



## 8 Design and Operating Notes

### 8.1 Guideline for oil selection

**General**

Unless a special arrangement is made, SEW-EURODRIVE supplies the drives without oil fill.



**It is therefore necessary to fill the gear unit with the correct type and quantity of oil before taking it into operation. The required information is indicated on the gear unit nameplate.**

The required type and quantity of the gear unit oil depends on the following:

- gear unit size and type
- gear unit design (MC..L., MC...V., MC...E) and housing orientation (M1...M6)
- oil operating temperature, which depends on
  - transmitted power
  - ambient temperature
  - lubrication type (splash, bath or pressure lubrication)
  - additional cooling methods
- minimum temperature at cold start

In addition to the required viscosity, the oil must meet the following criteria:

- High viscosity index
- Must contain anti-wear, anti-rust, anti-oxidant and anti-foam additives
- Must also contain pressure-resistant additives (EP additives)

If synthetic oils are selected due to operating temperatures or oil change intervals, SEW-EURODRIVE recommends polyalphaolefin-based (PAO) oil.

**Mineral oils**

**Standards**

Lubricating oils are grouped in ISO VG viscosity classes according to the ISO 3448 and DIN 51519 standards.

ISO class	ISO 6743-6 designation	DIN 51517-3 designation	AGMA 9005-D94 designation
220	ISO-L-CKC 220	DIN 51517-CLP 220	AGMA 5 EP
460	ISO-L-CKC 460	DIN 51517-CLP 460	AGMA 7 EP



## Design and Operating Notes

### Guideline for oil selection

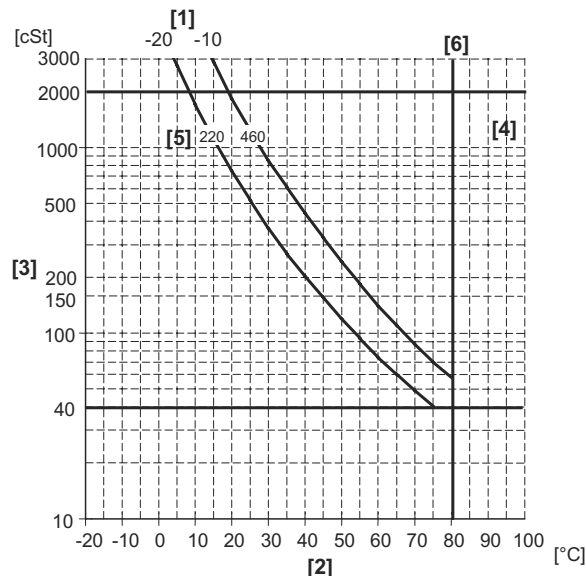
#### Selecting viscosity of mineral oils

Lubrication method	Ambient temperature	Mineral ISO VG
<ul style="list-style-type: none"> <li>Bath lubrication</li> <li>Splash lubrication</li> <li>Pressure lubrication with oil heater and cooler</li> </ul>	-15...+20 °C	220
<ul style="list-style-type: none"> <li>Bath lubrication</li> <li>Splash lubrication</li> <li>Pressure lubrication with oil heater and cooler</li> </ul>	-5...+40 °C	460
<ul style="list-style-type: none"> <li>Pressure lubrication with cooler</li> </ul>	+10...+20 °C	220
<ul style="list-style-type: none"> <li>Pressure lubrication without cooler</li> </ul>	+20...+40 °C	460



Pressure lubrication with or without cooler requires that the situation at cold start is checked! When using an oil pump (pressure lubrication), the starting viscosity must be below 2000 cSt (→ figure 55052AXX).

Use an oil heater (→ chapter 7.13) if necessary.



[1] Pour point [°C]

[2] Gear unit's operating temperature of oil [°C]

[3] Viscosity [cSt]

[4] Viscosity index VI = 90...100

[5] ISO VG

[6] Temperature limitation 80°C



Max. running temperature of gear unit must be noticed. Max allowed running temperature is 70°C (long running temp) for ISO VG 220 and 80°C for ISO VG 460. 90°C can be used for short periods.

When needed, a cooling device must be used (fan, water/air cooling) or the oil changing interval must be shortened (see chapter "Lubrication change interval" in the operating instructions).



