                        |



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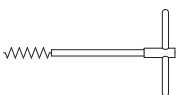
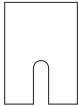
SEEPEx Inc.

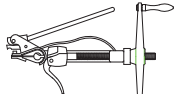
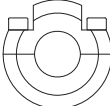
511 Speedway Drive

Enon, Ohio 45323

service.us@seepex.com

**Delivery address:**

| For installation of: | Packing gland                                                                       | Stator                                                                              | Universal joint sleeve                                                                |  |
|----------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
| Tool no.             | W1 <input type="checkbox"/>                                                         | W2 <input type="checkbox"/>                                                         | W15 <input type="checkbox"/>                                                          |  |
| Denomination:        | Packing puller                                                                      | Chain wrench plus spare chain                                                       | Mounting plate                                                                        |  |
| Order no.            | PKZ                                                                                 | KRZ                                                                                 | MTP                                                                                   |  |
|                      |  |  |  |  |

| For installation of: | Rotating unit                                                                       |                                                                                     |                                                                                       |  |
|----------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
|                      | Holding band                                                                        | Joint                                                                               | Plug-in shaft                                                                         |  |
| Tool no.             | W3 <input type="checkbox"/>                                                         | W4 <input type="checkbox"/>                                                         | W10 <input type="checkbox"/>                                                          |  |
| Denomination:        | Mounting tool                                                                       | Drift                                                                               | Dismantling tool                                                                      |  |
| Order no.            | MHB                                                                                 | MTD                                                                                 | AZV                                                                                   |  |
|                      |  |  |  |  |



12.1 Additional components

12.2 Technical information

12.3 Manufacturer's documents shaft seal



## 1. General



### NOTICE

#### **Dry-running of the pump/temperature increase in the stator**

Damage to property and malfunction can be caused.

- Adhere to max. permissible operating temperature.
- Install dry-running protection device (TSE).

#### **Functional principle:**

- continuous monitoring of the temperature in the stator (temperature sensor)
- Shut off the pump when reaching the set category temperature.

#### **Operating mode:**

- existing temperature at the stator is compared to the category temperature in the TSE control device.
- Two relays switch within the TSE control device when reaching the shut-off value.
- The drive motor is shut off through potential-free alternating contacts.
- An alert is triggered.
- A required acknowledgement of the alert prevents an automatic reactivation of the pump.

## 2. Technical Data

### 2.1 Temperature sensor

- The temperature is measured at the stator through an NTC resistor with a protective sleeve.

Permissible temperature range: 0-150°C  
 Standard resistor: 10 kOhm at 25°C

|                 |        |        |        |        |       |       |       |       |
|-----------------|--------|--------|--------|--------|-------|-------|-------|-------|
| Temp<br>°C      | 0      | 10     | 20     | 25     | 30    | 40    | 50    | 60    |
| Resistor<br>Ohm | 32,650 | 19,900 | 12,490 | 10,000 | 8,057 | 5,327 | 3,603 | 2,488 |

|                 |       |       |     |     |     |     |     |     |
|-----------------|-------|-------|-----|-----|-----|-----|-----|-----|
| Temp<br>°C      | 70    | 80    | 90  | 100 | 110 | 120 | 130 | 140 |
| Resistor<br>Ohm | 1.752 | 1.255 | 915 | 678 | 510 | 389 | 301 | 235 |

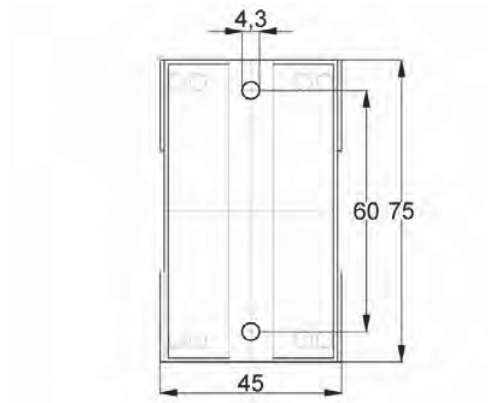
### 2.2 Technical data - TSE control device

- The TSE control device is suitable for cabinet installation or wall mounting.

|                              |                                                                                                                 |
|------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Types:                       | SGRTSE 230V ACB<br>SGRTSE 115V ACB<br>SGRTSE 24V ACB<br>SGRTSE 24V DCB                                          |
| Temperature range:           | 0-150°C                                                                                                         |
| Input:                       | NTC temperature sensor 10 kOhm (at 25°C) with sensor breakage guard at -25°C                                    |
| Relay output:                | 2 potential-free changeover contacts (K1, K2), switching capacity 500 VA at 110-230 V resistive load            |
| Available operating voltage: | 24V, 115V, 230V AC; 24V DC                                                                                      |
| Power drain:                 | max. 4 VA                                                                                                       |
| Sensor circuit:              | Open-circuit voltage max. 2.5 VDC<br>Short-circuit current max. 0.5 mA DC                                       |
| Display at the device:       | Malfunction/dry-running<br>Shut-off temperature                                                                 |
| Operation at the device:     | Setup shut-off temperature<br>Reset alert                                                                       |
| Housing material:            | ABS                                                                                                             |
| Fastening:                   | Installation on standard bar 35 mm in accordance with standard or screw connection in accordance with standard. |
| Protection:                  | Casing IP 40; terminals IP 20                                                                                   |
| Ambient temp.:               | 0-50!                                                                                                           |
| Dimensions:                  | 45x75x110 mm (WxHxD)                                                                                            |
| EMV (2004/108/EG):           | CE conform in accordance with standard                                                                          |

## 2.3 Dimensions and wall mounting

- Installation depth = 110 mm



## 3. Electrical connection

### 3.1 Installation instructions

#### Check line voltage

- Check line voltage/nominal voltage against information on type plate before connection and commissioning.
  - Permissible mains voltage variations of the nominal equipment voltage +/-10%
- Electrical connections are in accordance with the connection map, the provisions of the local utility or the relevant VDE regulations.

#### Mains power failure

- Initiate appropriate measures to prevent the failures.
  - Filter failures through external mains filter.
  - Equip device internally with mains filter.
  - Install sensor leads shielded.
  - Ground shield on one side.

### 3.2 Connection diagram TSE control device

- Terminal assignment

|          |                                               |
|----------|-----------------------------------------------|
| 1 + 3    | Operating voltage                             |
| 11 + 13  | Operating hour counter potential-free contact |
| 12 + 13  | external potential-free contact               |
| 14 + 15  | Temperature sensor                            |
| 5, 6, 7  | Relay output K1                               |
| 8, 9, 10 | Relay output K2                               |

- The TSE control device can be released after dry-running by a button (closer) at terminals 12+13.
- Install button (closer).



### 3.3 Relay function

| Actual temperature > shut-off temperature | (Malfunction/dry-running) |
|-------------------------------------------|---------------------------|
| Contact 6-5 and 9-8                       | closed                    |
| Contact 6-7 and 9-10                      | open                      |

- Relays K1 and K2 are in parallel and they work together.
  - K1: Switch-off condition integrated in motor contactor control.
  - K2: optional connection to the fault sensor or process computer (reserve).

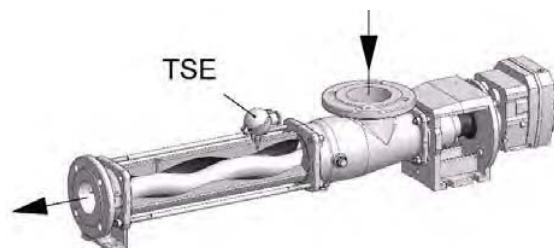
## 4. Measures before commissioning

### 4.1 Check position of temperature control point at pump

- At the factory, the temperature sensor is always installed at the liquid inlet side.
- Check the specified installation position of the temperature control point when changing the direction of rotation and exchanging the stator.

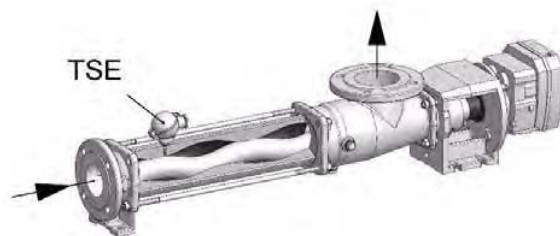
#### 4.1.1 Pump with "anti-clockwise rotation" - standard design

- Check suction casing side fitting position.



#### 4.1.2 Pump with "clockwise rotation" - special design.

- Pressure branch side fitting position.



#### 4.1.3 Performance check

- Execute performance check before first commissioning.
- Switch on control voltage at terminals 1+3.
  - Digital display at TSE control device is illuminated.



- Keep "stator temp" button depressed and read temperature value.

- The function exists if the display is in accordance with the existing temperature.
- Observe deviations in case of functional failures.
  - Find malfunctions, causes and remedies (→ see chapter 8) in the operating and assembly instructions.

## 5. Commissioning and control

### 5.1 Set the switch-off temperature

- Set the switch-off temperature at the TSE control device as low as possible.
  - Shorter shut-off times after the dry-running occurs.
  - optimum stator protection

#### 5.1.1 Coarse setting of the shut-off temperature

- When delivered, the shut-off temperature is factory-set to 50°C.
- Maintain factory settings during commissioning or, in case of higher medium temperatures, set a value of 20-30°C above the temperature of the pumped medium.



- After the coarse setting, commission the pump for a max time of 60 min.
  - Subsequently, perform the fine adjustment of the shut-off temperature (→ chapter 5.1.2).

### 5.1.2 Fine adjustment of the shut-off temperature

- Start pump until the operating temperature in the stator is stabilized (approx. 30-60 min.).



- This will be shown on the display of the TSE control device when the pump is running and by pressing the button "stator temp.".

- Set the final shut-off temperature (→ chapter 5.1.3).
  - The shut-off temperature is 10°C higher than the operating temperature displayed.
  - Adhere to chapter 5.1.3.
  - Consider maximum medium temperature that can occur during operation.
- Check information in the data sheet for a medium temperature > 40°C.
- Rotor/stator - consider sizing.



- A consultation with the manufacturer is required if the temperature information in the data sheet and the actual value do not conform.

### 5.1.3 Adjust shut-off temperature at the control unit.

- Switch control voltage on.
  - After a self-test at the control unit, the currently set shut-off temperature will be shown on the display.



- Press briefly
  - Setup mode is displayed.
  - The display shows alternating "SET" and the shut-off temperature set last.



- Increase shut-off value.
  - The value changes initially by +1° each.
  - After approx. 3 sec. in +10° steps.



- Decrease shut-off value.
  - The value changes initially by -1° each.
  - After approx. 3 sec. in -10° steps.



- Press briefly
  - Operating mode is displayed.
  - Adjusted shut-off temperature was transmitted to the permanent memory and will be shown on the display.

- In setup mode, the device changes - without saving possibly changed settings - after 10 sec. into the operating mode.

## 5.2 Switch display from °C to °F



- Press button 10 seconds until the display changes.

- The selected temperature unit will be displayed next to the °C or °F symbol.

## 5.3 Release control unit after the dry-running

- The installed relays switch-off and remain locked in this position if the set temperature at the TSE control unit is exceeded.
  - Red LED appears (alert).
- Acknowledge alert/release relay in accordance with the following options:
  - actuate "reset" button at the TSE control unit for at least 1 sec.
  - Shut-off operating voltage at the TSE control unit (terminals 1-3).
  - Actuate external contact ("reset" button, closed for at least 1 sec.).



## 5.4 Call operating hour counter

- The TSE control unit includes an operating hour counter. This value can be called on the service level. The transition to the service level is only possible after a code number has been entered.



- Press approx. 5 sec until the "Cod" is displayed.
  - The display shows alternating "Cod" and 100.



- Press button sequence.
- Enter code "33".



- Press briefly
  - Code will be acknowledged.
  - Transfer to the service level.

Display alternating:

"Hi" and #value# • No function



- Press briefly
  - Transfer to next parameter/display value.

Display alternating:

"bh.Hi" and #value# • Operating hour counter (displayed value x 10,000)



- Press briefly
  - Transfer to next parameter/display value.

Display alternating:

"bh.Lo" and #value# • Operating hour counter (displayed value x 1)



- Return to the operating mode.

# 6. Stator change

## 6.1 General

- List the material of the installed TSE sensor sleeve when ordering a replacement stator.
- Do not readjust the sensor sleeve installed at the factory.

## 6.2 Dismantling/reassembly connection head and temperature sensor

- Adherence to associated drawing required.

### 6.2.1 Dismantling



- Do not reuse sensor sleeve after dismantling.

- Open cover of connection head.
- Remove connection wires at the temperature sensor.
- After loosening the screw at the side, pull off connection head from the threaded sleeve.
- Rotate threaded sleeve out of the stator.
- Remove clamp screw, rubber ring and temperature sensor from sensor sleeve.

### 6.2.2 Reassembly

- Do not readjust the sensor sleeve installed at the factory.
- Install threaded sleeve in the stator.
- Install sensor sleeve.
- Open cover of connection head.
- Install connection wires at the temperature sensor.
- Remove protective tube (transport guard of sensor sleeve).
- Slide thermistor sensor with clamp screw and rubber ring up to the base of the sensor sleeve and fixate.
- Screw threaded sleeve with two O-rings into threaded hole at the stator.
- When installing the connection head, route connection cable at the thermistor sensor from below through the hole in the terminal board.
- After fixating the connection head on the threaded sleeve, fasten connection cable at existing terminals and close connection head.

## 7. Functional failure

Causes for alerts and shut-offs of the pump without dry-running:



- Sensor or wire break
- Short-circuit sensor/wire
- Overshooting or undershooting of the measuring range (-25...150°C)

We recommend the following approach for checking the TSE control device and the sensor circuit incl. temperature sensor.

### 7.1 Performance check sensor circuit

- Remove the temperature sensor supply line at the TSE control device terminals 14+15.
- Connect resistor measuring unit (multimeter/ohmmeter).
- Determine electrical resistance with using the table (→ chapter 2.1) and compare with the temperature at the pump.
- Proceed as follows in case of resistor value deviations >10% from the target value:
  - disconnect connecting wire to the control unit at the connection head of the pump
  - Repeat measurement at the connection head of the TSE.
    - A defect at the temperature sensor exists in case of identical deviations.
  - Exchange the temperature sensor.
    - Observe chapters 6.2 - 6.3.
- In case of correct values, a defect of the connection cable or the connection terminals exists.

### 7.2 Performance check TSE control device

- A defect at the TSE control device is probable if the sensor circuit is functioning properly.
- To check, disconnect terminal 14+15 of the sensor supply line.
- Connect commercially available carbon film or metal film resistor in accordance with the following array:

| Resistor<br>Ohm    | 10,000 | 5,600 | 2,200 | 1,000 | 560 | 220 |
|--------------------|--------|-------|-------|-------|-----|-----|
| Switch temp.<br>°C | 25     | 39    | 63    | 87    | 107 | 143 |

- Switch on control voltage at terminals 1+3.
  - Digital display at TSE control device is illuminated.



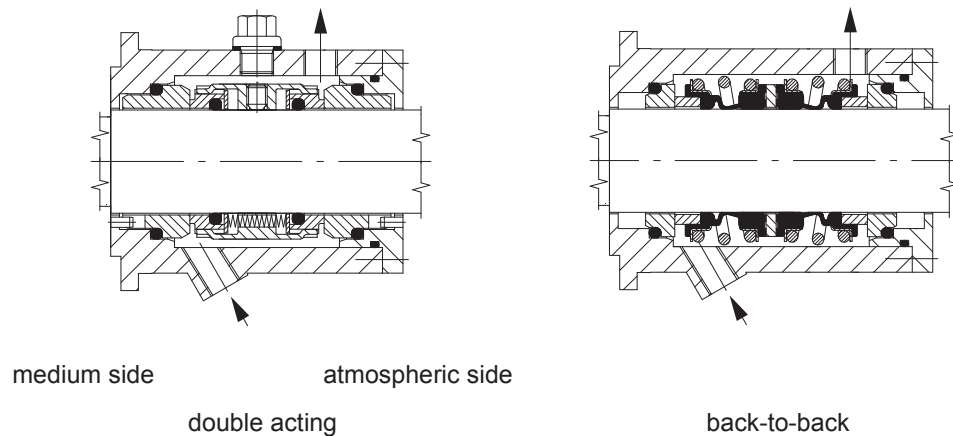
- Keep "stator temp" button depressed and read temperature value.
  - Read value must be in accordance with the switching temperature allocated to the resistor used.
- Return TSE control unit for repair in case of display deviations of more than 5-10°C or in case of no display.



## 1 Area of application

Conveying liquids with the following properties

- aggressive, toxic
- sticky, highly viscous
- polymerising
- tendency to leave deposits
- high vapour pressure or gaseous
- high pressure, high temperature



## 2 Buffer fluid

### 2.1 General

The buffer fluid fills the space between the set of mechanical seals on the medium side and the atmospheric side

### 2.2 Task

- to dissipate the corresponding frictional heat.
- to avoid infiltration of the product into the sealing gap.

### 2.3 Medium

- clean, cold and stable liquid is used, e.g. water.
- it must be compatible with the product and free of solids.
- it must not have a tendency to leave deposits.
- it should have low viscosity and a good thermal conductivity.
- Bear in mind the resistance to corrosion of all contact parts.

### 2.4 Pressure

The buffer fluid pressure must always be 1,5-2 bar greater than the maximum product pressure. This ensures that infiltration of the product in the mechanical seal (GLRD) sealing gap is prevented.

### 3 Buffer system in accordance with API 610, Plan 53 and Plan 54

#### Functions

- Pressure build-up in the buffer area
- Leakage compensation
- Agitation of the buffer fluid
- Colling of the buffer fluid

#### 3.1 Buffer system natural circulation (thermosyphon principle) API Plan 53

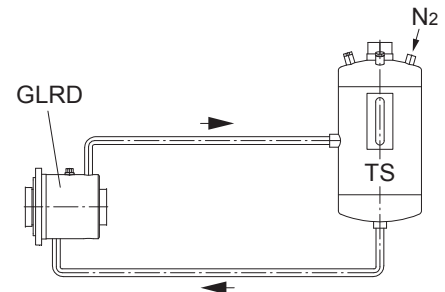
Thermosyphon vessel (TS)

Agitation - natural circulation

Cooling and leakage compensation in the TS vessels

Pressure function:

with nitrogen (N<sub>2</sub>)

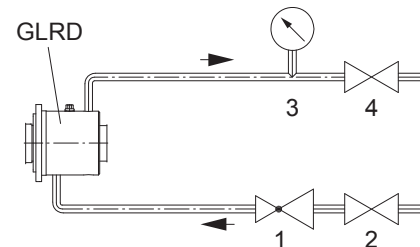


- Requisite buffer pressure in the mechanical seal (GLRD)
  - at least 1,5-2 bar above the maximum pressure in the pump suction casing.

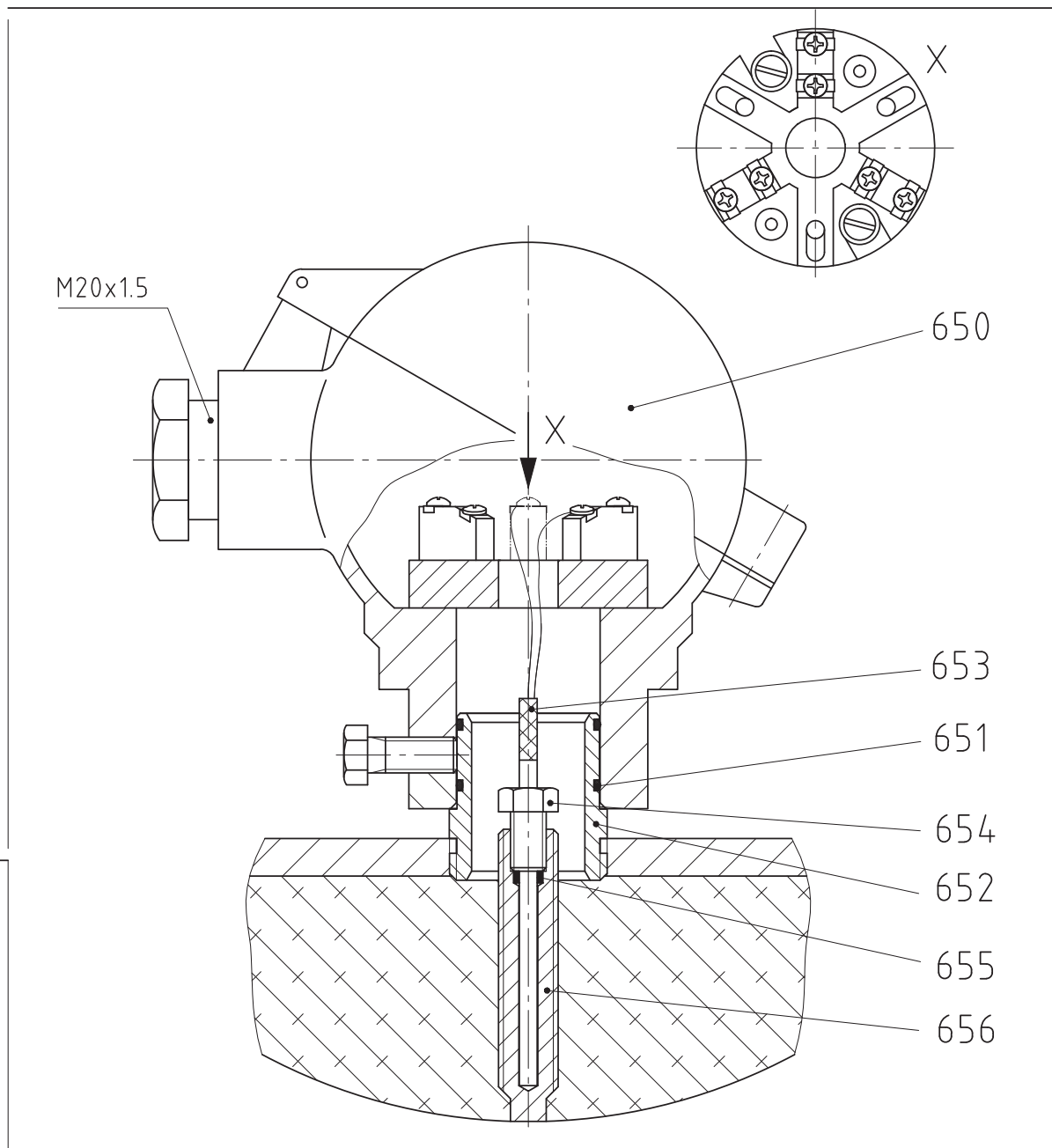
#### 3.2 Seal flush supply from an external system API Plan 54

- 1 Pressure reducing valve
- 2 Shut-off valve
- 3 Pressure manometer
- 4 Shut-off valve

GLRD mechanical seal



- Requisite buffer pressure in the mechanical seal (GLRD)
  - at least 1,5-2 bar above the maximum pressure in the pump suction casing.



| Stück<br>Unit | Norm<br>Standard | Pos./Item | Benennung/Denomination<br>Zeichnungs-Nummer/Drawing-Number | Werkstoff/Material | Bemerkung/Remark | Gewicht<br>Weight<br>kg |
|---------------|------------------|-----------|------------------------------------------------------------|--------------------|------------------|-------------------------|
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## SEEPEX. ALL THINGS FLOW

|                                                                                                 |                       |                          |              |               |                                                                                     |                    |                |
|-------------------------------------------------------------------------------------------------|-----------------------|--------------------------|--------------|---------------|-------------------------------------------------------------------------------------|--------------------|----------------|
| Allgemeintoleranzen<br>für Maße ohne<br>einzelne<br>Toleranzeintragung<br>DIN ISO 2768—mittel   | Aus-<br>gabe<br>Issue | Änderung<br>Modification | Name<br>Name | Datum<br>Date | Maßstab/Scale<br>%                                                                  | Werkstoff/Material | Gewicht/Weight |
| General tolerances<br>for dimensions<br>without specified<br>tolerances<br>DIN ISO 2768—average |                       |                          |              |               |  |                    |                |
|                                                                                                 |                       |                          |              |               | Bezeichnung/Denomination                                                            |                    |                |
|                                                                                                 |                       |                          |              |               | Schnittzeichnung TSE Anschlusskopf<br>sectional drawing TSE connection head         |                    |                |
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| Stck. | Pos. | DE                                | EN                                 | FR                          |
|-------|------|-----------------------------------|------------------------------------|-----------------------------|
|       |      | TSE-Anschlusskopf                 | TSE connection head                | TSE tête de connexion       |
|       |      | Schnittzeichnung Nr.<br>702-006A4 | sectional drawing No.<br>702-006A4 | plan no.<br>702-006A4       |
|       |      | Benennung<br>Stck. / Pos.         | denomination<br>Qty. / Item        | désignation<br>Qté. / Poste |
| 1     | 650  | Anschlusskopf                     | connection head                    | tête de connexion           |
| 2     | 651  | O-Ring                            | o-ring                             | joint torique               |
| 1     | 652  | Gewindehülse                      | screw socket                       | douille fileté              |
| 1     | 653  | Thermistorfühler                  | thermistor sensor                  | thermistance                |
| 1     | 654  | Klemmschraube                     | clamping screw                     | vis de blocage              |
| 1     | 655  | Gummiring                         | rubber ring                        | anneau de caoutchouc        |
| 1     | 656  | Fühlerhülse                       | sensor sleeve                      | fourreau de sonde           |



## Technical data:

- NTC-resistance sensor fitted in stainless steel protection sleeve.
- Standard resistance: 10 k $\Omega$  at 25°C.

| temp.<br>°C | resistance<br>$\Omega$ | temp.<br>°C | resistance<br>$\Omega$ | temp.<br>°C | resistance<br>$\Omega$ | temp.<br>°C | resistance<br>$\Omega$ |
|-------------|------------------------|-------------|------------------------|-------------|------------------------|-------------|------------------------|
| -20         | 97.080                 | 23          | 10.920                 | 66          | 2.011,0                | 109         | 525,00                 |
| -19         | 91.610                 | 24          | 10.450                 | 67          | 1.942,0                | 110         | 510,30                 |
| -18         | 86.490                 | <b>25</b>   | <b>10.000</b>          | 68          | 1.876,0                | 111         | 496,70                 |
| -17         | 81.690                 | 26          | 9.573,0                | 69          | 1.813,0                | 112         | 483,00                 |
| -16         | 77.180                 | 27          | 9.167,0                | 70          | 1.752,0                | 113         | 470,00                 |
| -15         | 72.950                 | 28          | 8.777,0                | 71          | 1.693,0                | 114         | 457,30                 |
| -14         | 68.980                 | 29          | 8.407,0                | 72          | 1.636,0                | 115         | 445,00                 |
| -13         | 65.240                 | 30          | 8.057,0                | 73          | 1.582,0                | 116         | 433,30                 |
| -12         | 61.730                 | 31          | 7.723,0                | 74          | 1.530,0                | 117         | 421,70                 |
| -11         | 58.430                 | 32          | 7.403,0                | 75          | 1.479,0                | 118         | 410,70                 |
| -10         | 55.330                 | 33          | 7.097,0                | 76          | 1.431,0                | 119         | 400,00                 |
| -9          | 52.400                 | 34          | 6.807,0                | 77          | 1.384,0                | 120         | 389,30                 |
| -8          | 49.650                 | 35          | 6.530,0                | 78          | 1.340,0                | 121         | 379,30                 |
| -7          | 47.060                 | 36          | 6.267,0                | 79          | 1.297,0                | 122         | 369,70                 |
| -6          | 44.620                 | 37          | 6.017,0                | 80          | 1.255,0                | 123         | 360,00                 |
| -5          | 42.330                 | 38          | 5.777,0                | 81          | 1.215,0                | 124         | 350,60                 |
| -4          | 40.160                 | 39          | 5.547,0                | 82          | 1.177,0                | 125         | 341,70                 |
| -3          | 38.110                 | 40          | 5.327,0                | 83          | 1.140,0                | 126         | 333,10                 |
| -2          | 36.190                 | 41          | 5.117,0                | 84          | 1.104,0                | 127         | 324,70                 |
| -1          | 34.370                 | 42          | 4.917,0                | 85          | 1.070,0                | 128         | 316,50                 |
| 0           | 32.650                 | 43          | 4.727,0                | 86          | 1.036,0                | 129         | 308,60                 |
| 1           | 31.030                 | 44          | 4.543,0                | 87          | 1.004,0                | 130         | 300,93                 |
| 2           | 29.500                 | 45          | 4.370,0                | 88          | 973,70                 | 131         | 293,47                 |
| 3           | 28.050                 | 46          | 4.200,0                | 89          | 944,00                 | 132         | 286,323                |
| 4           | 26.690                 | 47          | 4.040,0                | 90          | 915,30                 | 133         | 279,17                 |
| 5           | 25.390                 | 48          | 3.890,0                | 91          | 887,70                 | 134         | 272,03                 |
| 6           | 24.170                 | 49          | 3.743,0                | 92          | 861,00                 | 135         | 265,70                 |
| 7           | 23.010                 | 50          | 3.603,0                | 93          | 835,30                 | 136         | 259,30                 |
| 8           | 21.920                 | 51          | 3.467,0                | 94          | 810,30                 | 137         | 253,00                 |
| 9           | 20.880                 | 52          | 3.340,0                | 95          | 786,70                 | 138         | 246,93                 |
| 10          | 19.900                 | 53          | 3.217,0                | 96          | 763,30                 | 139         | 241,03                 |
| 11          | 18.970                 | 54          | 3.099,0                | 97          | 741,00                 | 140         | 235,27                 |
| 12          | 18.090                 | 55          | 2.986,0                | 98          | 719,30                 | 141         | 229,70                 |
| 13          | 17.250                 | 56          | 2.878,0                | 99          | 698,70                 | 142         | 224,30                 |
| 14          | 16.460                 | 57          | 2.774,0                | 100         | 678,30                 | 143         | 219,00                 |
| 15          | 15.710                 | 58          | 2.675,0                | 101         | 659,00                 | 144         | 213,90                 |
| 16          | 15.000                 | 59          | 2.579,0                | 102         | 640,30                 | 145         | 208,87                 |
| 17          | 14.320                 | 60          | 2.488,0                | 103         | 622,00                 | 146         | 204,03                 |
| 18          | 13.680                 | 61          | 2.400,0                | 104         | 604,30                 | 147         | 199,33                 |
| 19          | 13.070                 | 62          | 2.316,0                | 105         | 587,00                 | 148         | 194,77                 |
| 20          | 12.490                 | 63          | 2.235,0                | 106         | 571,00                 | 149         | 190,33                 |
| 21          | 11.940                 | 64          | 2.157,0                | 107         | 555,00                 | 150         | 185,97                 |
| 22          | 11.420                 | 65          | 2.083,0                | 108         | 539,70                 |             |                        |



## 1.0 Connection of the drive motor to a frequency inverter

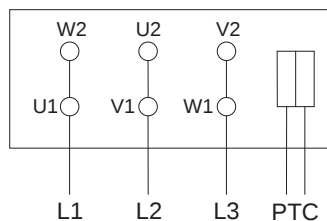
|  | NOTICE                                                                                                                                                         |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | <p>➤ Heed the technical information and information in the manufacturer's operating instructions when installing and commissioning the frequency inverter.</p> |

- Perform the connection of the frequency inverter and motor in accordance with the table.
- An incorrect motor connection causes considerable reduction in motor performance. The pump may possibly not start, or it might cause the drive to overheat.

| Details motor type place<br>(nominal motor voltage / circuit arrangement) | Line voltage of the frequency inverter | Output voltage of the frequency inverter | Motor connection |
|---------------------------------------------------------------------------|----------------------------------------|------------------------------------------|------------------|
| 230 V ▲ / 400 V Y                                                         | 1 x 230 V AC                           | 3 x 0 to 230 V                           | Delta ▲          |
| 230 V ▲ / 400 V Y                                                         | 3 x 400 V AC                           | 3 x 0 to 400 V                           | Star Y           |
| 400 V ▲ / 690 V Y                                                         | 3 x 400 V AC                           | 3 x 0 to 400 V                           | Delta ▲          |

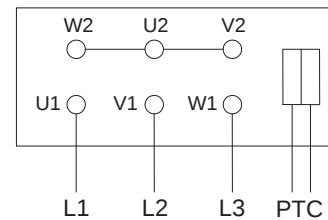
### 1.1 Standard three phase current squirrel cage motors with PTC thermistors

Delta connection (▲)



Motor terminal board

Star connection (Y)



Motor terminal board

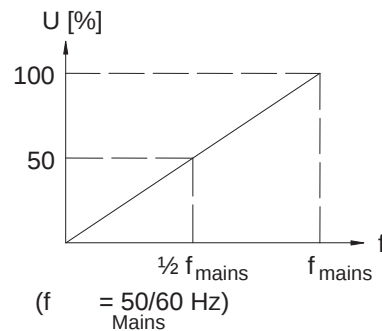
### 1.2 Self ventilated and force ventilated motors

- Self ventilated motors must be equipped with a PTC temperature monitoring device for speed control by means of a frequency inverter.
- Force ventilated motors may be loaded with nominal torque for the complete speed range.
- Connect force ventilators to a separate terminal board on the fan cover.
- Heed type plate details of the force ventilator or see separate terminal connection diagram.

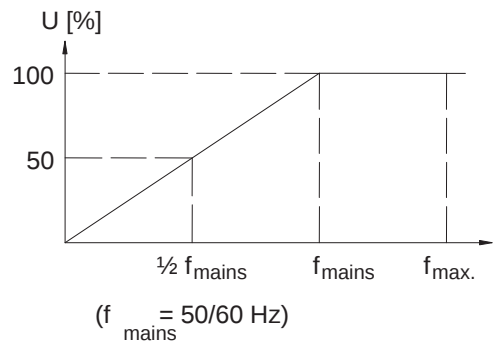
### 1.3 Setting up the frequency inverter

- The power output of the frequency inverter must correspond to the motor power.
  - Where applicable the power of the inverter can be customized to the motor rating by adjusting the parameters.
- The pump requires a higher torque to start (breakaway torque).
  - This required torque can only be achieved by frequency inverters, which make 1.5 times the rated current for the motor available for at least 30s.
  - The operating torque is approximately constant throughout the whole speed range where the conveying pressure remains constant.
- Heed the following frequency inverter characteristic curves (Item 1.3.1, 1.3.2).
  - The quadratic characteristic curve, which is frequently designated the pump and ventilator characteristic curve, is **not** suitable for progressive cavity pumps

### 1.3.1 Linear voltage / frequency characteristic curve up to mains frequency



### 1.3.2 Linear voltage / frequency characteristic curve up to levels above the mains frequency



### 1.3.3 Linear voltage / frequency characteristic curve with the installation of a magnetic bias (StartBoost)

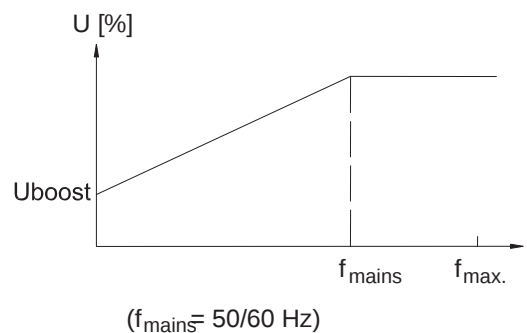
- If problems arise when starting the pump which make a higher breakaway torque necessary, these should be resolved by the adjustment of a magnetic bias. In the case of the magnetic bias the drive is supplied with current by the frequency inverter at just 0Hz.

#### NOTICE

##### **Magnetisation current set too high**

Damage to the motor due to overheating.

- Heed the frequency inverter manufacturer's instructions when setting the magnetic bias.



# Warranty Card

## Complete and return to validate warranty

Please complete this card and return it to seepex Inc. By using this card, the valid warranty period will commence at the pump "start-up" date. If this card is not completed the warranty coverage period will commence on the date the pump is shipped from the seepex factory. This card must be completed and mailed no later than one year from the date of shipment.

### Client

User Entity: ..... Address of plant: .....  
 Contact Person: .....  
 Phone Number: .....  
 Fax Number: .....  
 E-mail Address: .....

### Technical Pump Data

Pump Model: .....  
 Pump Commission: .....

### Performance Data

Pumped Product: .....  
 Diff. Pressure: ..... Flow Rate: .....  
 Temperature: ..... Viscosity: .....  
 Solids Size: ..... Solids %: .....

### Inquiry

Was the appearance of the pump acceptable? ..... Yes ..... No  
 Did the pump suffer any freight damage? ..... Yes ..... No  
 Did the pump perform as expected? ..... Yes ..... No  
 Did you receive: - Data Sheets? ..... Yes ..... No  
                             - O&M Manuals? ..... Yes ..... No  
 Did you local seepex distributor contact your to arrange a start-up?..... Yes ..... No

### other comments

.....  
 .....

### Name of person completing card (please print)

Date: ..... Signature: .....



## TERMS & CONDITIONS OF SALE AND/OR REPAIR 01.16

The following terms and conditions shall apply to an order for all or any part of the articles covered by the accompanying offer unless a specific exception is included therein. Acceptance of any order by SEEPEx Inc. is expressly made conditional upon Buyer's acceptance of SEEPEx Inc. Terms and Conditions of Sale and/or Repair. All prior or future terms, conditions or negotiations (whether written or oral) by Buyer will therefore be considered void and inapplicable, unless otherwise agreed in writing. SEEPEx Inc. reserves the right, in its sole discretion, to refuse any order, unconditionally, for any reason, including but not limited to: expiration of the validity of the offer, errors in the offer, unacceptable payment risks, conflicts with contractual commitments made to other potential customers and the chance that a customer may try to enforce an implied warranty or merchantability of the products offered.

### 1. PRICES

#### 1.1.

Any prices quoted shall only be valid for orders placed within 30 days from the date of issue of the offer. Prices are Ex-Works SEEPEx Inc. plant (Enon, Ohio USA) in U.S. dollars, unless otherwise agreed. SEEPEx Inc. reserves the right to correct typographical or clerical errors.

### 2. TERMS

#### 2.1.

All orders are subject to approval by the SEEPEx Inc. Credit Department. Unless otherwise agreed, if payment for the invoice due is not made in full within thirty (30) days after shipment, late fees of eighteen percent (18%) per year (equivalent to a nominal monthly interest rate of 1.5%) will be applied on the unpaid balance until paid in full. The terms and conditions herein set forth are based upon tariffs, taxes, foreign exchange rates, delivery, and other conditions in effect on the date of the customer's order. In the event that such tariffs, taxes, foreign exchange rates, delivery, and/or other conditions should change prior to delivery of the goods, SEEPEx Inc. reserves the right to charge such increased duties, taxes, or charges to the customer.

#### 2.2.

Unless the order includes the appropriate exemption certificates and/or licenses, duties and taxes levied by Federal, State, or other governments are required to be charged automatically at the rate imposed at time of importation/shipment. Any change in law, regulations, or Government practice which causes a variation of any kind in the applicable charges from the amounts stated in the offer shall result in an equivalent change in the price quoted.

#### 2.3.

Until payment is made in full, SEEPEx Inc. shall retain the right, without notice, to repossess and/or retain the items, and/or dispose of them, for its benefit and hold the customer responsible for any loss. Customer agrees to enter into any agreements, contracts, or notices required confirming such rights.

### 3. SECURITY

#### 3.1.

In order to secure any obligations due to SEEPEx Inc. from the customer the customer grants to SEEPEx Inc. a security interest in:

- a) The merchandise covered by the customer's order (s), and
- b) All property and funds of the customer now or hereafter in SEEPEx Inc.'s possession, and in all additions and proceeds of such merchandise and/or property. The customer hereby authorizes SEEPEx Inc. to sign alone any financing statement or statements and to do all and any other things which may be necessary to perfect such security interest.

### 4. CANCELLATION

#### 4.1.

After acceptance, orders may be canceled only with the express approval of SEEPEx Inc. In the event of an approved cancellation, the customer shall remain responsible for payment for all work performed and/or material expenses incurred by SEEPEx Inc. as of the time of cancellation. SEEPEx Inc. reserves the right to cancel the order if SEEPEx Inc. determines, in its sole discretion, that the customer's financial condition renders the customer unable or unlikely to pay for the order as agreed.

### 5. RETURN

#### 5.1.

No credit will be allowed for returns unless SEEPEx Inc. has authorized such returns in writing in advance. A copy of this authorization must be returned with the item as the packing slip. All returns are subject to restocking charges and to the SEEPEx Inc. Return Goods Authorization (RGA) Policy, which is available on [www.seepex.com](http://www.seepex.com), and is incorporated herein by reference. SEEPEx Inc. will only issue credits for items that can be resold. Items that are special for a specific customer, including but not limited to: special hoppers, baseplates, electrical panels, gear reducers and electric motors are specifically excluded from consideration for credit. Any items not received in good condition or items that cannot be put back into stock will not be accepted. Any elastomer material with over three (3) years of fabrication will not be accepted for return and/or credit. Customers must pay for all freight associated with any return, including parts or equipment that may be considered to be covered by the limited warranty protection clause below. Outstanding RGA's that have declined repair will be scrapped automatically after ninety (90) days if no other written instructions are provided.

