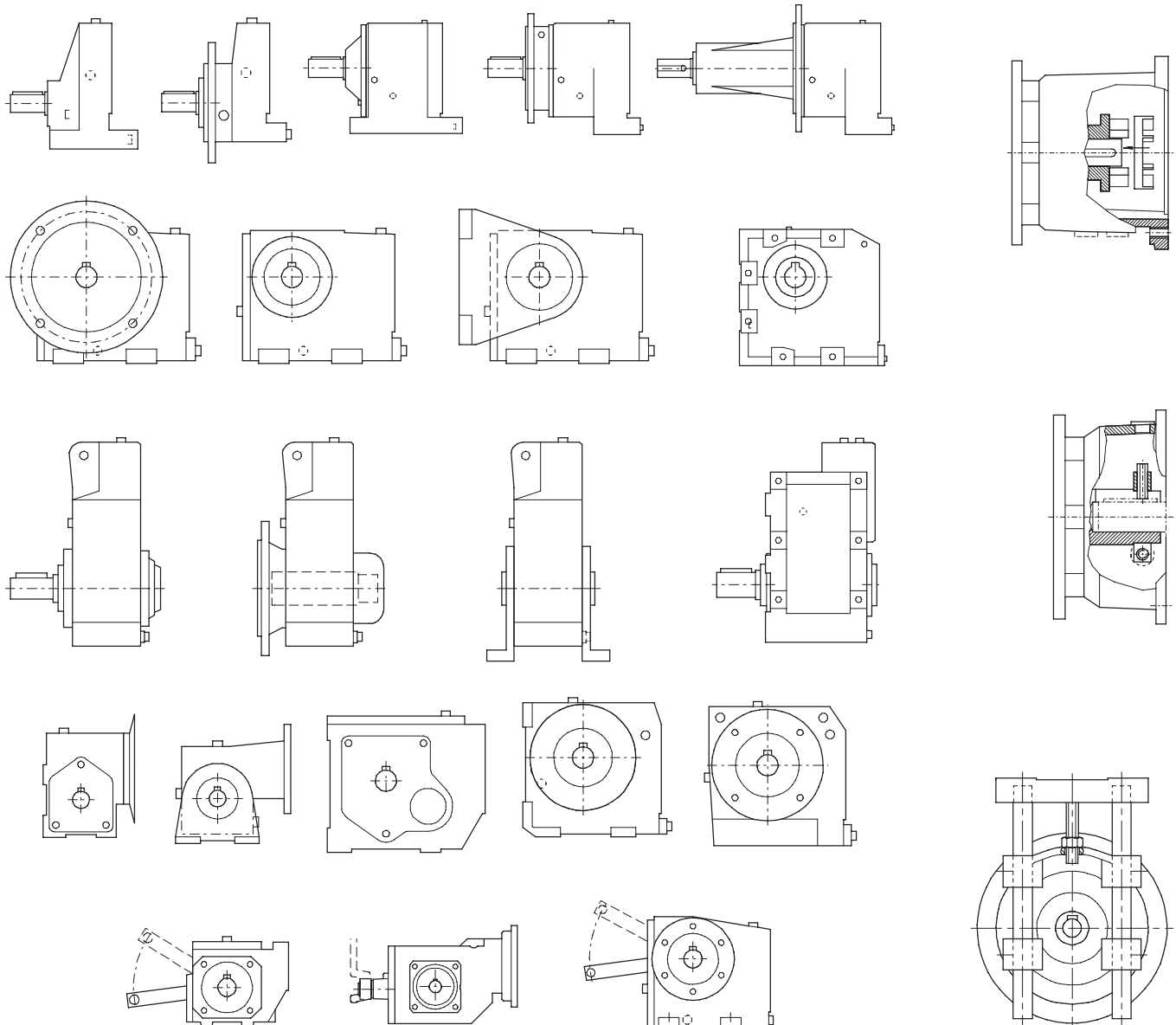


# Operating Instructions

## BA 2020 EN 12.05

Part no. 0328813



# MOTOX<sup>®</sup>

## Gear units and drive groups

# FLENDER

## DRIVES & AUTOMATION

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## 1. Important instructions

### 1.1 Instruction symbols in the operating instructions

Instructions relating to operating safety are emphasized as follows:



**Danger.**  
Possible consequences: Death or very severe injuries.



**Caution.**  
Possible consequences: Damage to the drive and the environment.



**Note.**  
Pointers for application and useful information.

### 1.2 General instructions

These operating instructions are an integral part of the gear unit delivery.

These operating instructions apply to the standard version of the **MOTOX<sup>®</sup>** gear unit:

Helical gear units E size 20 - 140, D/Z size 10 - 181.

Bevel-helical gear units K size 30 - 200.

Parallel shaft helical gear units F size 31 - 201.

Helical worm gear units C size 10 - 122, S01, S06, S11.

Self-powered trolley systems CF size 15 - 25, KF size 34 - 85.



**Note.**  
Special types of drive and their additional equipment are governed by the special contractual agreements and technical documents.  
Note also the other operating instructions for couplings, motors, brake motors, additional equipment for motors, etc., delivered with the equipment.



**Note.**  
We accept no responsibility for damage or disruption resulting from disregard of these operating instructions.

Keep these operating instructions in the vicinity of the gear unit.

Read these operating instructions before working with the drive.

Only a precise knowledge of these operating instructions will guarantee reliable, faultfree operation of the drive by avoiding operating errors and improper use.

The drives described in these Instructions reflect the state of technical development at the time these instructions went to print.

In the interest of technical progress we reserve the right to make changes to the individual assemblies and accessories which we regard as necessary to preserve their essential characteristics and improve the efficiency and safety of the drive.

The copyright to these operating instructions is held by **FLENDER TÜBINGEN GMBH**.

These operating instructions must not be wholly or partly reproduced, used in any unauthorised way for competitive purposes or made available to third parties without our agreement.

Amendments or additions to these operating instructions may be made only by us; otherwise any guarantee claim against us will lapse.

Technical enquiries should be addressed to the following works

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or to one of our customer-services. The addresses of the customer-services are given in section 12. "Stocking spare parts and customer service addresses".

### **1.3 Amendments**

These amended overall operating instructions replace the individual operating instructions BA G295, BA K295, BA F295, BA S295 and BA H295 including their annexes.

## **2. Safety instructions**

### **2.1 Intended use**

The **MOTOX®-drives** described in these operating instructions have been developed for stationary use in general engineering applications or as drives, e.g. in self-powered trolley systems, in conveyor technology applications. Unless otherwise agreed, the drives have been designed for use in plant and equipment in industrial environments.

The drives have been manufactured in accordance with the state of the art and are delivered in a condition for safe and reliable use. Any changes on the part of the user which may affect safety and reliability are prohibited.

The drives are designed only for the application described in section 3. "Technical data". They must not be operated outside the specified power limits. Other operating conditions must be contractually agreed.

### **2.2 General safety instructions**

The drives must be installed, started up, operated, maintained and, if necessary, repaired only by authorised, properly trained and qualified personnel. For definition of expert staff, refer to i.a. IEC 364.

The operator must ensure that all persons involved in installation, operation, maintenance and repair have read and understood these operating instructions and comply with them at all times in order to:

- avoid injury or damage
- ensure the safety and reliability of the drive
- avoid disruptions and environmental damage through incorrect use.

Carry out work on the drives only when they are at a standstill.

Secure the drive units against unintentional starting (e.g. lock key switches or remove fuses in the power supply).

A notice should be attached to the start switch stating clearly that work on the drives is in progress.

Carry out all work with great care and with due regard to safety.

Always observe the instructions on the plates on the drives. The plates must be kept free from paint and dirt at all times. Replace any missing plates.

Ensure compliance with the relevant safety and environmental regulations during transport, assembly and dismantling, operation, and care and maintenance of the unit.

Secure rotating drive parts, e.g. couplings, gears or belt drives, against contact by means of suitable safety devices.

Ensure adequate ventilation when working with solvents. Do not inhale vapours. Do not smoke.