*Selecting oil type of mineral oils*

Select the oil type according to the required viscosity from the table in chapter "8.2 Lubricants."

**Synthetic oils**

*Standard*

Lubricating oils are grouped in ISO VG viscosity classes according to the ISO 3448 and DIN 51519 standards.

ISO-L-CKT 460	ISO 6743-6 designation
220	ISO-L-CKT 220
320	ISO-L-CKT 320
460	ISO-L-CKT 460

Minimum requirements are the same as for mineral oils

*Selecting viscosity of synthetic oils*

Lubrication method	Ambient temperature	Synthetic ISO VG
<ul style="list-style-type: none"> <li>Bath lubrication</li> <li>Splash lubrication</li> <li>Pressure lubrication with oil heater and cooler</li> </ul>	-35...+30 °C	220
<ul style="list-style-type: none"> <li>Bath lubrication</li> <li>Splash lubrication</li> <li>Pressure lubrication with oil heater and cooler</li> </ul>	-30...+40 °C	320
<ul style="list-style-type: none"> <li>Bath lubrication</li> <li>Splash lubrication</li> <li>Pressure lubrication with oil heater and without cooler</li> </ul>	-25...+50 °C	460
<ul style="list-style-type: none"> <li>Pressure lubrication with cooler</li> </ul>	+5...+30 °C	220
<ul style="list-style-type: none"> <li>Pressure lubrication with cooler</li> </ul>	+10...+40 °C	320
<ul style="list-style-type: none"> <li>Pressure lubrication without cooler</li> </ul>	+15...+50 °C	460



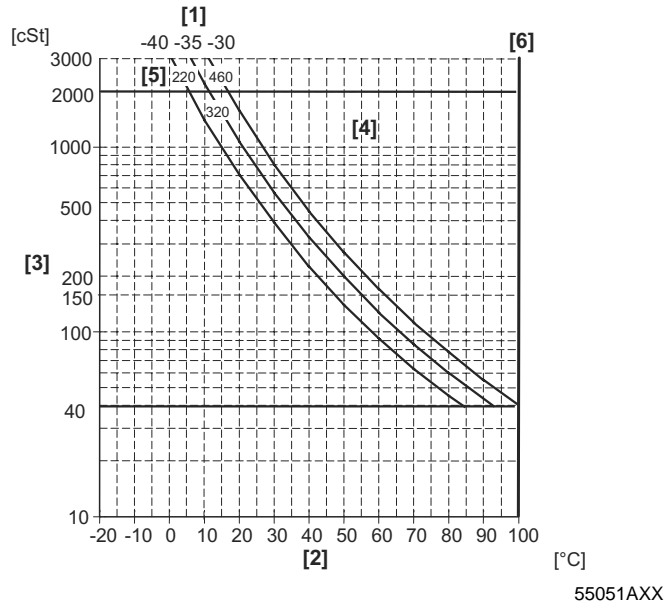
**Pressure lubrication with or without cooler requires that the situation at cold start is checked! When using an oil pump (pressure lubrication), the starting viscosity must be below 2000 cSt (→ 55051AXX).**

**Use an oil heater (→ chapter 7.13) if necessary.**



## Design and Operating Notes

### Guideline for oil selection



- |   |                                    |
|---|------------------------------------|
| [1] Pour point [°C]                               | [4] Viscosity index VI = 140...180 |
| [2] Gear unit's operating temperature of oil [°C] | [5] ISO VG                         |
| [3] Viscosity [cSt]                               | [6] Temperature limitation 100 °C  |



**Max. running temperature of gear unit must be noticed. Max allowed running temperature is 70°C (long running temp) for ISO VG 220 and 80°C for ISO VG 460. 90°C can be used for short periods.**

**When needed, a cooling device must be used (fan, water/air cooling) or the oil changing interval must be shortened (see chapter "Lubrication change interval" in the operating instructions).**

*Selecting oil type of synthetic oils*

Select the oil type according to the required viscosity from the table in chapter "8.2 Lubricants".



## 8.2 Lubricants for MC.. industrial gear units


**Lubricant table** The lubricant table on the following page shows the permitted lubricants for SEW-EURODRIVE gear units. Please note the following key to the lubricant table.