### 6. SHIPMENT

#### 6.1.

- a) Handling Charge: Customer shall be responsible for making all arrangements for shipment of the order with a suitable carrier. In the event that customer requests that SEEPEx Inc. make arrangements for shipment, then customer agrees to pay to SEEPEx Inc., in addition to the applicable shipping charges, a handling charge in the amount of 10% of the shipping charges with a minimum \$5.00 to a maximum charge of \$150.00, with special services requiring additional charges.
- b) New Articles: Where shipping instructions dictate no specific routing, SEEPEx Inc. will utilize its best judgement in determining routing but shall not be liable for any charges once the goods have reached their agreed upon point of delivery. If changes are made at customer's request in a) the agreed upon point of delivery, or b) in the routing selected by SEEPEx Inc. and if such changes involve additional costs to be incurred, such costs shall be borne exclusively by the customer, unless otherwise agreed in writing.
- c) Repair Work: All items for which the customer requests repair or other services by SEEPEx Inc. shall be delivered to and picked up from the SEEPEx Inc. plant (Enon, Ohio USA) unless otherwise agreed in writing. All costs of delivery shall be paid by the customer unless otherwise agreed to in writing prior to shipment.
- d) All Orders: On collect freight shipments, cartage charges from plant to carrier are the responsibility of the customer. Title to articles passes to customer upon delivery to carrier acting as customer's agent subject to any right of retention by SEEPEx Inc. All claims for shortage in, and damages in, shipment or otherwise must be reported to carrier immediately upon receipt with copy or report to ourselves within five (5) business days.

### 7. WARRANTIES & LIABILITY LIMITATIONS

#### 7.1.

- a) New Articles: SEEPEx Inc. warrants articles of our manufacture against defects in material and/or workmanship for a period of three (3) years from date of delivery, provided that the articles have been installed, maintained, and operated in strict accordance with SEEPEx Inc. recommendations and instructions.
- b) Repair Work: Defined herein as work and services performed by SEEPEx Inc. SEEPEx Inc. warrants all repair work and services that it performs against defects in workmanship and/or materials for a period of three (3) years from the date of delivery of the repaired articles.
- c) All Orders: All warranty claims shall be submitted promptly in writing to SEEPEx Inc. Any warranty replacement and/or repair shall be made Ex-Works SEEPEx Inc. plant (Enon, Ohio USA). SEEPEx Inc.'s warranty obligation shall be limited to the replacement and/or repair only of defective material and/or workmanship.

#### 7.2.

In no event shall SEEPEx Inc. be liable for any incidental or consequential loss or damage of whatever kind of nature including but not limited to loss of business income or profits, or damage resulting from delay in manufacture or delivery, loss of use or damage to any installation into which the article may be installed, whether arising out of contract or tort.

SEEPEx Inc.  
511 Speedway Drive  
Enon, Ohio 45323  
USA

T +1 937 864-7150  
[sales.us@seepex.com](mailto:sales.us@seepex.com)  
[www.seepex.com](http://www.seepex.com)

**7.3.**

SEEPEx Inc. shall not be liable for any loss or damage resulting from delay and/or late delivery due to causes beyond our reasonable control. Notwithstanding anything herein to the contrary, SEEPEx Inc.'s liability to customer on any cause of action shall be limited to the amount paid by the customer on the subject order. SEEPEx Inc. makes no warranties, express or implied, with respect to articles or products manufactured or provided by any party other than SEEPEx Inc., except to transfer to the customer, where permissible, any warranty provided to SEEPEx Inc. by the original manufacturer. On any claims for repairs and/or replacement under such warranty, all costs incurred by SEEPEx Inc. which are not underwritten by the original manufacturers shall be borne by the customer. Except as provided herein, SEEPEx Inc. expressly disclaims all representations, promises, or warranties, express or implied with respect to any products, articles, work, or services, including any warranties of merchantability and of fitness for a particular purpose. All warranties made by SEEPEx Inc. shall be void where the goods have been subject to misuse, neglect, damage or alteration. SEEPEx Inc. shall be held free and harmless from any dispute or claim anywhere arising from and relating to infringement of patent, design, trademark, or copyright of items, sold or repaired under this contract.

**8. PROPERTY RIGHTS AND RISKS**

**8.1.**

SEEPEx Inc. disclaims any liability or responsibility whatsoever with regard to loss or damages to the customer's property while in the possession, custody or control of SEEPEx Inc. for requested repairs or other services, and the customer expressly agrees to indemnify and hold SEEPEx Inc. harmless against any and all claims for such loss or damage.

**9. HAZARDOUS MATERIALS**

**9.1.**

Any hazardous materials or the existence of any hazards relative to the condition of any product tendered to SEEPEx Inc. for service or repair work must be disclosed by customer in writing in the RGA Request Form, whether or not required to be disclosed per federal law on the MSDS sheet. Customer shall defend, indemnify and hold SEEPEx Inc. harmless from and against any and all claims of injury or damage, including attorney's fees, caused by any hazardous condition or material on or about products accepted for service/repair. This obligation includes but is not limited to claims of bodily injury or death suffered by SEEPEx Inc. employees, or by other parties.

### 13.1 Manufacturer's documents / suppliers

- available



Intelligent Drivesystems



# B1000

Operating & Instruction Manuals  
For Gear Units

B1000

  
DRIVESYSTEMS



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# BIM TO USER MANUAL CROSS REFERENCE



DRIVESYSTEMS

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| Old BIM TITLE<br>(No Longer Available)                                                   | New User Manual<br>Document Numbers & Hyperlinks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BIM 1010 - Unibase Helical In-Line Gearboxes<br>Installation & Maintenance Instructions  | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10060 - Unit Installation</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10750 - Helical &amp; Bevel Reducer Lubrication</a><br><a href="#">U11000 - Helical &amp; Bevel Reducer Lubrication Types</a><br><a href="#">U11700 - Helical In-Line Footed Oil Fill Quantities</a><br><a href="#">U11800 - Helical In-Line Flanged Oil Fill Quantities</a><br><a href="#">U14100 - Helical In-Line Oil Plugs &amp; Vent Locations</a><br><a href="#">U15100 - Helical In-Line Parts Lists Drawings</a>     |
| BIM 1011 - NORDBLOC Helical Gearboxes<br>Installation & Maintenance Instructions         | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10060 - Unit Installation</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10750 - Helical &amp; Bevel Reducer Lubrication</a><br><a href="#">U11000 - Helical &amp; Bevel Reducer Lubrication Types</a><br><a href="#">U12700 - Nordbloc™ Footed Oil Fill Quantities</a><br><a href="#">U12800 - Nordbloc™ Flanged Oil Fill Quantities</a><br><a href="#">U14600 - Nordbloc™ Oil Plugs &amp; Vent Locations</a><br><a href="#">U15600 - Nordbloc™ Parts Lists Drawings</a>                             |
| BIM 1012 - Standard Helical In-Line Gearboxes<br>Installation & Maintenance Instructions | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10060 - Unit Installation</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10750 - Helical &amp; Bevel Reducer Lubrication</a><br><a href="#">U11000 - Helical &amp; Bevel Reducer Lubrication Types</a><br><a href="#">U11500 - Standard In-Line Footed Oil Fill Quantities</a><br><a href="#">U11600 - Standard In-Line Flanged Oil Fill Quantities</a><br><a href="#">U14000 - Standard In-Line Oil Plugs &amp; Vent Locations</a><br><a href="#">U15000 - Standard In-Line Parts Lists Drawings</a> |
| BIM 1013 - NORDBLOC.1 Helical Gearboxes<br>Installation & Maintenance Instructions       | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10060 - Unit Installation</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10750 - Helical &amp; Bevel Reducer Lubrication</a><br><a href="#">U11000 - Helical &amp; Bevel Reducer Lubrication Types</a><br><a href="#">U12900 - Nordbloc.1™ Footed Oil Fill Quantities</a><br><a href="#">U13000 - Nordbloc.1™ Flanged Oil Fill Quantities</a><br><a href="#">U14700 - Nordbloc.1™ Oil Plugs &amp; Vent Locations</a>                                                                                  |
| BIM 1020 - Unibase Shaft Mount Gearboxes<br>Installation & Maintenance Instructions      | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10060 - Unit Installation</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10580 - CLINCHER™ w/ Rubber Buffer</a><br><a href="#">U10750 - Helical &amp; Bevel Reducer Lubrication</a><br><a href="#">U11000 - Helical &amp; Bevel Reducer Lubrication Types</a><br><a href="#">U11900 - CLINCHER™ Oil Fill Quantities</a><br><a href="#">U14200 - CLINCHER™ Oil Plugs &amp; Vent Locations</a><br><a href="#">U15200 - CLINCHER™ Parts Lists Drawings</a>                                               |



# BIM TO USER MANUAL CROSS REFERENCE



DRIVESYSTEMS

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| Old BIM TITLE<br>(No Longer Available)                                                  | New User Manual<br>Document Numbers & Hyperlinks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BIM 1030 - Unicase Helical Worm Gearboxes<br>Installation & Maintenance Instructions    | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10770 - Helical-Worm Reducer Lubrication</a><br><a href="#">U11020 - Helical-Worm Reducer Lubrication Types</a><br><a href="#">U12400 - Helical-Worm Footed Oil Fill Quantities</a><br><a href="#">U12500 - Helical-Worm Solid Shaft/Flanged Oil Fill Quantities</a><br><a href="#">U12600 - Helical-Worm Hollow Shaft Oil Fill Quantities</a><br><a href="#">U14500 - Helical-Worm Oil Plugs &amp; Vent Locations</a><br><a href="#">U15500 - Helical-Worm Parts Lists Drawings</a>                                                                                                                                                                                                                                                                                       |
| BIM 1031 - MINICASE Worm Gearboxes<br>Installation & Maintenance Instructions           | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10770 - Helical Worm Reducer Lubrication</a><br><a href="#">U11040 - Minicase™ Worm Reducer Lubrication Types</a><br><a href="#">U13100 - Minicase™ Foot Mount Oil Fill Quantities</a><br><a href="#">U13200 - Minicase™ Flange Mount Oil Fill Quantities</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| BIM 1033 - SI Design FLEXBLOC Worm Gearboxes<br>Installation & Maintenance Instructions | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10770 - Helical Worm Reducer Lubrication</a><br><a href="#">U11060 - FLEXBLOC™ Worm Reducer Lubrication Types</a><br><a href="#">U13300 - FLEXBLOC™ Oil Fill Quantities</a><br><a href="#">U14800 - FLEXBLOC™ Oil Plugs &amp; Vent Locations</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| BIM 1040 - 92 & 90.1 Helical-Bevel<br>Installation & Maintenance Instructions           | <a href="#">U10000 - General Instructions</a><br><a href="#">U10020 - Safety Notes</a><br><a href="#">U10040 - Storage &amp; Commissioning</a><br><a href="#">U10060 - Unit Installation</a><br><a href="#">U10250 - Solid Shaft Connections</a><br><a href="#">U10500 - Reducer Mounting Footed &amp; Flange Mount Gear Units</a><br><a href="#">U10750 - Helical &amp; Bevel Reducer Lubrication</a><br><a href="#">U11000 - Helical &amp; Bevel Reducer Lubrication Types</a><br><a href="#">U12000 - Bevel Footed Oil Fill Quantities</a><br><a href="#">U12100 - Bevel Flanged Oil Fill Quantities</a><br><a href="#">U12200 - 92 Series Helical-Bevel Footed Oil Fill Quantities</a><br><a href="#">U12300 - 92 Series Helical-Bevel Flanged Oil Fill Quantities</a><br><a href="#">U14300 - 92 Series Helical-Bevel Oil Plugs &amp; Vent Locations</a><br><a href="#">U14400 - 90.1 Helical-Bevel Oil Plugs &amp; Vent Locations</a><br><a href="#">U15300 - 90.1 Helical-Bevel Parts Lists</a><br><a href="#">U15400 - 92 Series Helical-Bevel Parts Lists Drawings</a> |
| BIM 1001 - Hollow Shrink Disc Shaft Installation & Maintenance Instructions             | <a href="#">U10290 - Hollow Shaft with Shrink Disc</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| BIM 1002 - Keyed Shaft & Fixing Element<br>Installation & Maintenance Instructions      | <a href="#">U10270 - Keyed Hollow Shaft</a><br><a href="#">U10280 - Shaft Fixing Kit</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| BIM 1003 - Expansion Chambers<br>Installation & Maintenance Instructions                | <a href="#">U10830 - Expansion Chambers<br/>Installation &amp; Maintenance Manual</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| BIM 1009 - Inputs                                                                       | <a href="#">U45100 - NEMA IEC Inputs &amp; Their Couplings</a><br><a href="#">U45250 - NEMA or IEC Input Adapter Lubrication Options</a><br><a href="#">U45300 - Solid Input Shaft [W]</a><br><a href="#">U45400 - Motor Mount Platform</a><br><a href="#">U45500 - Sugar Scoop</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| BIM 1004 - Motors                                                                       | <a href="#">U30000 - Motors - AC Induction, Single and Polyphase</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BIM 1014 - Motor Brakes                                                                 | <a href="#">U35000 - Motor Brakes Installation &amp; Maintenance</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| BIM 1092 - Current Sensing Brake Relay [IR]                                             | <a href="#">U35195 - Identification of Rectifier</a><br><a href="#">U35200 - Current Sensing Relay</a><br><a href="#">U35205 - Current Sensing Relay</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| BIM 1095 - Fast Brake Rectifier [GPE & GPU]                                             | <a href="#">U35100 - Fast Brake Rectifier</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| BIM 9002 - GRIPMAXX™                                                                    | <a href="#">U10310 - NORD GRIPMAXX™</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



## 1. Importance of the operating instructions

These operating instructions are intended to provide general information and safety guidelines. It is the responsibility of the buyer, machine builder, installer and user of the NORD product to make sure that all the proper safety notes and operating instructions have been reviewed and understood. If the contents of this instruction or any applicable operating instructions are not understood, please consult NORD.



### WARNING



Electric motors, gearmotors, electrical brakes, variable frequency drives, and gear reducers contain potentially dangerous high-voltage, rotating-components and surfaces that may become hot during operation. All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians.

## 2. Inspect incoming freight

Before accepting shipment from the freight company, thoroughly inspect the NORD equipment for any shipping and handling damage. If any goods called for in the bill of lading or express receipt are damaged, or if the quantity is short, do not accept until the freight express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight carrier or express agent at once, and request a formal review of your claim.

Claims for loss or damage in shipment must not be deducted from the NORD invoice, nor should payment of the NORD invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery. NORD will try to assist in collecting claims for loss or damage during shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material.

## 3. Obtaining detailed operating instructions

One can receive the detailed installation and maintenance instructions by entering a serial number (or NORD order number) at the appropriate location on the NORD web site.

- Record the serial number from your gearmotor, gear reducer, or motor nameplate, or record the serial number found on your order confirmation.
- Go to [www.nord.com/docs](http://www.nord.com/docs) to download the appropriate operating instructions.

EXAMPLE: [www.nord.com/docs](http://www.nord.com/docs)

### Unit documentation

Gear unit installation and maintenance instructions can be found by entering the sales order number in the search field below. The sales order number can be found on the gear unit's nameplate (see illustration) or on the order confirmation.



Sales Order Number 200836833-400  
Model Type SK9382AZSH-180MH/4 TW RD VZ  
Mounting Position M4

| Type                                                           | Name | Pages | Size        |
|----------------------------------------------------------------|------|-------|-------------|
| U10000 - General Instructions                                  |      | 2     | (51.97 KB)  |
| U10040 - Storage                                               |      | 1     | (36.77 KB)  |
| U10060 - Unit Installation                                     |      | 2     | (60.94 KB)  |
| U10270 - Keyed Hollow Shaft                                    |      | 2     | (70.52 KB)  |
| U10750 - Helical and Bevel Reducer Lubrication                 |      | 2     | (75.66 KB)  |
| U11000 - Helical and Bevel Lubrication Types                   |      | 2     | (58.10 KB)  |
| U11900 - Lubrication Capacity - Clincher Shaft Mounted         |      | 1     | (894.56 KB) |
| U14200 - Oil Plug and Vent Locations - Clincher Parallel Shaft |      | 1     | (125.83 KB) |
| U15200 - Parts List - Clincher Parallel Shaft                  |      | 12    | (519.50 KB) |
| Complete Manual for 200836833-400 (PDF Format)                 |      | 31    | (2.25 MB)   |
| All Manuals for 200836833-400 (ZIP Format)                     |      |       | (2.01 MB)   |

## 4. Intended use

NORD is a supplier of electric motors, gearmotors, reducers, electromechanical brakes, mechanical variators, and electrical variable frequency drives that are intended for commercial installations on larger systems and machines.



### WARNING



NORD does not accept any liability for damage or injury caused by:

- Inappropriate use, operation or adaptation of the drive system.
- Unauthorized removal of housing covers, safety and inspection covers, guarding, etc.
- Unauthorized modifications to the drive system.
- Improper servicing or repair work on the drive system.
- Damage caused during shipment or transportation.
- Disregard of the important Safety Notes or Operating Instructions.



## 5. Notes concerning warranty and liability

All units are supplied according to the terms described in our standard "Conditions of Sale." The unit limited warranty is also defined in our "Conditions of Sale" and is located in the back of our product catalogs as well as the back of your order invoice.

All NORD Safety Notes and all related NORD Operating instructions shall be considered up-to-date at the time in which they were compiled by the buyer, machine builder, installer or user. NORD reserves the right to incorporate technical modifications and information updates to any safety/operating instructions that are within the scope of providing additional knowledge or clarification, communicating design changes, or product enhancements. Information updates may include any NORD product, or subsequent products purchased and supplied by NORD; No specific claims can be derived from the information or illustrations and descriptions contained in the safety notes or related operating instructions.



### **WARNING**



NORD assumes no liability for personal injury, equipment damage or malfunctions resulting from failure to comply with any installation safety notes. The applicable national, regional, and local work regulations and safety requirements must also be complied with. Failure to comply with any safety notes or regulations may result in serious injury, damage to property, or even death.

## 6. Checklist for installation and operation

- ☒ Verify that the purchased NORD product has been supplied with the expected accessories & options. Check the received goods and packing slip to make sure items are properly received.
- ☒ Make sure that you have all of the required Operating Instructions for your NORD electric motor, gearmotor, reducer, electromechanical brake, mechanical variable speed drives, or electrical variable frequency drives.
- ☒ Consult NORD if you feel you are missing any documentation or if you have questions.

## 1. Safety & information symbols

All work including transportation, storage, installation, electrical connection, commissioning, servicing, maintenance and repair must be performed **only by qualified specialists or personnel**. It is recommended that repairs to NORD Products are carried out by the NORD Service Department. Instructions related to operational safety will be emphasized as shown.

| Symbol                                                                            | Meaning                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>General Warning or Hazard</b> - Severe risk or danger of personal injury or death by working around dangerously high electrical voltage or moving machinery. Proper safety precautions must be taken. |
|  | <b>Possible Harmful Situation</b> - Care must be taken to avoid the possibility of damaging the drive unit, driven machine, or the environment.                                                          |
|  | <b>Important Note</b> - Useful note or tip to help assure trouble-free operation.                                                                                                                        |
|  | <b>Material Disposal Note</b> - Important note concerning suggested material disposal.                                                                                                                   |

## 2. Safety warnings

|  <b>GENERAL WARNINGS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>All work involved in the transport, connection, commissioning and maintenance of any NORD product must be carried out by qualified and responsible technicians. All applicable national, regional, and local work regulations and safety requirements must also be complied with. <b>NORD assumes no liability for personal injury, accidental death, or equipment damage and malfunctions resulting from failure to comply with installation or operating instructions, safety notes, or any work regulations and laws!</b></li> <li>Gear unit installation and maintenance work may only be performed when no power is available to the prime mover or motor. Electric motors, electrical brakes, and variable frequency drives, contain potentially dangerous high-voltage. Prior to installation or maintenance, shut down the power at the circuit breaker or power switch. <b>While working on the drive, make sure the power from the prime mover is isolated or secured on "lock-out" to prevent accidental start-up and to safeguard against injury!</b></li> <li>Surfaces of motors and gear units may become hot during operation or shortly after start-up. In some instances additional protection against accidental contact may be necessary. <b>Use caution to avoid burns or serious injury!</b></li> </ul> |

## 3. Observe published performance range & nameplate data

|  <b>HARMFUL SITUATION</b>                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Observe the data on all reducer nameplates and verify published ratings for the NORD item/s in question. Do not operate any NORD equipment outside the published performance range. Failure to comply may result in damage to the drive unit, driven machine, or the environment. |

### U.S. Nameplate

|                                          |       |
|------------------------------------------|-------|
| NORD GEAR CORPORATION-USA / WWW.NORD.COM |       |
| SK ①                                     |       |
| S/N ②                                    |       |
| RATIO ③                                  | SF ④  |
| TORQUE ⑤                                 | LB-IN |
| SPEED ⑥                                  | RPM   |
| ⑦ MTG POS                                |       |
| FOR GEAR LUBRICATION SEE MANUAL          |       |
| UNIGASE™                                 |       |

- ① Model/Type
- ② Serial Number
- ③ Gear Ratio
- ④ Service Factor
- ⑤ Torque Rating
- ⑥ Output Speed RPM
- ⑦ Mounting Position

### European Nameplate

|                                                                                          |                     |
|------------------------------------------------------------------------------------------|---------------------|
| Getriebebau NORD<br>GrbH&Co KG<br>D - 22934 Bargteheide                                  |                     |
| Type                                                                                     | SK ①                |
| No.                                                                                      | ②                   |
| i=                                                                                       | ③                   |
| n2=                                                                                      | ④ min <sup>-1</sup> |
| Siehe Wartungsanleitung<br>See maintenance instructions<br>Voir instructions d'entretien |                     |

- ① Model/Type
- ② Serial Number
- ③ Gear Ratio
- ④ Speed

## 4. Transportation and handling

Make sure that all eyebolts and lifting lugs are tight and lift only at designed points. Protect the mounting surface from possible damage during transportation.

|  <b>WARNING</b>  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Do not attach other machinery or loads to the NORD assembly, since the supplied lifting bolts are not designed for this purpose.                                                         |

If the gearmotor or assembly is equipped with two suspension eye bolts, then both locations should be used for transportation and placement of the unit; in this case the tension force of the slings must not exceed a 45° angle.

In some instances it may be appropriate to use additional lifting straps or slings in order to assure safe transportation of the assembly. Always use sufficiently rated handling equipment and ensure that adequate safety measures are taken to protect personnel from injury during transportation. Once the NORD assembly is properly installed, remove the transportation fixtures.



## 7. DISPOSAL



### **MATERIAL DISPOSAL**



Properly dispose of all used gear units and internal parts in accordance with all local regulations. In particular, all lubricants must be properly collected and disposed.

For confirmation of specific materials used in a specific reducer or gearmotor assembly, please consult NORD with the appropriate unit identification or serial number.

| Components                                                                             | Material                                                      |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Gear wheels, shafts, rolling bearings, parallel keys, snap rings, spacers, shims, etc. | Steel                                                         |
| Gear housing and housing components                                                    | Cast iron or Aluminum (depending on type and size)            |
| Worm gears                                                                             | Bronze alloy                                                  |
| Radial seals, sealing caps, and rubber components                                      | Elastomers with some steel                                    |
| Coupling components                                                                    | Plastic or Elastomer with Steel                               |
| Housing gaskets and flat oil seals                                                     | Asbestos-free sealing or gasket material (various types used) |
| Gear Oil                                                                               | Mineral, SHC-Synthetic or PG-Synthetic (can vary)             |

## 1. Storage



### IMPORTANT NOTE



For storage periods longer than 9 months, or for storage in less than desirable conditions, please consult NORD for recommendations.

Storage for up to 9 months is possible, so long as the following conditions are observed:

- Store the gear unit in its actual mounting position in accordance with the specified oil fill-level, in a clean and dry temperature controlled area. Avoid temperature fluctuations within the range of 0°C and 40°C (32°F to 104°F) and avoid relative humidity conditions in excess of 60%.
- Protect all exposed or unpainted shaft and flange surfaces with an anti-corrosion agent or grease.
- Store in a location free from shock and vibration, to avoid false brinelling of bearing elements and raceways.
- Whenever possible, rotate the shafts periodically, by hand if necessary, to help prevent brinelling (bearing damage) and to help keep the shaft seals pliable.
- Avoid direct exposure to the sun or UV light and aggressive or corrosive materials in the environment (ozone, gases, solvents, acids, caustic solutions, salts, radioactivity, etc).

## 2. Commissioning

Prior to gear unit start-up, complete the following:

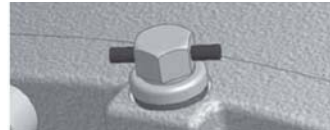
- Please check your gear unit for a vent and if applicable to your product, remove the sealing plug to activate.



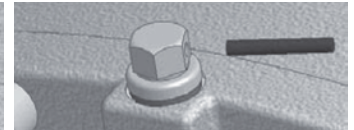
### WARNING



To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up.



Sealed vent



Activated vent

- Check the lubricant and be sure the gear unit is filled with the proper oil type, to the proper level, as determined by the mounting position.



### IMPORTANT NOTE



Some smaller gear units are supplied as maintenance free/lubricated for life gear units. Oil level may not be checked on some of these units.

- Check the condition of all shaft seals and all assembled flange gasket areas. If any change is detected in the shape, color, hardness or permeability, or if any leaks are detected, the corresponding shaft seals and/or gaskets must be replaced.
- Remove all anti-corrosive metal protectant from otherwise bare metal surfaces. Follow product manufacturers directions and warnings during surface protection removal.
- Check the resistance of all motor and brake windings to verify the integrity of the winding insulation and inspect all terminal box openings and wire connection areas to verify that all components are dry and free of corrosion.

## 3. Long-Term Storage

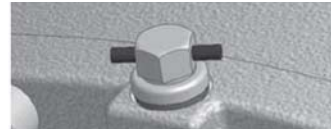
By taking special precautions, problems such as seal leakage and reducer failure due to the lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

- Store the gear unit in its actual mounting position in accordance with the specified oil fill-level, in a clean and dry temperature controlled area. Avoid temperature fluctuations within the range of 0°C and 40°C (32°F to 104°F) and avoid relative humidity conditions in excess of 60%.
- Fill the reducer full with oil that is compatible with the product normally used or recommended during service.
- Apply grease to all unpainted or unprotected shafts, bores, keyways, flange surfaces, tapped holes, and to the exterior of all oil seals.
- Store in a location free from shock and vibration, to avoid false brinelling of bearing elements and raceways.
- Once every few months rotate the input shaft approximately 10-20 revolutions to redistribute the weight of gears and shafts and to prevent brinelling of the bearings and drying of the seal track.
- Avoid direct exposure to the sun or UV light and aggressive or corrosive materials in the environment (ozone, gases, solvents, acids, caustic solutions, salts, radioactivity, etc.)

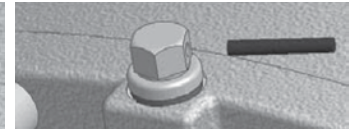
## 4. Commissioning After Long-Term Storage

- Please check your gear unit for a vent and if applicable to your product, remove the sealing plug to activate.

|                                                                                                                 |                |   |
|-----------------------------------------------------------------------------------------------------------------|----------------|---|
| ⚠                                                                                                               | <b>WARNING</b> | ⚠ |
| To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up. |                |   |



Sealed vent



Activated vent

- Remove all anti-corrosive metal protectant from otherwise bare metal surfaces. Follow product manufacturers directions and warnings during surface protection removal.
- Drain the reducer and refill it with the proper type and amount of lubricant.
- Observe start-up and initial operation to make sure there are no seal or gasket leaks, or unusual sounds, vibration or heat rise during operation.
- Check the resistance of all motor and brake windings to verify the integrity of the winding insulation and inspect all terminal box openings and wire connection areas to verify that all components are dry and free of corrosion.

## 1. Installation site

Drives must be properly installed if they are to produce the rated torque. Improper installation may lead to oil leaks, reduced life, or even catastrophic failure. NORD gear drives and motors are intended to be installed at a suitable mounting site under the following conditions:

- Unimpeded airflow to and around the units.
- Accessibility to oil drain, level and breather plugs.
- On brakemotors, allow adequate space for removing the fan guard and replacing and adjusting the brake.
- Mounting surfaces must be flat, torsionally rigid, and dampened against vibration.
- Unless special measures are taken, the immediate vicinity around the gear drive or motor should not be exposed to any aggressive or corrosive substances, contaminated air, ozone, gases, solvents, acids, alkalis, salts, radioactivity, etc.

## 2. Mounting position

Reducer mounting position charts illustrate the standard mounting positions for horizontal and vertical mounting. All gear units are assembled with the oil fill-level, oil-drain and vent plugs installed in their proper locations, **according to the customer-specified mounting position**. For mounting orientations other than shown consult NORD Gear.


**HARMFUL SITUATION**


The gear reducer may not receive proper lubrication if the unit is not mounted in the position for which it is designed. Observe the mounting position designated on the reducer nameplate, or specified in the order acknowledgement. Consult NORD prior to changing mounting position in the field. While it is often possible to simply relocate the oil fill-level and vent locations, and adjust the oil fill amount, in some cases, different mounting positions may lend themselves to different internal construction features.

## 3. Reducer mounting

- The support foundation must be straight, level and flat. Whether the gear unit is foot-mounted or flange-mounted, NORD recommends that the straightness and flatness of the customer-supplied support foundation follow **Table 1**.
- The gear unit must be properly aligned with the driven shaft of the machine in order to prevent additional stress or load forces from being imposed upon the gear unit.
- To facilitate oil drainage it may be desirable to elevate the gear box foundation above the surrounding support structure.
- All bolting surfaces must be clean and free from contamination and corrosion.

**Table 1: Recommended Straightness and Flatness of Customer-Supplied Support Foundation**

| Above<br>(in) | To &<br>Including<br>(in) | General Tolerance on<br>Straightness & Flatness<br>ISO 2768-2, Tolerance Class K |
|---------------|---------------------------|----------------------------------------------------------------------------------|
| 0.00          | 0.39                      | +/- 0.002 in                                                                     |
| 0.39          | 1.18                      | +/- 0.004 in                                                                     |
| 1.18          | 3.9                       | +/- 0.008 in                                                                     |
| 3.9           | 11.8                      | +/- 0.016 in                                                                     |
| 11.8          | 39                        | +/- 0.024 in                                                                     |
| 39            | 118                       | +/- 0.031 in                                                                     |

| Above<br>(mm) | To &<br>Including<br>(mm) | General Tolerance on<br>Straightness & Flatness<br>ISO 2768-2, Tolerance Class K |
|---------------|---------------------------|----------------------------------------------------------------------------------|
| 0             | 10                        | +/- 0.05 mm                                                                      |
| 10            | 30                        | +/- 0.1 mm                                                                       |
| 30            | 100                       | +/- 0.2 mm                                                                       |
| 100           | 300                       | +/- 0.4 mm                                                                       |
| 300           | 1000                      | +/- 0.6 mm                                                                       |
| 1000          | 3000                      | +/- 0.8 mm                                                                       |

**Straightness:** Based upon the length of the corresponding line.

**Flatness:** Based upon the longer lateral surface or the diameter of the circular surface.


**HARMFUL SITUATION**


The responsibility for the design and construction of the support foundation is with the user. The foundation must be adequate to withstand normal operating loads and possible overloads while maintaining alignment to attached system components under such loads. **Motors and drive components mounted on prefabricated base plates can become misaligned during shipment. Always check alignment after installation.**

## 4. Steel foundation

An engineered structural steel foundation should be designed to provide adequate rigidity and prevent loads from distorting the housing or causing misalignment of internal gears and shafts. When foot-mounting the gear reducer, a base plate or sole plate with suitable thickness (generally equal or greater than the thickness of the drive feet) should be securely bolted to steel supports and extend under the entire gear drive assembly. When flange-mounting the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear unit or gear motor.

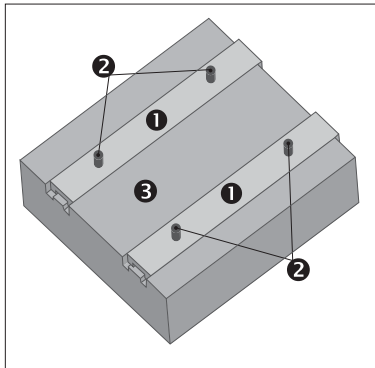

**HARMFUL SITUATION**


Do not weld on the gear unit or use the gear unit as an earth or ground connection for any welding procedure as this may cause permanent damage to the bearings and gears.

## 5. Concrete foundation

If a concrete foundation is used, allow the concrete to set firmly before bolting down the gear drive. Grout structural steel mounting pads and bolts of sufficient size into the concrete, to adequately distribute the load stress onto the concrete foundation.

Figure 1: Concrete Foundation



- ① Grouted Structural Steel Mounting Pads
- ② Mounting Bolts
- ③ Concrete Foundation

## 6. Bolt connections for footed & flange mounted units

NORD footed reducers and flange-mount reducers (with B5 flange) have clearance designed into the mounting holes to allow for some minor adjustments in alignment. Bolt size, strength and quantity should be verified to insure proper torque reaction capacity whatever the mounting arrangement. Tightening torque for gear reducer mounting bolts, and recommended fastener grades, are provided in Table 2.

Table 2A: Tightening Torque for Inch Reducer Mounting Bolts

| Thread Size<br>(in) | Grade SAE 5 /<br>ASTM A449 |      | Grade SAE 8 |       |
|---------------------|----------------------------|------|-------------|-------|
|                     | (lb-ft)                    | (Nm) | (lb-ft)     | (Nm)  |
| 1/4-20              | 7.1                        | 9.6  | 10.0        | 13.6  |
| 5/16-18             | 16                         | 21   | 22          | 30    |
| 3/8-16              | 28                         | 37   | 39          | 53    |
| 1/2-13              | 69                         | 93   | 98          | 132   |
| 5/8-11              | 138                        | 188  | 195         | 264   |
| 3/4-10              | 247                        | 334  | 348         | 472   |
| 7/8-9               | 396                        | 537  | 558         | 757   |
| 1-8                 | 592                        | 802  | 833         | 1,130 |
| 1 1/8-7             | -                          | -    | 1,233       | 1,672 |
| 1 1/4-7             | -                          | -    | 1,717       | 2,327 |
| 1 3/8-6             | -                          | -    | 2,267       | 3,073 |
| 1 1/2-6             | -                          | -    | 2,983       | 4,045 |
| 1 3/4-5             | -                          | -    | 4,458       | 6,045 |

- Calculated tightening torques are based a conventional 60°, clean and dry (un-lubricated) thread, with thread-friction and head-friction equal to 0.15.
- When using inch-fasteners, NORD recommends a minimum Grade SAE 5 (ASTM A-449) for sizes up to 1-8 UNC, and Grade SAE 8 for all larger sizes.

Table 2B: Tightening Torque for Metric Reducer Mounting Bolts

| Above<br>(mm) | ISO Grade 8.8 |       | ISO Grade 10.9 |       | ISO Grade 12.9 |        |
|---------------|---------------|-------|----------------|-------|----------------|--------|
|               | (lb-ft)       | (Nm)  | (lb-ft)        | (Nm)  | (lb-ft)        | (Nm)   |
| M4            | 2.4           | 3.2   | 3.5            | 4.7   | 4.1            | 5.5    |
| M5            | 4.7           | 6.4   | 6.9            | 9.3   | 8.1            | 11     |
| M6            | 8             | 11    | 12             | 16    | 14             | 19     |
| M8            | 20            | 27    | 29             | 39    | 34             | 46     |
| M10           | 39            | 53    | 58             | 78    | 67             | 91     |
| M12           | 68            | 92    | 100            | 135   | 110            | 155    |
| M14           | 107           | 145   | 159            | 215   | 180            | 250    |
| M16           | 170           | 230   | 247            | 335   | 290            | 390    |
| M18           | 240           | 325   | 343            | 465   | 400            | 540    |
| M20           | 339           | 460   | 487            | 660   | 570            | 770    |
| M22           | 465           | 630   | 664            | 900   | 770            | 1,050  |
| M24           | 583           | 790   | 848            | 1,150 | 960            | 1,300  |
| M27           | 848           | 1,150 | 1,217          | 1,650 | 1,440          | 1,950  |
| M30           | 1,180         | 1,600 | 1,660          | 2,250 | 1,950          | 2,650  |
| M36           | 2,050         | 2,780 | 2,884          | 3,910 | 3,470          | 4,710  |
| M42           | 3,297         | 4,470 | 4,639          | 6,290 | 5,560          | 7,540  |
| M48           | 4,940         | 6,700 | 7,010          | 9,500 | 8,260          | 11,200 |

- Calculated tightening torques are based on a conventional 60°, clean and dry (un-lubricated) thread, with thread-friction and head-friction equal to 0.15.
- When using metric-fasteners, NORD recommends a minimum ISO Grade 8.8 bolt.

## 7. Mounting the prime mover

When the motor is not flange mounted or integrally mounted to the gearbox, it is important to properly secure and align the gear drive with respect to the driven machine before attempting to align the prime mover or motor.

- After the main gear drive is properly aligned and bolted in place, align the prime mover with respect to the reducer input shaft.
- Use shims under the feet of the prime mover as needed, and secure in place with the proper mounting bolts. Dowel pins may be field-installed to help prevent misalignment and ensure proper realignment if removed for service.



### IMPORTANT NOTE



When using a high speed coupling connection between the prime mover and the reducer, check alignment per the coupling manufacturers recommendations. If the coupling is misaligned, the reducer alignment or shimming is incorrect. Re-align the gear reducer and re-check the high-speed coupling alignment before re-aligning the motor.

## 1. Solid shaft diameter tolerance

Reducer input and output shaft extensions have a diameter tolerance as specified in Table 1.

Table 1: Solid Shaft Diameter Tolerance

| Above<br>ø (in) | To &<br>Including<br>ø (in) | Tolerance<br>(in) |
|-----------------|-----------------------------|-------------------|
| 0.375           | 1.750                       | +0.0000 / -0.0005 |
| 1.750           | 7.500                       | +0.0000 / -0.0010 |

| Above<br>ø (mm) | To &<br>Including<br>ø (mm) | Tolerance<br>(mm) | ISO 286-2<br>Fit Class |
|-----------------|-----------------------------|-------------------|------------------------|
| 10              | 18                          | +0.012 / +0.001   | k6                     |
| 18              | 30                          | +0.015 / +0.002   | k6                     |
| 30              | 50                          | +0.018 / +0.002   | k6                     |
| 50              | 80                          | +0.030 / +0.011   | m6                     |
| 80              | 120                         | +0.035 / +0.013   | m6                     |
| 120             | 180                         | +0.040 / +0.015   | m6                     |
| 180             | 190                         | +0.046 / +0.017   | m6                     |

## 2. Fitting drive elements onto the reducer solid shaft

Solid input and output shaft extensions are provided with a drill and tap feature as indicated in Table 2. When installing drive elements such as coupling hubs, pulleys, sprockets, or gears, NORD recommends using the threaded hole in the end of the shaft, along with a suitable assembly device fitted into the threaded hole.

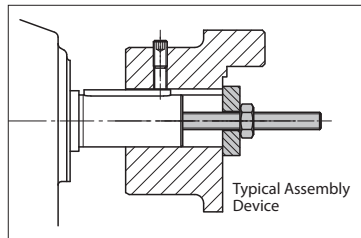


Table 2: Solid Shaft End - Threaded Holes

| Above<br>ø (in) | To &<br>Including<br>ø (in) | Tap size & Depth<br>(in) |
|-----------------|-----------------------------|--------------------------|
| 0.375           | 0.500                       | 10-24 x 0.43 in          |
| 0.500           | 0.875                       | 1/4-20 x 0.59 in         |
| 0.875           | 0.938                       | 5/16-18 x 0.71 in        |
| 0.938           | 1.100                       | 3/8-16 x 0.87 in         |
| 1.100           | 1.300                       | 1/2-13 x 1.10 in         |
| 1.300           | 1.875                       | 5/8-11 x 1.42 in         |
| 1.875           | 3.500                       | 3/4-10 x 1.73 in         |
| 3.500           | 5.125                       | 1-8 x 2.63 in            |
| 5.125           | 7.500                       | 1 1/4 - 7 x 3.15         |

| Above<br>ø (mm) | To &<br>Including<br>ø (mm) | Tap Size & Depth<br>(mm) |
|-----------------|-----------------------------|--------------------------|
| 10              | 13                          | M4 x 10 mm               |
| 13              | 16                          | M5 x 12.5 mm             |
| 16              | 21                          | M6 x 16 mm               |
| 21              | 24                          | M8 x 19 mm               |
| 24              | 30                          | M10 x 22 mm              |
| 30              | 38                          | M12 x 28 mm              |
| 38              | 50                          | M16 x 36 mm              |
| 50              | 85                          | M20 x 42 mm              |
| 85              | 130                         | M24 x 50 mm              |
| 130             | 190                         | M30 x 60 mm              |



## HARMFUL SITUATION



**DO NOT DRIVE** or **HAMMER** the coupling hub, pulley, sprocket, or gear into place. An endwise blow to the reducer shaft can generate damaging axial forces and cause damage to the reducer housing, bearings or internal components.