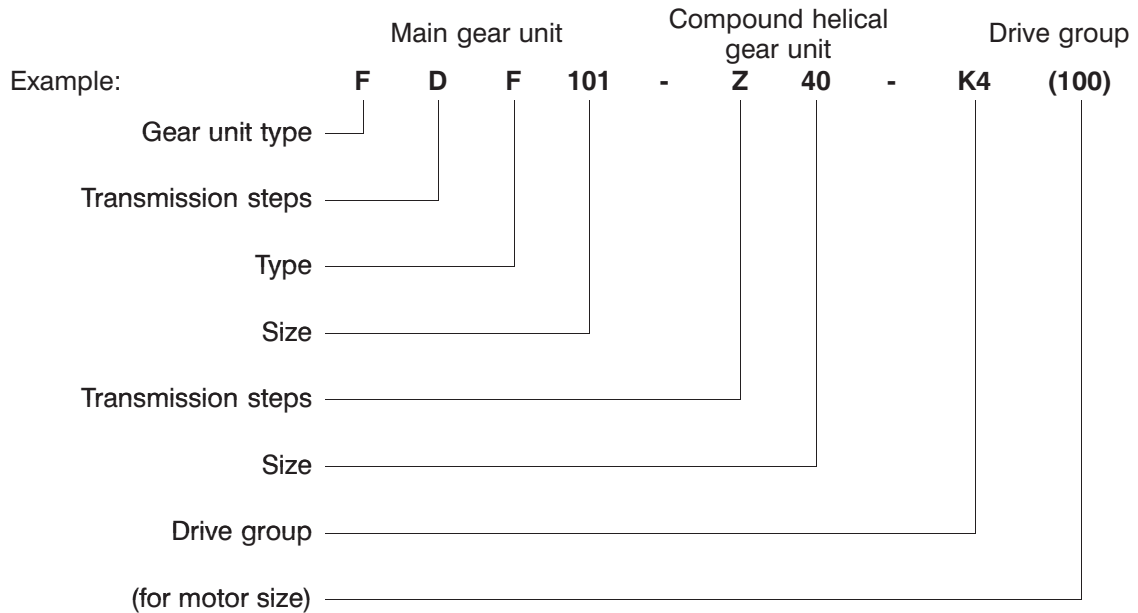
Collect and dispose of used oil in accordance with regulations. Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

When installing the drives in plant or equipment, the manufacturer of such plant or equipment must ensure that the contents of the present operating instructions are incorporated in his own instructions, information and descriptions.

### 3. Technical data

#### 3.1 Type designations

for gear units G, K, F, S



Gear unit type

- (-)** Helical gear unit
- K** Bevel helical gear unit, three-stage
- F** Parallel shaft helical gear unit
- C** Helical worm gear unit
- S** Helical worm gear unit

Transmission steps

- (-)**
- E** single-stage
- Z** two-stage
- D** three-stage

Type

Shaft

- (-)** Solid shaft
- A** Hollow shaft

Fixing

- (-)** Foot-mounted design
- F** Flanged version (A-type)
- B** Foot or flange version
- C** Additional feet on cover
- Z** Housing flange (C-type)
- D** Torque arm
- G** Flange (A-type) opposite output shaft
- R** Agitator flange
- K** Cooling tower flange

Connection

- (-)** Parallel key
- S** Shrink disc
- T** Hollow shaft with splines

Backstop

- X** Backstop in intermediate stage

Compound helical gear unit

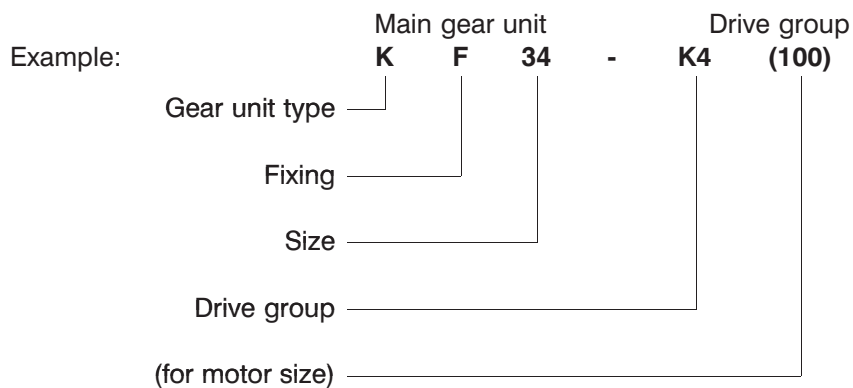
Transmission steps

- Z** two-stage
- D** three-stage

Drive group

- A/A5** Drive flange with free drive flange
- K2** Bell housing with flexible coupling for IEC flanged motors
- K2TC** Bell housing with flexible coupling for NEMA motors
- K4** Bell housing with stub-shaft connection for IEC flanged motors
- K5TC** Bell housing with stub-shaft connection for NEMA motors
- P** Motor bedplate version for IEC motor
- P5** Motor bedplate version for NEMA-Motor

**for self-powered trolley systems**



Gear unit type

- C** Helical worm gear unit
- K** Bevel helical gear unit, three-stage

Fixing

- F** Flanged version (A-type)

Drive group

- K4** Bell housing with stub-shaft connection for IEC flanged motors

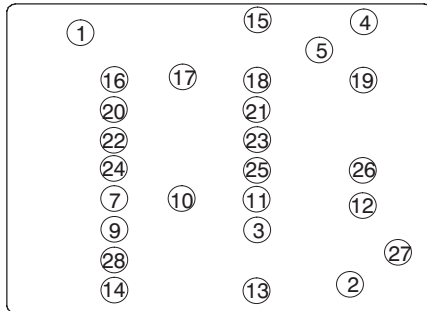
## 3.2 General technical data

The most important technical data are shown on the rating plate of the gear units or gear motors. These data together with the contractual agreements on the drive units determine the limits of its proper use.

In the case of gear motors a rating plate attached to the motor serves for the entire drive.

In certain cases separate rating plates are attached to the gear unit and the motor.

Examples: Rating plate - gear motor



Rating plate - gear unit

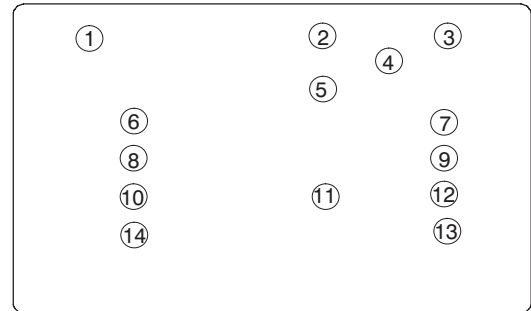




Figure 3.2–1: Rating plate

- 1 Company logo
- 2 Manufacturing date encoded
- 3 Weight  $m$  [kg]
- 4 Order no. / seq. no.
- 5 Model - Type - Size
- 6 Performance rating  $T_2$  [Nm]
- 7 Mounting position
- 8 Total transmission ratio  $i$
- 9 Speed  $n_2$  [ $\text{min}^{-1}$ ]
- 10 Type of oil
- 11 Oil viscosity ISO VG class to DIN 51519 / ISO 3448
- 12 Oil quantity [l] Main gear unit / ancillary transmission + extruder flange
- 13 Free space for additional data
- 14 max. ambient temperature  $T_{U_{\max}}$  [ $^{\circ}\text{C}$ ]
- 15 Phase number and type of current of the motor
- 16 Switch symbols to DIN EN 60617 T6 / IEC 617-6
- 17 Rating voltage  $U$  [V]
- 18 Rating current  $I$  [A]
- 19 Rating frequency  $f$  [Hz]
- 20 Rating speed  $n$  [ $\text{min}^{-1}$ ]
- 21 Rating performance  $P$  [kW]
- 22 Operating mode (if  $\neq S1$ )
- 23 Performance factor  $\cos \varphi$
- 24 Type of protection to IEC 60034-5 or IEC 529
- 25 Heat class Th. Cl.
- 26 applied standard
- 27 CE-marking or other marking, if any
- 28 Brake data

Symbols (IEC 617-2):  = Brake

 = Coupling

### 3.3 Weights

The weight of the overall drive including motor is indicated on the rating plate of the gear unit or gear motor, if it exceeds 30 kg; in each case it is shown in the delivery documents.

Where there are several rating plates on one drive, the specification on the main gear unit is decisive.

The weight specification refers only to the condition on delivery of the products.

### 3.4 Sound-pressure level

The A-assessed sound-pressure levels  $L_{WA}$  of a selection of gear units in figure 3.4 “Sound-pressure level” have been measured to DIN EN 21680, using measuring instruments to DIN IEC 651.

The noise depends mainly on speed, output and transmission ratio.