*Key to the lubricant table*

Abbreviations and meaning of shading and notes:

CLP = Mineral oil

CLP PAO = Synthetic polyalphaolefin

 = Synthetic lubricant (= synthetic anti-friction bearing grease)

 = Mineral lubricant (= mineral-based anti-friction bearing grease)

1) = Ambient temperature

 = please contact SEW-EURODRIVE



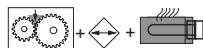
= Lubrication and cooling



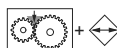
= Splash lubrication



= Bath lubrication



= Pressure lubrication with cooler and oil heater



= Pressure lubrication with cooler (without oil heater)



# Design and Operating Notes

## Lubricants for MC.. industrial gear units

### Lubricant table

47 0490 005

Temperature range (°C)	Gear unit icon	DIN (ISO)	ISO VG class	Mobil®	Shell	Klüber	ARAL	bp	TEKACO	FUCHS	Q8	Castrol	TOTAL								
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
-35 to +30	MC..P	CLP PAO	VG 220	Mobilgear SHC XMP220	Omala Oil HD 220	Klüber GEM 1-220N	Degol PAS 220 Degol G8220	Energol EP-XF 220 Energol SG-XP 220	Pinnacle EP 220	Renolin Unisyn CLP 220	Q8 ELGRECO 220	Optigear Synthetic X 220	Carter SH 220								
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
-30 to +50	MC..R	CLP PAO	VG 320	Mobilgear SHC XMP320 Mobil SHC 632	Omala Oil F320	Klüber GEM 1-320N	Degol PAS 320 Degol GS 320	Energol EP-XF 320 Energol SG-XP 320	Meropa 320	Renolin CLP320Plus	Q8 Goya NT 320	Alphamax 320 Tribol Optigear 1100 / 320 BM 320	Carter SH 320								
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
+10 to +40	MC..P	CLP	VG 460	Mobilgear XMP460	Omala Oil F460	Klüber GEM 1-460N	Degol Plus 460	Energol GX-XF 460	Meropa 460	Renolin CLP460Plus	Q8 Goya NT 460	Alphamax 460 Tribol 1100 / 460 Optigear BM 460	Carter SH 460								
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
+15 to +50	MC..R	CLP	VG 680	Mobilgear XMP680	Omala Oil HD 460	Klüber GEM 1-680N	Degol Plus 680	Energol GX-XF 680	Meropa 680	Renolin CLP460Plus	Q8 Goya NT 680	Tribol 1510/ 460 Tribol 1710/ 460 Optigear Synthetic A460 Optigear Synthetic X 460	Renolin Optigear BM 680								
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO
														CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO	CLP	CLP PAO



### 8.3 Sealing grease

SEW-EURODRIVE recommends the grease types listed in below table for operating temperatures from – 30°C to +100°C.

Company	Oil
Aral	Aralub HLP2
BP	Energrease LS-EPS
Castrol	Spheerol EPL2
Chevron	Dura-Lith EP2
Elf	Epexa EP2
Esso	Beacon EP2
Exxon	Beacon EP2
Gulf	Gulf crown Grease 2
Klüber	Centoplex EP2
Kuwait	Q8 Rembrandt EP2
Mobil	Mobilux EP2
Molub	Alloy BRB-572
Optimol	Olista Longtime 2
Shell	Alvania EP2
Texaco	Multifak EP2
Total	Multis EP2
Tribol	Tribol 3030-2



### 8.4 Mounting / removing hollow shaft gear units with keyed connection



- Included in the scope of delivery (→ Figure 56813AXX):
  - Circlips [3], end plate [4]
- **Not** included in the scope of delivery (→ Figure 56813AXX / Figure 56814AXX / Figure 56815AXX):
  - Threaded rod [2], nut [5], retaining screw [6], ejector screw [8]

Selecting the adequate thread and length of the threaded rod as well as the retaining screw depends on the design of the customer's machine.