## WARNING



To avoid serious injury the user must provide suitable safety guards for all rotating shafts and shaft components such as couplings, chain drives, belt drives, etc. All guarding must adhere to local regulations and safety standards.

## 3. Installing interference-fit hubs to the reducer shaft

Prior to installing any interference-fit hubs to the reducer shaft, consult with the manufacturer to determine proper assembly and fit. Interference-fits usually require heating the coupling, sprocket or gear hub, per the manufacturer's recommendations. Coupling hub installation typically follows ANSI/AGMA 9002-A86. Always make sure the reducer shaft seals are protected from the heat source. Apply uniform heat to the drive element hub to prevent distortion. NORD does not recommend heating the drive element hub beyond 212°F to 275°F (100°C to 135° C).



## WARNING



When using heat to mount a drive element hub, do not use open flame in a combustible atmosphere or near flammable materials. Use suitable protection to avoid burns or serious injury.



## HARMFUL SITUATION



When using external chain or belt drives, make sure the reducer is sized so that the shaft and bearings have adequate capacity. To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, etc.) so that the applied load center is as close to the gear housing as possible and check component alignment and tension of any belts or chains per the manufacturer's recommendation. Do not over tighten the belts or chains.

## 4. Coupling installation

The performance and life of any coupling depends upon how well it is installed. Coupling hubs are typically mounted flush with the shaft ends, unless specifically ordered for overhung mounting. Shaft couplings should be installed according to the coupling manufacturer's recommendations for gap, angular and parallel alignment. To help obtain critical shaft alignment coupling hubs may be installed to the machine shafts prior to final shimming or tightening of the foundation bolts. Proper coupling alignment allows for thermal and mechanical shaft movement during operation and ensures that only torque (no radial load) is transmitted between the mating shafts.

### Coupling gap and angular alignment

The shaft gap must be sufficient to accommodate any anticipated thermal or mechanical axial movement. When setting the coupling gap, insert a spacer or shim stock equal to the required spacing or gap between the coupling hub faces. Measure the clearance using feeler gauges at 90-degree intervals, to verify the angular alignment.

### Parallel (or offset) alignment

Mount a dial indicator to one coupling hub, and rotate this hub, sweeping the outside diameter of the other hub. The parallel or offset misalignment is equal to one-half of the total indicator reading. Another method is to rest a straight edge squarely on the outside diameter of the hubs at 90° intervals and measure any gaps with feeler gauges. The maximum gap measurement is the parallel or offset misalignment.

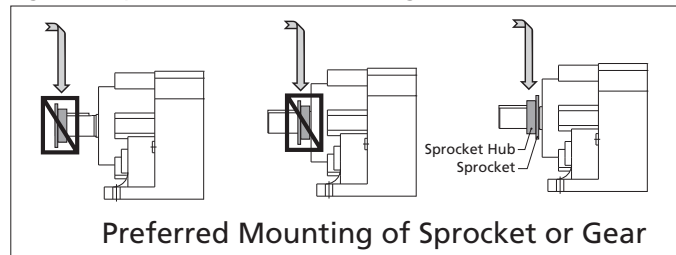
### Check alignment

After both angular and parallel alignments are within specified limits, tighten all foundation bolts securely and re-check critical alignment. If any of the specified limits for alignment are exceeded, realign the coupling.

## 5. Installing sheaves (pulleys), sprockets and gears

To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, gears, etc.) so that the applied load center is as close to the gear housing as possible, as shown in **Figure 2**.

**Figure 2: Sprocket or Gear Mounting**



Align the driver sheave or sprocket with the driven sheave or sprocket by placing a straight-edge length-wise across the face of the sheaves or sprockets. Alignment of bushed sheaves and sprockets should be checked only after bushings have been tightened. Check horizontal shaft alignment by placing one leg of a square or a level vertically against the face of the sheave or sprocket.

Always check component alignment and tension any belts or chains per the manufacturer's recommendation. The ideal belt or chain tension allows proper wrap of the driver and driven wheels, while maintaining the lowest possible tension of the belts or chain, so that no slipping occurs under load conditions. Check belt or chain tension frequently over the first 24 to 48 hours of operation.



### **HARMFUL SITUATION**



When using external chain or belt drives, make sure the reducer is sized so that the shaft and bearings have adequate capacity. To avoid unnecessary bearing loads and additional shaft deflection, mount all power take-off devices (sprockets, pulleys, etc.) so that the applied load center is as close the gear housing as possible and check component alignment and tension of any belts or chains per the manufacturer's recommendation. Do not over tension the belts or chains.

## 6. Outboard pinion gear alignment

Align outboard pinion gears and adjust the gear tooth clearance according to the manufacturer's recommendations, checking for acceptable outboard pinion tooth contact. The foundation bolts may have to be loosened and the gear unit moved slightly to obtain proper gear tooth contact. After the unit is moved to correct tooth contact, the prime mover may need to be realigned.

## 1. Keyed hollow shaft design

NORD uses high quality carbon steel to manufacture hollow-shafts. Upon request, NORD can provide alternate materials, such as stainless steel. NORD hollow shafts are designed with a bore relief (reduced contact area) between the mating shafts.

The bore relief provides a cavity to hold an anti-seize assembly paste. It also acts as a design feature intended to help prevent corrosion and to facilitate gearbox removal from the solid shaft.

NORD furnishes dual keys designed to be used in each of the bore land areas, as opposed to supplying a single long key. The dual keys are intended to simplify assembly onto the machine's solid shaft.



### IMPORTANT NOTE



If a single shaft key or dual shaft keys are supplied by others, the key/s must engage the full bore-land length at each end of the hollow shaft.

## 2. Key and keyway dimensions

Unless otherwise indicated, inch keys and keyways follow the ANSI B17.1 standard and metric keys and keyways follow the DIN6885-1 standard. Inch bores will typically utilize square keys but in some instances the larger hollow shaft bore sizes utilize the alternate rectangular key shown in the ANSI B17.1 standard.

Key slots for the solid machine shaft should be made with a Class 2, transitional-fit class (slightly loose to slightly tight). Key slots in the female shaft are designed to be a low clearance fit. These suggested practices should allow for easier assembly with the mating solid shaft, without allowing excessive clearance which could cause keys to work loose during reducer operation.



### IMPORTANT NOTE



If the key fit is too tight, light filing of the key sides and hand-fitting of the keys may be required.

## 3. Keyed hollow-shaft bore tolerances

Standard keyed hollow-shaft bore tolerances are shown in the following table.

**Table 1 - Keyed hollow bore tolerances**

| Above  | To and Including | Bore Diameter Tolerance |
|--------|------------------|-------------------------|
| ø [in] | ø [in]           | ø [in]                  |
| 0.4375 | 1.6250           | +0.0010 / -0.0000       |
| 1.6250 | 3.2500           | +0.0012 / -0.0000       |
| 3.2500 | 7.0000           | +0.0014 / -0.0000       |

| Above  | To and Including | Bore Diameter Tolerance |
|--------|------------------|-------------------------|
| ø [mm] | ø [mm]           | ø [mm]                  |
| 10     | 18               | +0.018 / -0.000         |
| 18     | 30               | +0.021 / -0.000         |
| 30     | 50               | +0.025 / -0.000         |
| 50     | 80               | +0.030 / -0.000         |
| 80     | 120              | +0.035 / -0.000         |
| 120    | 180              | +0.040 / -0.000         |
| 180    | 190              | +0.035 / -0.000         |

Metric hollow bore tolerances per ISO286-2, Class H7

## 4. Suggested solid shaft (machine shaft) tolerances

NORD recommends a close fit of the customer-supplied solid shaft or machine-shaft, for the following reasons:

- To help minimize the potential for fretting and corrosion.
- To help prevent excessive free play in the shaft connection that could lead to excessive load stress on the driven system, the gear drive, or both.

**Table 2 - Suggested solid shaft tolerances**

| Above  | To and Including | Shaft Diameter Tolerance |                   |
|--------|------------------|--------------------------|-------------------|
| ø [in] | ø [in]           | Uniform Load             | Shock Load        |
| ø [in] | ø [in]           | ø [in]                   | ø [in]            |
| 0.4375 | 0.8750           | +0.0000 / -0.0005        | +0.0000 / +0.0005 |
| 0.8750 | 4.5000           | +0.0000 / -0.0010        | +0.0000 / +0.0010 |
| 4.5000 | 7.0000           | +0.0000 / -0.0012        | +0.0000 / +0.0015 |

| Above  | To and Including | Shaft Diameter Tolerance |                 |
|--------|------------------|--------------------------|-----------------|
| ø [mm] | ø [mm]           | Uniform Load ①           | Shock Load ②    |
| ø [mm] | ø [mm]           | ø [mm]                   | ø [mm]          |
| 10     | 18               | +0.000 / -0.011          | +0.012 / +0.001 |
| 18     | 30               | +0.000 / -0.013          | +0.015 / +0.002 |
| 30     | 50               | +0.000 / -0.016          | +0.018 / +0.002 |
| 50     | 80               | +0.000 / -0.019          | +0.021 / +0.002 |
| 80     | 120              | +0.000 / -0.022          | +0.025 / +0.003 |
| 120    | 180              | +0.000 / -0.025          | +0.028 / +0.003 |
| 180    | 190              | +0.000 / -0.029          | +0.033 / +0.004 |

① Uniform load: Mating shaft diameter tolerance per ISO286-2, class h6

② Shock load: Mating shaft diameter tolerance per ISO286-2, class k6

As indicated in Table 2, different solid shaft tolerances are suggested depending upon the load type.

- If the machine load conditions are considered “Uniform” a clearance fit is allowed.
- If the machine load conditions are considered to have “Shock Load” a light clearance to interference fit condition is suggested.

Typically the machine builder will have good knowledge as to the load type. As an alternate method to classify load type, one could follow the “Mass Acceleration Factor Selection Method” that is discussed in NORD’s product catalog/s.

Straightness, roundness, and diameter tolerance variations of both shafts should be controlled as accurately as possible. When mating, solid shaft design features are not controlled, reducer installation may be very difficult without ordering special hollow-bore design features to accommodate.



## HARMFUL SITUATION



The supporting solid shaft or driven machine shaft must be of adequate size and strength to withstand normal operating loads and peak loads without damage to itself or any of the system components.

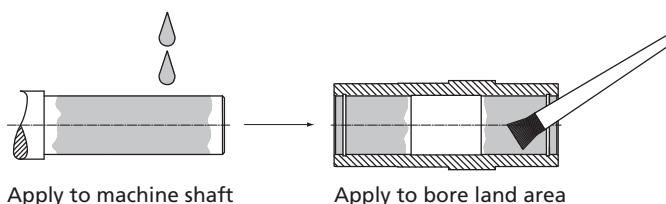
### 5. Suggested solid-shaft mating shaft surface finish

Controlling the mating shaft surface finish helps to assure proper fit and assembly while minimizing the possibility of corrosion and fretting. NORD recommends that the mating solid shaft surface should be at least 125 micro-inches (3.2 microns) or smoother.

### 6. Assembly to the machine shaft

- Clean and remove any dirt, grease, or rust-preventative coatings from both the reducer hollow shaft and the machine shaft.
- Make sure the edges of both the reducer hollow shaft and machine shaft are free from any nicks or burrs. If nicks or burrs are present remove them using an abrasive material such as an emery cloth.
- Before installing the gear reducer onto the machine shaft, apply an anti-seize compound or anti-corrosive lubricant to the mating shafts as shown in Figure 1. Assembly and subsequent dismantling will be aided by the anti-seize agent.

Figure 1 – Application of anti-seize to the mating shafts



- Fit the shaft key/s into place on the machine shaft. Depending upon the key slot design on the machine shaft, it may be necessary to stake or Loctite® the key/s into place so they do not slide axially while fitting the reducer to the shaft.
- Lift the gear unit assembly into place and align it carefully with respect to the machine shaft.
- Fit the gear unit assembly onto the machine shaft using a suitable pulling device.
- Secure the reducer onto the machine shaft in an axial direction, to prevent the reducer from shifting or walking out of place during operation.



## HARMFUL SITUATION



Do not use excessive force or try to hammer the gear unit into place. The housing, shafting, bearings or gear wheels may become damaged.

### 7. Securing the reducer onto the machine shaft

There are slight shaft oscillations during operation in any rotating shaft equipment or any shaft-mounted reducer assembly. Therefore it is important to secure the reducer in an axial direction onto the machine shaft, to prevent the reducer from shifting or walking out of place during operation.

Possible methods to secure the reducer axially to the machine shaft include:

- Using commercial set collars, retaining rings, or snap rings.
- Using the optional “NORD Fixing Element Kit” (see U10280).

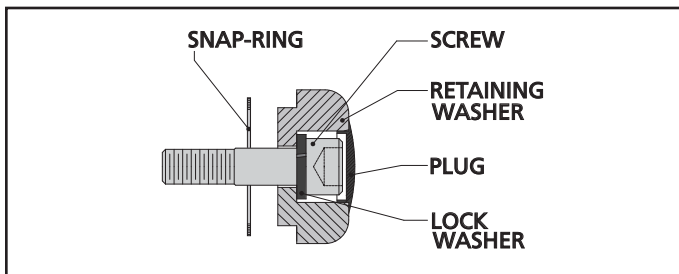
The NORD Fixing Element Kit includes all of the necessary parts to secure the shaft by using a tapped hole in the end of the mating male shaft.

*Loctite® is a registered trademark of Loctite Corporation U.S.A. and Henkel.*

## 1. Shaft fixing kit - basic design

The NORD Fixing Kit provides a method for securing the reducer in an axial direction, after the keyed-hollow shaft reducer is mounted onto the machine shaft. The fixing kit prevents the reducer from shifting or walking out of place during operation. NORD offers a variety of standard fixing kits, based upon bore size, as shown on Page 2 of this manual.

Figure 1 – Fixing kit components



### IMPORTANT NOTE



For installation of the keyed-hollow bore reducer to the machine-shaft, see user manual U10270.

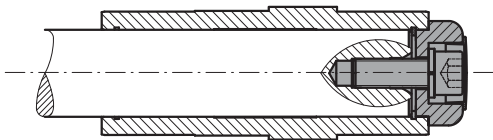
## 2. Assembly types

There are two types of assembly methods commonly used for securing the fixing kit.

Figure 2 – Fixing kit assembly methods

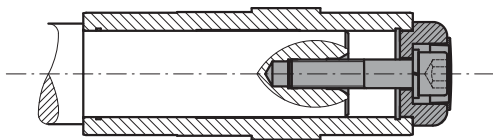
### Type 1

The machine-shaft is located against a fixed snap-ring located inside the bore of the reducer.



### Type 2

The machine shaft is shouldered and is pulled tight against the hollow-shaft; the snap-ring is no longer required.



### HARMFUL SITUATION



The maximum edge break on the solid machine shaft must not exceed the values shown on Page 2 of this manual. Otherwise the load-bearing capacity of the snap-ring will be reduced and may result in failure.

## 3. Assembly

- If using a Type 1 assembly, secure the appropriate snap-ring into the bore of the reducer. With Type 2 assembly, no snap-ring is required.
- Draw the hollow bore gear reducer onto the machine shaft as instructed in U10270. Remember to apply a suitable assembly paste or anti-seize compound to the mating shafts.
- Install the retaining washer over the end of the hollow bore.
- Secure the appropriate cap-screw into the machine shaft and tighten the screw based upon the assembly type, as noted below. Then install the protective plug over the screw hole.

### Type 1 - Screw tightening

Tighten until lightly snug and secure the screw with a thread-locking compound to prevent the screw from backing out.



### HARMFUL SITUATION



Over tightening the retaining screw may cause the snap ring to be pulled out of its seating groove, causing damage to the hollow-bore or snap ring.

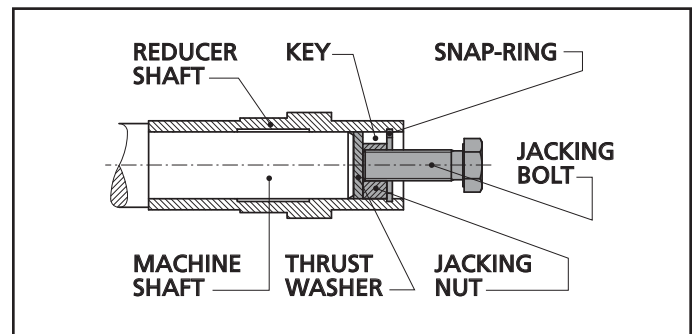
### Type 2 - Screw tightening

Follow the cap screw manufactures guidelines and tighten the screw to the proper torque, based upon the bolt grade and material. For reference tightening torque values, also see manual U10060, Table 2.

## 4. Disassembly

When using Type 2 assembly, it is possible to design a simple disassembly tool to allow easier removal of the hollow-bore reducer. The solid shaft is shouldered to rest against the hollow-bore of the reducer. The machine shaft is supported in both of the hollow bore land areas, but the overall length is reduced compared to Type 1 assembly.

Figure 3 – Disassembly Tool



### IMPORTANT NOTE



For suggestions on how to construct a disassembly tool for a particular reducer and bore size, please consult NORD's application engineering department.

## 5. Standard fixing kit size offerings

NORD offers a variety of standard fixing kit sizes as shown by the following tables.

Table 1 - Standard fixing kit size offerings

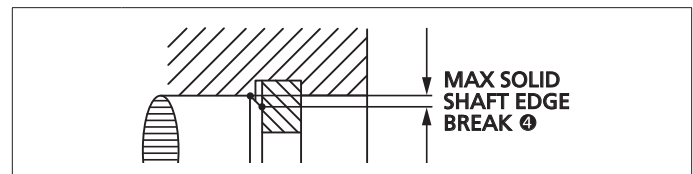
| Shaft Bore<br>[in] | Bolt Size | Allowable Thrust      |                     | Max. Edge Break ④<br>in<br>[mm] |
|--------------------|-----------|-----------------------|---------------------|---------------------------------|
|                    |           | Groove ②<br>lb<br>[N] | Ring ③<br>lb<br>[N] |                                 |
| 0.500              | 10-32     | 730<br>[3255]         | 520<br>[2300]       | 0.02<br>[0.5]                   |
| 0.750              | 1/4-20    | 1800<br>[7905]        | 560<br>[2500]       | 0.04<br>[1]                     |
| 1.000              | 3/8-16    | 2900<br>[13020]       | 1000<br>[4600]      | 0.04<br>[1]                     |
| 1.188              | 7/16-14   | 5100<br>[22630]       | 1000<br>[4700]      | 0.04<br>[1]                     |
| 1.250              | 7/16-14   | 5100<br>[22630]       | 1000<br>[4700]      | 0.04<br>[1]                     |
| 1.375              | 5/8-11    | 6500<br>[29140]       | 1400<br>[6400]      | 0.06<br>[1.5]                   |
| 1.438              | 5/8-11    | 6900<br>[30690]       | 1500<br>[6500]      | 0.06<br>[1.5]                   |
| 1.500              | 5/8-11    | 7800<br>[34875]       | 1500<br>[6700]      | 0.06<br>[1.5]                   |
| 1.625              | 5/8-11    | 9900<br>[44020]       | 1900<br>[8400]      | 0.08<br>[2]                     |
| 1.688              | 5/8-11    | 10500<br>[46810]      | 1800<br>[8200]      | 0.08<br>[2]                     |
| 1.938              | 5/8-11    | 11100<br>[49600]      | 1900<br>[8400]      | 0.08<br>[2]                     |
| 2.000              | 5/8-11    | 14100<br>[62775]      | 2700<br>[12100]     | 0.08<br>[2]                     |
| 2.063              | 5/8-11    | 14100<br>[62775]      | 2700<br>[12100]     | 0.08<br>[2]                     |
| 2.188              | 5/8-11    | 16800<br>[74865]      | 2900<br>[13000]     | 0.08<br>[2]                     |
| 2.375              | 3/4-10    | 17400<br>[77190]      | 2900<br>[13000]     | 0.08<br>[2]                     |
| 2.438              | 3/4-10    | 17400<br>[77190]      | 2900<br>[13000]     | 0.08<br>[2]                     |
| 2.750              | 3/4-10    | 19600<br>[87110]      | 4700<br>[21000]     | 0.10<br>[2.5]                   |
| 2.938              | 3/4-10    | 20900<br>[93000]      | 4700<br>[21000]     | 0.10<br>[2.5]                   |
| 3.188              | 3/4-10    | 27700<br>[123225]     | 7000<br>[31200]     | 0.12<br>[3]                     |
| 3.438              | 3/4-10    | 29300<br>[130200]     | 7000<br>[31400]     | 0.12<br>[3]                     |
| 3.625              | 3/4-10    | 30900<br>[137330]     | 7000<br>[31400]     | 0.12<br>[3]                     |
| 3.938              | 7/8-9     | 32400<br>[144305]     | 6900<br>[30800]     | 0.12<br>[3]                     |
| 4.000              | 7/8-9     | 39000<br>[173600]     | 16400<br>[73000]    | 0.12<br>[3]                     |
| 4.063              | 7/8-9     | 39000<br>[173600]     | 16400<br>[73000]    | 0.12<br>[3]                     |
| 4.375              | 7/8-9     | 41500<br>[184450]     | 16200<br>[72000]    | 0.12<br>[3]                     |
| 4.438              | 7/8-9     | 41500<br>[184450]     | 16200<br>[72000]    | 0.12<br>[3]                     |
| 4.750              | 7/8-9     | 44200<br>[196850]     | 15700<br>[70000]    | 0.12<br>[3]                     |
| 4.938              | 7/8-9     | 48000<br>[213900]     | 15500<br>[69000]    | 0.12<br>[3]                     |

Upon request, additional hollow-bore sizes & fixing kit sizes may be offered.

| Shaft Bore | Bolt Size | Allowable Thrust      |                     | Max. Edge Break ④<br>mm<br>[in] |
|------------|-----------|-----------------------|---------------------|---------------------------------|
|            |           | Groove ②<br>N<br>[lb] | Ring ③<br>N<br>[lb] |                                 |
| [mm]       |           |                       |                     |                                 |
| 16         | M5        | Not applicable ①      |                     |                                 |
| 20         | M6        | 8370<br>[1900]        | 5600<br>[1300]      | 1.0<br>[0.04]                   |
| 25         | M10       | 12400<br>[2800]       | 7300<br>[1600]      | 1.0<br>[0.04]                   |
| 30         | M10       | 17515<br>[3900]       | 7200<br>[1600]      | 1.0<br>[0.04]                   |
| 35         | M12       | 29140<br>[6500]       | 8700<br>[1900]      | 1.5<br>[0.06]                   |
| 40         | M16       | 41850<br>[9400]       | 10900<br>[2400]     | 2.0<br>[0.08]                   |
| 45         | M16       | 46810<br>[10500]      | 10700<br>[2400]     | 2.0<br>[0.08]                   |
| 50         | M16       | 62775<br>[14100]      | 19000<br>[4300]     | 2.0<br>[0.08]                   |
| 60         | M20       | 74865<br>[16800]      | 29200<br>[6600]     | 2.0<br>[0.08]                   |
| 70         | M20       | 87110<br>[19600]      | 30300<br>[6800]     | 2.5<br>[0.10]                   |
| 80         | M20       | 115630<br>[26000]     | 56000<br>[12600]    | 2.5<br>[0.10]                   |
| 90         | M24       | 130200<br>[29300]     | 56000<br>[12600]    | 3.0<br>[0.12]                   |
| 100        | M24       | 144305<br>[32400]     | 55000<br>[12400]    | 3.0<br>[0.12]                   |
| 110        | M24       | 181350<br>[40800]     | 71000<br>[16000]    | 3.0<br>[0.12]                   |
| 120        | M24       | 196850<br>[44300]     | 70000<br>[15700]    | 3.0<br>[0.12]                   |

Upon request, additional hollow-bore sizes and fixing kit sizes may be offered.

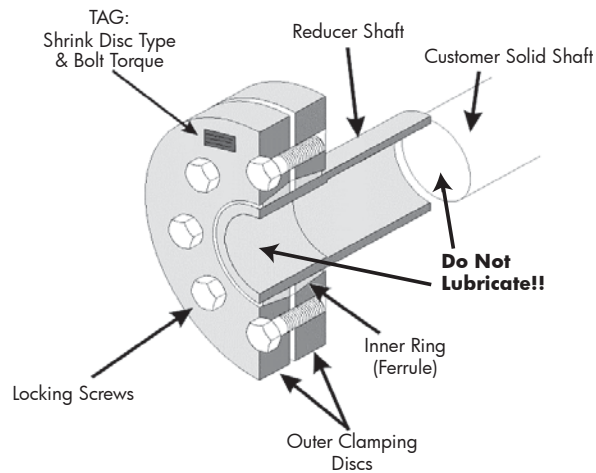
- This fixing kit is not supplied with a snap-ring.  
A Type 2 machine shaft is required.
- Thrust load-bearing capacity of the groove is based upon using a hollow-shaft material with a yield-strength of at least 45,000 psi (310 N/mm<sup>2</sup>).
- Thrust load-bearing capacity of the snap-ring is based upon a typical snap-ring material with a yield-strength of at least 30,500 psi (210 N/mm<sup>2</sup>).
- On the solid machine shaft, observe the maximum edge break (radius or chamfer) shown. A larger edge break will result in reduced load-bearing capacity of the snap-ring.



## 1. Shrink disc design concept

A shrink disc option is adaptable to many NORD hollow-bore reducers. The shrink disc applies a high-capacity, zero backlash, interference fit to the driven machine shaft. The double tapered inner ring converts most all of the screw clamping load into radial contact pressure, as the outer clamping discs are pulled together by proper tightening of the locking screws. As the inner ring is contracted, the clearance between the customer solid shaft and reducer shaft is absorbed.

- In their relaxed state, shrink discs provide a generous assembly clearance, thus eliminating the typical assembly and disassembly challenges of using interference fits.
- Shrink discs also reduce solid machine shaft stresses by eliminating the need for shaft keys and keyways.
- When properly applied, high shrink fits help eliminate shaft fretting corrosion and allow for easier shaft mounting and dismounting.



## 2. Solid (machine) shaft design guidelines

Always use a solid shaft material of adequate strength and apply proper shaft fits in order to establish adequate clamping force during assembly and assure proper shaft release during disassembly.

- Use solid shaft material with yield strength of at least 52,260 psi (360 N/mm<sup>2</sup>).
- The solid machine shaft should be machined according to ISO 286-2, Class h6 fit tolerances, with a shaft finish of 125 micro inches (3.2 µm) or smoother, per Table 1.
- The solid machine shaft must extend the full length of the reducer hollow shaft.

## 3. Safety

| ⚠                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>WARNING</b> | ⚠ |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---|
| <ul style="list-style-type: none"> <li>• The supporting solid shaft or driven machine shaft must be of adequate size and strength to withstand normal operating loads and peak loads without damage to itself or any of the system components.</li> <li>• The transmissible torque and the gripping capacity of the shrink disc may be reduced if shaft tolerances or clearances are larger than specified.</li> <li>• Excessive tightening torque can result in permanent deformation of the inner ring and the reducer hollow bore, making disassembly very difficult. Do not over tighten the shrink disc to compensate for excessive clearance between the machine shaft and reducer bore.</li> <li>• Observe the published ratings and safety factors for both the reducer and shrink disc. Overload conditions or excessively high torque can cause the shrink disc connection to slip. In extreme cases localized galling or welding of components may occur.</li> </ul> |                |   |

## 4. Shrink disc shaft tolerances

Recommended solid shaft tolerances and reducer bore tolerances are shown in the table below.

Table 1: Shrink disc shaft tolerances

| Above & Including<br>ø [in] | To & Including<br>ø [in] | Solid Shaft<br>Tolerance<br>ø [in] | Reducer Bore<br>Tolerance<br>ø [in] | Max. Assembly<br>Clearance<br>[in] |
|-----------------------------|--------------------------|------------------------------------|-------------------------------------|------------------------------------|
| 0.7500                      | 1.1250                   | +0.0000 / -0.0005                  | +0.0008 / -0.0000                   | 0.0013                             |
| 1.1250                      | 1.9375                   | +0.0000 / -0.0006                  | +0.0009 / -0.0000                   | 0.0015                             |
| 2.0000                      | 3.1250                   | +0.0000 / -0.0007                  | +0.0011 / -0.0000                   | 0.0018                             |
| 3.1875                      | 4.6875                   | +0.0000 / -0.0008                  | +0.0013 / -0.0000                   | 0.0021                             |
| 4.7500                      | 7.0625                   | +0.0000 / -0.0009                  | +0.0015 / -0.0000                   | 0.0024                             |
| 7.1250                      | 7.5000                   | +0.0000 / -0.0011                  | +0.0018 / -0.0000                   | 0.0029                             |

| Above<br>ø [mm] | To & Including<br>ø [mm] | Solid Shaft<br>Tolerance<br>ø [mm] | Reducer Bore<br>Tolerance<br>ø [mm] | Max. Assembly<br>Clearance<br>[mm] |
|-----------------|--------------------------|------------------------------------|-------------------------------------|------------------------------------|
| 18              | 30                       | +0.000 / -0.013                    | +0.021 / -0.000                     | 0.034                              |
| 30              | 50                       | +0.000 / -0.016                    | +0.025 / -0.000                     | 0.041                              |
| 50              | 80                       | +0.000 / -0.019                    | +0.030 / -0.000                     | 0.049                              |
| 80              | 120                      | +0.000 / -0.022                    | +0.035 / -0.000                     | 0.057                              |
| 120             | 180                      | +0.000 / -0.025                    | +0.040 / -0.000                     | 0.065                              |
| 180             | 190                      | +0.000 / -0.029                    | +0.046 / -0.000                     | 0.075                              |

Shaft/bore tolerances per ISO 282-6, Class h6/H7.

Solid shaft finish should be 125 micro inches (3.2 micro meters) or smoother.



### HARMFUL SITUATION



Contact NORD when using a shrink disc in an application where the shrink disc connection must simultaneously transmit torque and thrust.



# HOLLOW SHAFT WITH SHRINK DISC



## 5. Installation

⚠
**WARNING**
⚠

Disconnect all power sources from the equipment before beginning this installation procedure. Handle the components with care and avoid all sharp machined edges to prevent personal injury.

STOP
**HARMFUL SITUATION**
STOP

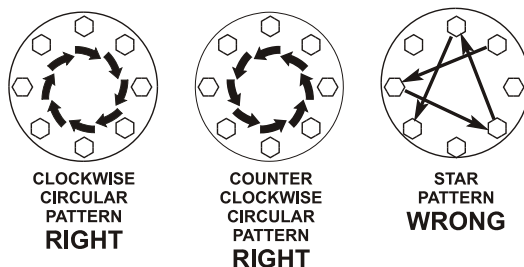
Do not tighten any of the shrink disc locking screws prior to installing the reducer with shrink disc onto the machine shaft. The inner ring of the shrink disc can become permanently contracted or damaged at relatively low tightening torque.

- A. Inspect the gear unit received. Make sure the shrink disc and extended hollow shaft projection is on the side of the reducer where it was specified or ordered.
- B. Loosen the shrink disc locking screws but do not take the shrink disc completely apart. Remove and discard any packaging material or transportation spacers that come with the shrink disc.
- C. Remove all burrs, rust, corrosion, lubricants, and foreign matter from the surfaces of the solid shaft and hollow-bore.
- D. Make sure the shrink disc is positioned onto the hollow shaft until the outer clamping ring is flush with the edge of the hollow shaft.
- E. To aid in assembly, it is acceptable to lightly grease the solid shaft, only in the area that will come in contact with the bronze-bushing side of the reducer hollow-shaft. **The reducer hollow shaft must be completely de-greased and free of lubricant, especially in the area of the shrink disc.**
- F. Position the gear reducer onto the solid machine shaft and make certain the area under the shrink disc is completely supported by the solid shaft.
- G. After confirming the proper positioning of gear reducer and the shrink disc, hand tighten (3) or (4) equally spaced locking screws to make sure the outer collars of the shrink disc are drawn together in a parallel fashion. Then hand-tighten the remaining screws.
- H. Refer to Table 2 for the specified tightening torques for the shrink disc locking screws. Using a properly set torque wrench using approximately ¼ (90°) turns; tighten the locking screws, by working in a circular clockwise or counterclockwise sequence around the shrink disc.
- I. Continue the tightening sequence (Step H.) even if some locking screws initially require very low tightening torque to achieve ¼ turns; do this for several passes until ¼ turns can no longer be achieved.
- J. Reset the torque wrench to approximately 3-5% over-torque and tighten the locking screws for 1 or 2 more passes. This procedure will compensate for relaxation of the locking screws, since tightening of a given screw will always tend to relax the adjacent screw. Without a slight overtorquing of the screws, an infinite number of passes would be required to reach the desired tightening torque.

Table 2 - Shrink Disc Locking Screw Torque

| Screw Size | Wrench Size [mm] | Tightening Torque |         |         |
|------------|------------------|-------------------|---------|---------|
|            |                  | [Nm]              | [lb-in] | [lb-ft] |
| M5         | 8                | 7                 | 62      | 5.2     |
| M6         | 10               | 12                | 106     | 8.9     |
| M8         | 13               | 30                | 266     | 22      |
| M10        | 17               | 59                | 522     | 44      |
| M12        | 19               | 100               | 885     | 74      |
| M16        | 24               | 250               | 2213    | 184     |
| M20        | 30               | 490               | 4337    | 361     |
| M24        | 36               | 840               | 7435    | 620     |
| M30        | 46               | 1700              | 15050   | 1254    |

### BOLT TIGHTENING PATTERN



- K. Reset the torque wrench to the correct tightening torque as indicated in Table 2. Make sure each locking screw has been properly tightened until the screws are no longer turning at the specified torque wrench setting. If necessary repeat Steps G. & H.

## 6. Removal

- A. Loosen the shrink disc locking screws in a circular pattern by using ½ (180°) turns, until the shrink disc hub can be moved or until the shrink disc hub and reducer shaft will return to their original fits.

⚠
**WARNING**
⚠

Do not completely remove the locking screws before the outer clamping disks of the shrink disc are disengaged from the inner ring. A sudden release of the outer collars will create high separating forces and could result in injury or even death.

- B. Loosen the outer collars of the shrink disc from the tapered inner ring. This may require tapping the bolts with a **soft faced** hammer or prying lightly between the outer collars.
- C. Remove the gear reducer from the machine shaft.

## 7. Re-installation

- A. It may be possible to re-use the shrink disc. However the shrink disc should not be re-used if it becomes damaged during removal, or excessively rusty or corroded. Shrink discs must always be disassembled and thoroughly cleaned before re-using.
- B. After cleaning the shrink disc, lubricate between the taper of the outer clamping disks and the outside of the inner ring using MOLYKOTE® G-Rapid Plus Paste (product of Dow Corning) or equivalent. In addition, grease screw threads and head contact area with multi-purpose grease.

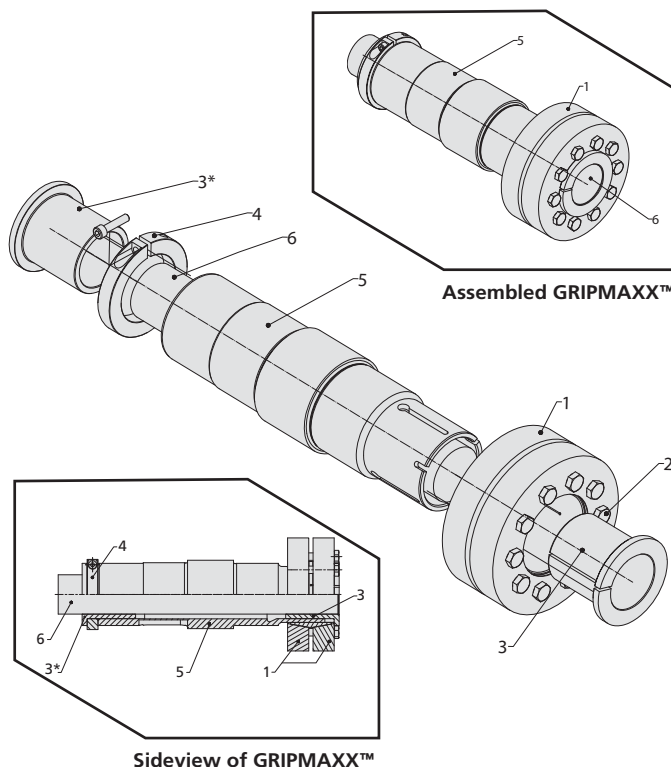
## 1. General information

The NORD GRIPMAXX™ keyless bushing system is adaptable to most all NORD shaft-mounted reducers. The bushing system offers interchangeable bushings to accommodate a large range of driven machine-shaft sizes.

The unique design of the NORD GRIPMAXX™ bushing system offers a number of distinct advantages as follows:

- The NORD GRIPMAXX™ allows the machine builder to utilize standard cold finished shaft stock, without the need for additional shaft machining or shaft keys.
- It uses a NORD shrink disc to apply a high-capacity, zero backlash, interference fit to the driven machine shaft, while eliminating the typical assembly and disassembly challenges of using interference fits.
- The built in clearance between the customer shaft and the bushing system helps to ensure easy installation and removal of the gearbox. To help ensure easy removal, the NORD GRIPMAXX™ bushings are prepared with a special low-wear, corrosion-resistant hardened surface treatment, that minimizes the formation of shaft corrosion and fretting.
- The NORD GRIPMAXX™ is ideal for start-stop operation and bi-directional loading because it does not depend on keys or keyways that transmit torque, which can also become loose or deform when subjected to these loading conditions.
- Unlike the typical conical or tapered bushing kits, the NORD GRIPMAXX™ design allows a tight fit against a shouldered machine shaft.
- The torque bushing and support bushing are the same part and are fully interchangeable with one another.

## 2. GRIPMAXX™ assembly detail



- [1] NORD Shrink Disc  
[2] Locking Screw  
[3] Bushing (Torque Side)  
[3\*] Bushing (Support Side)

- [4] Clamp Ring  
[5] Gear Reducer Hollow Shaft  
[6] Machine Shaft



### IMPORTANT NOTE



NORD recommends that the machine shaft have a yield strength of at least 52,260psi (360N/mm<sup>2</sup>)



### IMPORTANT NOTE



Observe the recommended machine shaft tolerances in table 1, page 2.



### WARNING



The supporting solid shaft or driven machine shaft must be of adequate size and strength to withstand normal operating loads and peak loads without damage to itself or any of the system components.

## 3. Installation

⚠
WARNING
⚠

Disconnect all power sources from the equipment before beginning this installation procedure. Handle the components with care and avoid all sharp or machined edges to prevent personal injury.

STOP
HARMFUL SITUATION
STOP

Do not tighten any of the shrink disc locking screws prior to installing the reducer with shrink disc onto the machine shaft. The inner ring of the shrink disc can become permanently contracted or damaged at a relatively low tightening torque.

**Table 1 - Required Machined Shaft Tolerance**

| Inch Machine Shaft |        |                            | Metric Machine Shaft |           |                            |
|--------------------|--------|----------------------------|----------------------|-----------|----------------------------|
| From               | To     | ISO 286-2 Tolerance h11(-) | Over                 | Including | ISO 286-2 Tolerance h11(-) |
| ø [in]             | ø [in] | [in]                       | ø [mm]               | ø [mm]    | [mm]                       |
| 0.4375             | 0.6875 | - 0.004                    | 10                   | 18        | - 0.11                     |
| 0.7500             | 1.0625 | - 0.005                    | 18                   | 30        | - 0.13                     |
| 1.1250             | 1.9375 | - 0.006                    | 30                   | 50        | - 0.16                     |
| 2.0000             | 3.1250 | - 0.007                    | 50                   | 80        | - 0.19                     |
| 3.1875             | 4.6875 | -0.008                     | 80                   | 120       | -0.22                      |
| 4.7500             | 4.7500 | -0.009                     | 120                  | 125       | -0.25                      |

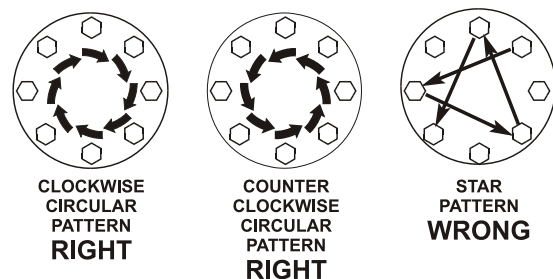
- A. Carefully inspect the machine shaft [6] and remove all burrs, rust, corrosion, lubricants, and foreign matter from the shaft surface. Verify that the diameter is within the dimensional tolerances shown in Table 1.
- B. Inspect the gear unit received to confirm the correct position of the shrink disc [1]. Make sure the hollow shaft [5] projection is on the side of the reducer where it was specified or ordered.
- C. In addition to cleaning the machine shaft [6], remove all dirt, grease or oils from the reducer hollow shaft [5], bushings [3], clamp ring [4], and shrink disc [1]. **Do not apply lubricants, corrosion preventatives, anti-sieze compounds or coatings to the mating surfaces of the shaft, bushings, clamp collars or shrink disc.**
- D. Position the clamp ring [4] and support bushing [3\*] over the machine shaft [6], making sure the support bushing is in its desired location. Then secure the support bushing [3\*] with the clamp ring [4] and tighten the clamp ring screw.
- E. Slide the gear reducer onto the machine shaft [6] until the gear reducer stops against the secured support bushing [3\*].