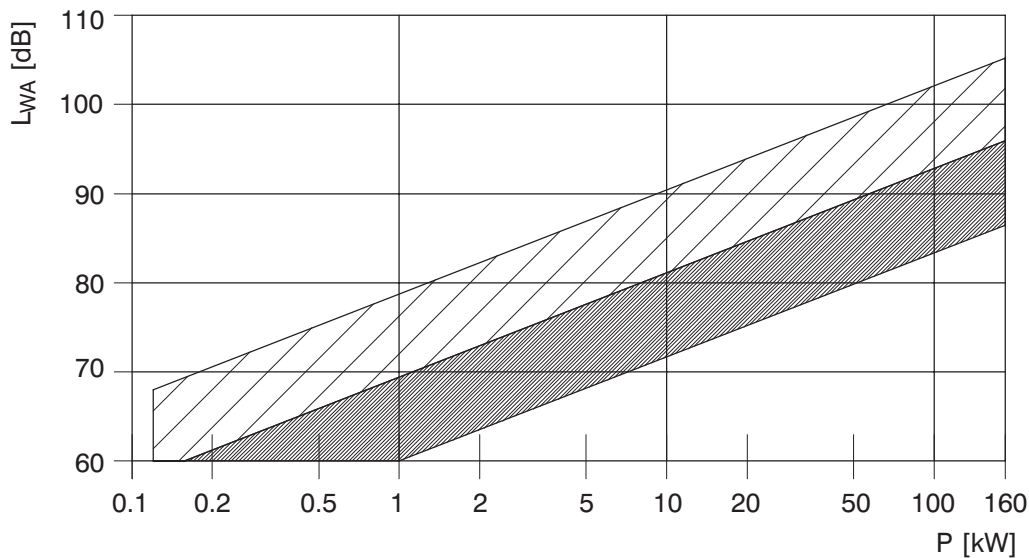


Figure 3.4: Sound-pressure level

The sound-pressure levels of **MOTOX<sup>®</sup> gear motors** fall mainly in the dark-coloured part of the range. Gear units with very small transmission ratios, high output and high input speed may fall in the cross-hatched part.

If repeat measurements on site do not produce conclusive results with regard to measuring technology, the measurement obtained on the **FLENDER TÜBINGEN GMBH** test bench will apply.

#### External noises

Noises not generated by the gear unit but emitted from it are not taken into consideration here.

Likewise noises emitted from the prime mover and output machines and from the foundation are not taken into consideration here, even if transmitted to these by the gear unit.

### 3.5 Mounting positions



**Note.**

Depending on the conditions of operation (e.g. travel on slopes, etc.), series drives for self-powered trolley systems are supplied without ventilation.

The assembly option designations are in accordance with IEC 60034-7 (Code I).

The drives must be operated only in the assembly option specified on the rating plate. This ensures that the correct quantity of lubricant is provided

Identification marking:



Oil level



Housing ventilation



Oil drain plug



Oil dipstick



Oil filling

A,B Position of stub-shaft and / or solid shaft

\* on opposite side

V The one-stage gear units size 20 (E/EF20) and the two-stage gear units size 10 (Z/ZF10) are standard-fitted with a screw plug at point "V".

- Mounting positions B3/B5, V1/V5 and V3/V6 are not possible for drive Z10 and ZF10.

① engaged

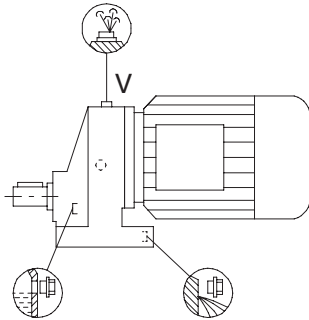
② disengaged

### 3.5.1 Helical gear units

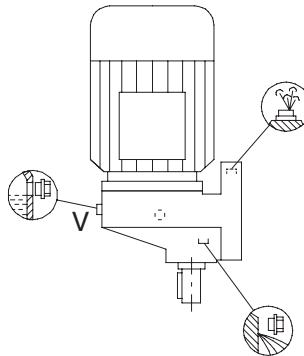


Note.  
For key to diagram symbols, see section 3.5 “Mounting positions”.

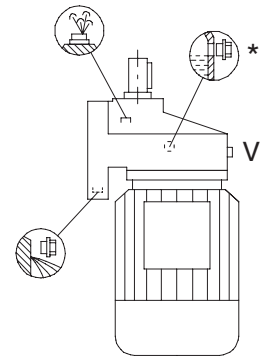
**E B3 (IM B3)**



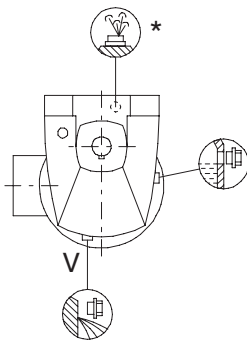
**E V5 (IM V5)**



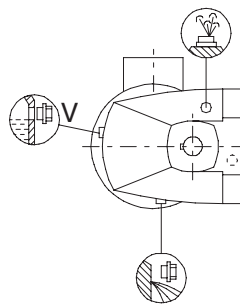
**E V6 (IM V6)**



**E B8 (IM B8)**



**E B7 (IM B7)**



**E B6 (IM B6)**

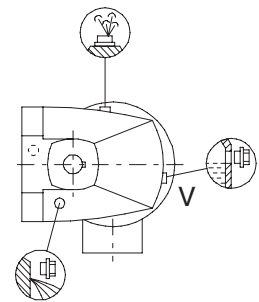
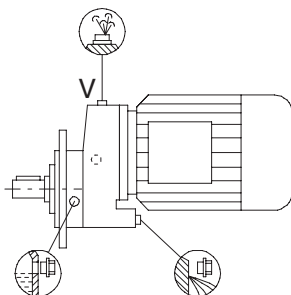
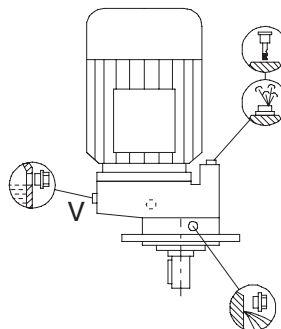


Figure 3.5.1–1: Mounting positions for E Size 20 - 140

**EF B5 (IM B5)**



**EF V1 (IM V1)**



**EF V3 (IM V3)**

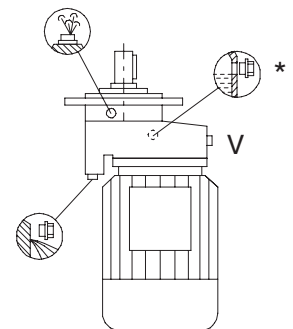


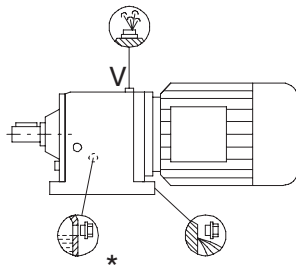
Figure 3.5.1–2: Mounting positions for EF Size 20 - 140



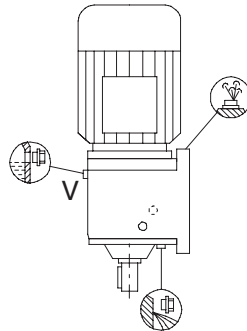
Note.

For key to diagram symbols, see section 3.5 "Mounting positions".

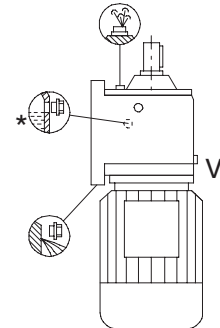
D/Z **B3 (IM B3)**



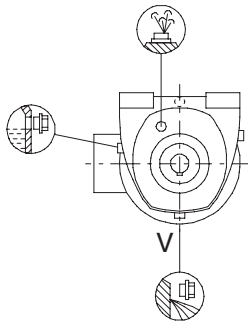
D/Z **V5 (IM V5)**



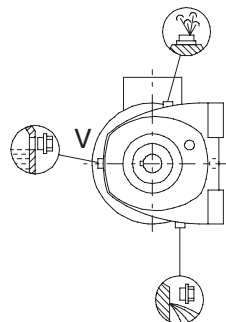
D/Z **V6 (IM V6)**



D/Z **B8 (IM B8)**



D/Z **B7 (IM B7)**



D/Z **B6 (IM B6)**

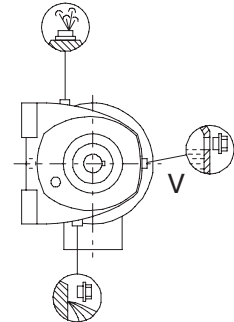
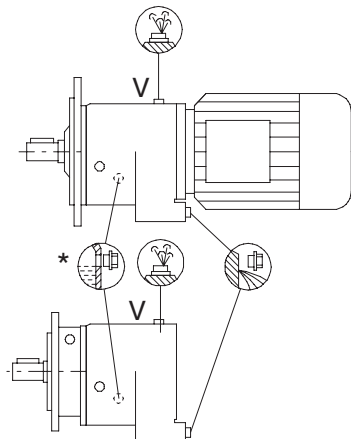
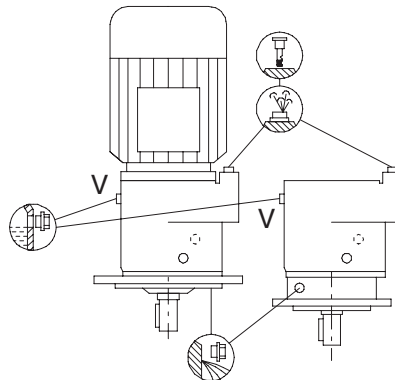