#### Thread sizes

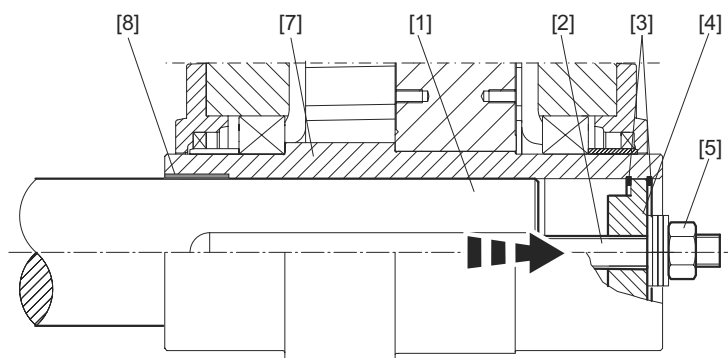
SEW-EURODRIVE recommends the following thread sizes:

Gear unit size	Thread size for • threaded rod [2] • nut (DIN 934) [5] • retaining screw [6]
02 - 06	M24
07 - 09	M30

The thread size of the ejector screw depends on the end plate [4]:

Gear unit size	Thread size of ejector screw [8]
02 - 06	M30
07 - 09	M36

#### Mounting the hollow shaft gear unit onto the customer's shaft



56813AXX

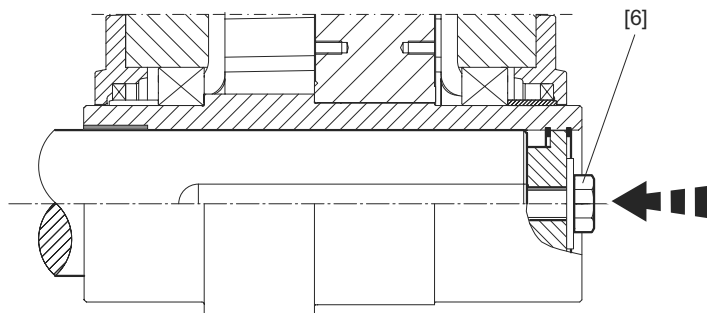
- |                      |                  |
|----------------------|------------------|
| [1] Customer's shaft | [5] Nut          |
| [2] Threaded rod     | [7] Hollow shaft |
| [3] Circlips         | [8] Bushing      |
| [4] End plate        |                  |

- To mount and secure the gear unit, attach the circlips [3] and the end plate [4] on the hollow shaft bore.



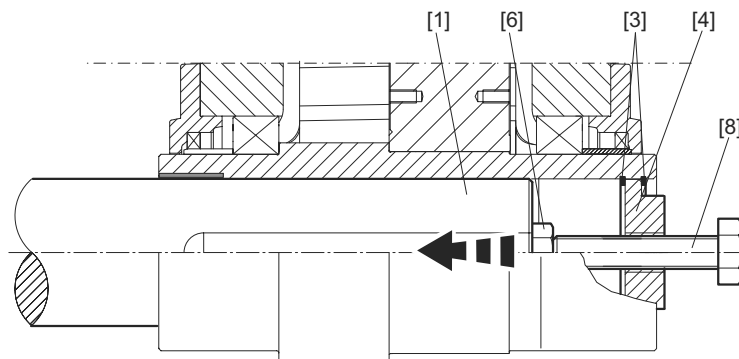


- Apply NOCO® fluid to the hollow shaft [7] and the shaft end of the customer's shaft [1].
- Push the gear unit onto the customer's shaft [1]. Thread the threaded rod [2] into the customer's shaft [1]. Tighten the customer's shaft [1] with the nut [5] until the shaft end of the customer's shaft [1] and the end plate [4] meet.
- Loosen the nut [5] and unscrew the threaded rod [2]. After having mounted the gear unit, secure the customer's shaft [1] using the retaining screw [6].



56814AXX

**Removing the hollow shaft gear unit from the customer's shaft**



56815AXX

- |                      |                     |
|----------------------|---------------------|
| [1] Customer's shaft | [6] Retaining screw |
| [3] Circlips         | [8] Ejector screw   |
| [4] End plate        |                     |

- Remove the retaining screw [Figure 56814AXX, Pos. 6].
- Remove the outer circlip [3] and the end plate [4].
- Thread the retaining screw [6] into the customer's shaft [1].
- Flip the end plate [4] and remount the end plate and the outer circlip [3].
- Thread the ejector screw [8] into the end plate [4] to remove the gear unit from the customer's shaft [1].