- F. Without taking the shrink disc [1] apart, loosen the shrink disc locking screws [2]. Slide the shrink disc over the reducer shaft [5] and slide the torque bushing [3] onto the machine shaft, making sure it is seated completely.
- G. Confirm the positioning of the shrink disc [1] and torque bushing [3]. **Do not tighten the shrink disc until the machine shaft and torque bushing are in proper position, or the reducer shaft will be damaged.** Hand-tighten 3 or 4 or locking screws [2] and make sure the outer collars of the shrink disc are drawn together in a parallel fashion and then hand-tighten the remaining screws.
- H. Refer to Table 2 for the specified tightening torques for the shrink disc locking screws. Using a properly set torque wrench using approximately ¼ (90°) turns; tighten the locking screws, by working in a circular clockwise or counterclockwise sequence around the shrink disc.
- I. Continue the tightening sequence (Step H.) even if some locking screws initially require very low tightening torque to achieve ¼ turns; do this for several passes until ¼ turns can no longer be achieved.
- J. Reset the torque wrench to approximately 3-5% over-torque and tighten the locking screws for 1 or 2 more passes. This procedure will compensate for relaxation of the locking screws, since tightening of a given screw will always tend to relax the adjacent screw. Without a slight overtorquing of the screws, an infinite number of passes would be required to reach the desired tightening torque.

**Table 2 - Shrink Disc Locking Screw Torque**

| Screw Size | Wrench Size [mm] | Tightening Torque |         |         |
|------------|------------------|-------------------|---------|---------|
|            |                  | [Nm]              | [lb-in] | [ft-lb] |
| M5         | 8                | 7                 | 62      | 5.2     |
| M6         | 10               | 12                | 106     | 8.9     |
| M8         | 13               | 30                | 266     | 22      |
| M10        | 17               | 59                | 522     | 44      |
| M12        | 19               | 100               | 885     | 74      |
| M16        | 24               | 250               | 2213    | 184     |
| M20        | 30               | 490               | 4337    | 361     |

### BOLT TIGHTENING PATTERN



- K. Reset the torque wrench to the correct tightening torque as indicated in Table 2. Make sure each locking screw has been properly tightened until the screws are no longer turning at the specified torque wrench setting. If necessary repeat Steps G. & H.

## 5. Bushing kit removal

- A. Loosen the shrink disc locking screws [2] in circular pattern by using  $\frac{1}{2}$  (180°) turns, until the shrink disc hub can be moved or until the shrink disc hub and reducer shaft will return to their original fits.



### WARNING

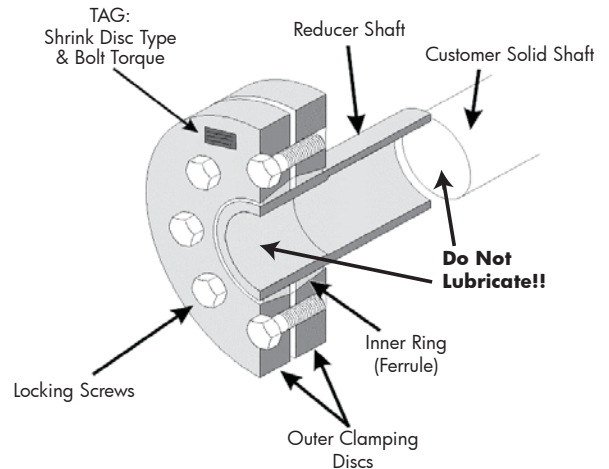


Do not completely remove the locking screws before the outer clamping disks of the shrink disc are disengaged from the inner ring. A sudden release of the outer collars will create high separating forces and could result in injury or even death.

- B. Loosen the outer collars of the shrink disc from the tapered inner ring. This may require tapping the bolts with a **soft faced** hammer or prying lightly between the outer collars.
- C. Remove the gear reducer from the machine shaft.

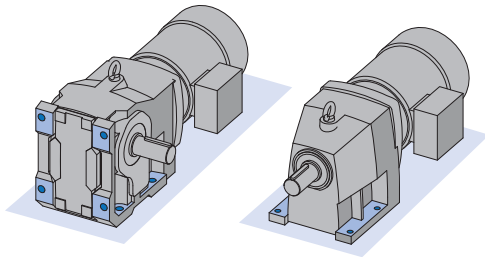
## 6. Re-installation

- A. It may be possible to re-use the bushings and shrink disc that are part of the NORD bushing system. However these components should not be re-used if they are damaged during removal, or excessively rusty or corroded.
- B. Never re-use any of the bushing kit components without prior cleaning. Shrink discs must always be disassembled and thoroughly cleaned before re-using.
- C. After cleaning the shrink disc, lubricate between the taper of the outer clamping disks and the outside of the inner ring using MOLYKOTE® G-Rapid Plus Paste (product of Dow Corning) or equivalent. In addition, grease screw threads and head contact area with multipurpose grease.



## 1. Foot-mounted reducers

When installing the foot-mounted gear unit, observe the flatness specifications and bolt tightening torque guidelines provided in U10060 and make sure the mating mounting surface and reducer feet are clean and free of debris. Use of shims under the feet of the gear unit may be required in order to align the output shaft to the driven equipment. Make sure that all feet are supported so that the housing will not distort when it is bolted down. Improper shimming will cause mis-alignment and may reduce the life of the gear unit or cause component failure. Dowel pins may be field-installed to help prevent misalignment and ensure proper realignment if removed for service.



### IMPORTANT NOTE



Gear units may be subjected to radial loads or side pull, caused by external chain drives or belt drives. In these instances it is recommended that the mounting base be designed with a slide-plate adjustment to accommodate extra slack in the chain or the belt after the feet are loosened. When using an external chain or belt drive, make sure the reducer is sized so that the shaft and bearings have adequate capacity.

## 2. Flange-mounted reducers (with B5 flange)

When using the B5 flange to mount the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear reducer or gearmotor. On the B5 mounting flange NORD provides a pilot register or and the flange pilot tolerance as listed per Table 1. When the mating hole is designed with the proper fit, the flange pilot tenon provides a means of accurately positioning the reducer while the hold-down bolts are properly secured; once the reducer is secured, the tenon helps prevent movement of the reducer and it helps locate the center of the reducer output shaft.

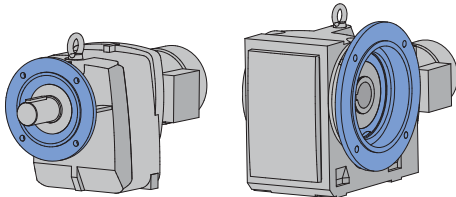


Table : Flange Pilot Tolerance

| Above<br>ø (in) | To &<br>Including<br>ø (in) | Tolerance<br>(in) | ISO 286-2<br>Fit Class |
|-----------------|-----------------------------|-------------------|------------------------|
| 1.969           | 3.150                       | +0.0005 / -0.0003 | j6                     |
| 3.150           | 4.724                       | +0.0005 / -0.0004 | j6                     |
| 4.724           | 7.087                       | +0.0006 / -0.0004 | j6                     |
| 7.087           | 9.055                       | +0.0000 / -0.0005 | h6                     |
| 9.055           | 9.843                       | +0.0000 / -0.0011 | h6                     |
| 9.843           | 12.402                      | +0.0000 / -0.0013 | h6                     |
| 12.402          | 15.748                      | +0.0000 / -0.0014 | h6                     |
| 15.748          | 19.685                      | +0.0000 / -0.0016 | h6                     |

| Above<br>ø (mm) | To &<br>Including<br>ø (mm) | Tolerance<br>(mm) | ISO 286-2<br>Fit Class |
|-----------------|-----------------------------|-------------------|------------------------|
| 50              | 80                          | +0.012 / -0.007   | j6                     |
| 80              | 120                         | +0.013 / -0.009   | j6                     |
| 120             | 180                         | +0.014 / -0.011   | j6                     |
| 180             | 230                         | +0.000 / -0.013   | h6                     |
| 230             | 250                         | +0.000 / -0.029   | h6                     |
| 250             | 315                         | +0.000 / -0.032   | h6                     |
| 315             | 400                         | +0.000 / -0.036   | h6                     |
| 400             | 500                         | +0.000 / -0.040   | h6                     |

When installing the flange mounted gear unit, observe the flatness specifications and bolt tightening torque guidelines provided in U10060. Make sure the mating mounting surface and reducer flange are clean and free of debris. Use a straight edge or parallel bar to check for high spots on the mating mounting surface and remove any raised material around the mounting holes.

Set the gear unit into place and tighten the bolts until they are snug. Before final bolt-tightening check for any material gaps between the mating surfaces and if shimming is required, use "U" shaped shims at least 2 times the width of the bolt. Avoid over shimming a very irregular surface as this will make it very difficult to achieve proper alignment.



### IMPORTANT NOTE



For heavy shock applications, it is advisable to field-install dowel pins through the mounting flange connection (in addition to the mounting bolts). This will help control flange movement or flange rotation and relieve the mounting bolts from this additional stress.



DRIVESYSTEMS

# REDUCER MOUNTING FOOTED & FLANGE MOUNT GEAR UNITS

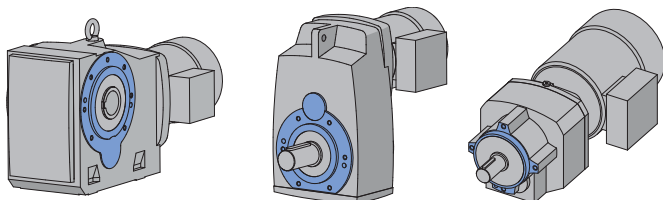


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RETAIN FOR FUTURE USE

## 3. Flange-mounted reducers (with B14 flange)

When using the B14 flange to mount the gear unit, the bulk head plate must be engineered to minimize buckling distortions and support the cantilevered weight of the gear reducer or gearmotor. When properly installed, the output flange of the reducer housing is designed to enable the permissible torques and radial forces to be reliably transmitted by the bolt connections.



### IMPORTANT NOTE



When using the B14 flange-face for mounting, if dowel pin holes are provided in addition to the threaded holes, then it is advisable to also use the proper dowel pins, to help control flange movement or flange rotation and relieve the mounting bolts from this additional stress. This is especially important for heavy shock applications.

## 4. Foot & flange reducer housings

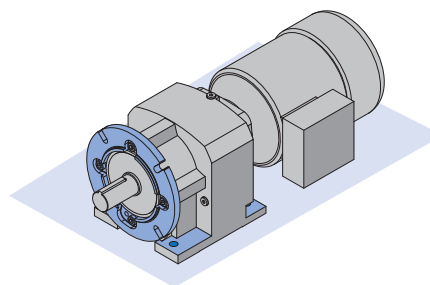
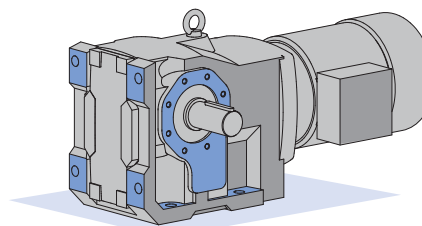
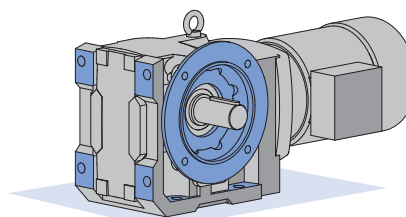
Some gear reducer housings are available with a foot and an output flange. Units with a foot and a B5 Flange are designated with the suffix XF after the primary model number and units with a B14 face-flange are designated with the suffix XZ after the primary model number. When a gear unit is provided with both a foot and a flange, the foot is considered the primary mounting surface. The flange is generally considered to be the secondary mounting option and it is intended that this surface be used for auxiliary add on elements that place minimal load stress on the reducer housing.



### HARMFUL SITUATION



To prevent overstress on the main gear unit housing, never tighten the reducer mounting feet and the mounting flange against one-another. Auxiliary add-on elements that are mounted to the reducer flange, must not transmit excessive force, torque or vibration to the main gear housing.





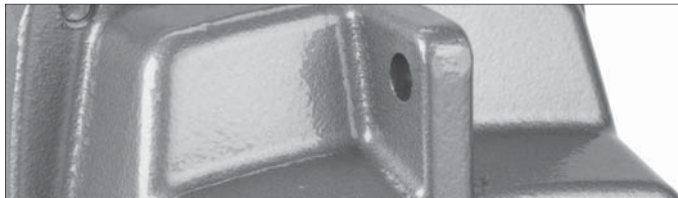
# CLINCHER™ SHAFT-MOUNT WITH RUBBER BUFFERS



## 1. Purpose of the built-in torque arm lug

The preferred method of installing a shaft-mounted Clincher™ reducer is to support the weight of the gear unit or gearmotor assembly from the driven solid machine shaft. In order to restrain the gearbox, react the torque, and keep the gear unit from spinning around the shaft, the Clincher™ gear units have a built-in torque arm lug or tab cast into the reducer housing. This torque tab is intended to be used in conjunction with the NORD Rubber Buffers.

Figure 1: Built-in torque lug



## 2. Rubber buffers

When specified, NORD provides two rubber buffers that are installed on either side of the gear unit's integral torque lug.

When properly used in tandem, on either side of the torque-arm lug, the rubber buffers help isolate and absorb the load forces present in the system and increase the reducer's service life by reducing cumulative torsional shock loads.

- The primary load force acts in the direction of driven shaft rotation, reacts the torque of the reducer, keeping the gearbox from spinning on the shaft.
- Additional forces present themselves in the direction opposite of the shaft rotation, due to the typical slight out-of-round condition present in the machine shaft. This condition is the reason most shaft mounted-reducers have a slight shaft-wobble, which is normal.

For further dampening it is possible to combine several rubber buffers in a row, on either side of the torque lug.



### IMPORTANT NOTE



Please reference Table 1 on page 2 of this manual for dimensional information.



### HARMFUL SITUATION



Always mount at least one rubber buffer on either side of the reducer's torque-arm lug. When using rubber buffers in tandem, make sure equal numbers are used on both sides of the torque tab. Failure to do so will not properly cushion the reducer and can result in excessive binding, bearing stress, and damage to the reducer.

## 3. Machine support



### WARNING



It is the responsibility of the machine builder to design a support bracket of adequate strength and rigidity, and supply an appropriate tightening bolt assembly. Failure to do so may result in injury caused from a damaged or broken torque-reaction assembly.

A single customer-supplied machine support bracket, of adequate strength and rigidity, can provide adequate restraint for both directions. This is because when the rubber buffer system is used, the applied load forces are always parallel to the retaining bolt and there are no twisting forces induced onto the bolt in either the clockwise or counter-clockwise direction. In some cases the customer may desire to supply a rigid support on either side of the rubber buffers. In these instances, longer assembly hardware is required.

## 4. Installation of the rubber buffers

- Install the Clincher™ hollow bore reducer onto the machine shaft. Line up the hole in the reducer's torque-arm lug with the hole in the machine's support bracket and temporarily hold the reducer in place.
- Properly secure the gear unit assembly to the driven shaft in an axial direction. If using the NORD Shaft Fixing Kit, follow the instructions in User Manual U10280.
- Install the rubber buffers on either side of the gear unit's torque-arm lug. Apply a thread locking compound to the end of the fixing bolt. Then place the fixing bolt through the rubber buffers, torque-arm lug and rigid machine support bracket and loosely secure the nut onto the end of the bolt.
- Tighten the fixing bolt and nut until lightly snug until all of the free play is eliminated from the rubber buffer assembly. Then snug the fixing bolt assembly by tightening an additional 1/4 to 1/2 turn.



### WARNING



To help prevent damage to the rubber buffers, avoid over-tightening.



### IMPORTANT NOTE



- A min. of (2) rubber buffers are required for each unit.
- For larger size CLINCHER'S™, NORD offers the heavy-duty rubber buffer (Option VG).
- A metric fixing bolt is preferred for rubber buffer assembly. NORD recommends a minimum ISO Grade 8.8 fixing bolt.



DRIVESYSTEMS

# CLINCHER™ SHAFT-MOUNT WITH RUBBER BUFFERS

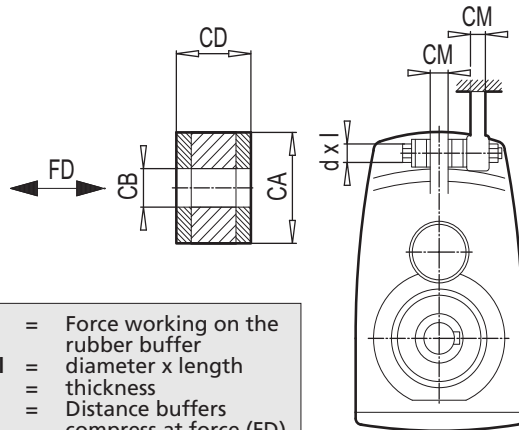


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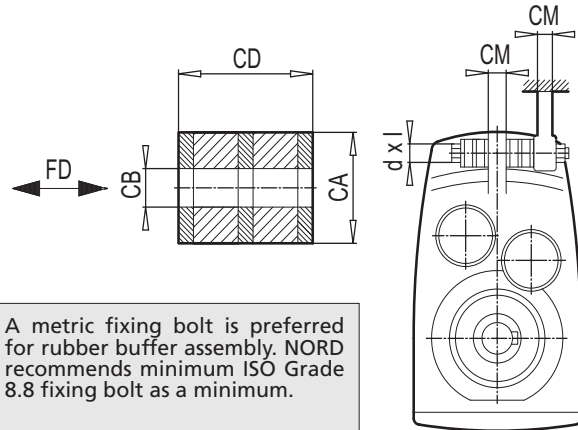
Table 1: Rubber buffer assembly/typical dimensions

Standard Rubber Buffer Assembly Option (G)

Heavy Duty Rubber Buffer Assembly Option (VG)



**FD** = Force working on the rubber buffer  
**d x l** = diameter x length  
**c** = thickness  
**S<sub>FD</sub>** = Distance buffers compress at force (FD)



A metric fixing bolt is preferred for rubber buffer assembly. NORD recommends minimum ISO Grade 8.8 fixing bolt as a minimum.

| Type        | Rubber Buffer P/N | CB<br>inch<br>[mm] | CA<br>inch<br>[mm] | CD<br>inch<br>[mm] | CM<br>inch<br>[mm] | Bolt<br>d x l<br>[metric] | FD<br>lb<br>[kN] | SFD<br>inch<br>[mm] |
|-------------|-------------------|--------------------|--------------------|--------------------|--------------------|---------------------------|------------------|---------------------|
| SK0182NB..G | 29603000          | 0.43<br>[11]       | 1.18<br>[30]       | 0.59<br>[15]       | 0.39<br>[10]       | M10 x 70                  | 217<br>[0.967]   | 0.06<br>[1.5]       |
| SK0282NB..G | 29603000          | 0.43<br>[11]       | 1.18<br>[30]       | 0.59<br>[15]       | 0.47<br>[12]       | M10 x 70                  | 234<br>[1.04]    | 0.07<br>[1.7]       |
| SK1282..G   | 29603000          | 0.43<br>[11]       | 1.18<br>[30]       | 0.59<br>[15]       | 0.55<br>[14]       | M10 x 80                  | 504<br>[2.24]    | 0.14<br>[3.6]       |
| SK1382NB..G | 29603000          | 0.43<br>[11]       | 1.18<br>[30]       | 0.59<br>[15]       | 0.55<br>[14]       | M10 x 80                  | 402<br>[1.79]    | 0.11<br>[2.8]       |
| SK2282..G   | 29604000          | 0.49<br>[12.5]     | 1.57<br>[40]       | 0.59<br>[15]       | 0.63<br>[16]       | M12 x 90                  | 600<br>[2.67]    | 0.07<br>[1.8]       |
| SK2382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK3282..G   | 29604000          | 0.49<br>[12.5]     | 1.57<br>[40]       | 0.59<br>[15]       | 0.71<br>[18]       | M12 x 90                  | 935<br>[4.16]    | 0.11<br>[2.9]       |
| SK3382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK4282..G   | 29606000          | 0.83<br>[21]       | 2.36<br>[60]       | 1.18<br>[30]       | 0.87<br>[22]       | M20 x 150                 | 1661<br>[7.39]   | 0.29<br>[7.3]       |
| SK4382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK5282..G   | 29606000          | 0.83<br>[21]       | 2.36<br>[60]       | 1.18<br>[30]       | 1.1<br>[28]        | M20 x 150                 | 2133<br>[9.49]   | 0.37<br>[9.4]       |
| SK5382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK6282..G   | 29608000          | 0.98<br>[25]       | 3.15<br>[80]       | 1.57<br>[40]       | 1.38<br>[35]       | M24 x 190                 | 3779<br>[16.81]  | 0.36<br>[9.2]       |
| SK6382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK7282..G   | 29608000          | 0.98<br>[25]       | 3.15<br>[80]       | 1.57<br>[40]       | 1.57<br>[40]       | M24 x 200                 | 4676<br>[20.8]   | 0.45<br>[11.4]      |
| SK7382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK8282..G   | 29610000          | 1.22<br>[31]       | 3.94<br>[100]      | 1.97<br>[50]       | 1.97<br>[50]       | M30 x 260                 | 6382<br>[28.39]  | 0.64<br>[16.3]      |
| SK8382..G   |                   |                    |                    |                    |                    |                           |                  |                     |
| SK9282..G   | 29610000          | 1.22<br>[31]       | 3.94<br>[100]      | 1.97<br>[50]       | 2.17<br>[55]       | M30 x 260                 | 9777<br>[43.49]  | 0.98<br>[24.9]      |
| SK9382..G   |                   |                    |                    |                    |                    |                           |                  |                     |

| Type       | Rubber Buffer P/N | CB<br>inch<br>[mm] | CA<br>inch<br>[mm] | CD<br>inch<br>[mm] | CM<br>inch<br>[mm] | Bolt<br>d x l<br>[metric] | FD<br>lb<br>[kN]  | SFD<br>inch<br>[mm] |
|------------|-------------------|--------------------|--------------------|--------------------|--------------------|---------------------------|-------------------|---------------------|
| SK7282.VG  | 29620850          | 0.98<br>[25]       | 3.35<br>[85]       | 2.36<br>[60]       | 1.57<br>[40]       | M24 x 240                 | 4676<br>[20.8]    | 0.48<br>[12.2]      |
| SK7382.VG  |                   |                    |                    |                    |                    |                           |                   |                     |
| SK8282.VG  | 29621100          | 1.22<br>[31]       | 4.33<br>[110]      | 3.54<br>[90]       | 1.97<br>[50]       | M30 x 340                 | 6382<br>[28.39]   | 0.76<br>[19.3]      |
| SK8382.VG  |                   |                    |                    |                    |                    |                           |                   |                     |
| SK9282.VG  | 29621400          | 1.22<br>[31]       | 5.51<br>[140]      | 4.33<br>[110]      | 2.17<br>[55]       | M30 x 380                 | 9777<br>[43.49]   | 0.83<br>[21.2]      |
| SK9382.VG  |                   |                    |                    |                    |                    |                           |                   |                     |
| SK10282.VG | 29621800          | 1.22<br>[31]       | 5.51<br>[140]      | 4.33<br>[110]      | 3.15<br>[80]       | M30 x 430                 | 12670<br>[56.36]  | 1.08<br>[27.4]      |
| SK10382.VG |                   |                    |                    |                    |                    |                           |                   |                     |
| SK11282.VG | 29621800          | 1.93<br>[49]       | 7.09<br>[180]      | 5.91<br>[150]      | 3.54<br>[90]       | M48 x 550                 | 18185<br>[80.89]  | 1.52<br>[38.5]      |
| SK11382.VG |                   |                    |                    |                    |                    |                           |                   |                     |
| SK12382.VG | 29621800          | 1.93<br>[49]       | 7.09<br>[180]      | 5.91<br>[150]      | 3.54<br>[90]       | M48 x 550                 | 23720<br>[105.51] | 1.98<br>[50.2]      |



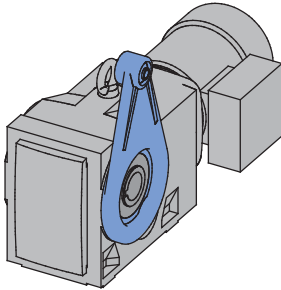
# RIGHT-ANGLE SHAFT-MOUNT WITH TORQUE ARM (D)



## 1. Torque arm (D)

The preferred method of installing a shaft-mounted reducer is to support the weight of the gear unit or gearmotor assembly from the driven solid machine shaft. A torque arm is required in order to restrain the gearbox, react the load torque, and keep the gear unit from spinning around the shaft.

The Torque-Arm (D) bracket is mounted to either side of the right-angle gear unit using mounting screws that thread into the B14 flange-face of the reducer. The anchor hole of the torque-arm bracket is supplied with a resilient rubber bushing.



### IMPORTANT NOTE



The side of the reducer that the torque arm is mounted on, and the angular position can be specified at time of order. Consult the appropriate NORD catalog for specific Torque Arm (D) mounting options and ordering guidelines.

## 2. Purpose of the built-in resilient rubber bushing

The resilient rubber bushing installed into the anchor hole end of the torque-arm helps isolate and absorb all the load forces present in the system and increase the reducer's service life by reducing cumulative torsional shock loads.

- The primary load force acts in the direction of driven shaft rotation, reacts the load torque of the reducer, and prevents the gearbox from spinning on the shaft.
- Additional forces present themselves in the direction opposite of the shaft rotation, due to the typical slight out-of-round condition present in the machine shaft. This condition is the reason most shaft mounted-reducers have a slight shaft-wobble, which is normal.



### HARMFUL SITUATION



Always make sure that the Torque Arm (D) has the resilient rubber bushing installed into the anchor hole end of the torque arm. Failure to do so will not properly cushion the reducer and can result in excessive binding, bearing stress, and damage to the reducer.

## 3. Machine support

The user must supply a suitably strong and rigid mating machine support that provides load bearing capacity on both sides of the torque-arm bracket.



### WARNING



It is the responsibility of the machine builder to design a support bracket of adequate strength and rigidity, and supply an appropriate tightening bolt assembly. Failure to do so may result in injury caused from a damaged or broken torque-reaction assembly.

## 4. Installation of a right-angle reducer with torque arm

A. Make sure the Torque-Arm (D) is mounted in the correct position on the reducer. Assembled screw heads should always sit flush with the torque arm.

- To reposition the torque-arm, remove the mounting screws, relocate the torque-arm, and reassemble the mounting screws as noted above.
- If the torque-arm was shipped loose, position the torque-arm in the correct location on the gear unit, and secure the torque-arm as noted above.



### IMPORTANT NOTES



- Torque arm mounting screws should be secured with a thread locking product (ex. Loctite® 242 or Loxeal® 54-03) and tightened per the table on page 2.
- Assembled screw heads should always sit flush with the torque arm.
- The support bracket should provide support on both sides of the torque arm or be in the form of a U-shape.
- Do not force the torque-arm. The torque arm must remain at a right angle to the gear unit.
- If mounting holes do not align properly the machine support may need to be moved.

B. Install the right-angle hollow bore reducer onto the machine shaft. Then line up the hole in the reducer's torque-arm with the hole in the machine's support bracket, and temporarily hold the reducer in place.

C. Apply a thread locking compound such as Loctite® 242 or Loxeal® 54-03 to the end of the anchor bolt that is used to secure the torque arm in place.

D. Place the anchor bolt through the support bracket and the reducer torque-arm. Attach the mating nut to the bolt and tighten the assembly until snug. At least one bolt diameter should protrude from the nut after assembly.



### WARNING



Do not force misalignment of the torque-arm. The torque arm must remain at a right angle to the gear unit or excessive load may be placed on the reducer shaft and bearings.

E. Properly secure the gear unit assembly to the driven shaft in an axial direction.

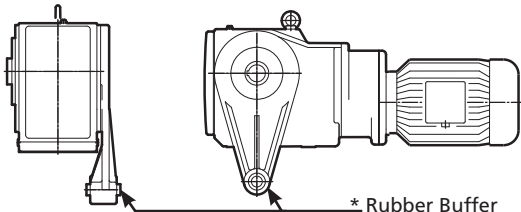
# RIGHT-ANGLE SHAFT-MOUNT WITH TORQUE ARM (D)

RETAIN FOR FUTURE USE



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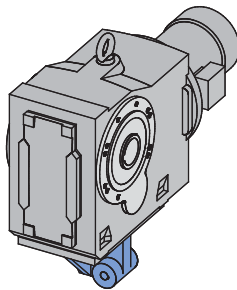
Table 1 - Torque Arm (D) with rubber buffer

|  |                         | <ul style="list-style-type: none"> <li>For all 90.1 Series Helical-Bevel gear units, NORD also offers a bottom mount Torque Arm (K). See User Manual U10620.</li> <li>For the large 90.1 Series Helical-Bevel gear units sizes: SK9082.1, SK9086.1, SK9092.1, and SK9096.1, please use the Torque Arm (K).</li> <li>A metric fixing bolt is preferred for fastening the Torque-Arm(D) to the machine support bracket.</li> </ul> |                   |                  |                           |          |       |             |                |                |
|-----------------------------------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|---------------------------|----------|-------|-------------|----------------|----------------|
| Gear Unit Series                                                                  | Torque Arm              |                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |                  | Torque Arm Mounting Screw |          |       |             |                |                |
|                                                                                   | Type                    | Rubber Buffer P/N                                                                                                                                                                                                                                                                                                                                                                                                                | Anchor Hole Size  | Anchor Bolt Size | Qty                       | Size     | Grade | Torque (Nm) | Torque (lb-ft) | Torque (lb-in) |
| 92.1/93.1 Series Helical-Bevel                                                    | SK92072.1AD/SK93072.1AD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 25  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK92172.1AD/SK93172.1AD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 25  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK92372.1AD/SK93372.1AD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M10 x 30 | 8.8   | 53          | 39             | 35             |
|                                                                                   | SK92672.1AD/SK93672.1AD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M10 x 30 | 8.8   | 53          | 39             | 35             |
|                                                                                   | SK92772.1AD/SK93772.1AD | 29603605                                                                                                                                                                                                                                                                                                                                                                                                                         | 16.5 mm [0.65 in] | M16              | 4                         | M12 x 30 | 8.8   | 92          | 68             | 35             |
| 92 Series Helical-Bevel                                                           | SK92172AZD              | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 8                         | M6 x 16  | 8.8   | 11          | 8              | 71             |
|                                                                                   | SK92372AZD              | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 8                         | M8 x 25  | 8.8   | 27          | 20             | 71             |
|                                                                                   | SK92672AZD              | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 8                         | M8 x 25  | 8.8   | 27          | 20             | 71             |
|                                                                                   | SK92772AZD              | 29603605                                                                                                                                                                                                                                                                                                                                                                                                                         | 16.5 mm [0.65 in] | M16              | 8                         | M8 x 25  | 8.8   | 27          | 20             | 71             |
| 90.1 Series Helical-Bevel                                                         | SK9012.1AZD/SK9013.1AZD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 7                         | M8 x 20  | 8.8   | 27          | 20             | 62             |
|                                                                                   | SK9016.1AZD/SK9017.1AZD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 7                         | M8 x 20  | 8.8   | 27          | 20             | 62             |
|                                                                                   | SK9022.1AZD/SK9023.1AZD | 29603605                                                                                                                                                                                                                                                                                                                                                                                                                         | 16.5 mm [0.65 in] | M16              | 7                         | M8 x 25  | 8.8   | 27          | 20             | 62             |
|                                                                                   | SK9032.1AZD/SK9033.1AZD | 29603605                                                                                                                                                                                                                                                                                                                                                                                                                         | 16.5 mm [0.65 in] | M16              | 7                         | M10 x 30 | 8.8   | 53          | 39             | 62             |
|                                                                                   | SK9042.1AZD/SK9043.1AZD | 29605205                                                                                                                                                                                                                                                                                                                                                                                                                         | 25 mm [0.98 in]   | M24              | 7                         | M12 x 35 | 8.8   | 92          | 68             | 62             |
|                                                                                   | SK9052.1AZD/SK9053.1AZD | 29605205                                                                                                                                                                                                                                                                                                                                                                                                                         | 25 mm [0.98 in]   | M24              | 7                         | M12 x 35 | 8.8   | 92          | 68             | 62             |
|                                                                                   | SK9072.1AZD             | 29605205                                                                                                                                                                                                                                                                                                                                                                                                                         | 25 mm [0.98 in]   | M24              | 7                         | M16 x 45 | 8.8   | 230         | 170            | 62             |
| Helical-Worm                                                                      | SK02040AZD              | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M6 x 20  | 8.8   | 11          | 8              | 35             |
|                                                                                   | SK02050AZD/SK13050AZD   | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 20  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK12063AZD/SK13063AZD   | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 7                         | M8 x 22  | 8.8   | 27          | 20             | 62             |
|                                                                                   | SK12080AZD/SK13080AZD   | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 7                         | M10 x 25 | 8.8   | 53          | 39             | 62             |
|                                                                                   | SK32100AZD/SK33100AZD   | 29603605                                                                                                                                                                                                                                                                                                                                                                                                                         | 16.5 mm [0.65 in] | M16              | 7                         | M12 x 30 | 8.8   | 92          | 68             | 62             |
|                                                                                   | SK42125AZD/SK43125AZD   | 29603605                                                                                                                                                                                                                                                                                                                                                                                                                         | 16.5 mm [0.65 in] | M16              | 7                         | M12 x 30 | 8.8   | 92          | 68             | 62             |
| MINICASE® SMI Series Worm                                                         | SK1SMI31AZD             | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M6 x 16  | 8.8   | 11          | 8              | 35             |
|                                                                                   | SK1SMI40AZD/SK2SMI40AZD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 22  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SMI50AZD/SK2SMI50AZD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 22  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SMI50AZD/SK2SMI50AZD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 22  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SMI63AZD/SK2SMI63AZD | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M10 x 25 | 8.8   | 53          | 39             | 35             |
|                                                                                   | SK1SMI75AZD             | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M12 x 30 | 8.8   | 92          | 68             | 35             |
| MINICASE® SM Series Worm                                                          | SK1SM31AZD              | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M6 x 20  | 8.8   | 11          | 8              | 35             |
|                                                                                   | SK1SM40AZD/SK2SM40AZD   | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 20  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SM50AZD/SK2SM50AZD   | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 20  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SM63AZD/SK2SM63AZD   | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 20  | 8.8   | 27          | 20             | 35             |
| "FLECBLOC™ SI Series Worm"                                                        | SK1SI31D                | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M6 x 16  | 8.8   | 11          | 8              | 35             |
|                                                                                   | SK1SI40D                | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 22  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SI50D                | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M8 x 22  | 8.8   | 27          | 20             | 35             |
|                                                                                   | SK1SI63D                | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M10 x 25 | 8.8   | 53          | 39             | 35             |
|                                                                                   | SK1SMI75D               | 29602505                                                                                                                                                                                                                                                                                                                                                                                                                         | 10.5 mm [0.41 in] | M10              | 4                         | M12 x 30 | 8.8   | 92          | 68             | 35             |

## 1. Torque arm (K)

The preferred method of installing a shaft-mounted reducer is to support the weight of the gear unit or gearmotor assembly from the driven solid machine shaft. A torque arm is required in order to restrain the gearbox, react to the load torque, and keep the gear unit from spinning around the shaft.

Table 1 (Page 2) provides a list of Torque-Arm (K) part numbers available for the 90.1 Series Helical-Bevel gear units. The Torque Arm (K) is secured to the base of the reducer. On most sizes there is an integral resilient rubber bushing located at the fastening hole-end of the torque arm. On the larger sizes, rubber buffers are used in conjunction with the torque arm and when properly used they are applied in tandem, on either side of the torque arm lug.



### IMPORTANT NOTE



When ordering the Torque Arm (K) one can specify which side of the reducer to mount the fastening hole that bolts to the machine support bracket. Consult the appropriate NORD catalog for specific Torque Arm (K) mounting options and ordering guidelines.

## 2. Purpose of the rubber bushing or rubber buffers

Regardless if the Torque Arm (K) is supplied with the integral rubber bushing or whether separate rubber buffers are required, the bushing/buffers help isolate and absorb all the load forces present in the system and increase the reducer's service life by reducing cumulative torsional shock loads.

- The primary load force acts in the direction of driven shaft rotation, reacts the load torque of the reducer, and prevents the gearbox from spinning on the shaft.
- Additional forces present themselves in the direction opposite of the shaft rotation, due to the typical slight out-of-round condition present in the machine shaft. This condition is the reason most shaft mounted-reducers have a slight shaft-wobble, which is normal.



### HARMFUL SITUATION



Always make sure that the Torque Arm (K) is used in conjunction with the required rubber bushing/s. Failure to do so will not properly cushion the reducer and can result in excessive binding, bearing stress, and damage to the reducer.

## 3. Machine support

The user must supply a suitably strong and rigid mating machine support that provides load bearing capacity on both sides of the machine support bracket.



### WARNING



It is the responsibility of the machine builder to design a support bracket of adequate strength and rigidity, and supply an appropriate tightening bolt assembly. Failure to do so may result in injury caused from a damaged or broken torque-reaction assembly.

## 4. Installation of the right-angle reducer with torque arm (K)

- Make sure the Torque-Arm (K) is mounted so that the machine fastening hole is on the correct side of the reducer.
  - The torque-arm can be repositioned on the as-received unit by removing the fixing screws, re-position the torque-arm in the correct location, and re-securing the fixing screws to the proper tightening torque, as indicated in Table 2 (Page 2).
  - If the torque-arm was shipped loose, position the torque-arm in the correct location on the gear unit, and secure the torque-arm with the proper fixing screws & tightening torque, as indicated in Table 2 (Page 2).
- Install the right-angle hollow bore reducer onto the machine shaft. Line up the hole in the reducer's torque-arm with the hole in the machine's support bracket, and temporarily hold the reducer in place
- Properly secure the gear unit assembly to the driven shaft in an axial direction.
- Apply thread locking compound to the end of the fixing bolt, then place the fastening bolt through the rigid machine support bracket and reducer torque-arm and loosely secure the nut onto the end of the bolt.
- If the torque arm has an integral rubber bushing follow step F and skip steps G-H. If the torque arm uses rubber buffers skip forward to steps G-H.
- Tighten the fixing bolt to the proper tightening torque as indicated in Table 2 (Page 2).
- Install the rubber buffers on either side of the gear unit's torque-arm lug and place the fixing bolt through the rubber buffers and torque-arm lug and into the rigid machine support bracket.
- Tighten the fixing bolt and nut lightly snug, until all the free-play is eliminated from the rubber buffer assembly. Then snug the fixing bolt assembly by tightening an additional  $\frac{1}{4}$  to  $\frac{1}{2}$  turn.



### WARNING



To prevent damage to the rubber buffers, avoid over-tightening.



# 90.1 HELICAL-BEVEL SHAFT-MOUNT WITH BOTTOM MOUNT TORQUE ARM (K)

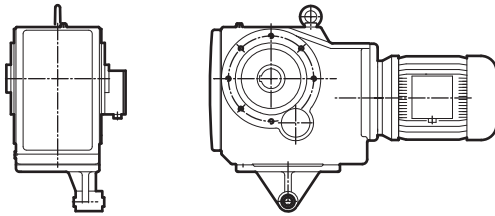


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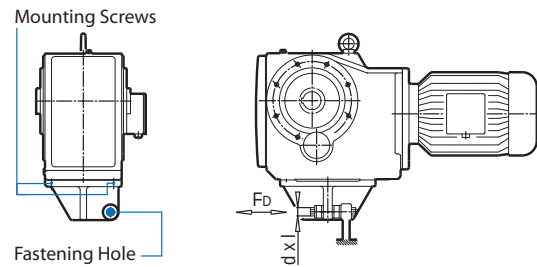
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Torque Arm (K) with integrated bushing



Available for Sizes SK9012.1 - SK9072.1

Torque Arm (K) with rubber buffer



Available for Sizes SK9082.1 - SK90906.1

- For most all 90.1 series Helical-Bevel gear units, an optional tear-drop shaped side-mounted torque arm (D) is available. See user manual U10600.