Figure 3.5.1–3: Mounting positions for D/Z Size 30/31 - 181

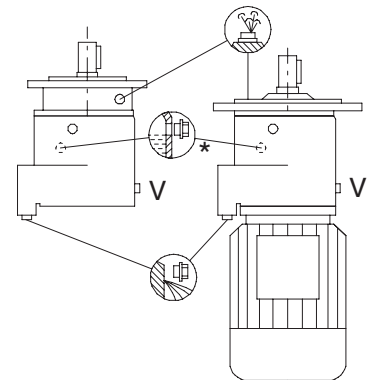
DF/ZF **B5 (IM B5)**



DF/ZF **V1 (IM V1)**



DF/ZF **V3 (IM V3)**

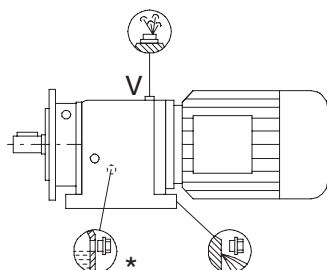




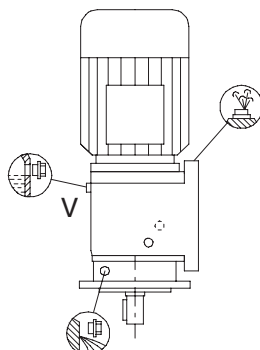
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

DF/ZF B3/B5 (IM B35)



DF/ZF V1/V5 (IM V15)



D/Z V3/V6 (IM V36)

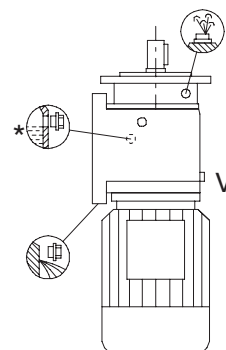
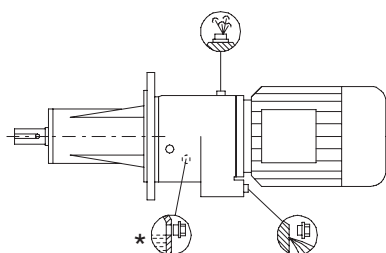
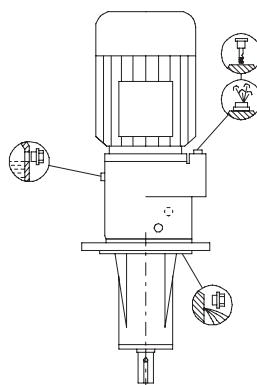


Figure 3.5.1–4: Mounting positions for DF/ZF Size 30/31 - 181

DR/ZR B5 (IM B5)



DR/ZR V1 (IM V1)



DR/ZR V3 (IM V3)

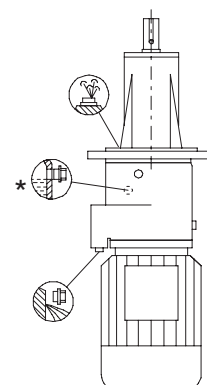


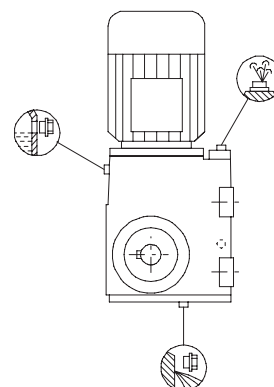
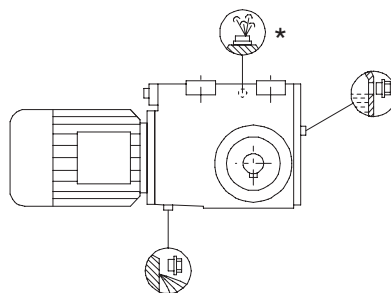
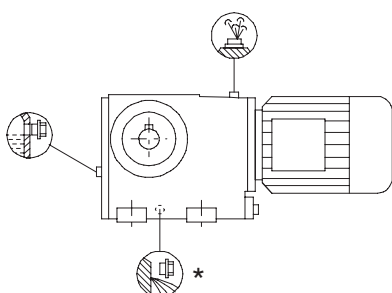
Figure 3.5.1–5: Mounting positions for DR/ZR Size 60/61 - 162

### 3.5.2 Bevel-helical gear units

K B3-00 (IM B3-00)  
KF B5-01 (IM B5-01)  
KA. H-01

K B8-00 (IM B8-00)  
KF B5-03 (IM B5-03)  
KA. H-02

K B7-00 (IM B7-00)  
KF B5-02 (IM B5-02)  
KA. H-03

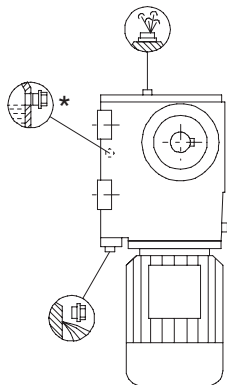




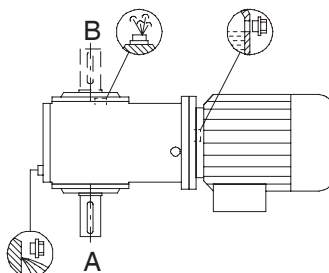
Note.

For key to diagram symbols, see section 3.5 "Mounting positions".

K **B6-00 (IM B6-00)**  
KF **B5-00 (IM B5-00)**  
KA. **H-04**



K **V5-00 (IM V5-00)**  
KF **V1-00 (IM V1-00)**  
KA. **H-05**



K **V6-00 (IM V6-00)**  
KF **V3-00 (IM V3-00)**  
KA. **H-06**

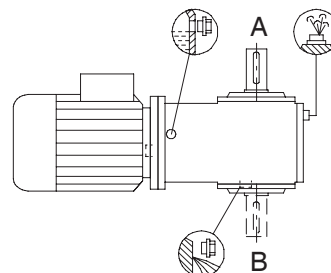
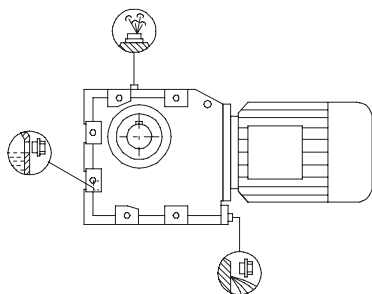
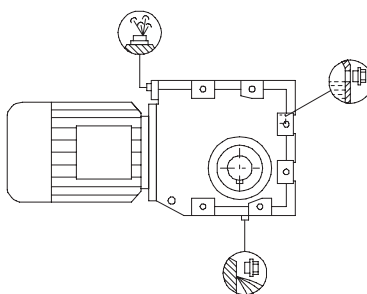


Figure 3.5.2–1: Mounting positions for K. Size 30 - 180

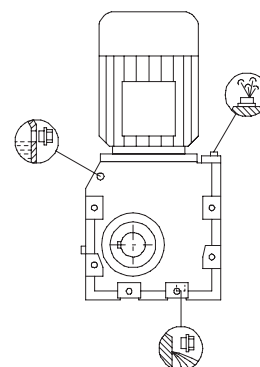
K **B3-00 (IM B3-00)**  
KF **B5-01 (IM B5-01)**  
KA. **H-01**



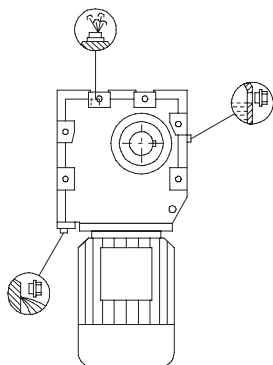
K **B8-00 (IM B8-00)**  
KF **B5-03 (IM B5-03)**  
KA. **H-02**



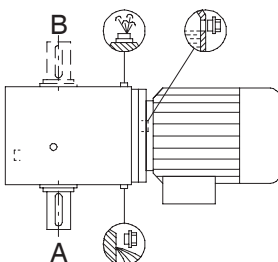
K **B7-00 (IM B7-00)**  
KF **B5-02 (IM B5-02)**  
KA. **H-03**