#### 8.5 Mounting / removing hollow shaft gear units with shrink disc

A shrink disc serves as connecting element between the hollow shaft of the gear unit and the customer's shaft. For the shrink disc type used (designation: RLK608), refer to section "Identifying shrink disc type"



- Included in the scope of delivery (→ Figure 56816AXX):
  - Circlip [3], end plate [4]
- **Not** included in the scope of delivery (→ Figure 56816AXX / Figure 56817AXX / Figure 56818AXX):
  - Threaded rod [2], nut [5], retaining screw [6], ejector screw [8]

Selecting the appropriate thread and length of the threaded rod as well as the retaining screw depends on the design of the customer's machine.

#### Thread sizes

SEW-EURODRIVE recommends the following thread sizes:

Gear unit size	Thread size for • threaded rod [2] • nut (DIN 934) [5] • retaining screw [6]	→ Figure 56816AXX, 56817AXX
02 - 06		M24
07 - 09		M30

The thread size of the ejector screw depends on the end plate [4]:

Gear unit size	Thread size of the ejector screw [8]
02 - 06	M30
07 - 09	M36

#### Identifying shrink disc type

Normally, the shrink disc type RLK608 is used. It has a metallic colour shade. The letters "RLK 608-..." are engraved.

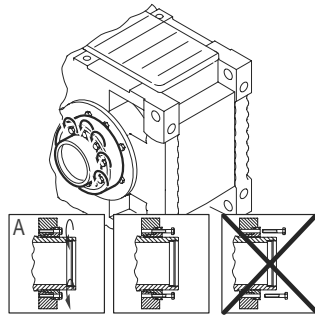


Order-specific, other shrink disc types can be used. In this case please refer to the separate shrink disc-specific manual.



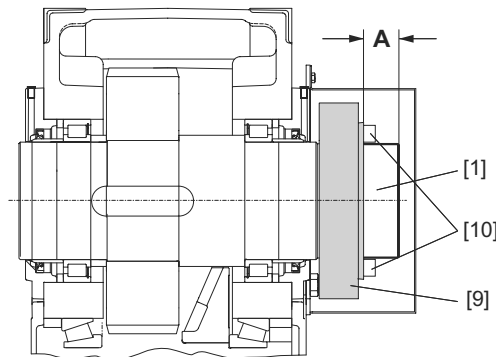
**Mounting the shrink disc**

- Do not tighten the locking screws [10] before the customer's shaft [1] has been mounted, else the hollow shaft could be deformed!



56810AXX

- Slide the shrink disc [9] with untightened screws onto the hub of the hollow shaft bore. Position the customer's shaft [1] in the hollow shaft bore. Next move the shrink disc [9] by dimension A (→ following figure, Sec. "Dimension A") from the shaft end of the hollow shaft:



56901AXX

- [1] Customer's shaft                      [10] Locking screws  
 [9] Shrink disc



**It is essential to make sure that the clamping area of the shrink disc is free from grease.**

*Dimension A*

Gear unit size MC..	Shrink disc type RLK608 Dimension A [mm]
02	39
03	45
04	44
05	42
06	44
07	50
08	51
09	49

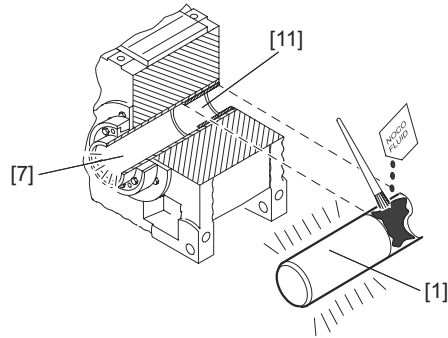


## Design and Operating Notes

### Mounting / removing hollow shaft gear units with shrink disc

#### Mounting the hollow shaft gear unit onto the customer's shaft

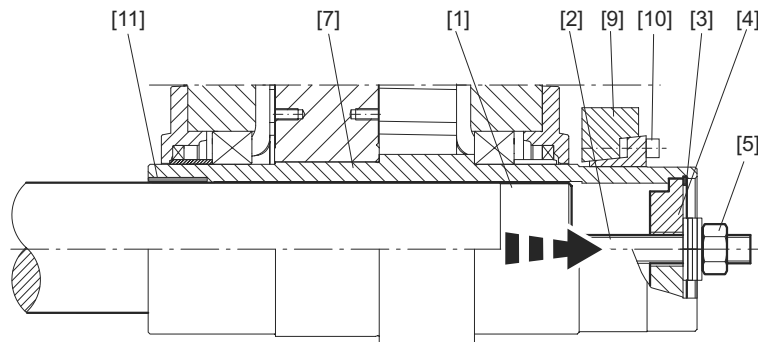
- Before mounting the gear unit, degrease the hollow shaft bore and the customer's shaft [1].
- Apply a small amount of NOCO® fluid on the customer's shaft to the area of the bushing [11].