- A metric fixing bolt is preferred for fastening the torque arm (K) to the machine support bracket.

| Type                           | Torque Arm P/N | Reducer Hardware Hex Head Cap Screws + Lock Washer | Mounting Screw P/N | Lock Washer P/N | Rubber Buffer P/N | Fastening Hole In [mm] | Fastening Bolt Size | Bolt d x l [metric] | FD lb [N]         | SFD inch [mm]  |
|--------------------------------|----------------|----------------------------------------------------|--------------------|-----------------|-------------------|------------------------|---------------------|---------------------|-------------------|----------------|
| SK9012.1...K<br>SK9013.1...K   | 68190600       | M10 X 30 + A10<br>(Qty 3 Ea.)                      | 22010300           | 28560106        | N/A               | 0.41 [10.5]            | M10                 | N/A                 | N/A               | N/A            |
| SK9016.1...K<br>SK9017.1...K   | 68190600       | M10 X 30 + A10<br>(Qty 3 Ea.)                      | 22010300           | 28560106        | N/A               | 0.41 [10.5]            | M10                 | N/A                 | N/A               | N/A            |
| SK9022.1...K<br>SK9023.1...K   | 68290610       | M12 X 35 + A12<br>(Qty 3 Ea.)                      | 22012350           | 28560126        | N/A               | 0.65 [16.5]            | M16                 | N/A                 | N/A               | N/A            |
| SK9032.1...K<br>SK9033.1...K   | 68390610       | M12 X 35 + A12<br>(Qty 3 Ea.)                      | 22012350           | 28560126        | N/A               | 0.65 [16.5]            | M16                 | N/A                 | N/A               | N/A            |
| SK9042.1...K<br>SK9043.1...K   | 68490610       | M16 X 40 + A16<br>(Qty 3 Ea.)                      | 22016400           | 28560166        | N/A               | 0.98 [25]              | M24                 | N/A                 | N/A               | N/A            |
| SK9052.1...K<br>SK9053.1...K   | 68590620       | M16 X 40 + A16<br>(Qty 3 Ea.)                      | 22016450           | 28560166        | N/A               | 0.98 [25]              | M24                 | N/A                 | N/A               | N/A            |
| SK9072.1...K                   | 68690620       | M24 X 60 + A24<br>(Qty 4 Ea.)                      | 22024060           | 28560246        | N/A               | 0.98 [25]              | M24                 | N/A                 | N/A               | N/A            |
| SK9082.1...K<br>SK9082.1...SHK | 68819010       | M24 x 65 + A24<br>(Qty 4 Ea.)                      | 22024650           | 22024650        | 29610000          | 1.22 [31]              | M30                 | M30 x 260           | 5300<br>[23.64]   | 0.53<br>[13.5] |
| SK9086.1...K<br>SK9086.1...SHK | 68819010       | M24 x 65 + A24<br>(Qty 4 Ea.)                      | 22024650           | 22024650        | 29610000          | 1.22 [31]              | M30                 | M30 x 260           | 6900<br>[30.77]   | 0.69<br>[17.6] |
| SK9092.1...SHK                 | 68919010       | M36 x 90 + A36<br>(Qty 4 Ea.)                      | 22036900           | 28560366        | 29610000          | 1.22 [31]              | M30                 | M30 x 260           | 10300<br>[45.71]  | 1.03<br>[26.2] |
| SK9096.1...SHK                 | 69019000       | M42 x 120 + A42<br>(Qty 4 Ea.)                     | 22042120           | 28560426        | 29621800          | 1.93 [49]              | M48                 | M48 x 550           | 12,500<br>[55.56] | 1.06<br>[27.0] |

## 1. Importance of proper lubrication

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective “fluid boundary” between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

Most NORD reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position.

## 2. Standard oil type

The following tables indicate the standard oil fill type used. Please see user manual U11000 for more specific information and for optional helical and bevel gear lubricants:

| Serviceable Gear Units     |                                               |
|----------------------------|-----------------------------------------------|
| Helical In-line            | Standard Oil Fill:<br>ISO VG 220, Mineral Oil |
| Clincher Parallel-Shaft    |                                               |
| Right-Angle Bevel          |                                               |
| NORDBLOC® Series In-line   |                                               |
| NORDBLOC®.1 Series In-line |                                               |
| Standard Series In-line    |                                               |



### IMPORTANT NOTE



For shipping purposes, the following large Clincher™ gear units are supplied without oil:

- Clincher™ Sizes SK11282, SK11382 and SK12382

| Maintenance-free / Lubricated For Life Gear Units         |                                                          |
|-----------------------------------------------------------|----------------------------------------------------------|
| Clincher™ sizes SK0182NB, SK0282NB & SK1382NB             | Standard Oil Fill:<br>ISO VG220 SHC/PAO<br>Synthetic Oil |
| NORDBLOC® Sizes SK172, SK272, SK371F, SK372, SK373, SK320 |                                                          |



### IMPORTANT NOTE



Maintenance-free units are supplied as sealed units with no vent-plug. Consult NORD prior to ordering if interested in ordering any of the above sizes as serviceable gear units.



### IMPORTANT NOTE



Consult the sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Some units have special lubricants designed to operate in certain environments or intended to extend the service life or service temperature range of the lubricant. If in doubt about which lubricant is needed for a certain application, please contact NORD Gear.

## 3. Lubrication replacement

If the gear unit is filled with mineral oil, the lubricant should be replaced at least after every 10,000 operating hours or after every two years. If the gear unit is filled with synthetic oil, the lubricant should be replaced at least after every 20,000 operating hours or after every four years. Often gear reducers are exposed to extreme ambient conditions, hostile environments, wet conditions, or dirty and dusty operating areas. Especially in these situations, it is important to establish a condition-based oil service interval.

## 4. Oil viscosity

Viscosity, or the oil’s resistance to shear under load, is often considered the single most important property of any gear oil.

- Often one will consider making a viscosity correction to the oil to improve the performance when operating the gear unit at low temperature or high temperature.
- In cases of extreme load conditions, gear pairs and antifriction bearings may be more susceptible to sliding or scuffing wear. In these operating conditions, it may also be beneficial to consider an increased lubrication viscosity and/or a lubrication with improved antiwear additive packages.



### IMPORTANT NOTE



The user should consult with their primary lubrication supplier before considering changes in oil type or viscosity.

## 5. Maximum oil sump temperature limit

To prevent reducer overheating, the reducer’s maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation depending upon reducer size).

| Oil Type  | Maximum Oil Temperature Limit |               |
|-----------|-------------------------------|---------------|
|           | NORD                          | AGMA 9005-D94 |
| Mineral   | 80-85°C (176-185°F)           | 95°C (203°F)  |
| Synthetic | 105°C (220°F)                 | 107°C (225°F) |



### IMPORTANT NOTE



**Use caution when specifying gear reducers for high temperature service.** If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.

## 6. The importance of routine oil analysis

Routine oil analysis, sound lubrication practices, and good tracking of oil performance trends will help establish proper lubrication maintenance and change-out intervals. To maximize equipment reliability, NORD Gear generally recommends a condition-based lubrication maintenance program. One may take exceptions to this general recommendation on sealed-for-life or maintenance-free gear units or smaller and less costly gear units. In these instances, the replacement cost of the gear unit is often small compared to the costs associated with this type of oil analysis program.

| STOP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>HARMFUL SITUATION</b> | STOP |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|
| <p>NORD suggests replacing the gear oil if oil analysis indicates any of the following:</p> <ul style="list-style-type: none"> <li>• Viscosity has changed by approximately 10% or more.</li> <li>• Debris particles (silicon, dust, dirt or sand) exceed 25 ppm.</li> <li>• Iron content exceeds 150-200 ppm.</li> <li>• Water content is greater than 0.05% (500 ppm).</li> <li>• The total acid number (TAN) tests indicate a significant level of oxidative break-down of the oil, and a critical reduction in performance; If the TAN number measured changes by more than 5% over the new oil, then an oil change would be recommended.</li> </ul> |                          |      |

## 7. Mounting position and oil fill quantity

All NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. **For additional information, please see the separate mounting position diagrams and the corresponding oil fill quantity tables for the specified gear unit.**

The gearbox nametag will indicate the mounting position that was provided. **For mounting orientations other than shown in the mounting position charts, please consult NORD Gear.**

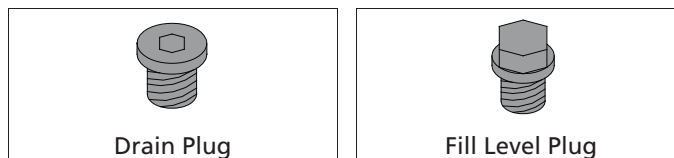
| STOP                                                                                                                                                                                                                                                                                                                     | <b>HARMFUL SITUATION</b> | STOP |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|
| <p>Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil-level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.</p> |                          |      |

## 8. Oil plug locations

All gear units are assembled with the oil fill-level, oil-drain and vent plugs installed in their proper locations, according to the specified mounting position. All standard plugs are metric and utilize sealing gaskets between the head of the plug and the reducer housing.

## 9. Drain and fill-level plugs

All reducer drain plugs are metric socket head cap screws. For easier identification, it is NORD's standard practice to provide a hex-head screw for the fill-level plug. For ease of draining the used oil from the gear reducer, use the socket head screw located at the lowest part of the gearbox.

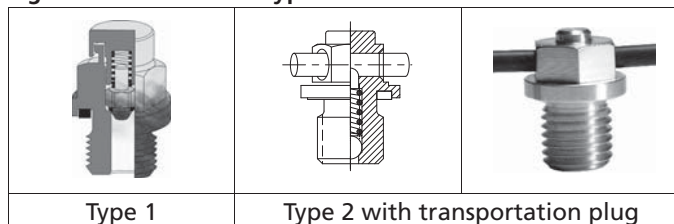


## 10. Vent plug locations

Reducer venting allows for air pressure differences that occur during operation, between the inner space of the reducer and the atmosphere, while ensuring leak-free operation. The AUTOVENT™ is standard for all vented gear units, unless otherwise noted.

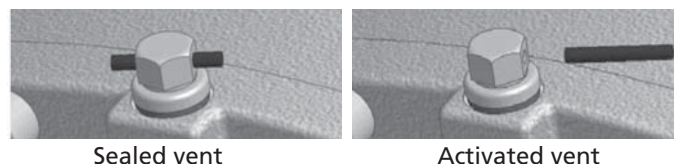
**AUTOVENT™** - The AUTOVENT™ helps prevent bearing and gear damage by behaving like a check valve to block the entry of foreign material (water, dust, corrosives, etc.). The breather opens at approximately 2-3 psi during operation and closes tightly as the gearbox cools. This option is perfect for humid conditions and wash-down environments, helping to maintain proper oil cleanliness, and reducing foaming and oxidation. NORD may choose to offer one of two style options as shown in Figure 1. The Type 2 AUTOVENT™ comes closed upon delivery with a transportation sealing plug (see Warning).

Figure 1 AUTOVENT™ Types



**Open Vent** - An optional open vent can be supplied by NORD. The open vent comes closed upon delivery with a transportation sealing plug (see Warning).

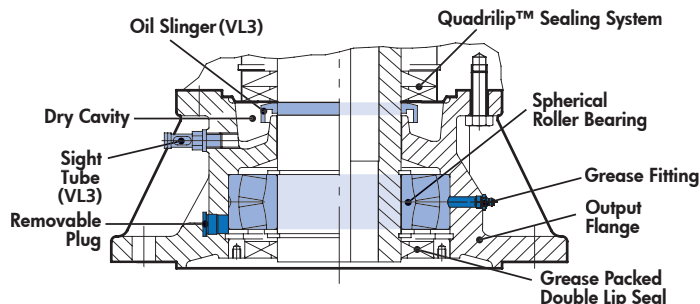
| ⚠                                                                                                                      | <b>WARNING</b> | ⚠ |
|------------------------------------------------------------------------------------------------------------------------|----------------|---|
| <p>To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up.</p> |                |   |



**Filtered Vent** - NORD may offer an optional filtered vent, which allows gases to permeate, but does not allow dust and debris to pass through the vent.

## 1. VL2 – Spread Bearing Design

NORD offers reinforced output shaft bearings with increased bearing distance. The lower bearing is a oversized, double row spherical bearing, which absorbs high overhung and thrust loads while providing a longer bearing service life. The spherical roller bearing is especially useful in compensating for alignment errors in long agitator shafts. The VL2 spread bearing design is commonly used for shredders, mixers, overhead conveyors or applications requiring increased bearing load carrying capacities. Included with the VL2 design is a grease fitting for the lower bearing and a removable plug to allow excess grease to purge from the bearing cavity.



## 2. VL3 – Spread Bearing Design with Oil Safe Dry Cavity

The VL3 dry cavity design adds additional oil leak protective measures to the VL2 spread bearing design. NORD's Quadralip™ sealing system prevents oil from leaking from the gearbox into the VL2 flange. If in any case oil does leak past the Quadralip™ seals, it would flow down to the oil slinger mounted onto the shaft. As the shaft rotates, the oil will sling off into the dry cavity. A sight tube is provided for dry cavity inspection. At the bottom of the spread bearing flange is greased packed, double lip seal.

## 3. Service Guidelines for the Extended Bearing Flange

The spherical roller bearing on the extended bearing housing should be re-greased with 0.75 to 1.0 ounces (20-25 grams) of grease after every 2,500 hours of service or at least every 6 months. Prior to re-greasing the screw plug located opposite to the grease nipple should be unscrewed. After re-greasing the screw plug must be reinstalled and tightened. The extended bearing is factory assembled with the proper amount and type of grease. The type of grease supplied depends upon the type of oil specified at time of order.

### Bearing Grease Options

| Reducer Oil Type | Grease Type      | Thickener Type | NLGI Grade | Ambient Temperature Range    | Manufacture Brand / Type |
|------------------|------------------|----------------|------------|------------------------------|--------------------------|
| Mineral          | Standard         | Li-Complex     | NLGI 2     | -30 to 60 °C (-22 to 140 °F) | Mobil Grease XHP222      |
| Synthetic        | High-Temperature | Polyurea       | NLGI 2     | -25 to 80 °C (-13 to 176 °F) | Mobil / Polyrex EP 2     |
| Food-Grade       | Food-Grade       | Al-Complex     | NLGI 2     | -25 to 40 °C (-13 to 104 °F) | Mobil / FM222            |



### HARMFUL SITUATION



Grease compatibility depends upon the type of thickener or soap complex used, the base oil type suspended within the thickener, and the type of additives used. The user should check with the lubrication supplier before making substitutions in brand and type in order to assure compatibility and to avoid causing possible damage to the extended bearing.



# HELICAL-WORM REDUCER LUBRICATION



DRIVESYSTEMS

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## 1. Importance of proper lubrication

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective “fluid boundary” between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

NORD helical-worm reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position.

## 2. Standard oil type

NORD helical worm gear reducers are filled with ISO VG 680 synthetic-hydrocarbon/polyalphaolefin (SHC/PAO) worm gear oil.

- SHC/PAO worm gear oils have good high and low temperature stability, are compatible with most paint and seal types, and are miscible with mineral oils.
- SHC/PAO worm gear oils also contain a small amount of organic ester and other antiwear (AW) packages to offer improved lubrication conditions, especially in the worm mesh, where a sideways sliding motion prevails.

Please see user manual U11020 for more specific information and for optional helical worm lubricants.



## HARMFUL SITUATION



In worm gears avoid using extreme pressure (EP) gear oils containing sulfur-phosphorous chemistries; these additives can react adversely with bronze worm gears, and accelerate wear.



## IMPORTANT NOTE



Consult the sticker adjacent to the fill plug to determine the type of lubricant installed at the factory. Some units have special lubricants designed to operate in certain environments or intended to extend the service life or service temperature range of the lubricant. If in doubt about which lubricant is needed for a certain application, please contact NORD Gear.

## 3. Lubrication replacement

The helical-worm gear oil should be replaced at least after every 20,000 operating hours or after every four years. Often gear reducers are exposed to extreme ambient conditions, hostile environments, wet conditions, or dirty and dusty operating areas. Especially in these situations, it is important to establish a condition-based oil service interval.

## 4. Efficiency

Helical worm gears reach efficiencies up to 92% and are generally much more efficient than worm-only gear units. However, it is important to consider the following, when using worm gears.

- Worm gears reach their peak rated efficiency, after they undergo a natural run-in process (up to 25 hours operating time at maximum rated load). Catalog published power and torque figures are based upon the rated efficiency after the run-in is complete.
- Worm gears have naturally lower startup efficiencies compared to operating efficiencies. As input speed increases the enhanced hydrodynamic effects of the oil result in less tooth friction and increased worm gear efficiency.



## IMPORTANT NOTE



**Worm gear reducers applied in cold temperature service,** may require increased motor power for the following reasons:

- Lower operating temperatures, cause lubrication viscosity to increase in both the gearbox and in the moving areas of the driven machine.
- Worm-gears have naturally lower start-up efficiencies compared to operating efficiencies.
- In extreme cases, one might need to consider increasing the motor power and lowering the oil viscosity

## 5. Oil Viscosity

Viscosity, or the oil’s resistance to shear under load, is often considered the single most important property of any gear oil.

- Often one will consider making a viscosity correction to the oil to improve the performance when operating the gear unit at low temperature or high temperature.
- In cases of extreme load conditions, gear pairs and antifriction bearings may be more susceptible to sliding or scuffing wear. In these operating conditions, it may also be beneficial to consider an increased lubrication viscosity and/or a lubrication with improved antiwear additive packages.



## IMPORTANT NOTE



The user should consult with their primary lubrication supplier before considering changes in oil type or viscosity.

## 6. Maximum oil sump temperature limit

To prevent reducer overheating, the reducer’s maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation depending upon reducer size).

| Oil Type  | Maximum Oil Temperature Limit |               |
|-----------|-------------------------------|---------------|
|           | NORD                          | AGMA 9005-D94 |
| Synthetic | 105°C (220°F)                 | 107°C (225°F) |



## IMPORTANT NOTE



**Use caution when specifying gear reducers for high temperature service.** If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.

## 7. The importance of routine oil analysis

Routine oil analysis, sound lubrication practices, and good tracking of oil performance trends will help establish proper lubrication maintenance and change-out intervals. To maximize equipment reliability, NORD Gear generally recommends a condition-based lubrication maintenance program. One may take exceptions to this general recommendation on sealed-for-life or maintenance-free gear units or smaller and less costly gear units. In these instances, the replacement cost of the gear unit is often small compared to the costs associated with this type of oil analysis program.

| STOP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>HARMFUL SITUATION</b> | STOP |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|
| <p>NORD suggests replacing the gear oil if oil analysis indicates any of the following:</p> <ul style="list-style-type: none"> <li>• Viscosity has changed by approximately 10% or more.</li> <li>• Debris particles (silicon, dust, dirt or sand) exceed 25 ppm.</li> <li>• Iron content exceeds 150-200 ppm.</li> <li>• Water content is greater than 0.05% (500 ppm).</li> <li>• The total acid number (TAN) tests indicate a significant level of oxidative break-down of the oil, and a critical reduction in performance; If the TAN number measured changes by more than 5% over the new oil, then an oil change would be recommended.</li> </ul> |                          |      |

## 8. Mounting position and oil fill quantity

All NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. **For additional information, please see the separate mounting position diagrams and the corresponding oil fill quantity tables for the specified gear unit.**

The gearbox nametag will indicate the mounting position that was provided. **For mounting orientations other than shown in the mounting position charts, please consult NORD Gear.**

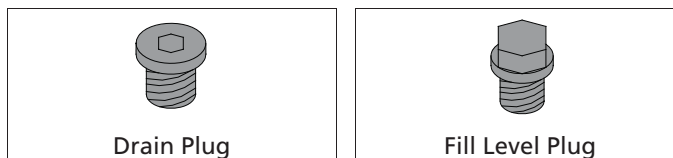
| STOP                                                                                                                                                                                                                                                                                                                     | <b>HARMFUL SITUATION</b> | STOP |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|
| <p>Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil-level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.</p> |                          |      |

## 9. Oil plug locations

All gear units are assembled with the oil fill-level, oil-drain and vent plugs installed in their proper locations, according to the specified mounting position. All standard plugs are metric and utilize sealing gaskets between the head of the plug and the reducer housing.

## 10. Drain and fill-level plugs

All reducer drain plugs are metric socket head cap screws. For easier identification, it is NORD's standard practice to provide a hex-head screw for the fill-level plug. For ease of draining the used oil from the gear reducer, use the socket head screw located at the lowest part of the gearbox.

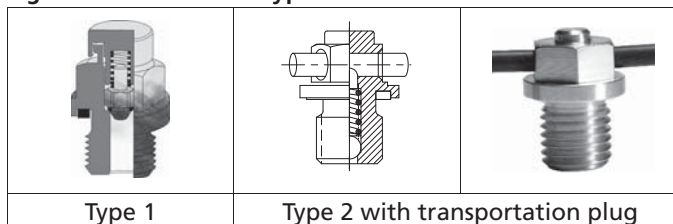


## 11. Vent plug locations

Reducer venting allows for air pressure differences that occur during operation, between the inner space of the reducer and the atmosphere, while ensuring leak-free operation. The AUTOVENT™ is standard for all vented gear units, unless otherwise noted.

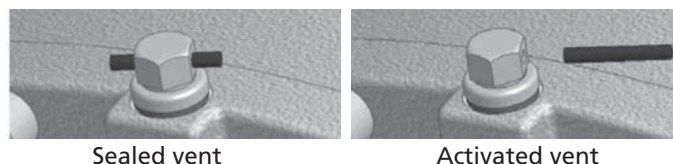
**AUTOVENT™** - The AUTOVENT™ helps prevent bearing and gear damage by behaving like a check valve to block the entry of foreign material (water, dust, corrosives, etc.). The breather opens at approximately 2-3 psi during operation and closes tightly as the gearbox cools. This option is perfect for humid conditions and wash-down environments, helping to maintain proper oil cleanliness, and reducing foaming and oxidation. NORD may choose to offer one of two style options as shown in Figure 1. The Type 2 AUTOVENT™ comes closed upon delivery with a transportation sealing plug (see Warning).

Figure 1 AUTOVENT™ Types



**Open Vent** - An optional open vent can be supplied by NORD. The open vent comes closed upon delivery with a transportation sealing plug (see Warning).

| ⚠                                                                                                                      | <b>WARNING</b> | ⚠ |
|------------------------------------------------------------------------------------------------------------------------|----------------|---|
| <p>To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start up.</p> |                |   |



**Filtered Vent** - NORD may offer an optional filtered vent, which allows gases to permeate, but does not allow dust and debris to pass through the vent.



# MINICASE® (SM SERIES) WORM GEAR LUBRICATION GUIDELINES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U10790 - 1 of 2

## 1. Importance of proper gearbox lubrication

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective “fluid boundary” between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

## 2. Maintenance free design

MINICASE® (SM series) worm gear reducers are designed to be maintenance-free and are supplied completely sealed. They are factory oil-filled with a pre-determined oil fill amount in accordance to the specified reducer size and mounting position. The synthetic lubrication used is suitable for the life of the product so the MINICASE™ is inherently maintenance free.

## 3. Standard oil type

The standard factory oil fill for MINICASE® (SM) worm gear reducers is ISO viscosity VG synthetic hydrocarbon/polyalphaolefin (SHC/PAO oil) food grade oil suitable for NSF-H1 incidental contact and is a factory stocked lubricant. Food grade oil suitable for NSF-H1 incidental contact is a factory stocked option.

See user manual U11040 for specific information and for optional MINICASE® (SM) worm lubrication types and options.



## HARMFUL SITUATION



In worm gears avoid using extreme pressure (EP) gear oils containing sulfur-phosphorous chemistries; these additives can react adversely with bronze worm gears, and accelerate wear.

## 4. Efficiency

It is important to consider the following, when using worm gears.

- Worm gears reach their peak rated efficiency, after they undergo a natural run-in process (up to 25 hours operating time at maximum rated load). Catalog published power and torque figures are based upon the rated efficiency after the run-in is complete.
- Worm gears have naturally lower startup efficiencies compared to operating efficiencies. As input speed increases the enhanced hydrodynamic effects of the oil result in less tooth friction and increased worm gear efficiency.



## IMPORTANT NOTE



**Worm gear reducers applied in cold temperature service**, may require increased motor power for the following reasons:

- Lower operating temperatures, cause lubrication viscosity to increase in both the gearbox and in the moving areas of the driven machine.
- Worm-gears have naturally lower start-up efficiencies compared to operating efficiencies.
- In extreme cases, one might need to consider increasing the motor power and/or lowering the oil viscosity.

## 5. Maximum oil sump temperature limit

To prevent reducer overheating, the reducer's maximum oil sump temperature limit must not be exceeded for prolonged periods of operation (up to 3 hours continuous operation depending upon reducer size).

| Oil Type  | Maximum Oil Temperature Limit |               |
|-----------|-------------------------------|---------------|
|           | NORD                          | AGMA 9005-D94 |
| Synthetic | 105°C (220°F)                 | 107°C (225°F) |



## IMPORTANT NOTE



**Use caution when specifying gear reducers for high temperature service.** If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.



# MINICASE® (SM SERIES) WORM GEAR LUBRICATION GUIDELINES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U10790 - 2 of 2

## 6. Oil Viscosity

The viscosity rating determines the operating oil's resistance to shear under load conditions. Some important viscosity considerations include the following:

- Lightly loaded gears require lower viscosity oils than highly loaded gears.
- Lower viscosity will provide thin oil film, lower friction, higher mechanical efficiency, and better heat removal conditions.
- Higher viscosity will provide thicker oil film, and better resistance to sliding wear, scuffing wear, and galling at high pressure.
- Higher operating temperatures will cause a reduction in viscosity and lower operating temperatures, cause an increase in viscosity or a thickening of the oil.

The standard oil-fill is considered acceptable for most applications. In certain situations an oil viscosity change may be beneficial.

- If the gear unit is exposed to frequent high load conditions. A higher viscosity oil will have a higher film thickness offering better overall resistance to oil shear, sliding wear and scuffing wear in gears and roller element bearings.
- An oil viscosity correction or lubrication change may improve the overall performance when operating the gear unit at very low or high ambient temperature conditions.



### IMPORTANT NOTE



The user should consult with their primary lubrication supplier before considering changes in oil type or viscosity.

## 7. Viscosity Index

Viscosity index helps quantify the rate of oil viscosity change with respect to temperature changes. Oils with a reasonably high viscosity index tend to be more stable in a changing temperature environment. The ability of an oil to maintain a small viscosity differential over the operating range of the gearbox provides a more consistent lubricating film and better wear performance.

Synthetic oils typically have a higher viscosity index than mineral oils and polyglycol oils tend to have an exceptionally high viscosity index compared to other synthetic oils like polyalphaolefin or ester based products.



# MINICASE® (SMI/SMID) WORM GEAR LUBRICATION GUIDELINES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U10800 - 1 of 2

## 1. Importance of proper gearbox lubrication

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective “fluid boundary” between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

## 2. Factory Oil-Filled / Maintenance-Free

NORD modular worm gear units are inherently maintenance-free, factory oil filled, and supplied with a high-quality, long-life, synthetic oil which is intended to be suitable for the life of the gear unit.

MINICASE® (SMI/SMID) worm gear units are assembled at the factory from stocked component parts. They are filled at time of assembly in accordance to the specified reducer mounting position. See user manuals U13150 and U13250 for more info.

## 3. Standard Oil Types

MINICASE® (SMI/SMID) worm gear units are factory filled with synthetic poly glycol oil. Food-grade polyglycol oil is optional. The specific oil type and viscosity grade are displayed on the reducer nameplate. See user manual 11050 for specific MINICASE® (SMI/SMID) worm lubrication types and options.



### HARMFUL SITUATION



In worm gears avoid using extreme pressure (EP) gear oils containing sulfur-phosphorous chemistries; these additives can react adversely with bronze worm gears, and accelerate wear.

## 4. Efficiency

It is important to consider the following, when ordering worm gears.

- Worm gears reach their peak rated efficiency, after they undergo a natural run-in process (up to 25 hours operating time at maximum rated load). Catalog published power and torque figures are based upon the rated efficiency after the run-in is complete.
- Worm gears have naturally lower startup efficiencies compared to operating efficiencies. As input speed increases the enhanced hydrodynamic effects of the oil result in less tooth friction and increased worm gear efficiency.



### IMPORTANT NOTE



**Worm gear reducers applied in cold temperature service**, may require increased motor power for the following reasons:

- Lower operating temperatures, cause lubrication viscosity to increase in both the gearbox and in the moving areas of the driven machine.
- Worm-gears have naturally lower start-up efficiencies compared to operating efficiencies.
- In extreme cases, one might need to consider increasing the motor power and lowering the oil viscosity

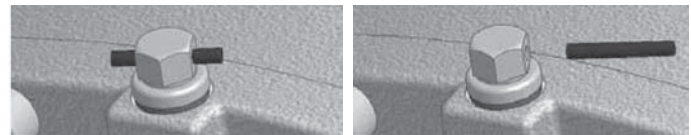
## 5. Optional Vent Kits

MINICASE® (SMI/SMID) worm gear units are designed to operate sealed or vented. As a standard the modular worm gear units are factory oil filled and supplied with oil plugs in the housing, making vent plugs optional. See user manual U14750.

NORD can supply an AUTOVENT™ or an open vent with each gear unit size. If a vent is desired the type must be specified at the time of order. Reducer vents are sealed with a transportation plug that must be removed prior to gear unit start-up.

| Type      | Transportation Seal | Installation          | Part Number                          |
|-----------|---------------------|-----------------------|--------------------------------------|
| AUTOVENT™ | Included            | Factory or Field site | 66093510                             |
| Open Vent | None                | Field Only            | 60693500                             |
| Open Vent | Included            | Factory or Field site | 22008004 (vent)<br>25308120 (gasket) |

Unless noted by a separate part number, vent kits include the housing gasket



### WARNING



To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start-up.

## 6. AUTOVENT™

The AUTOVENT™ helps prevent bearing and gear damage by behaving like a check valve to block the entry of foreign material (water, dust, corrosives, etc.). The breather opens at approximately 2-3 psi during operation and closes tightly as the gearbox cools. This option is perfect for humid conditions and wash-down environments, helping to maintain proper oil cleanliness, while reducing foaming and oxidation.

## 7. Open Vent

A typical gearbox industry open vent option can also be supplied by NORD. This option allows free exchange of air and does not build-up any back pressure inside the gear unit. This option is ideal for many operating conditions where the geared product is used in relatively clean and moisture-free environment.



# MINICASE® (SMI/SMID) WORM GEAR LUBRICATION GUIDELINES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

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## 8. When to Use a Sealed or a Vented Unit

There are many conditions that should be considered when deciding whether to use a sealed or vented unit.

1. If the duty cycle is intermittent, the run times are short, and any build-up of internal pressure or temperature is relatively low, the sealed unit option may be used.
2. If running continuous and under moderate to high load conditions, worm gears can generate higher operating temperatures and a build-up of internal pressure. In these instances a vent is strongly recommended. Consult NORD if operation at high load conditions is required.
3. If running continuous at 4-pole electric motor speeds (1800 rpm at 60 Hz) or higher, then a vent option is usually recommended. Consult NORD if operation at higher speeds is required.
4. Radial shaft seals produce a hydrodynamic pumping action to help push lubricant back into the gear unit, causing a small amount of ingested air and a small pressure increase (1-2 psi) that does not normally require a reducer vent; however when combined with continuous operation under high load (Condition 2), additional operating pressures will result and a vent should be used.
5. When the environment is contaminated with water, dirt, or other objects that may be ingested into the breather, increased wear of bearings, gearing, and lubrication breakdown can result. In these instances the sealed option or an AUTOVENT™ should be considered.

## 9. Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil-ump temperature limit must not be exceeded for prolonged periods of operation.

| Oil Type  | Maximum Oil Temperature Limit |               |
|-----------|-------------------------------|---------------|
|           | NORD                          | AGMA 9005-D94 |
| Synthetic | 105°C (220°F)                 | 107°C (225°F) |



### IMPORTANT NOTE



Use caution when specifying gear reducers for high temperature service. If there is concern about exceeding the safe operating temperature limit, please consult NORD to discuss alternatives.

## 10. Oil Viscosity

The viscosity rating determines the operating oil's resistance to shear under load conditions. Some important viscosity considerations include the following:

- Lightly loaded gears require lower viscosity oils than highly loaded gears.
- Lower viscosity will provide thin oil film, lower friction, higher mechanical efficiency, and better heat removal conditions.
- Higher viscosity will provide thicker oil film, and a better resistance to sliding wear, scuffing wear, and galling at high pressure.
- Higher operating temperatures will cause a reduction in viscosity and lower operating temperatures, cause an increase in viscosity or a thickening of the oil.

The standard oil-fill is considered acceptable for most applications. In certain situations an oil viscosity change may be beneficial.

- If the gear unit is exposed to frequent high load conditions. A higher viscosity oil will have a higher film thickness offering better overall resistance to oil shear, sliding wear and scuffing wear in gears and roller element bearings.
- An oil viscosity correction or lubrication change may improve the overall performance when operating the gear unit at very low or high ambient temperature conditions.



### IMPORTANT NOTE



The user should consult with their primary lubrication supplier before considering changes in oil type or viscosity.

## 11. Viscosity Index

Viscosity index helps quantify the rate of oil viscosity change with respect to temperature changes. Oils with a reasonably high viscosity index tend to be more stable in a changing temperature environment. The ability of an oil to maintain a small viscosity differential over the operating range of the gearbox provides a more consistent lubricating film and better wear performance.

Synthetic oils typically have a higher viscosity index than mineral oils and polyglycol oils tend to have an exceptionally high viscosity index compared to other synthetic oils like polyalpha-olefin or ester based products.



# FLEXBLOC™ (SI/SID SERIES) WORM GEAR LUBRICATION GUIDELINES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U10810 - 1 of 2

## 1. Importance of Proper Lubrication

Proper gearbox lubrication is essential in order to reduce friction, heat, and component wear. Lubricants reduce heat and wear by inserting a protective "fluid boundary" between mating parts and preventing direct metal to metal contact. Lubricants also help prevent corrosion and oxidation, minimize foam, improve heat transfer, optimize reducer efficiency, absorb shock loads and reduce noise.

## 2. Factory Oil-Filled / Maintenance-Free

NORD modular worm gear units are inherently maintenance-free, factory oil filled, and supplied with a high-quality, long-life, synthetic oil which is intended to be suitable for the life of the gear unit.

FLEXBLOC™ SI worm gear units are filled at time of assembly to a universal oil fill, allowing for many mounting position possibilities. See user manual U13300.

## 3. Standard oil type

FLEXBLOC™ (SI/SID) worm gear units are factory filled with synthetic poly glycol oil. Food-grade polyglycol oil is optional. The specific oil type and viscosity grade are displayed on the reducer nameplate. See user manual 11060 for specific FLEXBLOC™ (SI/SID) worm lubrication types and options.



### HARMFUL SITUATION



In worm gears avoid using extreme pressure (EP) gear oils containing sulfur-phosphorous chemistries; these additives can react adversely with bronze worm gears, and accelerate wear.

## 4. Efficiency

It is important to consider the following, when ordering worm gears.

- Worm gears reach their peak rated efficiency, after they undergo a natural run-in process (up to 25 hours operating time at maximum rated load). Catalog published power and torque figures are based upon the rated efficiency after the run-in is complete.
- Worm gears have naturally lower startup efficiencies compared to operating efficiencies. As input speed increases the enhanced hydrodynamic effects of the oil result in less tooth friction and increased worm gear efficiency.



### IMPORTANT NOTE



**Worm gear reducers applied in cold temperature service**, may require increased motor power for the following reasons:

- Lower operating temperatures, cause lubrication viscosity to increase in both the gearbox and in the moving areas of the driven machine.
- Worm-gears have naturally lower start-up efficiencies compared to operating efficiencies.
- In extreme cases, one might need to consider increasing the motor power and lowering the oil viscosity

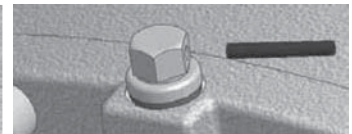
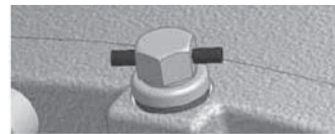
## 5. Optional Vent Kits

FLEXBLOC™ (SI) worm gear units are designed to operate sealed or vented. As a standard the modular worm gear units are factory oil filled and supplied with oil plugs in the housing, making vent plugs optional. See user manual U14800 for vent locations.

NORD can supply an AUTOVENT™ or an open vent with each gear unit size. If a vent is desired the type must be specified at the time of order. Reducer vents are sealed with a transportation plug that must be removed prior to gear unit start-up.

| Type      | Transportation Seal | Installation          | Part Number                          |
|-----------|---------------------|-----------------------|--------------------------------------|
| AUTOVENT™ | Included            | Factory or Field site | 66093510                             |
| Open Vent | None                | Field Only            | 60693500                             |
| Open Vent | Included            | Factory or Field site | 22008004 (vent)<br>25308120 (gasket) |

Unless noted by a separate part number, vent kits include the housing gasket



### WARNING



To prevent build-up of excessive pressure, sealed vents must be activated as shown prior to gear unit start-up.

## 6. AUTOVENT™

The AUTOVENT™ helps prevent bearing and gear damage by behaving like a check valve to block the entry of foreign material (water, dust, corrosives, etc.). The breather opens at approximately 2-3 psi during operation and closes tightly as the gearbox cools. This option is perfect for humid conditions and wash-down environments, helping to maintain proper oil cleanliness, while reducing foaming and oxidation.

## 7. Open Vent

A typical gearbox industry open vent option can also be supplied by NORD. This option allows free exchange of air and does not build-up any back pressure inside the gear unit. This option is ideal for many operating conditions where the geared product is used in relatively clean and moisture-free environment.



# FLEXBLOC™ (SI/SID SERIES) WORM GEAR LUBRICATION GUIDELINES



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## 8. When to Use a Sealed or a Vented Unit

There are many conditions that should be considered when deciding whether to use a sealed or vented unit.

1. If the duty cycle is intermittent, the run times are short, and any build-up of internal pressure or temperature is relatively low, the sealed unit option may be used.
2. If running continuous and under moderate to high load conditions, worm gears can generate higher operating temperatures and a build-up of internal pressure. In these instances a vent is strongly recommended. Consult NORD if operation at high load conditions is required.
3. If running continuous at 4-pole electric motor speeds (1800 rpm at 60 Hz) or higher, then a vent option is usually recommended. Consult NORD if operation at higher speeds is required.
4. Radial shaft seals produce a hydrodynamic pumping action to help push lubricant back into the gear unit, causing a small amount of ingested air and a small pressure increase (1-2 psi) that does not normally require a reducer vent; however when combined with continuous operation under high load (Condition 2), additional operating pressures will result and a vent should be used.
5. When the environment is contaminated with water, dirt, or other objects that may be ingested into the breather, increased wear of bearings, gearing, and lubrication breakdown can result. In these instances the sealed option or an AUTOVENT™ should be considered.

## 9. Maximum Oil Sump Temperature Limit

To prevent reducer overheating, the reducer's maximum oil-ump temperature limit must not be exceeded for prolonged periods of operation.

| Oil Type  | Maximum Oil Temperature Limit |               |
|-----------|-------------------------------|---------------|
|           | NORD                          | AGMA 9005-D94 |
| Synthetic | 105°C (220°F)                 | 107°C (225°F) |



### IMPORTANT NOTE



Use caution when specifying gear reducers for high temperature service. If there is concern about exceeding the allowable safe operating temperatures, please consult NORD to discuss alternatives.

## 10. Oil Viscosity

The viscosity rating determines the operating oil's resistance to shear under load conditions. Some important viscosity considerations include the following:

- Lightly loaded gears require lower viscosity oils than highly loaded gears.
- Lower viscosity will provide thin oil film, lower friction, higher mechanical efficiency, and better heat removal conditions.
- Higher viscosity will provide thicker oil film, and better resistance to sliding wear, scuffing wear, and galling at high pressure.
- Higher operating temperatures will cause a reduction in viscosity and lower operating temperatures, cause an increase in viscosity or a thickening of the oil.

The standard oil-fill is considered acceptable for most applications. In certain situations an oil viscosity change may be beneficial.

- If the gear unit is exposed to frequent high load conditions. A higher viscosity oil will have a higher film thickness offering better overall resistance to oil shear, sliding wear and scuffing wear in gears and roller element bearings.
- An oil viscosity correction or lubrication change may improve the overall performance when operating the gear unit at very low or high ambient temperature conditions.



### IMPORTANT NOTE



The user should consult with their primary lubrication supplier before considering changes in oil type or viscosity.