K **B6-00 (IM B6-00)**  
KF **B5-00 (IM B5-00)**  
KA. **H-04**



K **V5-00 (IM V5-00)**  
KF **V1-00 (IM V1-00)**  
KA. **H-05**



K **V6-00 (IM V6-00)**  
KF **V3-00 (IM V3-00)**  
KA. **H-06**

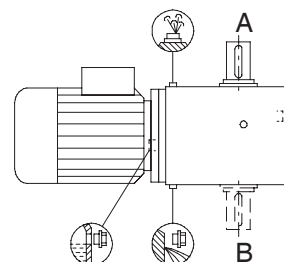


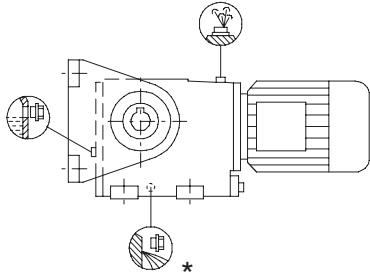
Figure 3.5.2–2: Mounting positions for K.200



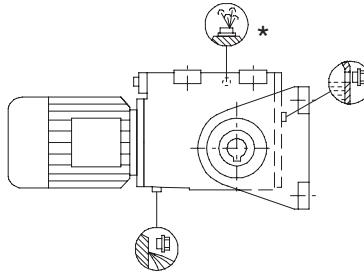
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

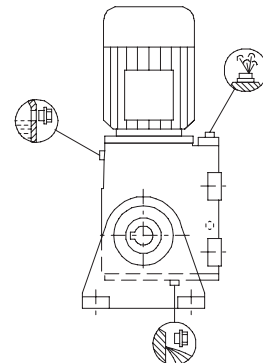
KAC H-012



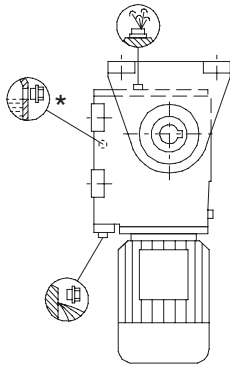
KAC H-022



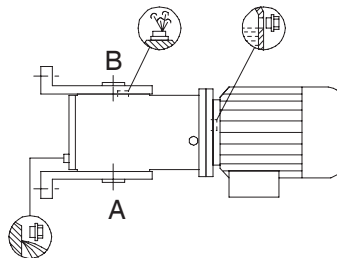
KAC H-032



KAC H-042



KAC H-052



KAC H-062

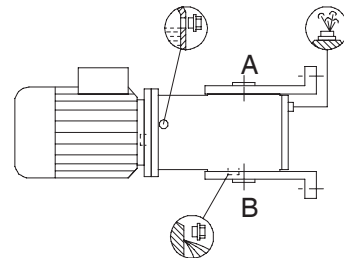
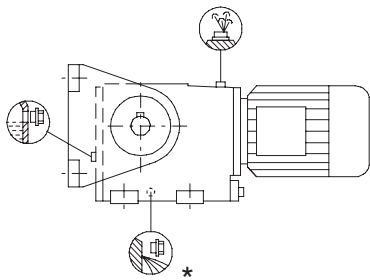
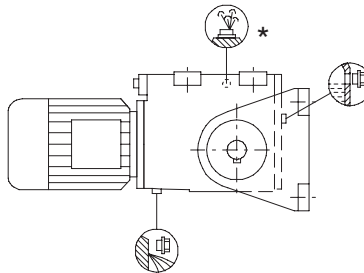


Figure 3.5.2–3: Mounting positions for KAC Size 40 - 180

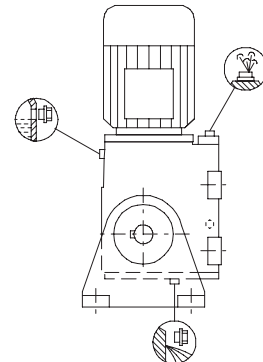
KC B32



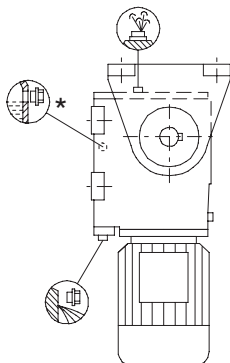
KC B82



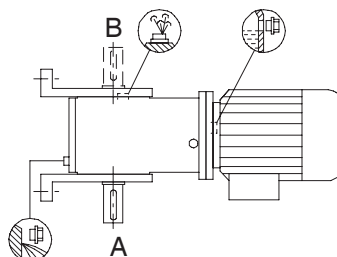
KC B72



KC B62



KC V-52



KC V-62

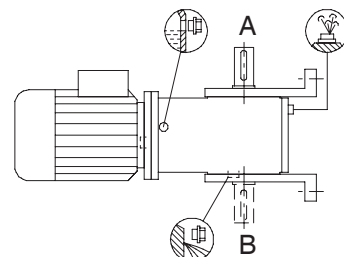


Figure 3.5.2–4: Mounting positions for KC Size 40 - 180

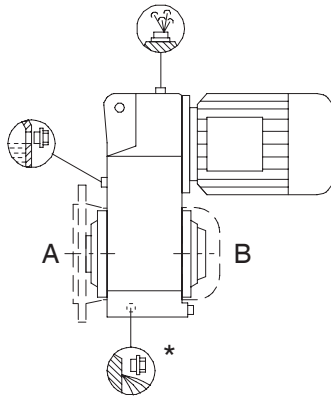
### 3.5.3 Parallel shaft helical gear units



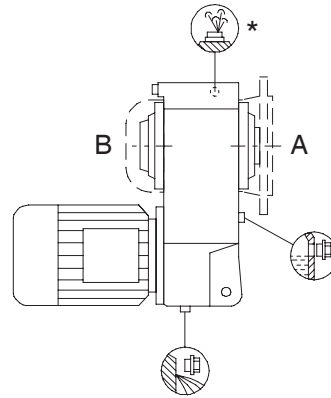
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

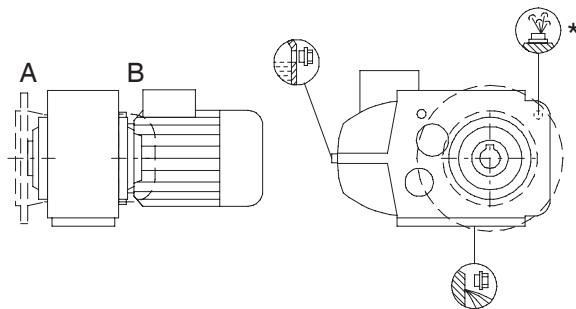
F.A. H-01



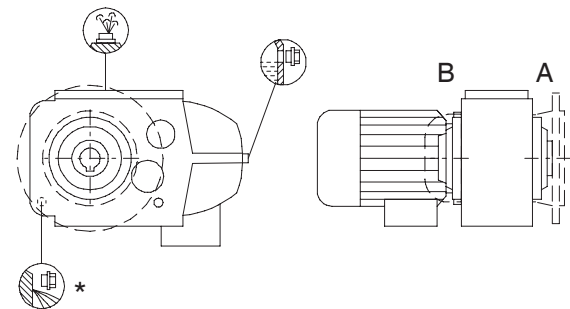
F.A. H-02



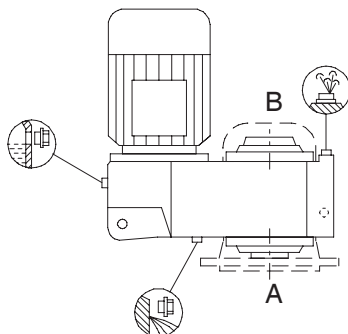
F.A. H-03



F.A. H-04



F.A. H-05



F.A. H-06

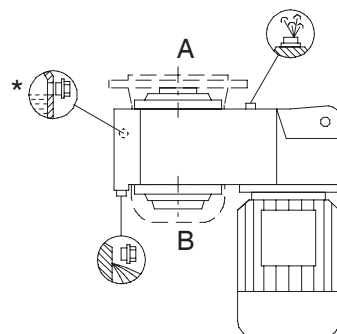


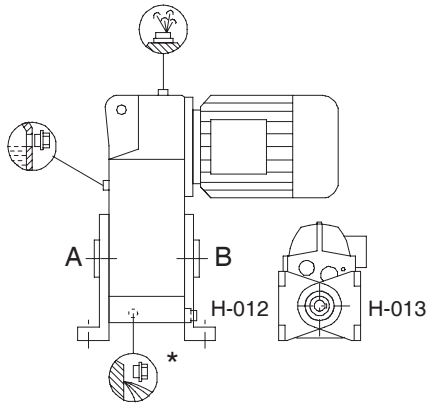
Figure 3.5.3–1: Mounting positions for F.A. Size 31 - 181