56811AXX



**Never apply NOCO® fluid directly to the bushing as the paste might get into the clamping area of the shrink disc when the input shaft is mounted.**



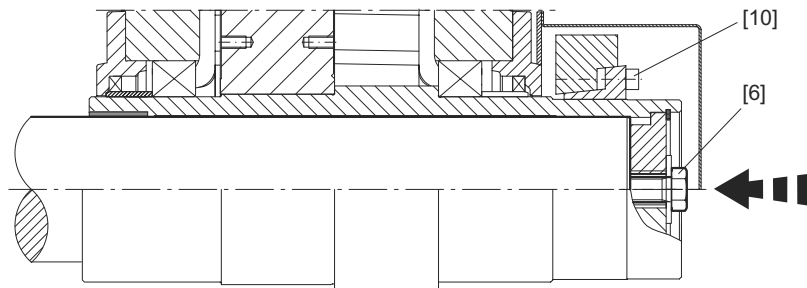
56816AXX

- |                      |                     |
|----------------------|---------------------|
| [1] Customer's shaft | [7] Hollow shaft    |
| [2] Threaded rod     | [9] Shrink disc     |
| [3] Circlip          | [10] Locking screws |
| [4] End plate        | [11] Bushing        |
| [5] Nut              |                     |

- To mount and secure the gear unit, attach the circlips [3] and the end plate [4] on the hollow shaft bore.
- Push the gear unit onto the customer's shaft [1]. Thread the threaded rod [2] into the customer's shaft [1]. Tighten the customer's shaft [1] with the nut [5] until the shaft end of the customer's shaft [1] and the end plate [4] meet.



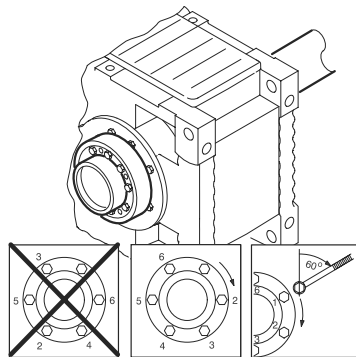
- Loosen the nut [5] and unscrew the threaded rod [2]. After having mounted the gear unit, secure the customer's shaft [1] using the retaining screw [6].



56817AXX

**Tightening shrink disc type RLK608**

Tighten the locking screws by hand while aligning the shrink disc. Tighten the clamping screws one by one in a clockwise direction (not crosswise) by only 1/4 revolution each.



56812AXX



The screws of shrink discs with slitted cone bushing have to be tightened in such a way that you start with the screw on one side of the slit and continue with the screw on the other side of the slit.

Continue tightening the screws by 1/4 revolution in several stages until the screw side faces of the outer ring and the inner ring are in line as shown in Figure 56812AXX.

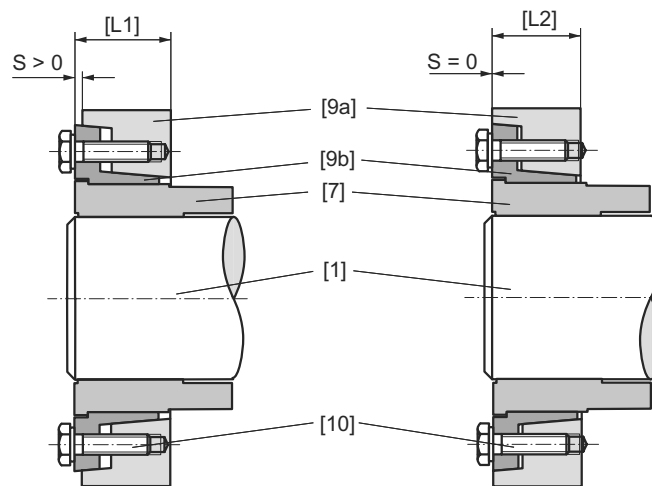


The assembly is defined by the axial movement of the cone bushing and can be done without a torque wrench.