## 11. Viscosity Index

Viscosity index helps quantify the rate of oil viscosity change with respect to temperature changes. Oils with a reasonably high viscosity index tend to be more stable in a changing temperature environment. The ability of an oil to maintain a small viscosity differential over the operating range of the gearbox provides a more consistent lubricating film and better wear performance.

Synthetic oils typically have a higher viscosity index than mineral oils and polyglycol oils tend to have an exceptionally high viscosity index compared to other synthetic oils like polyalphaolefin or ester based products.



# EXPANSION CHAMBERS INSTALLATION & MAINTENANCE MANUAL



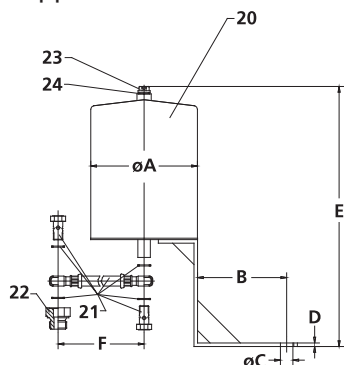
DRIVESYSTEMS

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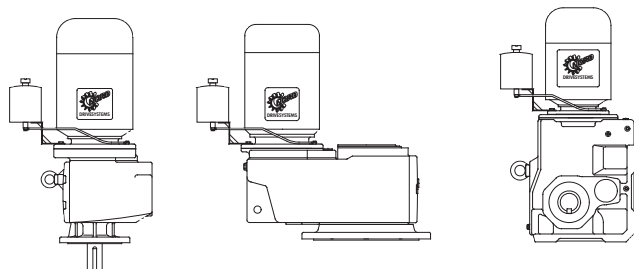
U10830 - 1 of 2

## Installation Instructions

Sometimes NORD requires the use of an oil expansion chamber when the motor or reducer input is mounted vertically. Consult your NORD catalog for additional information and application considerations.



1. Secure the gear reducer in the proper mounting position for the application and remove the vent plug from the gear reducer. The hose assembly kit (21) will be fitted to the reducer using the housing port provided.
2. When using the larger 2.7 and 5.4 liter chambers, screw the adapter fitting (22) into the reducer housing port. Use all sealing gaskets provided.
3. Mount the overflow tank (20) at the highest location from the reducer, as permitted by the hose assembly kit (21). Typical mounting configurations are represented below. Use one of the input cover's mounting bolts, to mount the chamber support leg to the reducer.



4. Be sure to use the proper fittings. Assemble one end of the vent-hose assembly (21) to bottom of the chamber and one-end to the reducer.
5. Secure the vent-plug (23) and gasket (24) that is supplied with the kit to the top of the expansion chamber.

## Expansion Chamber Kit Dimensions & Parts List

Kit Part Number: 28390390 - 0.7 Liter Oil Expansion Chamber

| Kit P/N                 | Ø A         | B          | Ø C          | D         | E           | F            | Units      |
|-------------------------|-------------|------------|--------------|-----------|-------------|--------------|------------|
| 28390390<br>(0.7 Liter) | 3.94<br>100 | 1.97<br>50 | 0.53<br>13.5 | 0.20<br>5 | 8.50<br>216 | 19.69<br>500 | inch<br>mm |

| Item | Part Number | Description                                                                                                         |
|------|-------------|---------------------------------------------------------------------------------------------------------------------|
| 20   | 28300390    | Overflow Tank - 0.7 Liter                                                                                           |
| 21   | 28310020    | Flexible Vent Hose Assembly - Includes: Hose, metal gaskets & 2 Hollow Bolts (1 Bolt. - M12 X 1.5 and 1 Pc. - G1/4) |
| 22   | None        | Adapter Fitting                                                                                                     |
| 23   | 22012004    | Normal Style Vent Plug (M12 X 1.5, DIN 910)                                                                         |
| 24   | 25312150    | Vent Plug Gasket (12 X 15.5 X 1.5)                                                                                  |

Kit Part Number: 28390400 - 2.7 Liter Oil Expansion Chamber

| Kit P/N                 | Ø A         | B           | Ø C          | D         | E              | F            | Units      |
|-------------------------|-------------|-------------|--------------|-----------|----------------|--------------|------------|
| 28390400<br>(2.7 Liter) | 5.91<br>150 | 4.92<br>125 | 0.69<br>17.5 | 0.20<br>5 | 15.22<br>386.5 | 27.56<br>700 | inch<br>mm |

| Item | Part Number | Description                                                                              |
|------|-------------|------------------------------------------------------------------------------------------|
| 20   | 28300400    | Overflow Tank - 2.7 Liter                                                                |
| 21   | 28310030    | Flexible Vent Hose Assy - Includes: Hose, metal gaskets & 2 Hollow Bolts (2 Pcs. - G1/4) |
| 22   | 22024030    | Adapter Fitting (M24 X 1.5 to G1/4)                                                      |
| 23   | 22012004    | Normal Style Vent Plug (M12 X 1.5, DIN 910)                                              |
| 24   | 25312150    | Vent Plug Gasket (12 X 15.5 X 1.5)                                                       |

Kit Part Number: 28390410 - 5.4 Liter Oil Expansion Chamber

| Kit P/N                 | Ø A         | B          | Ø C          | D         | E              | F            | Units      |
|-------------------------|-------------|------------|--------------|-----------|----------------|--------------|------------|
| 28390410<br>(5.4 Liter) | 7.09<br>180 | 3.54<br>90 | 0.69<br>17.5 | 0.20<br>5 | 15.18<br>385.5 | 31.50<br>800 | inch<br>mm |

| Item | Part Number | Description                                                                              |
|------|-------------|------------------------------------------------------------------------------------------|
| 20   | 28300410    | Overflow Tank - 5.4 Liter                                                                |
| 21   | 28310040    | Flexible Vent Hose Assy - Includes: Hose, metal gaskets & 2 Hollow Bolts (2 Pcs. - G1/4) |
| 22   | 22030030    | Adapter Fitting (M30 X 1.5 to G1/4)                                                      |
| 23   | 22012004    | Normal Style Vent Plug (M12 X 1.5, DIN 910)                                              |
| 24   | 25312150    | Vent Plug Gasket (12 X 15.5 X 1.5)                                                       |

Please see page 2 for gearbox compatibility



### HARMFUL SITUATION



Remove the protective "rubber element" from the supplied vent prior to use so that an open-vent is formed on top of the overflow tank. Avoid using a pressurized AUTOVENT™ breather on the overflow tank since this may create an undesired pressure-vacuum in the overflow tank.

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## Expansion Chamber Compatibility Chart

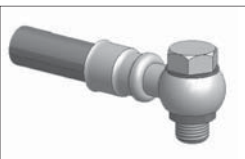
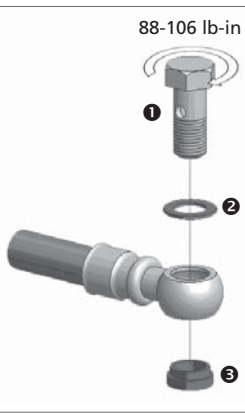
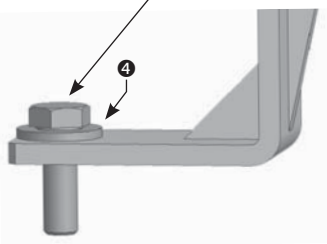
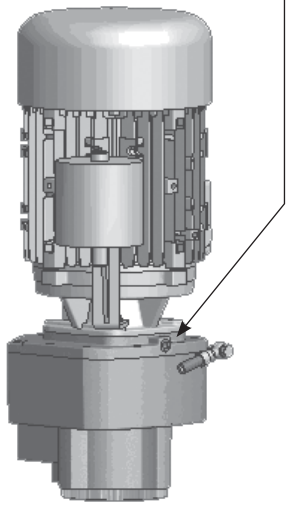
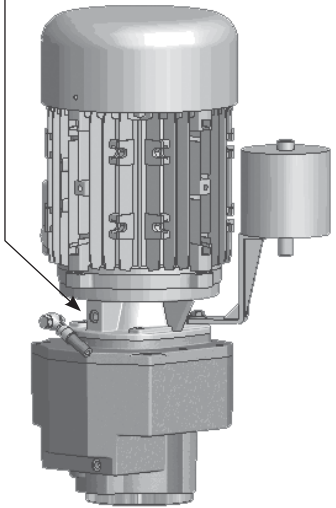
| Helical In-line                    | NORDBLOC™                                                                  | NORDBLOC.1™                      | Clincher™                               | Helical-Bevel                        | Part Number | [lb] |
|------------------------------------|----------------------------------------------------------------------------|----------------------------------|-----------------------------------------|--------------------------------------|-------------|------|
| SK 42/43<br>SK 52/53<br>SK 63      | SK472/473<br>SK572/573<br>SK672/673<br>SK772/773<br>SK872/873<br>SK972/973 | SK572.1/573.1*<br>SK672.1/673.1* | SK 4282/4382<br>SK 5282/5382<br>SK 6382 | SK 9042.1/9043.1<br>SK 9052.1/9053.1 | 28390390    | 11.0 |
| SK 62<br>SK 72/73                  |                                                                            |                                  | SK 6282<br>SK 7282/7382                 | SK 9072.1<br>SK 9082.1               | 28390400    | 13.2 |
| SK 82/83<br>SK 92/93<br>SK 102/103 |                                                                            |                                  | SK 8282/8382                            | SK 9086.1<br>SK 9092.1<br>SK 9096.1  | 28390410    | 15.4 |

\* Need to additionally order part #28390380 which is sub-assembly shown below.

## Sub-Assembly P/N 28390380 for NORDBLOC®.1 gear units with M10x1 air vent.

|                                                                                                                                     |                                                                                                                                          |                                                                                                                                   |                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <br><b>1</b><br>1x DIN 7643<br>M10x1<br>283 00380 | <br><b>2</b><br>1x DIN 7603A Cu<br>10x16x1<br>253 10166 | <br><b>3</b><br>1x Ring<br>10x14x5<br>283 00370 | <br><b>4</b><br>1xDIN<br>9021 ø8,4<br>227 10840 |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|

## Assembly of the expansion unit at the gear unit. Types SK 572.1/573.1, SK 672.1/673.1

|                                                                                                                                                                                                      |                                                                                                                                                                                                                           |                                                                                                                                                                   |                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>Vent Hose Sub-Assembly<br> | <p><b>4</b> For motor sizes 63, 71, 80, 90, 100 &amp; 112</p> <ul style="list-style-type: none"> <li>Motor attachment bolt</li> </ul>  | <p>Motor Sizes 63, 71 &amp; 80:<br/>Assembly vent-hose to port as shown.</p>  | <p>Motor Sizes 90, 100 &amp; 112:<br/>Assembly vent-hose to port as shown.</p>  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|



# HELICAL & BEVEL REDUCER LUBRICATION TYPES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U11000 - 1 of 2

## Lubrication Tables – Helical and Bevel Gear Units

### Standard Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Manufacturer Brand/Type | Notes |
|---------------|----------|----------------------------|-------------------------|-------|
| VG220         | MIN-EP   | 0 to 40°C (32 to 104°F)    | Mobilgear 600XP220      | ⚡ⓘ    |
|               | PAO      | -35 to 60°C (-31 to 140°F) | Mobil SHC630            | ⚡Ⓔ    |
|               | FG       | -5 to 40°C (23 to 104°F)   | Fuchs FM220             | ⚡     |

### Optional Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Manufacturer Brand/Type | Notes |
|---------------|----------|----------------------------|-------------------------|-------|
| VG460         | PAO      | -35 to 80°C (-31 to 176°F) | Mobil SHC 634           | -     |
|               | FG-PAO   | -35 to 80°C (-31 to 176°F) | Mobil SHC Cibus 460     | -     |
| VG220         | FG-PAO   | -35 to 60°C (-31 to 140°F) | Mobil SHC Cibus 220     | -     |
| VG150         | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC629            | -     |

### Grease Options (applied to greased bearings and seal cavities)

| NLGI Grade | Grease Type/Thickener | Ambient Temperature Range  | Manufacturer Brand/Type | Notes |
|------------|-----------------------|----------------------------|-------------------------|-------|
| NLGI 2     | Standard (Li-Complex) | -30 to 60°C (-22 to 140°F) | Mobil Grease XHP222     | ⚡ⓘ    |
|            | High Temp (Polyurea)  | -40 to 80°C (-40 to 176°F) | Mobil / Polyrex EP 2    | ⚡Ⓔ    |
|            | Food-Grade (Polyurea) | -30 to 40°C (-22 to 104°F) | Mobil SHC Polyrex 222   | ⚡     |

⚡ Stocked Lubricants

ⓘ Standard product on serviceable gear units

Ⓔ Standard product on maintenance free gear units



## IMPORTANT NOTES



- The “Ambient Temperature” is intended to be an operation guideline based upon the typical properties of all the lubricant. The viscosity and other properties of the lubricant change based upon load, speed, ambient conditions, and reducer operating temperatures. The user should consult with their lubrication supplier & NORD gear before considering changes in oil type or viscosity.
- To prevent reducer overheating, observe the maximum operating oil temperature limits:  
Mineral Oil: 80-85 °C (176 – 180 °F).  
Synthetic Oil: 105 °C (225 °F).
- In the following instances, please consult NORD for specific recommendations:
  - ✓ Gear units will operate in high ambient temperature conditions exceeding 40 °C (104 °F).
  - ✓ Gear units will operate in cold ambient temperature conditions approaching 0 °C (32 °F) or lower.
  - ✓ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.
  - ✓ Fluid grease is required for lubricating the gear unit.
- Observe the general lubrication guidelines outlined in user manual U10750.

### Oil Formulation Codes

|        |   |                                                |
|--------|---|------------------------------------------------|
| MIN-EP | - | Mineral Oil with EP Additive                   |
| PAO-EP | - | Synthetic Polyalphaolefin Oil with EP Additive |
| PAO    | - | Synthetic Polyalphaolefin Oil                  |
| PG     | - | Synthetic Polyglycol Oil                       |
| FG     | - | Food-Grade Oil                                 |
| FG-PAO | - | Food-Grade, Synthetic Polyalphaolefin Oil      |
| FG-PG  | - | Food-Grade, Synthetic Polyglycol Oil           |

### Lubrication Notes

- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not to mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil or polyalphaolefin (PAO) synthetic oil.

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# HELICAL & BEVEL REDUCER LUBRICATION TYPES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

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Oil Cross-reference Chart

| ISO Viscosity | Oil Type | Ambient Temperature Range    | Mobil               | Shell        | Castrol        | FUCHS                | KLÜBER LUBRICATION     |
|---------------|----------|------------------------------|---------------------|--------------|----------------|----------------------|------------------------|
| VG150         | MIN-EP   | 0 to 25°C (32 to 77°F)       | Mobilgear 600XP150  | Omala 150    | Alpha SP150    | Renolin EP150        | Klüberoil GEM 1-150N   |
|               | PAO-EP   | -30 to 25 °C (-22 to 77 °F)  | Mobilgear SHC150    | Omala HD 150 | Alphasyn EP150 | Gearmaster SYN150/NA | Klübersynth EG 4-150   |
|               | PAO      | -30 to 25°C (-22 to 77°F)    | Mobil SHC629        | Omala RL 150 | Alphasyn T150  | N/A                  | Klübersynth GEM 4-150N |
|               | PG       | -25 to 25°C (-13 to 77°F)    | Mobil Glygoyle 150  | Tivela S150  | Alphasyn PG150 | Renolin PG150        | Klübersynth GH 6-150   |
|               | FG       | 0 to 25°C (32 to 77°F)       | Mobil DTE FM 150    | N/A          | N/A            | N/A                  | N/A                    |
|               | FG-PAO   | -15 to 25°C (5 to 77°F)      | Mobil SHC Cibus 150 | N/A          | N/A            | Cassida GL150        | Klüberoil 4 UH 1-150N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)    | Mobil Glygoyle 150  | N/A          | N/A            | N/A                  | Klübersynth UH1 6-150  |
| VG220         | MIN-EP   | 0 to 40°C (32 to 104°F)      | Mobilgear 600XP220  | Omala 220    | Alpha SP220    | Renolin EP220        | Klüberoil GEM 1-220N   |
|               | PAO-EP   | -30 to 60 °C (-22 to 140 °F) | Mobilgear SHC220    | Omala HD220  | Alphasyn EP220 | Gearmaster SYN220/NA | Klübersynth EG 4-220   |
|               | PAO      | -30 to 60°C (-22 to 140°F)   | Mobil SHC630        | Omala RL220  | Alphasyn T220  | N/A                  | Klübersynth GEM 4-220N |
|               | PG       | -25 to 60°C (-13 to 140°F)   | Mobil Glygoyle 220  | Tivela S220  | Alphasyn PG220 | Renolin PG220        | Klübersynth GH 6-220   |
|               | FG       | 0 to 40°C (32 to 104°F)      | Mobil DTE FM 220    | N/A          | N/A            | Fuchs FM220          | N/A                    |
|               | FG-PAO   | -25 to 60°C (-13 to 140°F)   | Mobil SHC Cibus 220 | N/A          | N/A            | Cassida GL220        | Klüberoil 4 UH 1-220N  |
|               | FG-PG    | -25 to 60°C (-13 to 140°F)   | Mobil Glygoyle 220  | N/A          | N/A            | Cassida WG220        | Klübersynth UH1 6-220  |
| VG460         | MIN-EP   | 0 to 40°C (32 to 104°F)      | Mobilgear 600XP460  | Omala 460    | Alpha SP460    | Renolin EP460        | Klüberoil GEM 1-460N   |
|               | PAO-EP   | -20 to 80°C (-4 to 176°F)    | Mobilgear SHC460    | Omala HD460  | Alphasyn EP460 | Gearmaster SYN460/NA | Klübersynth EG 4-460   |
|               | PAO      | -20 to 80°C (-4 to 176°F)    | Mobil SHC 634       | Omala RL460  | Alphasyn T460  | N/A                  | Klübersynth GEM 4-460N |
|               | PG       | -20 to 80°C (-4 to 176°F)    | Mobil Glygoyle 460  | Tivela S460  | Alphasyn PG460 | N/A                  | Klübersynth GH 6-460   |
|               | FG       | 0 to 40°C (32 to 104°F)      | Mobil DTE FM460     | N/A          | N/A            | Fuchs FM460          | N/A                    |
|               | FG-PAO   | -20 to 80°C (-4 to 176°F)    | Mobil SHC Cibus 460 | N/A          | N/A            | Cassida GL460        | Klüberoil 4 UH 1-460N  |
|               | FG-PG    | -20 to 80°C (-4 to 176°F)    | Mobil Glygoyle 460  | N/A          | N/A            | Cassida WG460        | Klübersynth UH1 6-460  |

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.



# HELICAL-WORM REDUCER LUBRICATION TYPES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U11020 - 1 of 2

## Lubrication Tables – Helical Worm Gear Units

### Standard Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range | Manufacturer Brand/Type | Notes |
|---------------|----------|---------------------------|-------------------------|-------|
| VG680         | PAO      | 0 to 60°C (32 to 140°F)   | Mobil SHC636            | ⬆     |

### Optional Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range | Manufacturer Brand/Type | Notes |
|---------------|----------|---------------------------|-------------------------|-------|
| VG460         | PAO      | 0 to 50°C (32 to 122°F)   | Mobil SHC 634           | -     |
|               | FG-PAO   | 0 to 50°C (32 to 122°F)   | Mobil SHC Cibus 460     | -     |

### Grease Options (applied to greased bearings and seal cavities)

| NLGI Grade | Grease Type/Thickener | Ambient Temperature Range  | Manufacturer Brand/Type | Notes |
|------------|-----------------------|----------------------------|-------------------------|-------|
| NLGI 2     | Standard (Li-Complex) | -30 to 60°C (-22 to 140°F) | Mobil Grease XHP222     | ⬆     |
|            | High Temp (Polyurea)  | -40 to 80°C (-40 to 176°F) | Mobil / Polyrex EP 2    | ⬆     |
|            | Food-Grade (Polyurea) | -30 to 40°C (-22 to 104°F) | Mobil SHC Polyrex 222   | ⬆     |

### ⬆ Stocked Lubricants

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>IMPORTANT NOTES</b> |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--|
| <ul style="list-style-type: none"> <li>The “Ambient Temperature” is intended to be an operation guideline based upon the typical properties of all the lubricant. The viscosity and other properties of the lubricant change based upon load, speed, ambient conditions, and reducer operating temperatures. The user should consult with their lubrication supplier &amp; NORD Gear before considering changes in oil type or viscosity.</li> <li>To prevent reducer overheating, observe the maximum operating oil temperature limits:<br/>Synthetic Oil: 105 °C (225 °F).</li> <li>In the following instances, please consult NORD for specific recommendations:               <ul style="list-style-type: none"> <li>✓ Gear units will operate in high ambient temperature conditions exceeding 40 °C (104 °F).</li> <li>✓ Gear units will operate in cold ambient temperature conditions approaching 0 °C (32 °F) or lower.</li> <li>✓ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.</li> <li>✓ Fluid grease is required for lubricating the gear unit.</li> </ul> </li> <li>Observe the general lubrication guidelines outlined in user manual U10770.</li> </ul> |                        |  |

### Oil Formulation Codes

|        |   |                                           |
|--------|---|-------------------------------------------|
| PAO    | - | Synthetic Polyalphaolefin Oil             |
| PG     | - | Synthetic Polyglycol Oil                  |
| FG-PAO | - | Food-Grade, Synthetic Polyalphaolefin Oil |
| FG-PG  | - | Food-Grade, Synthetic Polyglycol Oil      |

### Lubrication Notes

- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral oil or polyalphaolefin (PAO) synthetic oil.



DRIVESYSTEMS

# HELICAL-WORM REDUCER LUBRICATION TYPES



RETAIN FOR FUTURE USE

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Oil Cross-reference Chart

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Mobil               | Shell        | Castrol        | FUCHS         | KLÜBER LUBRICATION     |
|---------------|----------|----------------------------|---------------------|--------------|----------------|---------------|------------------------|
| VG 100        | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC627        | N/A          | N/A            | N/A           | Klübersynth GEM 4-100N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth GH 6-100   |
|               | FG-PAO   | -35 to 25°C (-31 to 77°F)  | Mobil SHC Cibus 100 | N/A          | N/A            | N/A           | Klüberoil 4 UH 1-100N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth UH1 6-100  |
| VG150         | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC629        | Omala RL 150 | Alphasyn T150  | N/A           | Klübersynth GEM 4-150N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | Tivela S150  | Alphasyn PG150 | Renolin PG150 | Klübersynth GH 6-150   |
|               | FG-PAO   | -15 to 25°C (5 to 77°F)    | Mobil SHC Cibus 150 | N/A          | N/A            | Cassida GL150 | Klüberoil 4 UH 1-150N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | N/A          | N/A            | N/A           | Klübersynth UH1 6-150  |
| VG220         | PAO      | -15 to 40°C (5 to 104°F)   | Mobil SHC630        | Omala RL220  | Alphasyn T220  | N/A           | Klübersynth GEM 4-220N |
|               | PG       | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | Tivela S220  | Alphasyn PG220 | Renolin PG220 | Klübersynth GH 6-220   |
|               | FG-PAO   | -25 to 40°C (-13 to 104°F) | Mobil SHC Cibus 220 | N/A          | N/A            | Cassida GL220 | Klüberoil 4 UH 1-220N  |
|               | FG-PG    | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | N/A          | N/A            | Cassida WG220 | Klübersynth UH1 6-220  |
| VG460         | PAO      | 0 to 50°C (32 to 122°F)    | Mobil SHC 634       | Omala RL460  | Alphasyn T460  | N/A           | Klübersynth GEM 4-460N |
|               | PG       | 0 to 50°C (32 to 122°F)    | Mobil Glygoyle 460  | Tivela S460  | Alphasyn PG460 | N/A           | Klübersynth GH 6-460   |
|               | FG-PAO   | 0 to 50°C (32 to 122°F)    | Mobil SHC Cibus 460 | N/A          | N/A            | Cassida GL460 | Klüberoil 4 UH 1-460N  |
|               | FG-PG    | 0 to 50°C (32 to 122°F)    | Mobil Glygoyle 460  | N/A          | N/A            | Cassida WG460 | Klübersynth UH1 6-460  |
| VG680         | PAO      | 0 to 60°C (32 to 140°F)    | Mobil SHC636        | Omala RL680  | N/A            | N/A           | Klübersynth GEM 4-680N |
|               | PG       | 0 to 60°C (32 to 140°F)    | Mobil Glygoyle 680  | Tivela S680  | N/A            | N/A           | Klübersynth GH 6-680   |
|               | FG-PAO   | 0 to 60°C (32 to 140°F)    | N/A                 | N/A          | N/A            | Cassida GL680 | Klüberoil 4 UH1-680N   |
|               | FG-PG    | 0 to 60°C (32 to 140°F)    | Mobil Glygoyle 680  | N/A          | N/A            | Cassida WG680 | Klübersynth UH1 6-680  |

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.



# MINICASE® (SM SERIES) WORM GEAR LUBRICATION TYPES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U11040 - 1 of 2

## Lubrication Tables – MINICASE® (SM series) Worm Gear Units

### Standard Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range | Manufacturer Brand/Type | Notes |
|---------------|----------|---------------------------|-------------------------|-------|
| VG680         | PG       | -20 to 40°C (-4 to 104°F) | Klübersynth GH 6-680    | ⬆     |

### Optional Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Manufacturer Brand/Type | Notes |
|---------------|----------|----------------------------|-------------------------|-------|
| VG680         | FG-PG    | -25 to 80°C (-13 to 176°F) | Klübersynth UH1 6-680   | ⬆     |

### Grease Options (applied to greased bearings and seal cavities)

| NLGI Grade | Grease Type/Thickener         | Ambient Temperature Range  | Manufacturer Brand/Type         | Notes |
|------------|-------------------------------|----------------------------|---------------------------------|-------|
| NLGI 2     | High Temp (Polyurea)          | -25 to 80°C (-13 to 176°F) | Kluber / Petamo GHY133N         | ⬆     |
|            | Food-Grade (Aluminum Complex) | -25 to 40°C (-13 to 104°F) | Kluber / Klübersynth UH1 14-151 | ⬆     |

### ⬆ Stocked Lubricants



## IMPORTANT NOTES



- Observe the general lubrication guidelines in User Manual U17900.
- Ambient temperature range is a guideline only. The allowed operating temperature range for the gear unit is dependent upon assembly components used, their individual temperature limits, and the actual operating conditions.
- The selected oil type and viscosity is considered appropriate for most applications utilizing the specified NORD gear unit type. Different oil types or viscosity grades may be recommended if the gear unit is exposed to frequent high load conditions or operating under extreme low or high ambient temperature conditions.
- To prevent reducer overheating, observe the maximum operating oil temperature limits:  
Synthetic oil: 105 °C (225 °F).
- Consult NORD for recommendations in the following instances:
  - ✓ The gear unit is exposed to frequent high load conditions.
  - ✓ Ambient temperature conditions exceed 40 °C (104 °F) or approach 0 °C (32 °F) or lower.
  - ✓ Fluid grease is being considered or specified for lubricating the gear unit.
  - ✓ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.

### Oil Formulation Codes

|        |   |                                           |
|--------|---|-------------------------------------------|
| PAO    | - | Synthetic Polyalphaolefin Oil             |
| PG     | - | Synthetic Polyglycol Oil                  |
| FG-PAO | - | Food-Grade, Synthetic Polyalphaolefin Oil |
| FG-PG  | - | Food-Grade, Synthetic Polyglycol Oil      |



## WARNING



- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral or polyalphaolefin (PAO) oils.



# MINICASE® (SM SERIES) WORM GEAR LUBRICATION TYPES



DRIVESYSTEMS

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Oil Cross-reference Chart

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Mobil               | Shell        | Castrol        | FUCHS         | KLÜBER LUBRICATION     |
|---------------|----------|----------------------------|---------------------|--------------|----------------|---------------|------------------------|
| VG 100        | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC627        | N/A          | N/A            | N/A           | Klübersynth GEM 4-100N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth GH 6-100   |
|               | FG-PAO   | -30 to 25°C (-22 to 77°F)  | Mobil SHC Cibus 100 | N/A          | N/A            | N/A           | Klüberoil 4 UH 1-100N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth UH1 6-100  |
| VG150         | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC629        | Omala RL 150 | Alphasyn T150  | N/A           | Klübersynth GEM 4-150N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | Tivela S150  | Alphasyn PG150 | Renolin PG150 | Klübersynth GH 6-150   |
|               | FG-PAO   | -15 to 25°C (5 to 77°F)    | Mobil SHC Cibus 150 | N/A          | N/A            | Cassida GL150 | Klüberoil 4 UH 1-150N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | N/A          | N/A            | N/A           | Klübersynth UH1 6-150  |
| VG220         | PAO      | -35 to 40°C (-31 to 104°F) | Mobil SHC630        | Omala RL220  | Alphasyn T220  | N/A           | Klübersynth GEM 4-220N |
|               | PG       | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | Tivela S220  | Alphasyn PG220 | Renolin PG220 | Klübersynth GH 6-220   |
|               | FG-PAO   | -25 to 40°C (-13 to 104°F) | Mobil SHC Cibus 220 | N/A          | N/A            | Cassida GL220 | Klüberoil 4 UH 1-220N  |
|               | FG-PG    | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | N/A          | N/A            | Cassida WG220 | Klübersynth UH1 6-220  |
| VG460         | PAO      | -20 to 40°C (-4 to 104°F)  | Mobil SHC 634       | Omala RL460  | Alphasyn T460  | N/A           | Klübersynth GEM 4-460N |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Mobil Glygoyle 460  | Tivela S460  | Alphasyn PG460 | N/A           | Klübersynth GH 6-460   |
|               | FG-PAO   | -5 to 40°C (23 to 104°F)   | Mobil SHC Cibus 460 | N/A          | N/A            | Cassida GL460 | Klüberoil 4 UH 1-460N  |
|               | FG-PG    | -5 to 40°C (23 to 104°F)   | Mobil Glygoyle 460  | N/A          | N/A            | Cassida WG460 | Klübersynth UH1 6-460  |
| VG680         | PAO      | -20 to 40°C (-4 to 104°F)  | Mobil SHC636        | Omala RL680  | N/A            | N/A           | Klübersynth GEM 4-680N |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Mobil Glygoyle 680  | Tivela S680  | N/A            | N/A           | Klübersynth GH 6-680   |
|               | FG-PAO   | -5 to 40°C (23 to 104°F)   | N/A                 | N/A          | N/A            | Cassida GL680 | Klüberoil 4 UH1-680N   |
|               | FG-PG    | -25 to 80°C (-13 to 176°F) | Mobil Glygoyle 680  | N/A          | N/A            | Cassida WG680 | Klübersynth UH1 6-680  |

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.



# MINICASE® (SMI/SMID) WORM GEAR LUBRICATION TYPES



DRIVESYSTEMS

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## Lubrication Tables – MINICASE® (SMI/SMID series) Worm Gear Units

### Standard Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range | Manufacturer Brand/Type | Notes |
|---------------|----------|---------------------------|-------------------------|-------|
| VG680         | PG       | -20 to 40°C (-4 to 104°F) | Klübersynth GH 6-680    | ⬇     |

### Optional Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Manufacturer Brand/Type | Notes |
|---------------|----------|----------------------------|-------------------------|-------|
| VG680         | FG-PG    | -25 to 80°C (-13 to 176°F) | Klübersynth UH1 14-151  | ⬇     |

### Grease Options (applied to greased bearings and seal cavities)

| NLGI Grade | Grease Type/Thickener         | Ambient Temperature Range  | Manufacturer Brand/Type         | Notes |
|------------|-------------------------------|----------------------------|---------------------------------|-------|
| NLGI 2     | High Temp (Polyurea)          | -25 to 80°C (-13 to 176°F) | Kluber / Petamo GHY133N         | ⬇     |
|            | Food-Grade (Aluminum Complex) | -25 to 40°C (-13 to 104°F) | Kluber / Klübersynth UH1 14-151 | ⬇     |

### ⬇ Stocked Lubricants



## IMPORTANT NOTES



- Observe the general lubrication guidelines in User Manual U10800.
- Ambient temperature range is a guideline only. The allowed operating temperature range for the gear unit is dependent upon assembly components used, their individual temperature limits, and the actual operating conditions.
- The selected oil type and viscosity is considered appropriate for most applications utilizing the specified NORD gear unit type. Different oil types or viscosity grades may be recommended if the gear unit is exposed to frequent high load conditions or operating under extreme low or high ambient temperature conditions.
- To prevent reducer overheating, observe the maximum operating oil temperature limits:  
Synthetic oil: 105 °C (225 °F).
- Consult NORD for recommendations in the following instances:
  - ✓ The gear unit is exposed to frequent high load conditions.
  - ✓ Ambient temperature conditions exceed 40 °C (104 °F) or approach 0 °C (32 °F) or lower.
  - ✓ Fluid grease is being considered or specified for lubricating the gear unit.
  - ✓ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.

### Oil Formulation Codes

|        |   |                                           |
|--------|---|-------------------------------------------|
| PAO    | - | Synthetic Polyalphaolefin Oil             |
| PG     | - | Synthetic Polyglycol Oil                  |
| FG-PAO | - | Food-Grade, Synthetic Polyalphaolefin Oil |
| FG-PG  | - | Food-Grade, Synthetic Polyglycol Oil      |



## WARNING



- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral or polyalphaolefin (PAO) oils.



# MINICASE® (SMI/SMID) WORM GEAR LUBRICATION TYPES



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Oil Cross-reference Chart

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Mobil               | Shell        | Castrol        | FUCHS         | KLÜBER LUBRICATION     |
|---------------|----------|----------------------------|---------------------|--------------|----------------|---------------|------------------------|
| VG 100        | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC627        | N/A          | N/A            | N/A           | Klübersynth GEM 4-100N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth GH 6-100   |
|               | FG-PAO   | -30 to 25°C (-22 to 77°F)  | Mobil SHC Cibus 100 | N/A          | N/A            | N/A           | Klüberoil 4 UH 1-100N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth UH1 6-100  |
| VG150         | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC629        | Omala RL 150 | Alphasyn T150  | N/A           | Klübersynth GEM 4-150N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | Tivela S150  | Alphasyn PG150 | Renolin PG150 | Klübersynth GH 6-150   |
|               | FG-PAO   | -15 to 25°C (5 to 77°F)    | Mobil SHC Cibus 150 | N/A          | N/A            | Cassida GL150 | Klüberoil 4 UH 1-150N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | N/A          | N/A            | N/A           | Klübersynth UH1 6-150  |
| VG220         | PAO      | -35 to 40°C (-31 to 104°F) | Mobil SHC630        | Omala RL220  | Alphasyn T220  | N/A           | Klübersynth GEM 4-220N |
|               | PG       | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | Tivela S220  | Alphasyn PG220 | Renolin PG220 | Klübersynth GH 6-220   |
|               | FG-PAO   | -25 to 40°C (-13 to 104°F) | Mobil SHC Cibus 220 | N/A          | N/A            | Cassida GL220 | Klüberoil 4 UH 1-220N  |
|               | FG-PG    | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | N/A          | N/A            | Cassida WG220 | Klübersynth UH1 6-220  |
| VG460         | PAO      | -20 to 40°C (-4 to 104°F)  | Mobil SHC 634       | Omala RL460  | Alphasyn T460  | N/A           | Klübersynth GEM 4-460N |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Mobil Glygoyle 460  | Tivela S460  | Alphasyn PG460 | N/A           | Klübersynth GH 6-460   |
|               | FG-PAO   | -5 to 40°C (23 to 104°F)   | Mobil SHC Cibus 460 | N/A          | N/A            | Cassida GL460 | Klüberoil 4 UH 1-460N  |
|               | FG-PG    | -5 to 40°C (23 to 104°F)   | Mobil Glygoyle 460  | N/A          | N/A            | Cassida WG460 | Klübersynth UH1 6-460  |
| VG680         | PAO      | -20 to 40°C (-4 to 104°F)  | Mobil SHC636        | Omala RL680  | N/A            | N/A           | Klübersynth GEM 4-680N |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Mobil Glygoyle 680  | Tivela S680  | N/A            | N/A           | Klübersynth GH 6-680   |
|               | FG-PAO   | -5 to 40°C (23 to 104°F)   | N/A                 | N/A          | N/A            | Cassida GL680 | Klüberoil 4 UH1-680N   |
|               | FG-PG    | -25 to 80°C (-13 to 176°F) | Mobil Glygoyle 680  | N/A          | N/A            | Cassida WG680 | Klübersynth UH1 14-151 |

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.



# FLEXBLOC™ (SI/SID SERIES) WORM GEAR LUBRICATION TYPES



DRIVESYSTEMS

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## Lubrication Tables – FLEXBLOC™ (SI/SID Series) Worm Gear Units

### Standard Oil Lubricants

NORD uses a semi automated assembly process to produce the FLEXBLOC™ gear unit assemblies. During this process the gear units are factory filled in accordance with the following table.

#### Standard Oil Lubricants

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Manufacturer Brand/Type | Notes  |
|---------------|----------|----------------------------|-------------------------|--------|
| VG680         | FG-PG    | -25 to 80°C (-13 to 176°F) | Klübersynth UH1 6-680   | Inch   |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Klübersynth GH 6-680    | Metric |
| VG220         | FG-PG    | -25 to 40°C (-13 to 104°F) | Klübersynth UH1 6-220   | Inch   |
|               | PG       | -25 to 40°C (-13 to 104°F) | Klübersynth GH 6-220    | Metric |

#### Grease Options (applied to greased bearings and seal cavities)

| NLGI Grade | Grease Type/Thickener         | Ambient Temperature Range  | Manufacturer Brand/Type         | Notes |
|------------|-------------------------------|----------------------------|---------------------------------|-------|
| NLGI 2     | High Temp (Polyurea)          | -25 to 80°C (-13 to 176°F) | Kluber / Petamo GHY133N         | ⬆     |
|            | Food-Grade (Aluminum Complex) | -25 to 40°C (-13 to 104°F) | Kluber / Klübersynth UH1 14-151 | ⬆     |

#### ⬆ Stocked Lubricants



### IMPORTANT NOTES



- Observe the general lubrication guidelines in User Manual U10800.
- Ambient temperature range is a guideline only. The allowed operating temperature range for the gear unit is dependent upon assembly components used, their individual temperature limits, and the actual operating conditions.
- The selected oil type and viscosity is considered appropriate for most applications utilizing the specified NORD gear unit type. Different oil types or viscosity grades may be recommended if the gear unit is exposed to frequent high load conditions or operating under extreme low or high ambient temperature conditions.
- To prevent reducer overheating, observe the maximum operating oil temperature limits:  
Synthetic oil: 105 °C (225 °F).
- Consult NORD for recommendations in the following instances:
  - ✓ The gear unit is exposed to frequent high load conditions.
  - ✓ Ambient temperature conditions exceed 40 °C (104 °F) or approach 0 °C (32 °F) or lower.
  - ✓ Fluid grease is being considered or specified for lubricating the gear unit.
  - ✓ Lower than an ISO VG100 viscosity oil is being considered for a cold-temperature service.

### Oil Formulation Codes

- PAO - Synthetic Polyalphaolefin Oil
- PG - Synthetic Polyglycol Oil
- FG-PAO - Food-Grade, Synthetic Polyalphaolefin Oil
- FG-PG - Food-Grade, Synthetic Polyglycol Oil



### WARNING



- Avoid using (EP) gear oils in worm gears that contain sulfur-phosphorous chemistries, as these additives can react adversely with bronze worm gears and accelerate wear.
- Food grade lubricants must be in compliance with FDA 212 CFR 178.3570 and qualify as a NSF-H1 lubricant. Please consult with lubrication manufacturer for more information.
- When making a lubrication change, check with the lubrication supplier to assure compatibility and to obtain recommended cleaning or flushing procedures.
- Do not to mix different oils with different additive packages or different base oil formulation types. Polyglycol (PG) oils are not miscible with other oil types and should never be mixed with mineral or polyalphaolefin (PAO) oils.