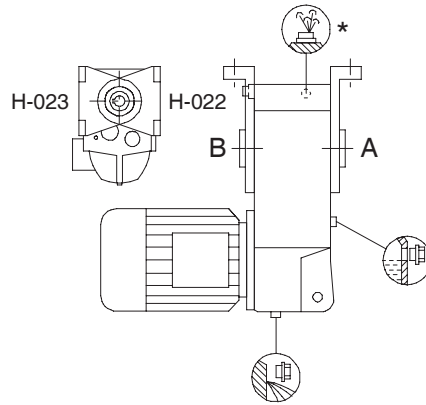
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

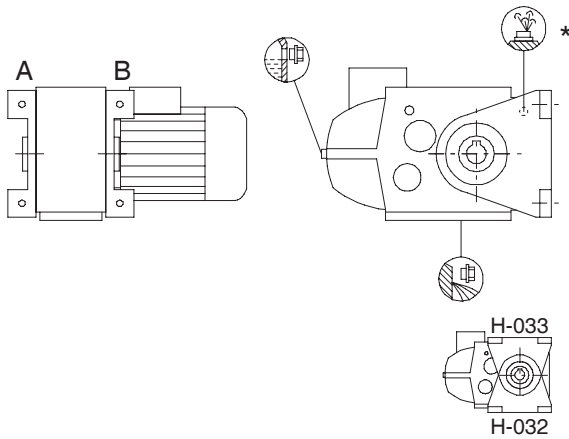
F.AC H-011



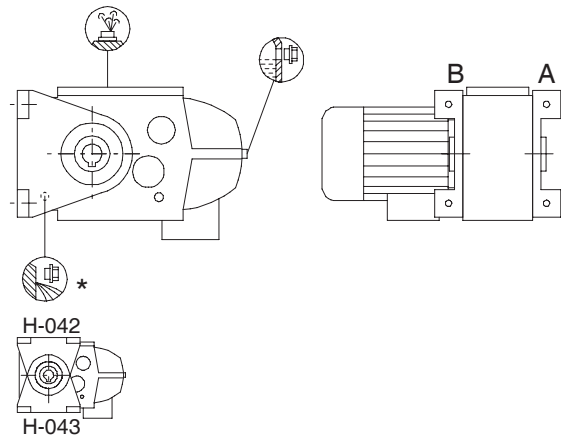
F.AC H-021



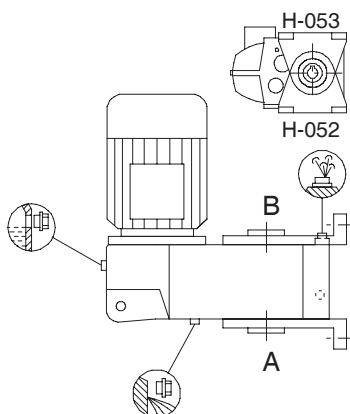
F.AC H-031



F.AC H-041



F.AC H-051



F.AC H-061

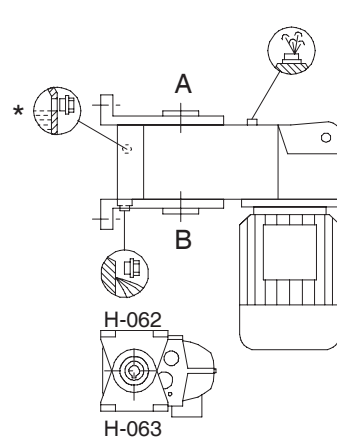


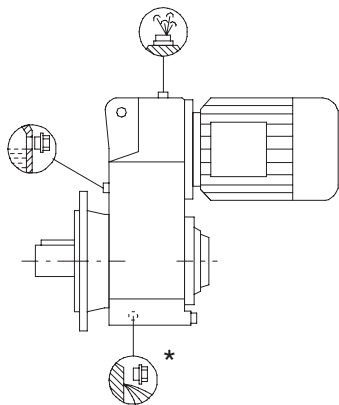
Figure 3.5.3–2: Mounting positions for F.AC Size 41 - 181



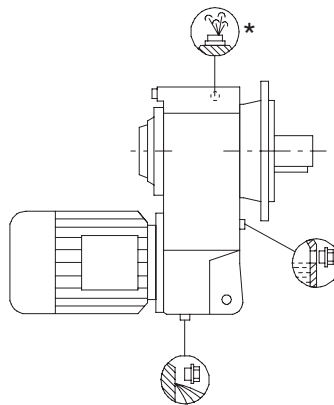
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

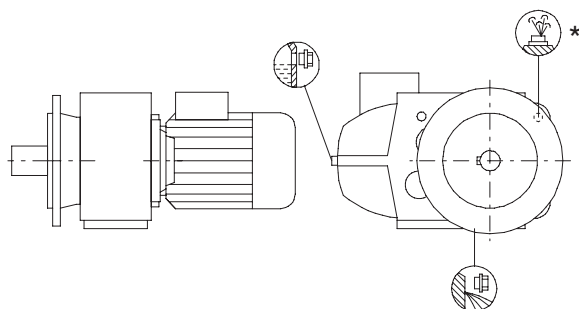
F.F./F.Z. **B5-01 (IM B5-01)**



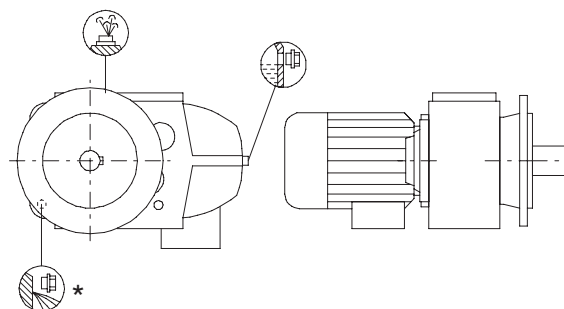
F.F./F.Z. **B5-03 (IM B5-03)**



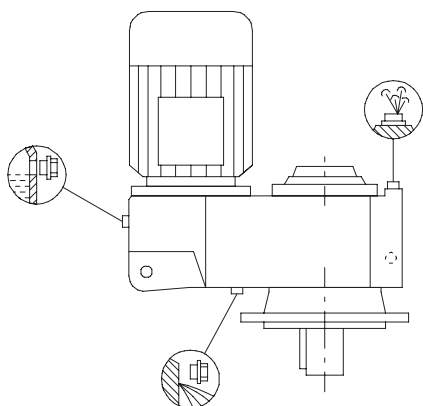
F.F./F.Z. **B5-02 (IM B5-02)**



F.F./F.Z. **B5-00 (IM B5-00)**



F.F./F.Z. **V1-00 (IM V1-00)**



F.F./F.Z. **V3-00 (IM V3-00)**

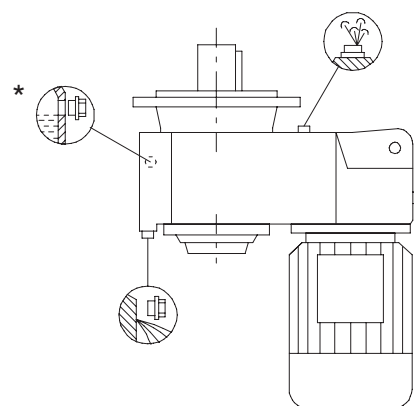


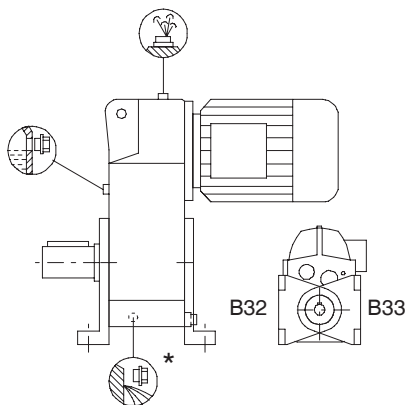
Figure 3.5.3–3: Mounting positions for F.F./F.Z. Size 31 - 181



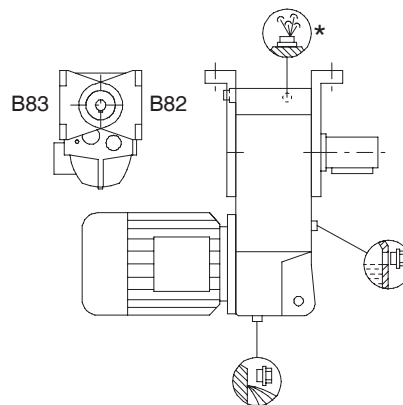
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