## Design and Operating Notes

### Mounting / removing hollow shaft gear units with shrink disc



56886AXX

[L1] State at time of delivery (pre assembled)

[7] Hollow shaft

[L2] Ready for operation (final assembly)

[1] Customer's shaft

[9a] Cone

[10] Locking screws

[9b] Cone bushing

#### Removing the shrink disc



Loosen the locking screws [10] by 1/4 revolution each in sequence evenly in several stages so as to avoid tilting of the clamping surface.

**Never unscrew the locking screws completely from the tapped hole, else there is a danger of an accident occurring.**

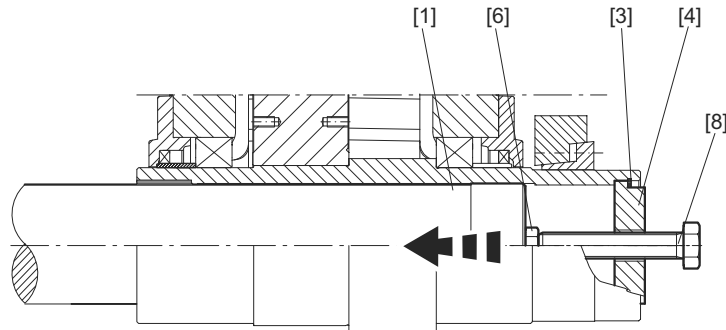
If the cone bushing and cone ring do not loosen from each other by themselves:

Take the required quantity of locking screws and bolt them evenly into the removing thread bores. Tighten the locking screws in several stages until the cone bushing is separated from the cone ring.

Remove the shrink disc from the hollow shaft.



**Removing the hollow shaft gear unit from the customer's shaft**



56818AXX

- [1] Customer's shaft
- [2] Retaining screw
- [3] Circlip
- [4] End plate
- [5] Ejector screw

- Remove the retaining screw [Figure 56817AXX, Pos. 6].
- Remove the outer circlip [3] and the end plate [4].
- Thread the retaining screw [6] into the customer's shaft [1].
- Flip the end plate [4] and remount the end plate and the outer circlip [3].
- Thread the ejector screw [8] into the end plate [4] to remove the gear unit from the customer's shaft [1].

**8.6 Optional hollow shaft bore diameters**

**Hollow shaft with keyway**

The maximum bore diameter can be read from the following table

Gear unit size	Standard bore [mm]	Max. bore [mm]
02	80	85
03	95	100
04	105	110
05	115	120
06	125	132
07	135	140
08	150	152
09	165	165



Refer to SEW-EURODRIVE for

- smaller bores than standard for hollow shaft with keyway
- bores other than standard (smaller or larger) for hollow shaft gear units with shrink disc connection



#### 8.7 Fastening of gear units

Not included in the scope of delivery:

- Wrench set
- Torque wrench (for shrink discs)
- Mounting device
- Shims and spacing rings if necessary
- Fasteners for input and output elements
- Lubricant (e.g. NOCO<sup>®</sup> fluid from SEW-EURODRIVE)
- For hollow shaft gear units (→ Sec. "Mounting/removal of hollow shaft gear units with keyed connection): Threaded rod, nut (DIN 934), retaining screw, ejector screw
- Securing components for the gear unit foundation

#### Installation tolerances

Shaft end	Flanges
Diametric tolerance in accordance with DIN 748 <ul style="list-style-type: none"> <li>• ISO k6 for solid shafts with <math>\varnothing \leq 50</math> mm</li> <li>• ISO m6 for solid shafts with <math>\varnothing &gt; 50</math> mm</li> <li>• ISO H7 for hollow shafts for shrink disc</li> <li>• ISO H8 for hollow shafts with keyway</li> <li>• Center hole in accordance with DIN 332, shape DS..</li> </ul>	Centering shoulder tolerance: <ul style="list-style-type: none"> <li>• ISO js7 / H8</li> </ul>

#### Tightening torques

Gear unit size	Screw / nut	Tightening torque screw / nut [Nm]
02	M20	315
03		
04	M24	540
05		
06	M30	1090
07		
08	M36	1900
09		