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# FLEXBLOC™ (SI/SID SERIES) WORM GEAR LUBRICATION TYPES



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Oil Cross-reference Chart

| ISO Viscosity | Oil Type | Ambient Temperature Range  | Mobil               | Shell        | Castrol        | FUCHS         | KLÜBER LUBRICATION     |
|---------------|----------|----------------------------|---------------------|--------------|----------------|---------------|------------------------|
| VG 100        | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC627        | N/A          | N/A            | N/A           | Klübersynth GEM 4-100N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth GH 6-100   |
|               | FG-PAO   | -30 to 25°C (-22 to 77°F)  | Mobil SHC Cibus 100 | N/A          | N/A            | N/A           | Klüberoil 4 UH 1-100N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 100  | N/A          | N/A            | N/A           | Klübersynth UH1 6-100  |
| VG150         | PAO      | -35 to 25°C (-31 to 77°F)  | Mobil SHC629        | Omala RL 150 | Alphasyn T150  | N/A           | Klübersynth GEM 4-150N |
|               | PG       | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | Tivela S150  | Alphasyn PG150 | Renolin PG150 | Klübersynth GH 6-150   |
|               | FG-PAO   | -15 to 25°C (5 to 77°F)    | Mobil SHC Cibus 150 | N/A          | N/A            | Cassida GL150 | Klüberoil 4 UH 1-150N  |
|               | FG-PG    | -25 to 25°C (-13 to 77°F)  | Mobil Glygoyle 150  | N/A          | N/A            | N/A           | Klübersynth UH1 6-150  |
| VG220         | PAO      | -35 to 40°C (-31 to 104°F) | Mobil SHC630        | Omala RL220  | Alphasyn T220  | N/A           | Klübersynth GEM 4-220N |
|               | PG       | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | Tivela S220  | Alphasyn PG220 | Renolin PG220 | Klübersynth GH 6-220   |
|               | FG-PAO   | -25 to 40°C (-13 to 104°F) | Mobil SHC Cibus 220 | N/A          | N/A            | Cassida GL220 | Klüberoil 4 UH 1-220N  |
|               | FG-PG    | -25 to 40°C (-13 to 104°F) | Mobil Glygoyle 220  | N/A          | N/A            | Cassida WG220 | Klübersynth UH1 6-220  |
| VG460         | PAO      | -20 to 40°C (-4 to 104°F)  | Mobil SHC 634       | Omala RL460  | Alphasyn T460  | N/A           | Klübersynth GEM 4-460N |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Mobil Glygoyle 460  | Tivela S460  | Alphasyn PG460 | N/A           | Klübersynth GH 6-460   |
|               | FG-PAO   | -5 to 40°C (23 to 104°F)   | Mobil SHC Cibus 460 | N/A          | N/A            | Cassida GL460 | Klüberoil 4 UH 1-460N  |
|               | FG-PG    | -5 to 40°C (23 to 104°F)   | Mobil Glygoyle 460  | N/A          | N/A            | Cassida WG460 | Klübersynth UH1 6-460  |
| VG680         | PAO      | -20 to 40°C (-4 to 104°F)  | Mobil SHC636        | Omala RL680  | N/A            | N/A           | Klübersynth GEM 4-680N |
|               | PG       | -20 to 40°C (-4 to 104°F)  | Mobil Glygoyle 680  | Tivela S680  | N/A            | N/A           | Klübersynth GH 6-680   |
|               | FG-PAO   | -5 to 40°C (23 to 104°F)   | N/A                 | N/A          | N/A            | Cassida GL680 | Klüberoil 4 UH1-680N   |
|               | FG-PG    | -25 to 80°C (-13 to 176°F) | Mobil Glygoyle 680  | N/A          | N/A            | Cassida WG680 | Klübersynth UH1 6-680  |

Low-end service temperature limit may vary for a specific lubricant; Please also see the important notes on Page 1.



DRIVESYSTEMS

# STANDARD IN-LINE FOOTED OIL FILL QUANTITIES



RETAIN FOR FUTURE USE

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## Standard In-line footed lubrication

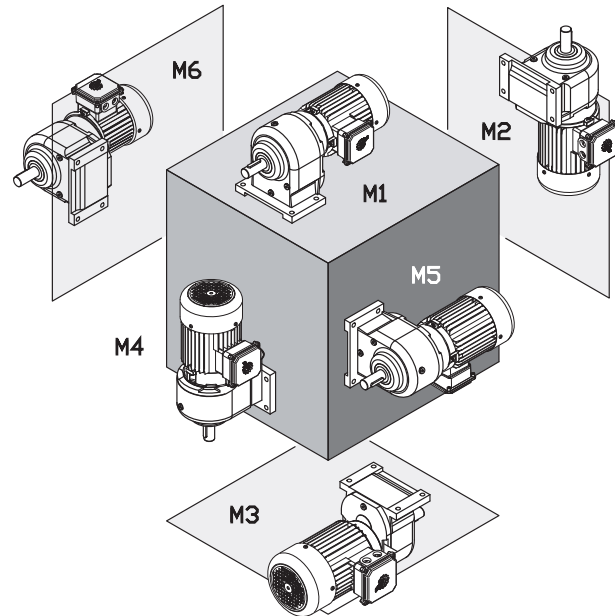
All Standard In-line reducers are shipped from NORD with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. When filling these gear units the oil must be measured and added until one establishes the proper fill quantity. For additional information please refer to the "Oil & vent plug locations" documentation for your specified gear unit



### HARMFUL SITUATION



For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type           | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK0 / SK05     | 0.14   | 0.13   | 0.23   | 0.22   | 0.14   | 0.13   | 0.23   | 0.22   | 0.14   | 0.13   | 0.14   | 0.13   |
| SK000          | 0.25   | 0.24   | 0.42   | 0.40   | 0.25   | 0.24   | 0.42   | 0.40   | 0.25   | 0.24   | 0.25   | 0.24   |
| SK01 / SK015   | 0.23   | 0.22   | 0.40   | 0.38   | 0.23   | 0.22   | 0.40   | 0.38   | 0.23   | 0.22   | 0.23   | 0.22   |
| SK010 / SK0105 | 0.40   | 0.38   | 0.63   | 0.60   | 0.40   | 0.38   | 0.63   | 0.60   | 0.40   | 0.38   | 0.40   | 0.38   |
| SK20 / SK205   | 0.58   | 0.55   | 1.06   | 1.00   | 0.58   | 0.55   | 1.06   | 1.00   | 0.58   | 0.55   | 0.58   | 0.55   |
| SK200 / SK2005 | 0.85   | 0.80   | 1.37   | 1.30   | 0.85   | 0.80   | 1.37   | 1.30   | 0.85   | 0.80   | 0.85   | 0.80   |
| SK25 / SK255   | 0.53   | 0.50   | 1.06   | 1.00   | 0.53   | 0.50   | 1.06   | 1.00   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK250 / SK2505 | 1.27   | 1.20   | 1.59   | 1.50   | 1.27   | 1.20   | 1.59   | 1.50   | 1.27   | 1.20   | 1.27   | 1.20   |
| SK30 / SK305   | 0.95   | 0.90   | 1.37   | 1.30   | 0.95   | 0.90   | 1.37   | 1.30   | 0.95   | 0.90   | 0.95   | 0.90   |
| SK300 / SK3005 | 1.27   | 1.20   | 2.11   | 2.00   | 1.27   | 1.20   | 2.11   | 2.00   | 1.27   | 1.20   | 1.27   | 1.20   |
| SK33 / SK335   | 1.06   | 1.00   | 1.69   | 1.60   | 1.06   | 1.00   | 1.69   | 1.60   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK330 / SK3305 | 1.90   | 1.80   | 2.96   | 2.80   | 1.90   | 1.80   | 2.96   | 2.80   | 1.90   | 1.80   | 1.90   | 1.80   |



# STANDARD IN-LINE FLANGED OIL FILL QUANTITIES



## Standard In-line flanged lubrication

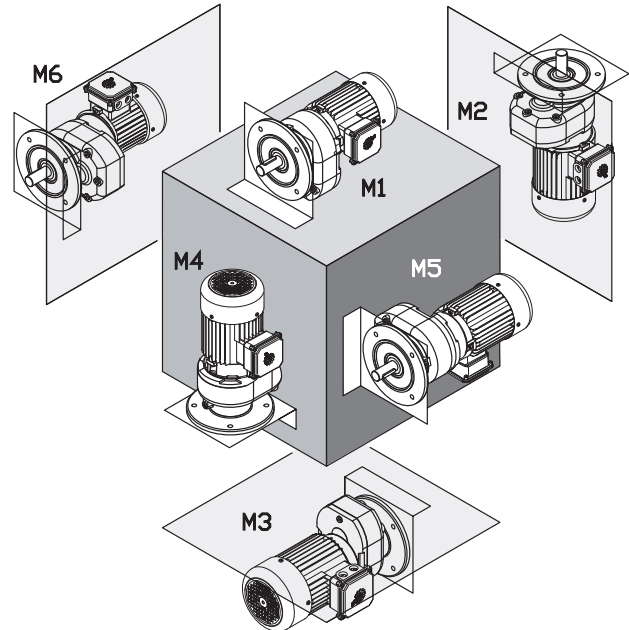
All Standard In-line reducers are shipped from NORD with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. When filling these gear units the oil must be measured and added until one establishes the proper fill quantity. For additional information please refer to the "Oil & vent plug locations" documentation for your specified gear unit.



### HARMFUL SITUATION



For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type               | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                    | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK0 F / SK05 F     | 0.14   | 0.13   | 0.23   | 0.22   | 0.14   | 0.13   | 0.23   | 0.22   | 0.14   | 0.13   | 0.14   | 0.13   |
| SK000 F            | 0.25   | 0.24   | 0.43   | 0.41   | 0.25   | 0.24   | 0.43   | 0.41   | 0.25   | 0.24   | 0.25   | 0.24   |
| SK01 F             | 0.23   | 0.22   | 0.40   | 0.38   | 0.23   | 0.22   | 0.40   | 0.38   | 0.23   | 0.22   | 0.23   | 0.22   |
| SK010 F / SK0105 F | 0.37   | 0.35   | 0.69   | 0.65   | 0.37   | 0.35   | 0.78   | 0.74   | 0.37   | 0.35   | 0.37   | 0.35   |
| SK20 F             | 0.37   | 0.35   | 0.63   | 0.60   | 0.37   | 0.35   | 0.63   | 0.60   | 0.37   | 0.35   | 0.37   | 0.35   |
| SK200 F / SK2005 F | 0.69   | 0.65   | 1.00   | 0.95   | 0.69   | 0.65   | 1.16   | 1.10   | 0.69   | 0.65   | 0.69   | 0.65   |
| SK25 F             | 0.53   | 0.50   | 1.06   | 1.00   | 0.53   | 0.50   | 1.06   | 1.00   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK250 F / SK2505 F | 0.95   | 0.90   | 1.48   | 1.40   | 0.95   | 0.90   | 1.69   | 1.60   | 0.95   | 0.90   | 0.95   | 0.90   |
| SK30 F             | 0.74   | 0.70   | 1.16   | 1.10   | 0.74   | 0.70   | 1.16   | 1.10   | 0.74   | 0.70   | 0.74   | 0.70   |
| SK300 F / SK3005 F | 1.32   | 1.25   | 1.59   | 1.50   | 1.32   | 1.25   | 1.90   | 1.80   | 1.32   | 1.25   | 1.32   | 1.25   |
| SK33 F / SK335F    | 1.06   | 1.00   | 1.59   | 1.50   | 1.06   | 1.00   | 1.59   | 1.50   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK330 F / SK3305 F | 1.69   | 1.60   | 2.64   | 2.50   | 1.69   | 1.60   | 3.06   | 2.90   | 1.69   | 1.60   | 1.69   | 1.60   |



DRIVESYSTEMS

# HELICAL IN-LINE FOOTED OIL FILL QUANTITIES



RETAIN FOR FUTURE USE

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## Helical In-line footed lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

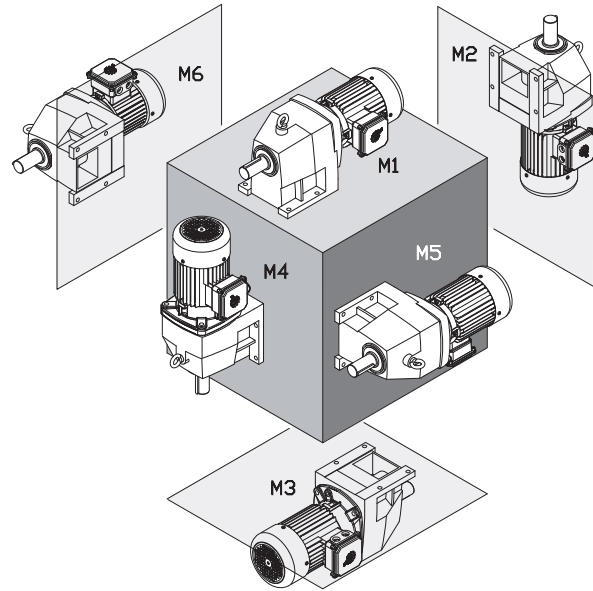


### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type   | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|        | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK02   | 0.21   | 0.20   | 0.79   | 0.75   | 0.79   | 0.75   | 0.69   | 0.65   | 0.63   | 0.60   | 0.63   | 0.60   |
| SK 03  | 0.37   | 0.35   | 1.27   | 1.20   | 0.85   | 0.80   | 1.06   | 1.00   | 0.74   | 0.70   | 0.74   | 0.70   |
| SK11E  | 0.26   | 0.25   | 0.53   | 0.50   | 0.69   | 0.65   | 0.53   | 0.50   | 0.42   | 0.40   | 0.42   | 0.40   |
| SK12   | 0.26   | 0.25   | 0.85   | 0.80   | 0.90   | 0.85   | 0.79   | 0.75   | 0.58   | 0.55   | 0.58   | 0.55   |
| SK 13  | 0.79   | 0.75   | 1.37   | 1.30   | 1.37   | 1.30   | 1.27   | 1.20   | 0.79   | 0.75   | 0.79   | 0.75   |
| SK21E  | 0.63   | 0.60   | 1.27   | 1.20   | 1.37   | 1.30   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK22   | 0.53   | 0.50   | 2.01   | 1.90   | 2.22   | 2.10   | 1.90   | 1.80   | 1.48   | 1.40   | 1.48   | 1.40   |
| SK 23  | 1.27   | 1.20   | 2.11   | 2.00   | 2.01   | 1.90   | 2.54   | 2.40   | 1.69   | 1.60   | 1.69   | 1.60   |
| SK31E  | 1.16   | 1.10   | 2.11   | 2.00   | 2.32   | 2.20   | 1.80   | 1.70   | 1.59   | 1.50   | 1.59   | 1.50   |
| SK32   | 0.95   | 0.90   | 2.64   | 2.50   | 3.28   | 3.10   | 3.28   | 3.10   | 2.11   | 2.00   | 2.11   | 2.00   |
| SK 33N | 1.85   | 1.75   | 3.17   | 3.00   | 3.59   | 3.40   | 4.23   | 4.00   | 2.43   | 2.30   | 2.43   | 2.30   |
| SK41E  | 1.69   | 1.60   | 2.75   | 2.60   | 3.49   | 3.30   | 2.96   | 2.80   | 2.43   | 2.30   | 2.43   | 2.30   |
| SK42   | 1.48   | 1.40   | 4.76   | 4.50   | 4.76   | 4.50   | 4.54   | 4.30   | 3.38   | 3.20   | 3.38   | 3.20   |
| SK 43  | 3.17   | 3.00   | 5.92   | 5.60   | 5.49   | 5.20   | 6.97   | 6.60   | 3.80   | 3.60   | 3.80   | 3.60   |
| SK51E  | 1.90   | 1.80   | 3.70   | 3.50   | 4.33   | 4.10   | 4.23   | 4.00   | 4.02   | 3.80   | 4.02   | 3.80   |
| SK52   | 2.64   | 2.50   | 7.40   | 7.00   | 7.19   | 6.80   | 7.19   | 6.80   | 5.39   | 5.10   | 5.39   | 5.10   |
| SK 53  | 4.76   | 4.50   | 9.19   | 8.70   | 8.14   | 7.70   | 9.19   | 8.70   | 6.34   | 6.00   | 6.34   | 6.00   |
| SK62   | 6.87   | 6.50   | 15.9   | 15.0   | 13.7   | 13.0   | 16.9   | 16.0   | 15.9   | 15.0   | 15.9   | 15.0   |
| SK 63  | 13.7   | 13.0   | 15.3   | 14.5   | 15.3   | 14.5   | 16.9   | 16.0   | 13.7   | 13.0   | 13.7   | 13.0   |
| SK72   | 10.6   | 10.0   | 24.3   | 23.0   | 19.0   | 18.0   | 27.5   | 26.0   | 24.3   | 23.0   | 24.3   | 23.0   |
| SK 73  | 21.7   | 20.5   | 21.1   | 20.0   | 23.8   | 22.5   | 28.5   | 27.0   | 21.1   | 20.0   | 21.1   | 20.0   |
| SK82   | 14.8   | 14.0   | 37.0   | 35.0   | 28.5   | 27.0   | 46.5   | 44.0   | 33.8   | 32.0   | 33.8   | 32.0   |
| SK 83  | 31.7   | 30.0   | 32.8   | 31.0   | 35.9   | 34.0   | 39.1   | 37.0   | 34.9   | 33.0   | 34.9   | 33.0   |
| SK92   | 26.4   | 25.0   | 77.0   | 73.0   | 49.7   | 47.0   | 80.0   | 76.0   | 55.0   | 52.0   | 55.0   | 52.0   |
| SK 93  | 56.0   | 53.0   | 74.0   | 70.0   | 62.0   | 59.0   | 76.0   | 72.0   | 52.0   | 49.0   | 52.0   | 49.0   |
| SK102  | 38.0   | 36.0   | 84.0   | 79.0   | 70.0   | 66.0   | 108    | 102    | 75.0   | 71.0   | 75.0   | 71.0   |
| SK 103 | 78.0   | 74.0   | 75.0   | 71.0   | 78.0   | 74.0   | 102    | 97.0   | 71.0   | 67.0   | 71.0   | 67.0   |



DRIVESYSTEMS

# HELICAL IN-LINE FLANGED OIL FILL QUANTITIES



RETAIN FOR FUTURE USE

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## Helical In-line flanged lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

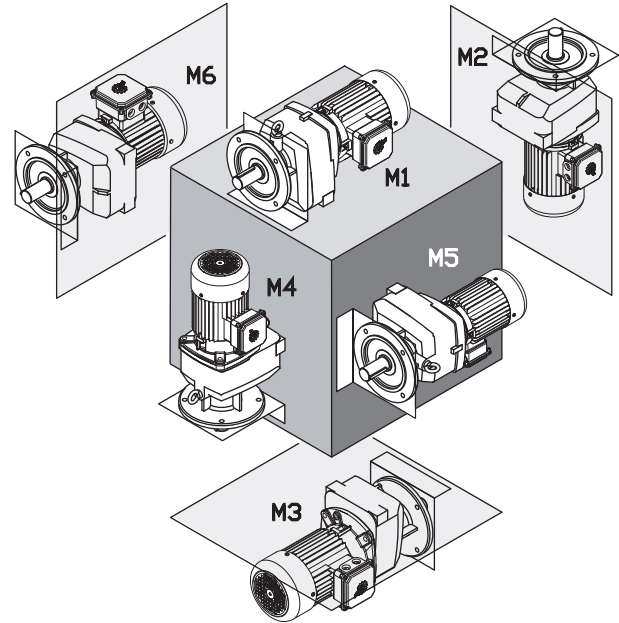


### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type     | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|          | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK02F    | 0.26   | 0.25   | 0.74   | 0.70   | 0.74   | 0.70   | 0.74   | 0.70   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK 03 F  | 0.58   | 0.55   | 1.00   | 0.95   | 0.95   | 0.90   | 1.27   | 1.20   | 0.95   | 0.90   | 0.95   | 0.90   |
| SK11E F  | 0.32   | 0.30   | 0.53   | 0.50   | 0.53   | 0.50   | 0.48   | 0.45   | 0.42   | 0.40   | 0.42   | 0.40   |
| SK12F    | 0.37   | 0.35   | 0.90   | 0.85   | 0.95   | 0.90   | 0.95   | 0.90   | 0.74   | 0.70   | 0.74   | 0.70   |
| SK 13 F  | 1.06   | 1.00   | 1.37   | 1.30   | 1.37   | 1.30   | 1.27   | 1.20   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK21E F  | 0.53   | 0.50   | 1.27   | 1.20   | 1.37   | 1.30   | 0.63   | 0.60   | 0.95   | 0.90   | 0.95   | 0.90   |
| SK22F    | 0.74   | 0.70   | 1.90   | 1.80   | 1.90   | 1.80   | 1.90   | 1.80   | 1.48   | 1.40   | 1.48   | 1.40   |
| SK 23 F  | 1.48   | 1.40   | 2.75   | 2.60   | 2.43   | 2.30   | 2.96   | 2.80   | 2.96   | 2.80   | 2.96   | 2.80   |
| SK31E F  | 0.95   | 0.90   | 1.90   | 1.80   | 1.74   | 1.65   | 1.37   | 1.30   | 1.32   | 1.25   | 1.32   | 1.25   |
| SK32F    | 1.27   | 1.20   | 2.96   | 2.80   | 3.28   | 3.10   | 3.28   | 3.10   | 2.32   | 2.20   | 2.32   | 2.20   |
| SK 33N F | 2.32   | 2.20   | 3.17   | 3.00   | 3.59   | 3.40   | 4.44   | 4.20   | 2.43   | 2.30   | 2.43   | 2.30   |
| SK41E F  | 1.27   | 1.20   | 2.43   | 2.30   | 2.85   | 2.70   | 2.11   | 2.00   | 2.01   | 1.90   | 2.01   | 1.90   |
| SK42F    | 1.90   | 1.80   | 4.65   | 4.40   | 4.76   | 4.50   | 4.23   | 4.00   | 3.91   | 3.70   | 3.91   | 3.70   |
| SK 43 F  | 3.70   | 3.50   | 6.02   | 5.70   | 5.28   | 5.00   | 6.45   | 6.10   | 4.33   | 4.10   | 4.33   | 4.10   |
| SK51E F  | 1.90   | 1.80   | 3.70   | 3.50   | 4.33   | 4.10   | 3.17   | 3.00   | 4.02   | 3.80   | 4.02   | 3.80   |
| SK52F    | 3.17   | 3.00   | 7.19   | 6.80   | 6.55   | 6.20   | 7.82   | 7.40   | 5.92   | 5.60   | 5.92   | 5.60   |
| SK 53 F  | 5.49   | 5.20   | 8.88   | 8.40   | 7.40   | 7.00   | 9.40   | 8.90   | 7.08   | 6.70   | 7.08   | 6.70   |
| SK 62 F  | 7.40   | 7.00   | 15.9   | 15.0   | 14.8   | 14.0   | 19.5   | 18.5   | 16.9   | 16.0   | 16.9   | 16.0   |
| SK 63 F  | 14.3   | 13.5   | 14.8   | 14.0   | 16.4   | 15.5   | 19.0   | 18.0   | 14.8   | 14.0   | 14.8   | 14.0   |
| SK 72 F  | 10.6   | 10.0   | 24.3   | 23.0   | 19.5   | 18.5   | 29.6   | 28.0   | 24.3   | 23.0   | 24.3   | 23.0   |
| SK 73 F  | 23.2   | 22.0   | 23.8   | 22.5   | 24.3   | 23.0   | 29.1   | 27.5   | 21.1   | 20.0   | 21.1   | 20.0   |
| SK 82 F  | 15.9   | 15.0   | 39.1   | 37.0   | 30.6   | 29.0   | 47.6   | 45.0   | 36.5   | 34.5   | 36.5   | 34.5   |
| SK 83 F  | 32.8   | 31.0   | 35.9   | 34.0   | 37.0   | 35.0   | 42.3   | 40.0   | 35.9   | 34.0   | 35.9   | 34.0   |
| SK 92 F  | 27.5   | 26.0   | 77.0   | 73.0   | 49.7   | 47.0   | 82.0   | 78.0   | 55.0   | 52.0   | 55.0   | 52.0   |
| SK 93 F  | 56.0   | 53.0   | 74.0   | 70.0   | 62.0   | 59.0   | 78.0   | 74.0   | 52.0   | 49.0   | 52.0   | 49.0   |
| SK 102 F | 42.3   | 40.0   | 86.0   | 81.0   | 70.0   | 66.0   | 110    | 104    | 76.0   | 72.0   | 76.0   | 72.0   |
| SK 103 F | 73.0   | 69.0   | 82.0   | 78.0   | 82.0   | 78.0   | 105    | 99.0   | 71.0   | 67.0   | 71.0   | 67.0   |



DRIVESYSTEMS

# CLINCHER™ OIL FILL QUANTITIES

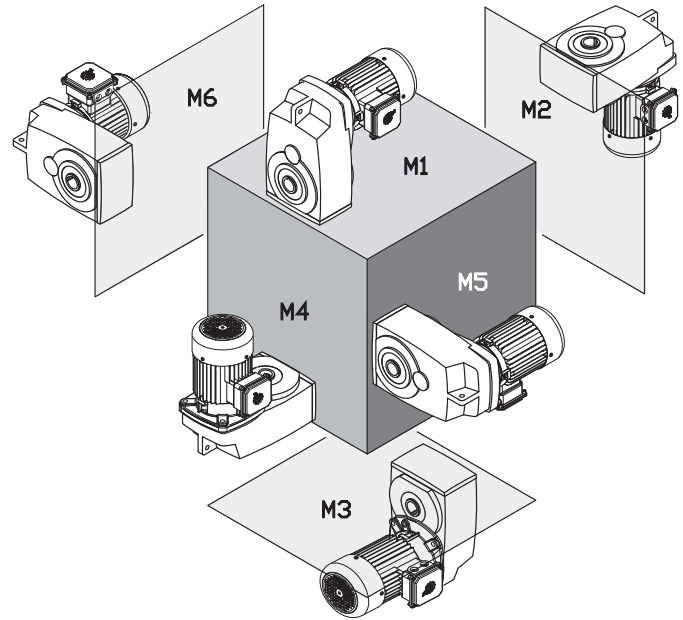


RETAIN FOR FUTURE USE

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## CLINCHER™ lubrication

Unless otherwise noted below, the following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type      | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 0182NB | 0.42   | 0.40   | 0.58   | 0.55   | 0.58   | 0.55   | 0.42   | 0.40   | 0.42   | 0.40   | 0.42   | 0.40   |
| SK 0282NB | 0.74   | 0.70   | 1.16   | 1.10   | 0.85   | 0.80   | 1.16   | 1.10   | 0.95   | 0.90   | 0.95   | 0.90   |
| SK 1282   | 1.00   | 0.95   | 1.37   | 1.30   | 0.95   | 0.90   | 1.37   | 1.30   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK 1382NB | 1.48   | 1.40   | 2.43   | 2.30   | 2.32   | 2.20   | 2.32   | 2.20   | 2.11   | 2.00   | 2.11   | 2.00   |
| SK 1382   | 1.53   | 1.45   | 1.69   | 1.60   | 1.22   | 1.15   | 1.80   | 1.70   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 2282   | 1.80   | 1.70   | 2.43   | 2.30   | 1.80   | 1.70   | 2.32   | 2.20   | 2.01   | 1.90   | 2.01   | 1.90   |
| SK 2382   | 2.43   | 2.30   | 2.85   | 2.70   | 2.22   | 2.10   | 3.38   | 3.20   | 2.11   | 2.00   | 2.11   | 2.00   |
| SK 3282   | 2.96   | 2.80   | 4.23   | 4.00   | 3.49   | 3.30   | 4.02   | 3.80   | 3.17   | 3.00   | 3.17   | 3.00   |
| SK 3382   | 4.02   | 3.80   | 4.54   | 4.30   | 3.17   | 3.00   | 5.81   | 5.50   | 3.17   | 3.00   | 3.17   | 3.00   |
| SK 4282   | 4.44   | 4.20   | 5.71   | 5.40   | 4.65   | 4.40   | 5.28   | 5.00   | 4.44   | 4.20   | 4.44   | 4.20   |
| SK 4382   | 6.45   | 6.10   | 7.29   | 6.90   | 5.18   | 4.90   | 8.88   | 8.40   | 5.28   | 5.00   | 5.28   | 5.00   |
| SK 5282   | 7.93   | 7.50   | 9.30   | 8.80   | 7.93   | 7.50   | 9.30   | 8.80   | 7.61   | 7.20   | 7.61   | 7.20   |
| SK 5382   | 13.2   | 12.5   | 12.7   | 12.0   | 7.08   | 6.70   | 14.8   | 14.0   | 8.77   | 8.30   | 8.77   | 8.30   |
| SK 6282   | 18.0   | 17.0   | 16.4   | 15.5   | 13.2   | 12.5   | 18.5   | 17.5   | 11.6   | 11.0   | 14.8   | 14.0   |
| SK 6382   | 16.9   | 16.0   | 13.7   | 13.0   | 10.6   | 10.0   | 19.0   | 18.0   | 14.8   | 14.0   | 13.2   | 12.5   |
| SK 7282   | 26.9   | 25.5   | 22.2   | 21.0   | 21.7   | 20.5   | 28.5   | 27.0   | 16.9   | 16.0   | 22.2   | 21.0   |
| SK 7382   | 23.2   | 22.0   | 22.2   | 21.0   | 16.9   | 16.0   | 26.4   | 25.0   | 24.3   | 23.0   | 23.2   | 22.0   |
| SK 8282   | 39.6   | 37.5   | 34.9   | 33.0   | 32.2   | 30.5   | 46.5   | 44.0   | 32.8   | 31.0   | 32.8   | 31.0   |
| SK 8382   | 36.5   | 34.5   | 34.3   | 32.5   | 26.4   | 25.0   | 40.2   | 38.0   | 37.0   | 35.0   | 31.7   | 30.0   |
| SK 9282   | 79.0   | 75.0   | 74.0   | 70.0   | 59.0   | 56.0   | 85.0 † | 80.0 † | 69.0   | 65.0   | 62.0   | 59.0   |
| SK 9382   | 78.0   | 74.0   | 74.0   | 70.0   | 45.4   | 43.0   | 79.0 † | 75.0 † | 69.0   | 65.0   | 63.0   | 60.0   |
| SK 10282  | 95.0   | 90.0   | 95.0   | 90.0   | 42.3   | 40.0   | 95.0 † | 90.0 † | 63.0   | 60.0   | 87.0   | 82.0   |
| SK 10382  | 90.0   | 85.0   | 95.0   | 90.0   | 77.0   | 73.0   | 106 †  | 100 †  | 85     | 80.0   | 85.0   | 80.0   |
| SK 11282* | 174    | 165    | 169    | 160    | 153    | 145    | 206 †  | 195 †  | 106    | 100    | 148    | 140    |
| SK 11382* | 169    | 160    | 164    | 155    | 148    | 140    | 222 †  | 210 †  | 164    | 155    | 143    | 135    |
| SK 12382* | 169    | 160    | 164    | 155    | 148    | 140    | 222 †  | 210 †  | 164    | 155    | 143    | 135    |

\* For shipping purposes the larger Clincher™ gear units are supplied without oil.

† Oil quantities shown are for the gearbox only. When the OT (oil tank) option is used, the oil must be filled to the level shown on the dipstick which is located inside of the oil tank. Even when the gear unit is filled by NORD, the user MUST add more oil until the oil is filled to the proper level.



DRIVESYSTEMS

# 90.1 HELICAL-BEVEL FOOTED OIL FILL QUANTITIES

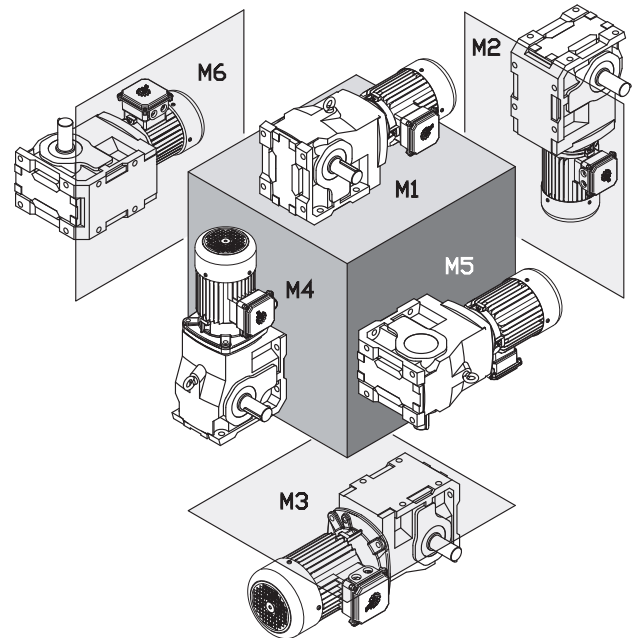


RETAIN FOR FUTURE USE

U12000 - 1 of 1

## 90.1 Helical-bevel footed lubrication

Unless otherwise noted below, the following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type      | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 9012.1 | 0.74   | 0.70   | 1.80   | 1.70   | 2.01   | 1.90   | 2.22   | 2.10   | 1.16   | 1.10   | 1.59   | 1.50   |
| SK 9013.1 | 1.43   | 1.35   | 2.22   | 2.10   | 2.27   | 2.15   | 2.91   | 2.75   | 1.06   | 1.00   | 1.90   | 1.80   |
| SK 9016.1 | 0.74   | 0.70   | 1.80   | 1.70   | 2.01   | 1.90   | 2.22   | 2.10   | 1.16   | 1.10   | 1.59   | 1.50   |
| SK 9017.1 | 1.37   | 1.30   | 2.11   | 2.00   | 2.22   | 2.10   | 2.85   | 2.70   | 1.06   | 1.00   | 1.80   | 1.70   |
| SK 9022.1 | 1.37   | 1.30   | 3.06   | 2.90   | 3.49   | 3.30   | 4.02   | 3.80   | 1.80   | 1.70   | 2.96   | 2.80   |
| SK 9023.1 | 2.32   | 2.20   | 3.38   | 3.20   | 3.80   | 3.60   | 4.97   | 4.70   | 2.32   | 2.20   | 3.06   | 2.90   |
| SK 9032.1 | 1.90   | 1.80   | 5.71   | 5.40   | 6.45   | 6.10   | 7.19   | 6.80   | 3.17   | 3.00   | 4.86   | 4.60   |
| SK 9033.1 | 3.28   | 3.10   | 6.02   | 5.70   | 6.66   | 6.30   | 8.45   | 8.00   | 3.59   | 3.40   | 5.07   | 4.80   |
| SK 9042.1 | 2.85   | 2.70   | 9.51   | 9.00   | 10.6   | 10.0   | 11.3   | 10.7   | 5.49   | 5.20   | 8.14   | 7.70   |
| SK 9043.1 | 5.28   | 5.00   | 10.7   | 10.1   | 11.6   | 11.0   | 14.1   | 13.3   | 6.02   | 5.70   | 8.56   | 8.10   |
| SK 9052.1 | 6.87   | 6.50   | 16.9   | 16.0   | 20.1   | 19.0   | 22.7   | 21.5   | 11.6   | 11.0   | 16.4   | 15.5   |
| SK 9053.1 | 10.6   | 10.0   | 18.0   | 17.0   | 21.1   | 20.0   | 25.9   | 24.5   | 12.2   | 11.5   | 17.4   | 16.5   |
| SK 9062.1 | 10.6   | 10.0   | 29.1   | 27.5   | 33.8   | 32.0   | 38.0   | 36.0   | 19.0   | 18.0   | 25.4   | 24.0   |
| SK 9072.1 | 10.6   | 10.0   | 29.1   | 27.5   | 33.8   | 32.0   | 38.0   | 36.0   | 19.0   | 18.0   | 25.4   | 24.0   |
| SK 9082.1 | 18.0   | 17.0   | 54.0   | 52.0   | 66.0   | 63.0   | 76.0   | 72.0   | 34.9   | 33.0   | 49.1   | 46.5   |
| SK 9086.1 | 30.6   | 29.0   | 77.0   | 73.0   | 90.0   | 85.0   | 108    | 102    | 51.0   | 48.0   | 66.0   | 62.0   |
| SK 9092.1 | 43.3   | 41.0   | 166    | 157    | 180    | 170    | 182    | 172    | 85.0   | 80.0   | 95.0   | 90.0   |
| SK 9096.1 | 74.0   | 70.0   | 198    | 187    | 205    | 194    | 268    | 254    | 115    | 109    | 161    | 152    |

Oil Levels shown apply to base models and gear units ending in LX, AX, & VX.

**NORD Gear Limited**

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12.22.14

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# 90.1 HELICAL-BEVEL FLANGED OIL FILL QUANTITIES



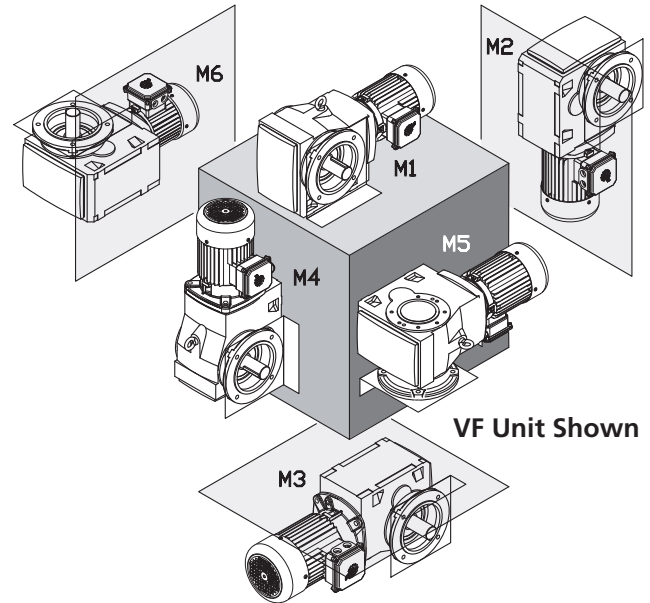
DRIVESYSTEMS

RETAIN FOR FUTURE USE

U12100 - 1 of 1

## 90.1 Helical-bevel flanged lubrication

Unless otherwise noted below, the following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add addition oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type      | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 9012.1 | 1.06   | 1.00   | 2.01   | 1.90   | 2.01   | 1.90   | 2.32   | 2.20   | 1.27   | 1.20   | 1.80   | 1.70   |
| SK 9013.1 | 1.53   | 1.45   | 2.43   | 2.30   | 2.22   | 2.10   | 2.96   | 2.80   | 1.11   | 1.05   | 1.90   | 1.80   |
| SK 9016.1 | 1.06   | 1.00   | 2.01   | 1.90   | 2.01   | 1.90   | 2.32   | 2.20   | 1.27   | 1.20   | 1.80   | 1.70   |
| SK 9017.1 | 1.53   | 1.45   | 2.43   | 2.30   | 2.22   | 2.10   | 2.96   | 2.80   | 1.11   | 1.05   | 1.90   | 1.80   |
| SK 9022.1 | 1.69   | 1.60   | 3.70   | 3.50   | 3.70   | 3.50   | 4.44   | 4.20   | 2.43   | 2.30   | 2.96   | 2.80   |
| SK 9023.1 | 2.43   | 2.30   | 3.70   | 3.50   | 4.02   | 3.80   | 5.60   | 5.30   | 2.32   | 2.20   | 3.59   | 3.40   |
| SK 9032.1 | 2.22   | 2.10   | 5.07   | 4.80   | 6.76   | 6.40   | 7.50   | 7.10   | 3.49   | 3.30   | 5.39   | 5.10   |
| SK 9033.1 | 3.91   | 3.70   | 6.02   | 5.70   | 7.08   | 6.70   | 9.09   | 8.60   | 3.80   | 3.60   | 5.60   | 5.30   |
| SK 9042.1 | 4.76   | 4.50   | 10.6   | 10.0   | 10.6   | 10.0   | 12.2   | 11.5   | 6.87   | 6.50   | 8.66   | 8.20   |
| SK 9043.1 | 6.87   | 6.50   | 11.1   | 10.5   | 12.6   | 11.9   | 15.5   | 14.7   | 7.08   | 6.70   | 9.83   | 9.30   |
| SK 9052.1 | 7.93   | 7.50   | 17.4   | 16.5   | 21.1   | 20.0   | 24.8   | 23.5   | 12.2   | 11.5   | 19.0   | 18.0   |
| SK 9053.1 | 13.7   | 13.0   | 19.0   | 18.0   | 22.7   | 21.5   | 28.0   | 26.5   | 13.7   | 13.0   | 18.0   | 17.0   |
| SK 9062.1 | 12.7   | 12.0   | 29.1   | 27.5   | 34.9   | 33.0   | 40.7   | 38.5   | 20.1   | 19.0   | 27.5   | 26.0   |
| SK 9072.1 | 12.7   | 12.0   | 29.1   | 27.5   | 34.9   | 33.0   | 40.7   | 38.5   | 20.1   | 19.0   | 27.5   | 26.0   |
| SK 9082.1 | 22.2   | 21.0   | 57.0   | 54.0   | 70.0   | 66.0   | 85.0   | 80.0   | 40.2   | 38.0   | 55.0   | 52.0   |
| SK 9086.1 | 38.0   | 36.0   | 82.0   | 78.0   | 96.0   | 91.0   | 113    | 107    | 56.0   | 53.0   | 80.0   | 76.0   |
| SK 9092.1 | 42.3   | 40.0   | 137    | 130    | 163    | 154    | 185    | 175    | 87.0   | 82.0   | 96.0   | 91.0   |
| SK 9096.1 | 85.0   | 80.0   | 198    | 187    | 204    | 193    | 272    | 257    | 119    | 113    | 165    | 156    |

Oil Levels shown apply to base models and gear units ending in AZ, AF, VZ, & VF.