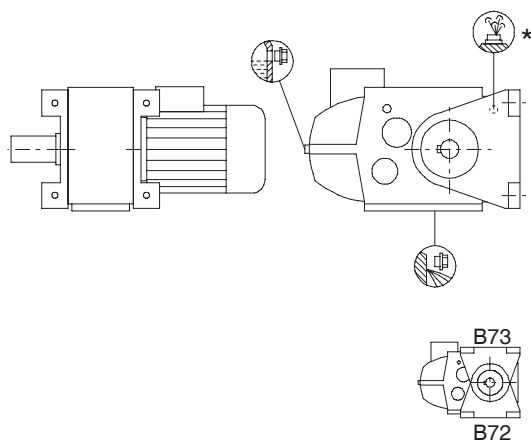
F.C B31 (IM B31)



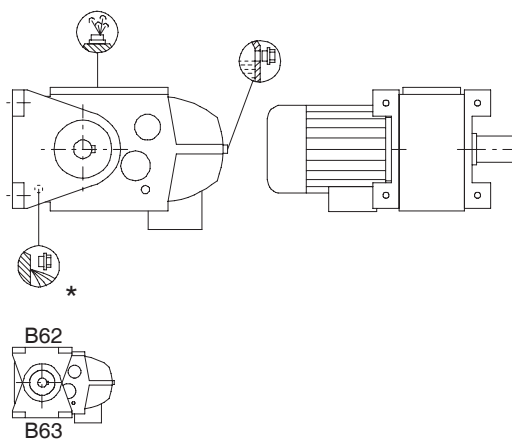
F.C B81 (IM B81)



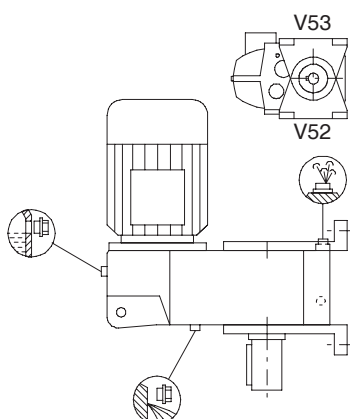
F.C B71 (IM B71)



F.C B61 (IM B61)



F.C V51 (IM V51)



F.C V61 (IM V61)

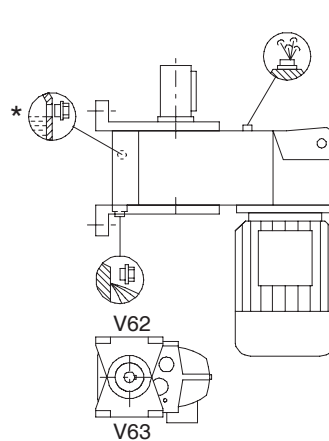


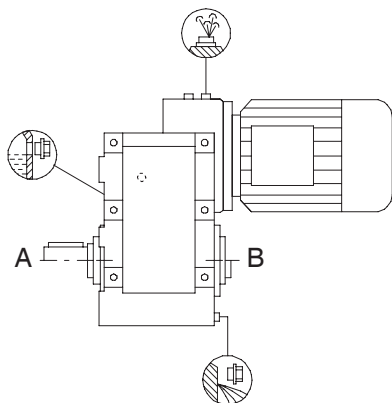
Figure 3.5.3–4: Mounting positions for F.C Size 41 - 181



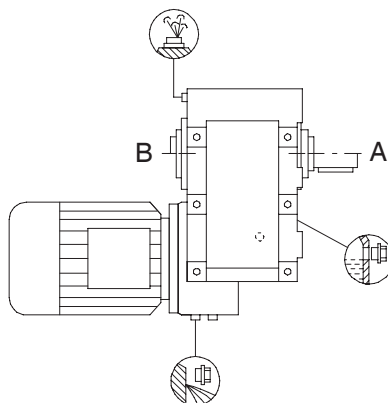
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

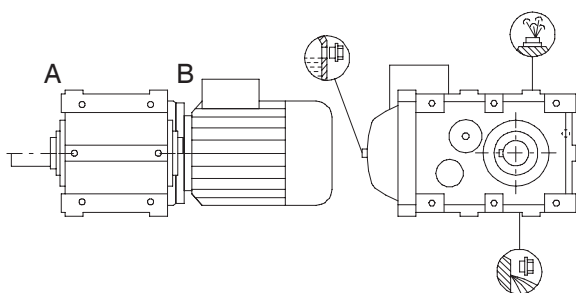
F. **B3 (IM B3)**  
F.A. **H-01**



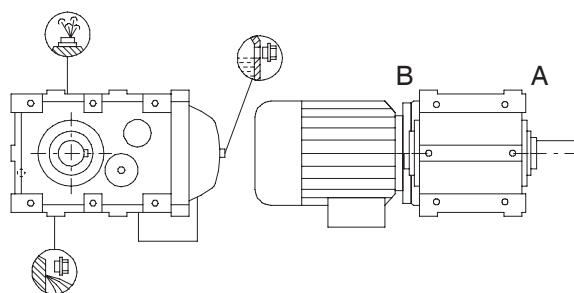
F. **B8 (IM B8)**  
F.A. **H-02**



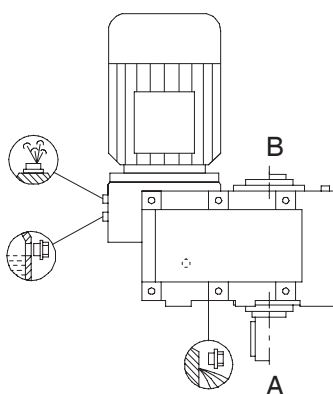
F. **B7 (IM B7)**  
F.A. **H-03**



F. **B6 (IM B6)**  
F.A. **H-04**



F. **V5 (IM V5)**  
F.A. **H-05**



F. **V6 (IM V6)**  
F.A. **H-06**

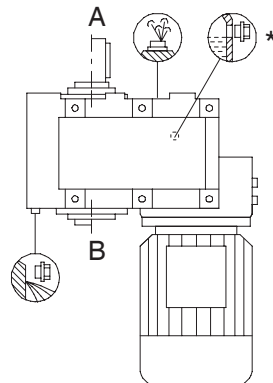


Figure 3.5.3–5: Mounting positions for F.201

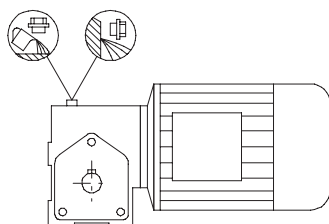
### 3.5.4 Helical worm gear units



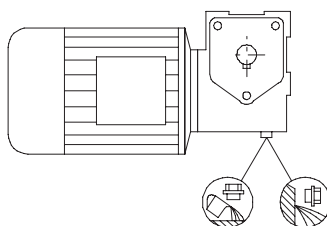
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

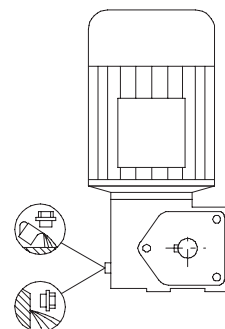
S **B3-00/B6-01**  
(IM B3-00/IM B6-01)  
SF **B5-01 (IM B5-01)**  
SA. **H-01**



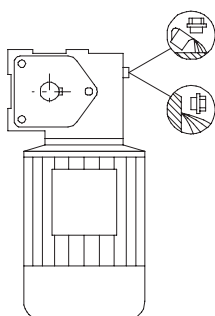
S **B8-00/B6-03**  
(IM B8-00/IM B6-03)  
SF **B5-03 (IM B5-03)**  
SA. **H-02**



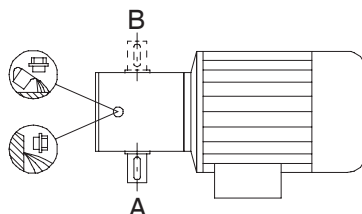
S **B3-01/B6-02**  
(IM B3-01/IM B6-02)  
SF **B5-02 (IM B5-02)**  
SA. **H-03**