# 92 SERIES HELICAL-BEVEL FOOTED OIL FILL QUANTITIES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

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## 92 Helical-bevel footed lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

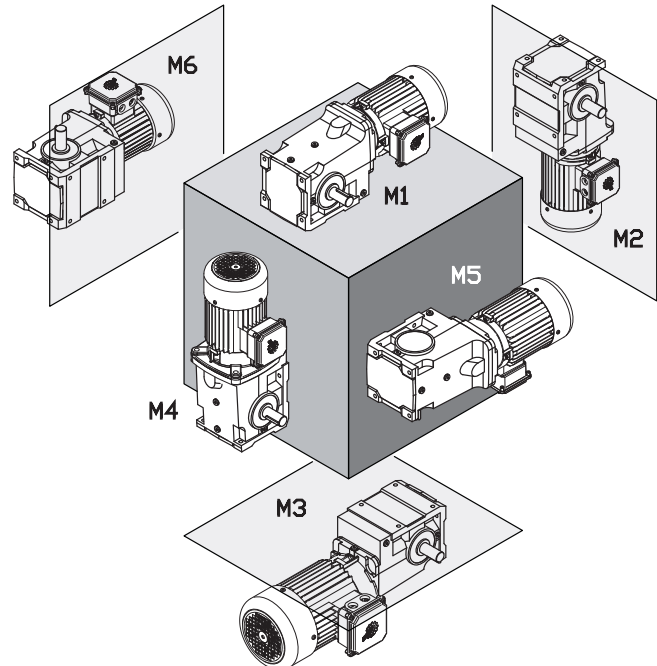


### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type     | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|          | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 92072 | 0.42   | 0.40   | 0.63   | 0.60   | 0.53   | 0.50   | 0.58   | 0.55   | 0.42   | 0.40   | 0.42   | 0.40   |
| SK 92172 | 0.63   | 0.60   | 0.95   | 0.90   | 1.06   | 1.00   | 1.16   | 1.10   | 1.16   | 1.10   | 0.85   | 0.80   |
| SK 92372 | 0.95   | 0.90   | 1.69   | 1.60   | 1.59   | 1.50   | 2.01   | 1.90   | 1.59   | 1.50   | 0.95   | 0.90   |
| SK 92672 | 1.90   | 1.80   | 3.70   | 3.50   | 3.80   | 3.60   | 3.59   | 3.40   | 2.75   | 2.60   | 2.75   | 2.60   |
| SK 92772 | 2.43   | 2.30   | 4.76   | 4.50   | 4.86   | 4.60   | 5.60   | 5.30   | 4.33   | 4.10   | 4.33   | 4.10   |

Oil Levels shown apply to base models and gear units ending in LX, AX, & VX.

**NORD Gear Limited**

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**NORD Gear Corporation**

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# 92.1/93.1 SERIES HELICAL-BEVEL OIL FILL QUANTITIES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U12205 - 1 of 1

## 92.1/93.1 Helical-bevel lubrication

All NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size & mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

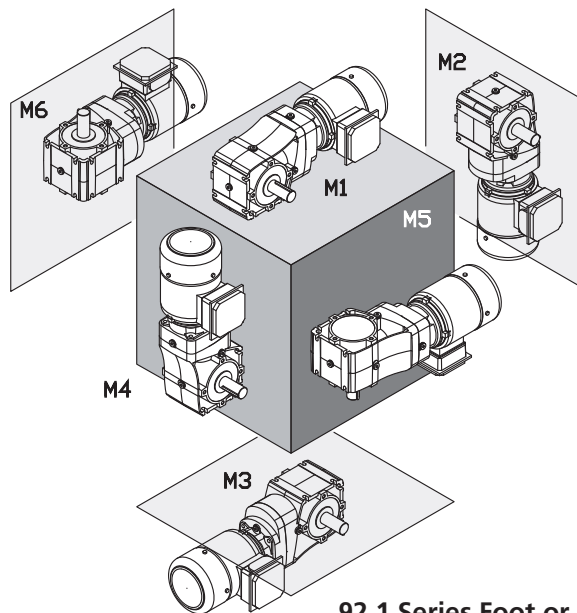


### HARMFUL SITUATION

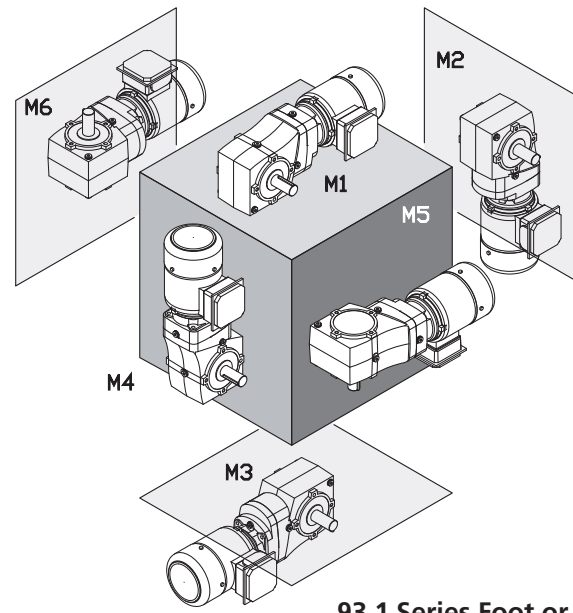


Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



**92.1 Series Foot or  
Flange Mount**



**93.1 Series Foot or  
Flange Mount**

#### 92.1 Series Oil Fill

|            | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|            | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 92072.1 | 0.28   | 0.26   | 0.52   | 0.49   | 0.44   | 0.42   | 0.57   | 0.54   | 0.31   | 0.29   | 0.33   | 0.31   |
| SK 92172.1 | 0.36   | 0.34   | 0.65   | 0.61   | 0.55   | 0.52   | 0.71   | 0.67   | 0.44   | 0.42   | 0.51   | 0.48   |
| SK 92372.1 | 0.45   | 0.43   | 0.97   | 0.92   | 0.77   | 0.73   | 0.88   | 0.83   | 0.58   | 0.55   | 0.65   | 0.61   |
| SK 92672.1 | 0.90   | 0.85   | 1.69   | 1.60   | 1.27   | 1.20   | 1.59   | 1.50   | 1.08   | 1.02   | 1.08   | 1.02   |
| SK 92772.1 | 1.37   | 1.30   | 2.80   | 2.65   | 1.97   | 1.86   | 2.59   | 2.45   | 1.69   | 1.60   | 1.69   | 1.60   |

Oil levels shown apply to all foot & flange mounted units.

#### 93.1 Series Oil Fill

|            | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|            | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 93072.1 | 0.41   | 0.39   | 0.98   | 0.93   | 0.84   | 0.79   | 1.08   | 1.02   | 0.52   | 0.49   | 0.66   | 0.62   |
| SK 93172.1 | 0.63   | 0.60   | 1.24   | 1.17   | 0.99   | 0.94   | 1.29   | 1.22   | 0.69   | 0.65   | 0.90   | 0.85   |
| SK 93372.1 | 1.06   | 1.00   | 2.08   | 1.97   | 1.74   | 1.65   | 2.26   | 2.14   | 1.18   | 1.12   | 1.42   | 1.34   |
| SK 93672.1 | 1.90   | 1.80   | 3.41   | 3.23   | 2.86   | 2.71   | 4.44   | 4.20   | 2.13   | 2.02   | 2.59   | 2.45   |
| SK 93772.1 | 2.87   | 2.72   | 4.89   | 4.63   | 3.91   | 3.70   | 5.71   | 5.40   | 3.10   | 2.93   | 3.43   | 3.25   |

Oil levels shown apply to all foot & flange mounted units.

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# 92 SERIES HELICAL-BEVEL FLANGED OIL FILL QUANTITIES



## 92 Helical-bevel flanged lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

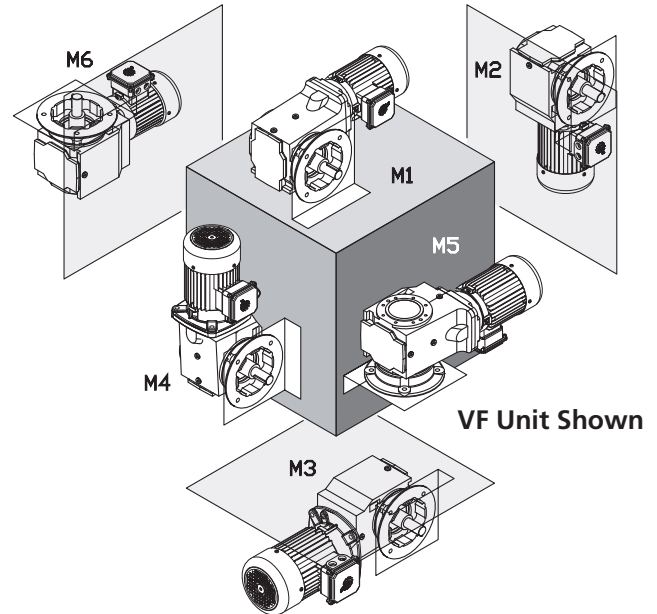


### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type     | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|          | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 92072 | 0.42   | 0.40   | 0.63   | 0.60   | 0.58   | 0.55   | 0.58   | 0.55   | 0.42   | 0.40   | 0.42   | 0.40   |
| SK 92172 | 0.53   | 0.50   | 1.06   | 1.00   | 0.95   | 0.90   | 1.11   | 1.05   | 0.95   | 0.90   | 0.63   | 0.60   |
| SK 92372 | 1.27   | 1.20   | 1.69   | 1.60   | 1.59   | 1.50   | 2.01   | 1.90   | 1.37   | 1.30   | 1.37   | 1.30   |
| SK 92672 | 1.69   | 1.60   | 2.96   | 2.80   | 2.64   | 2.50   | 3.49   | 3.30   | 2.54   | 2.40   | 2.54   | 2.40   |
| SK 92772 | 2.96   | 2.80   | 4.65   | 4.40   | 4.76   | 4.50   | 5.81   | 5.50   | 3.70   | 3.50   | 3.70   | 3.50   |

Oil Levels shown apply to gear units ending in AZ, AF, VZ, & VF.



DRIVESYSTEMS

# HELICAL-WORM FOOTED OIL FILL QUANTITIES



U12400 - 1 of 1

## Helical-worm footed lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

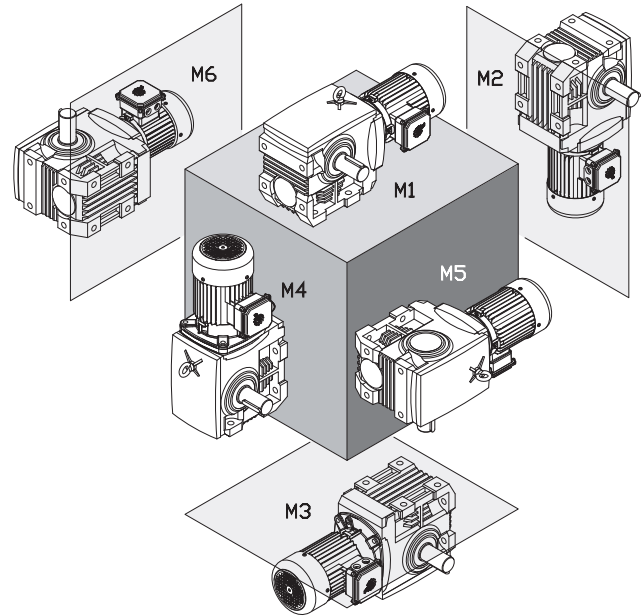


### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type     | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|          | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 02040 | 0.42   | 0.40   | 0.85   | 0.80   | 0.79   | 0.75   | 0.69   | 0.65   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK 02050 | 0.42   | 0.40   | 1.48   | 1.40   | 1.16   | 1.10   | 1.37   | 1.30   | 0.74   | 0.70   | 0.74   | 0.70   |
| SK 13050 | 0.79   | 0.75   | 1.85   | 1.75   | 1.37   | 1.30   | 1.85   | 1.75   | 0.79   | 0.75   | 0.79   | 0.75   |
| SK 12063 | 0.63   | 0.60   | 1.90   | 1.80   | 1.27   | 1.20   | 1.69   | 1.60   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK 13063 | 1.06   | 1.00   | 2.43   | 2.30   | 1.59   | 1.50   | 2.32   | 2.20   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 12080 | 0.95   | 0.90   | 3.28   | 3.10   | 2.54   | 2.40   | 3.17   | 3.00   | 1.90   | 1.80   | 1.90   | 1.80   |
| SK 13080 | 1.80   | 1.70   | 3.70   | 3.50   | 3.70   | 3.50   | 3.70   | 3.50   | 2.11   | 2.00   | 2.11   | 2.00   |
| SK 32100 | 1.59   | 1.50   | 6.66   | 6.30   | 5.92   | 5.60   | 5.81   | 5.50   | 3.80   | 3.60   | 3.80   | 3.60   |
| SK 33100 | 2.54   | 2.40   | 6.76   | 6.40   | 5.71   | 5.40   | 6.87   | 6.50   | 3.59   | 3.40   | 3.59   | 3.40   |
| SK 42125 | 2.96   | 2.80   | 12.5   | 11.8   | 10.8   | 10.2   | 10.6   | 10.0   | 6.55   | 6.20   | 6.55   | 6.20   |
| SK 43125 | 4.49   | 4.25   | 13.7   | 13.0   | 11.1   | 10.5   | 14.3   | 13.5   | 7.61   | 7.20   | 7.61   | 7.20   |



# HELICAL-WORM SOLID SHAFT/FLANGED OIL FILL QUANTITIES



DRIVESYSTEMS

RETAIN FOR FUTURE USE

U12500 - 1 of 1

## Helical-worm solid shaft/flanged lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.

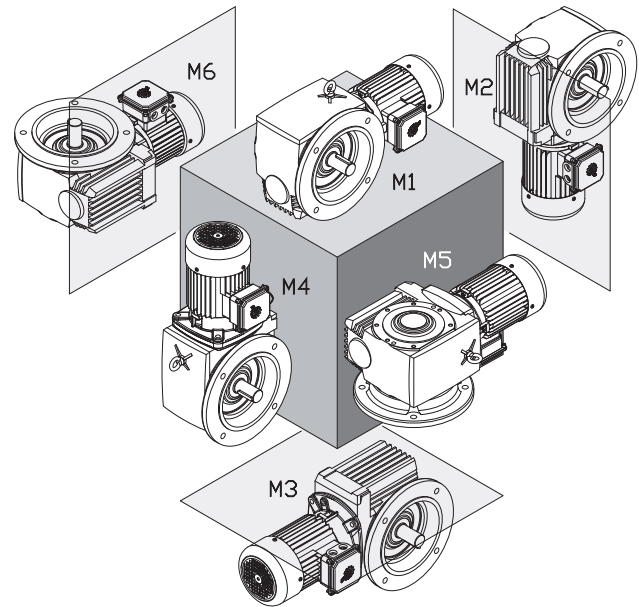


### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.



| Type        | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|             | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 02040 VF | 0.53   | 0.50   | 0.85   | 0.80   | 0.79   | 0.75   | 0.63   | 0.60   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK 02050 VF | 0.42   | 0.40   | 1.59   | 1.50   | 1.32   | 1.25   | 1.27   | 1.20   | 0.95   | 0.90   | 0.79   | 0.75   |
| SK 13050 VF | 0.79   | 0.75   | 1.90   | 1.80   | 1.59   | 1.50   | 1.80   | 1.70   | 1.11   | 1.05   | 0.95   | 0.90   |
| SK 12063 VF | 0.53   | 0.50   | 2.06   | 1.95   | 1.80   | 1.70   | 1.85   | 1.75   | 1.27   | 1.20   | 1.00   | 0.95   |
| SK 13063 VF | 1.06   | 1.00   | 2.43   | 2.30   | 2.01   | 1.90   | 2.32   | 2.20   | 1.43   | 1.35   | 1.16   | 1.10   |
| SK 12080 VF | 0.95   | 0.90   | 3.91   | 3.70   | 3.38   | 3.20   | 3.59   | 3.40   | 2.64   | 2.50   | 2.43   | 2.30   |
| SK 13080 VF | 1.69   | 1.60   | 4.02   | 3.80   | 3.70   | 3.50   | 4.12   | 3.90   | 2.85   | 2.70   | 2.64   | 2.50   |
| SK 32100 VF | 1.48   | 1.40   | 6.66   | 6.30   | 6.45   | 6.10   | 6.45   | 6.10   | 4.23   | 4.00   | 3.80   | 3.60   |
| SK 33100 VF | 2.80   | 2.65   | 7.61   | 7.20   | 6.76   | 6.40   | 8.03   | 7.60   | 4.54   | 4.30   | 4.02   | 3.80   |
| SK 42125 VF | 3.17   | 3.00   | 12.2   | 11.5   | 12.2   | 11.5   | 11.6   | 11.0   | 8.88   | 8.40   | 7.71   | 7.30   |
| SK 43125 VF | 4.97   | 4.70   | 15.9   | 15.0   | 13.7   | 13.0   | 16.9   | 16.0   | 9.51   | 9.00   | 8.14   | 7.70   |



# HELICAL-WORM HOLLOW SHAFT OIL FILL QUANTITIES

DRIVESYSTEMS

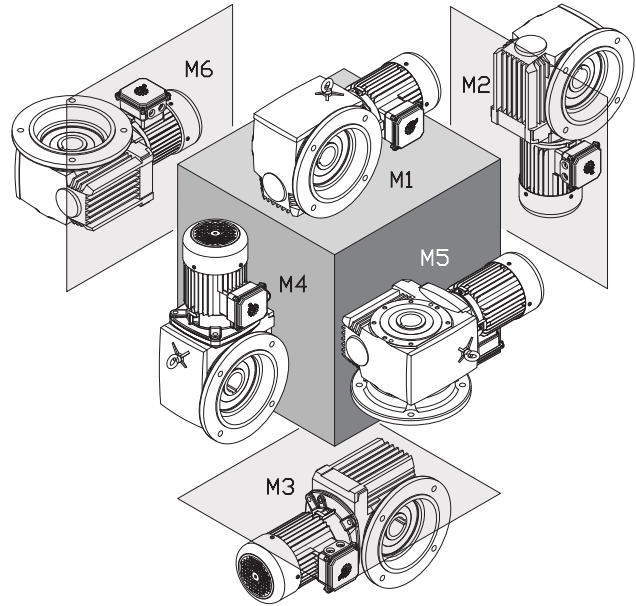
RETAIN FOR FUTURE USE



U12600 - 1 of 1

## Helical-worm hollow shaft lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



AF Unit Shown

STOP

### HARMFUL SITUATION

STOP

Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type     | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|          | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 02040 | 0.42   | 0.40   | 0.74   | 0.70   | 0.69   | 0.65   | 0.69   | 0.65   | 0.58   | 0.55   | 0.58   | 0.55   |
| SK 02050 | 0.48   | 0.45   | 1.48   | 1.40   | 1.22   | 1.15   | 1.16   | 1.10   | 0.79   | 0.75   | 0.79   | 0.75   |
| SK 13050 | 0.95   | 0.90   | 1.90   | 1.80   | 1.37   | 1.30   | 1.74   | 1.65   | 1.37   | 1.30   | 1.37   | 1.30   |
| SK 12063 | 0.58   | 0.55   | 1.53   | 1.45   | 1.69   | 1.60   | 1.69   | 1.60   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 13063 | 1.11   | 1.05   | 2.22   | 2.10   | 1.90   | 1.80   | 2.22   | 2.10   | 1.48   | 1.40   | 1.48   | 1.40   |
| SK 12080 | 0.85   | 0.80   | 3.28   | 3.10   | 3.38   | 3.20   | 2.96   | 2.80   | 1.90   | 1.80   | 1.90   | 1.80   |
| SK 13080 | 1.69   | 1.60   | 3.80   | 3.60   | 3.06   | 2.90   | 3.96   | 3.75   | 2.11   | 2.00   | 2.11   | 2.00   |
| SK 32100 | 1.59   | 1.50   | 5.92   | 5.60   | 5.92   | 5.60   | 5.60   | 5.30   | 4.23   | 4.00   | 4.23   | 4.00   |
| SK 33100 | 2.75   | 2.60   | 6.34   | 6.00   | 6.13   | 5.80   | 6.34   | 6.00   | 3.70   | 3.50   | 3.70   | 3.50   |
| SK 42125 | 3.17   | 3.00   | 13.2   | 12.5   | 11.4   | 10.8   | 11.4   | 10.8   | 6.87   | 6.50   | 6.87   | 6.50   |
| SK 43125 | 4.86   | 4.60   | 14.4   | 13.6   | 12.0   | 11.4   | 15.1   | 14.3   | 8.03   | 7.60   | 8.03   | 7.60   |

Oil Levels shown apply to gear units ending in AZ, AF.

**NORD Drivesystems**

Línea gratuita en México: 800.836.9192

**NORD Gear Corporation**

Línea gratuita en Estados Unidos: 888.314.6673



DRIVESYSTEMS

# NORDBLOC® FOOTED OIL FILL QUANTITIES

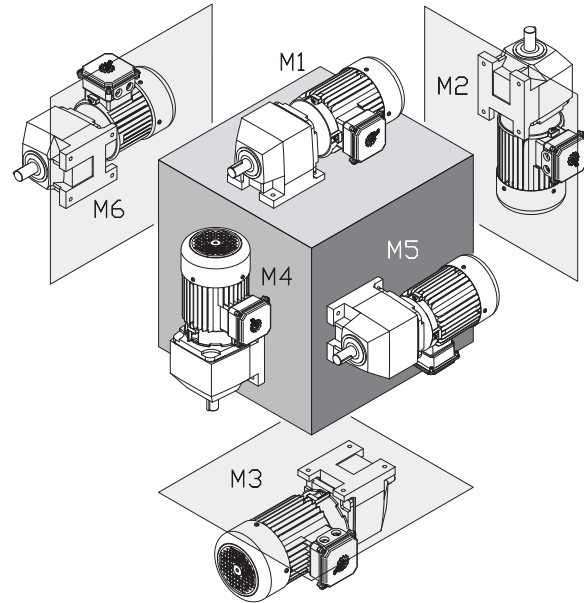


RETAIN FOR FUTURE USE

U12700 - 1 of 1

## NORDBLOC® footed lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type   | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|        | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 172 | 0.37   | 0.35   | 0.53   | 0.50   | 0.53   | 0.50   | 0.53   | 0.50   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK 272 | 0.63   | 0.60   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK 273 | 0.66   | 0.62   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 372 | 0.63   | 0.60   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK 373 | 0.58   | 0.55   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 472 | 1.06   | 1.00   | 2.01   | 1.90   | 2.01   | 1.90   | 2.11   | 2.00   | 1.90   | 1.80   | 1.90   | 1.80   |
| SK 473 | 1.37   | 1.30   | 2.64   | 2.50   | 2.22   | 2.10   | 2.54   | 2.40   | 2.22   | 2.10   | 2.22   | 2.10   |
| SK 572 | 1.06   | 1.00   | 2.01   | 1.90   | 2.01   | 1.90   | 2.11   | 2.00   | 1.90   | 1.80   | 1.90   | 1.80   |
| SK 573 | 1.37   | 1.30   | 2.64   | 2.50   | 2.22   | 2.10   | 2.54   | 2.40   | 2.22   | 2.10   | 2.22   | 2.10   |
| SK 672 | 1.48   | 1.40   | 3.59   | 3.40   | 3.28   | 3.10   | 3.33   | 3.15   | 1.53   | 1.45   | 3.33   | 3.15   |
| SK 673 | 1.90   | 1.80   | 4.02   | 3.80   | 3.38   | 3.20   | 3.59   | 3.40   | 3.06   | 2.90   | 3.17   | 3.00   |
| SK 772 | 2.11   | 2.00   | 3.49   | 3.30   | 3.70   | 3.50   | 4.44   | 4.20   | 2.85   | 2.70   | 3.49   | 3.30   |
| SK 773 | 2.64   | 2.50   | 4.76   | 4.50   | 3.91   | 3.70   | 4.86   | 4.60   | 3.49   | 3.30   | 3.49   | 3.30   |
| SK 872 | 3.91   | 3.70   | 10.1   | 9.60   | 9.62   | 9.10   | 7.71   | 7.30   | 4.97   | 4.70   | 8.45   | 8.00   |
| SK 873 | 6.55   | 6.20   | 8.88   | 8.40   | 7.93   | 7.50   | 9.62   | 9.10   | 7.93   | 7.50   | 7.93   | 7.50   |
| SK 972 | 6.87   | 6.50   | 16.9   | 16.0   | 16.6   | 15.7   | 15.5   | 14.7   | 8.98   | 8.50   | 14.8   | 14.0   |
| SK 973 | 11.6   | 11.0   | 16.7   | 15.8   | 13.7   | 13.0   | 16.9   | 16.0   | 14.1   | 13.3   | 13.7   | 13.0   |



DRIVESYSTEMS

# NORDBLOC® FLANGED OIL FILL QUANTITIES

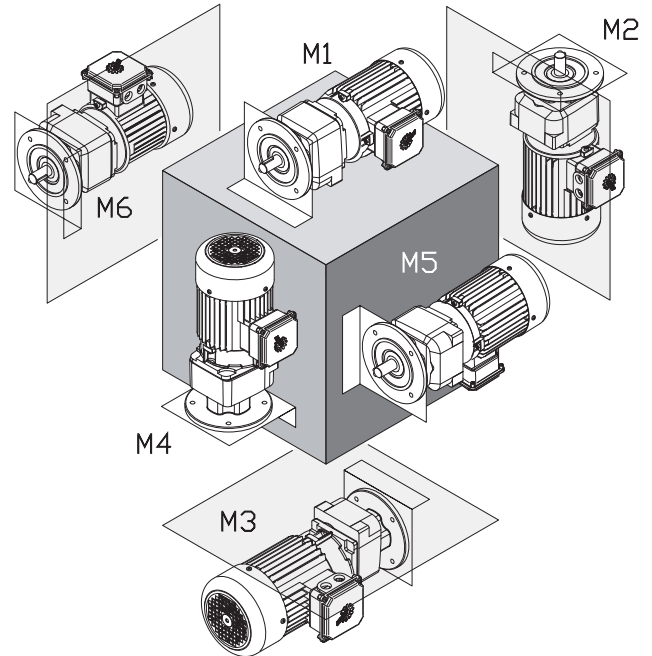


RETAIN FOR FUTURE USE

U12800 - 1 of 1

## NORDBLOC® flanged lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Mounting Position | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                   | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK 172 F          | 0.37   | 0.35   | 0.53   | 0.50   | 0.53   | 0.50   | 0.53   | 0.50   | 0.53   | 0.50   | 0.53   | 0.50   |
| SK 272 F          | 0.63   | 0.60   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK 273 F          | 0.66   | 0.62   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 372 F          | 0.63   | 0.60   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   | 1.06   | 1.00   |
| SK 373 F          | 0.58   | 0.55   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   | 1.16   | 1.10   |
| SK 472 F          | 1.06   | 1.00   | 2.01   | 1.90   | 2.01   | 1.90   | 2.01   | 1.90   | 2.01   | 1.90   | 1.59   | 1.50   |
| SK 473 F          | 1.32   | 1.25   | 2.54   | 2.40   | 2.22   | 2.10   | 2.64   | 2.50   | 2.22   | 2.10   | 2.22   | 2.10   |
| SK 572 F          | 1.06   | 1.00   | 2.01   | 1.90   | 2.01   | 1.90   | 2.01   | 1.90   | 2.01   | 1.90   | 1.59   | 1.50   |
| SK 573 F          | 1.32   | 1.25   | 2.54   | 2.40   | 2.22   | 2.10   | 2.64   | 2.50   | 2.22   | 2.10   | 2.22   | 2.10   |
| SK 672 F          | 1.22   | 1.15   | 3.59   | 3.40   | 2.85   | 2.70   | 2.96   | 2.80   | 1.32   | 1.25   | 2.85   | 2.70   |
| SK 673 F          | 1.80   | 1.70   | 4.02   | 3.80   | 3.17   | 3.00   | 3.38   | 3.20   | 3.17   | 3.00   | 3.17   | 3.00   |
| SK 772 F          | 1.69   | 1.60   | 3.49   | 3.30   | 3.70   | 3.50   | 3.49   | 3.30   | 3.28   | 3.10   | 3.28   | 3.10   |
| SK 773 F          | 2.43   | 2.30   | 5.28   | 5.00   | 3.80   | 3.60   | 4.76   | 4.50   | 4.12   | 3.90   | 4.12   | 3.90   |
| SK 872 F          | 3.70   | 3.50   | 9.51   | 9.00   | 8.35   | 7.90   | 8.14   | 7.70   | 4.12   | 3.90   | 7.61   | 7.20   |
| SK 873 F          | 5.28   | 5.00   | 9.30   | 8.80   | 8.03   | 7.60   | 8.45   | 8.00   | 8.45   | 8.00   | 8.45   | 8.00   |
| SK 972 F          | 6.87   | 6.50   | 15.9   | 15.0   | 13.7   | 13.0   | 14.3   | 13.5   | 6.87   | 6.50   | 12.7   | 12.0   |
| SK 973 F          | 10.9   | 10.3   | 17.4   | 16.5   | 13.7   | 13.0   | 16.9   | 16.0   | 14.8   | 14.0   | 14.8   | 14.0   |

NORD Gear Limited

Toll Free in Canada: 800.668.4378

NORD Gear Corporation

Toll Free in the United States: 888.314.6673

12.22.14

www.nord.com/doc154



DRIVESYSTEMS

# NORDBLOC®.1 FOOTED OIL FILL QUANTITIES

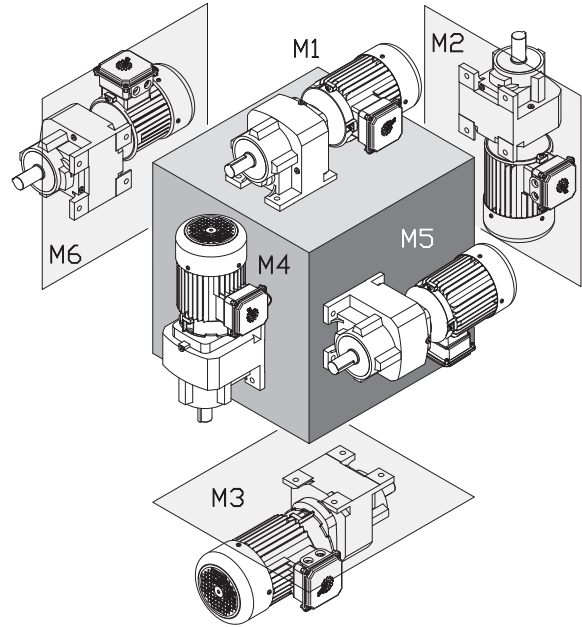


RETAIN FOR FUTURE USE

U12900 - 1 of 1

## NORDBLOC®.1 footed lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type      | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK072.1   | 0.17   | 0.16   | 0.34   | 0.32   | 0.22   | 0.21   | 0.24   | 0.23   | 0.19   | 0.18   | 0.21   | 0.20   |
| SK172.1   | 0.29   | 0.27   | 0.62   | 0.59   | 0.44   | 0.42   | 0.48   | 0.45   | 0.34   | 0.32   | 0.41   | 0.39   |
| SK372.1   | 0.48   | 0.45   | 1.11   | 1.05   | 0.79   | 0.75   | 1.06   | 1.00   | 0.63   | 0.60   | 0.69   | 0.65   |
| SK373.1   | 0.48   | 0.45   | 1.11   | 1.05   | 0.79   | 0.75   | 1.06   | 1.00   | 0.63   | 0.60   | 0.69   | 0.65   |
| SK572.1   | 0.79   | 0.75   | 2.01   | 1.90   | 1.59   | 1.50   | 2.11   | 2.00   | 1.16   | 1.10   | 1.22   | 1.15   |
| SK573.1   | 0.79   | 0.75   | 2.01   | 1.90   | 1.59   | 1.50   | 2.11   | 2.00   | 1.16   | 1.10   | 1.22   | 1.15   |
| SK672.1   | 1.16   | 1.10   | 2.75   | 2.60   | 2.27   | 2.15   | 2.85   | 2.70   | 1.64   | 1.55   | 1.74   | 1.65   |
| SK673.1   | 1.16   | 1.10   | 2.75   | 2.60   | 2.27   | 2.15   | 2.85   | 2.70   | 1.64   | 1.55   | 1.74   | 1.65   |
| SK772.1   | 1.37   | 1.30   | 4.02   | 3.80   | 2.54   | 2.40   | 3.38   | 3.20   | 1.69   | 1.60   | 2.64   | 2.50   |
| SK773.1   | 2.43   | 2.30   | 4.02   | 3.80   | 3.49   | 3.30   | 3.38   | 3.20   | 2.54   | 2.40   | 3.28   | 3.10   |
| SK872.1   | 3.06   | 2.90   | 8.24   | 7.80   | 4.86   | 4.60   | 6.76   | 6.40   | 2.64   | 2.50   | 4.23   | 4.00   |
| SK873.1   | 4.44   | 4.20   | 8.24   | 7.80   | 6.23   | 5.90   | 6.76   | 6.40   | 4.33   | 4.10   | 6.23   | 5.90   |
| SK972.1   | 4.76   | 4.50   | 12.7   | 12.0   | 7.93   | 7.50   | 12.2   | 11.5   | 4.44   | 4.20   | 7.93   | 7.50   |
| SK973.1   | 7.93   | 7.50   | 12.7   | 12.0   | 11.1   | 10.5   | 12.2   | 11.5   | 7.93   | 7.50   | 11.1   | 10.5   |
| SK772.1VL | 2.11   | 2.00   | 4.02   | 3.80   | 2.54   | 2.40   | 3.38   | 3.20   | 1.69   | 1.60   | 2.64   | 2.50   |
| SK773.1VL | 2.43   | 2.30   | 4.02   | 3.80   | 3.49   | 3.30   | 3.38   | 3.20   | 2.54   | 2.40   | 3.28   | 3.10   |
| SK872.1VL | 5.28   | 5.00   | 8.24   | 7.80   | 4.86   | 4.60   | 6.76   | 6.40   | 2.64   | 2.50   | 4.23   | 4.00   |
| SK873.1VL | 4.44   | 4.20   | 8.24   | 7.80   | 6.23   | 5.90   | 6.76   | 6.40   | 4.33   | 4.10   | 6.23   | 5.90   |
| SK972.1VL | 8.98   | 8.50   | 12.7   | 12.0   | 7.93   | 7.50   | 12.2   | 11.5   | 4.44   | 4.20   | 7.93   | 7.50   |
| SK973.1VL | 7.93   | 7.50   | 12.7   | 12.0   | 11.1   | 10.5   | 12.2   | 11.5   | 7.93   | 7.50   | 11.1   | 10.5   |



DRIVESYSTEMS

# NORDBLOC®.1 FLANGED OIL FILL QUANTITIES

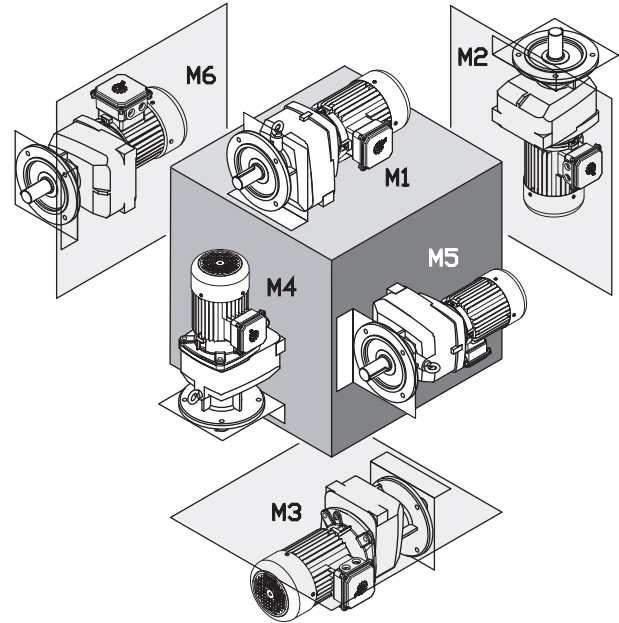


RETAIN FOR FUTURE USE

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## NORDBLOC®.1 flanged lubrication

The following NORD Gear reducers are shipped from the factory with a pre-determined oil fill level in accordance to the specified reducer size and mounting position. For additional information, please refer to the "Oil Plug & Vent Locations" documentation for your gear unit.



### HARMFUL SITUATION



Actual oil volume can vary slightly depending upon the gear case size, mounting and ratio. Prior to commissioning the reducer, check the oil-fill level using the reducer's oil level plug and drain or add additional oil as needed. The minimum acceptable oil level is 0.15 in (4mm) below the oil level hole.

For mounting orientations other than shown please consult NORD Gear. Reducer modifications may be required.

| Type        | M1     |        | M2     |        | M3     |        | M4     |        | M5     |        | M6     |        |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|             | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters | Quarts | Liters |
| SK072.1 F   | 0.17   | 0.16   | 0.34   | 0.32   | 0.22   | 0.21   | 0.24   | 0.23   | 0.19   | 0.18   | 0.21   | 0.20   |
| SK172.1 F   | 0.29   | 0.27   | 0.62   | 0.59   | 0.44   | 0.42   | 0.48   | 0.45   | 0.34   | 0.32   | 0.41   | 0.39   |
| SK372.1 F   | 0.48   | 0.45   | 1.11   | 1.05   | 0.79   | 0.75   | 1.06   | 1.00   | 0.63   | 0.60   | 0.69   | 0.65   |
| SK373.1 F   | 0.48   | 0.45   | 1.11   | 1.05   | 0.79   | 0.75   | 1.06   | 1.00   | 0.63   | 0.60   | 0.69   | 0.65   |
| SK572.1 F   | 0.79   | 0.75   | 2.01   | 1.90   | 1.59   | 1.50   | 2.11   | 2.00   | 1.16   | 1.10   | 1.22   | 1.15   |
| SK573.1 F   | 0.79   | 0.75   | 2.01   | 1.90   | 1.59   | 1.50   | 2.11   | 2.00   | 1.16   | 1.10   | 1.22   | 1.15   |
| SK672.1 F   | 1.16   | 1.10   | 2.75   | 2.60   | 2.27   | 2.15   | 2.85   | 2.70   | 1.64   | 1.55   | 1.74   | 1.65   |
| SK673.1 F   | 1.16   | 1.10   | 2.75   | 2.60   | 2.27   | 2.15   | 2.85   | 2.70   | 1.64   | 1.55   | 1.74   | 1.65   |
| SK772.1 F   | 1.37   | 1.30   | 4.02   | 3.80   | 2.54   | 2.40   | 3.49   | 3.30   | 1.80   | 1.70   | 2.54   | 2.40   |
| SK773.1 F   | 2.11   | 2.00   | 3.70   | 3.50   | 3.38   | 3.20   | 3.06   | 2.90   | 2.43   | 2.30   | 3.17   | 3.00   |
| SK872.1 F   | 3.06   | 2.90   | 7.93   | 7.50   | 5.39   | 5.10   | 7.08   | 6.70   | 2.75   | 2.60   | 4.54   | 4.30   |
| SK873.1 F   | 4.33   | 4.10   | 8.03   | 7.60   | 7.29   | 6.90   | 6.97   | 6.60   | 5.28   | 5.00   | 6.97   | 6.60   |
| SK973.1 F   | 7.82   | 7.40   | 12.9   | 12.2   | 11.7   | 11.1   | 12.3   | 11.6   | 8.45   | 8.00   | 11.5   | 10.9   |
| SK972.1 F   | 4.76   | 4.50   | 13.2   | 12.5   | 8.45   | 8.00   | 13.2   | 12.5   | 4.76   | 4.50   | 8.14   | 7.70   |
| SK772.1F VL | 2.11   | 2.00   | 4.02   | 3.80   | 2.54   | 2.40   | 3.49   | 3.30   | 1.80   | 1.70   | 2.54   | 2.40   |
| SK773.1F VL | 2.11   | 2.00   | 3.70   | 3.50   | 3.38   | 3.20   | 3.06   | 2.90   | 2.43   | 2.30   | 3.17   | 3.00   |
| SK872.1F VL | 5.28   | 5.00   | 7.93   | 7.50   | 5.39   | 5.10   | 7.08   | 6.70   | 2.75   | 2.60   | 4.54   | 4.30   |
| SK873.1F VL | 4.33   | 4.10   | 8.03   | 7.60   | 7.29   | 6.90   | 6.97   | 6.60   | 5.28   | 5.00   | 6.97   | 6.60   |
| SK972.1F VL | 8.98   | 8.50   | 13.2   | 12.5   | 8.45   | 8.00   | 13.2   | 12.5   | 4.76   | 4.50   | 8.14   | 7.70   |
| SK973.1F VL | 7.82   | 7.40   | 12.9   | 12.2   | 11.7   | 11.1   | 12.3   | 11.6   | 8.45   | 8.00   | 11.5   | 10.9   |

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