S **B6-00/B8-01**  
(IM B6-00/IM B8-01)  
SF **B5-00 (IM B5-00)**  
SA. **H-04**



S **V5-00/V5-01**  
(IM V5-00/IM V5-01)  
SF **V1-00 (IM V1-00)**  
SA. **H-05**



S **V6-00/V6-01**  
(IM V6-00/IM V6-01)  
SF **V3-00 (IM V3-00)**  
SA. **H-06**

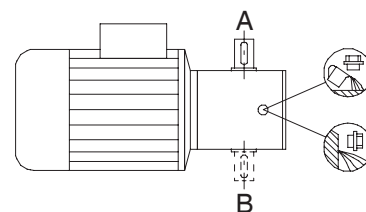
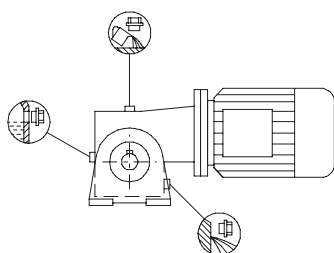
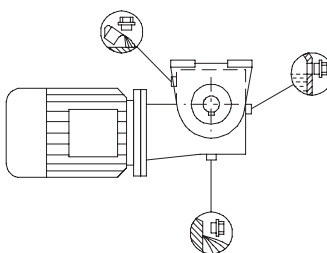


Figure 3.5.4–1: Mounting positions for S.01

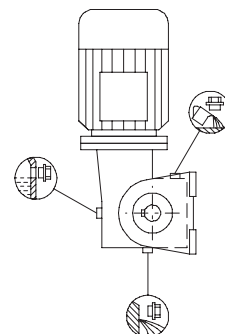
S **B3-00 (IM B3-00)**  
SF **B5-01 (IM B5-01)**  
SA. **H-01**



S **B8-00 (IM B8-00)**  
SF **B5-03 (IM B5-03)**  
SA. **H-02**



S **B6-02 (IM B6-02)**  
SF **B5-02 (IM B5-02)**  
SA. **H-03**

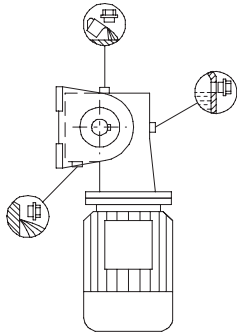




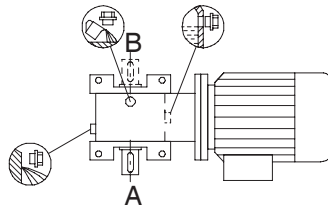
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

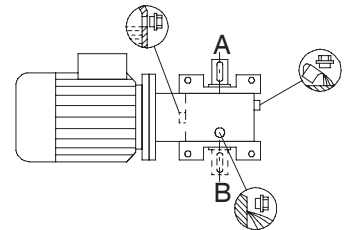
S **B6-00 (IM B6-00)**  
SF **B5-00 (IM B5-00)**  
SA. **H-04**



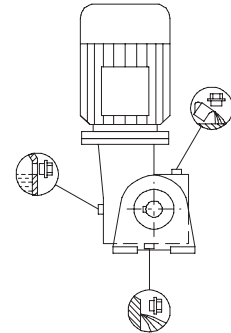
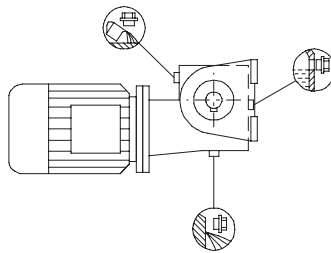
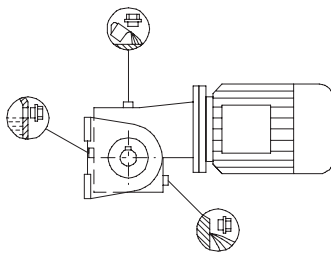
S **V5-00 (IM V5-00)**  
SF **V1-00 (IM V1-00)**  
SA. **H-05**



S **V6-00 (IM V6-00)**  
SF **V3-00 (IM V3-00)**  
SA. **H-06**



SC (vertical) **B6-01 (IM B6-01)** SC (vertical) **B6-03 (IM B6-03)** SC (vertical) **B3-01 (IM B3-01)**



SC (vertical) **B8-01 (IM B8-01)** SC (vertical) **V5-01 (IM V5-01)** SC (vertical) **V6-01 (IM V6-01)**

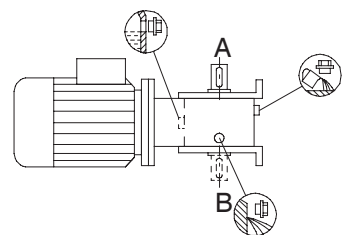
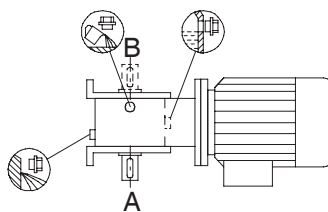
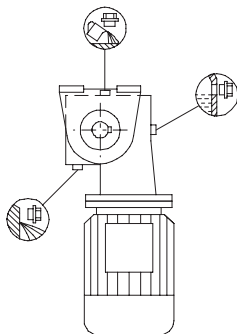


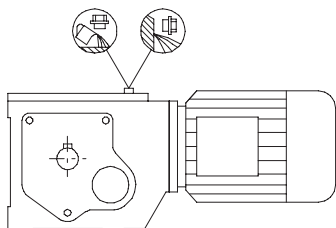
Figure 3.5.4–2: Mounting positions for S.06, S.11



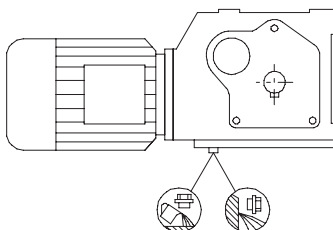
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

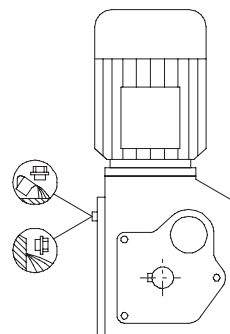
C **B3-00/B6-01**  
(IM B3-00/IM B6-01)  
CZ, CF **B5-01** (IM B5-01)  
CA. **H-01**



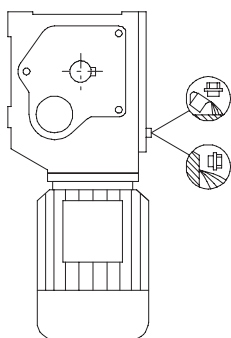
C **B8-00/B6-03**  
(IM B8-00/IM B6-03)  
CZ, CF **B5-03** (IM B5-03)  
CA. **H-02**



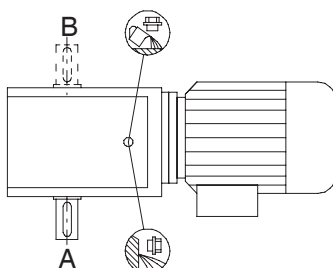
C **B3-01/B6-02**  
(IM B3-01/IM B6-02)  
CZ, CF **B5-02** (IM B5-02)  
CA. **H-03**



C **B6-00/B8-01**  
(IM B6-00/IM B8-01)  
CZ, CF **B5-00** (IM B5-00)  
CA. **H-04**



C **V5-00/V5-01**  
(IM V5-00/IM V5-01)  
CZ, CF **V1-00** (IM V1-00)  
CA. **H-05**



C **V6-00/V6-01**  
(IM V6-00/IM V6-01)  
CZ, CF **V3-00** (IM V3-00)  
CA. **H-06**

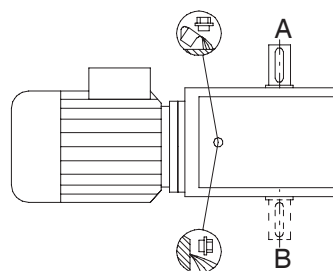
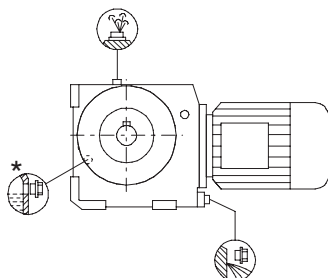
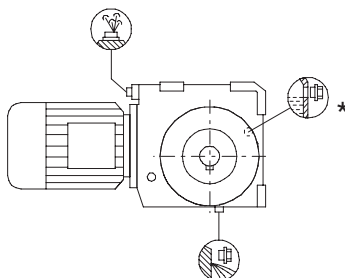


Figure 3.5.4–3: Mounting positions for C.10

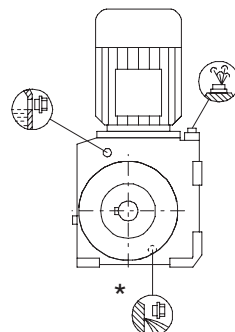
C **B3-00** (IM B3-00)  
**B6-01** (IM B6-01)



C **B8-00** (IM B8-00)  
**B6-03** (IM B6-03)



C **B3-01** (IM B3-01)  
**B6-02** (IM B6-02)

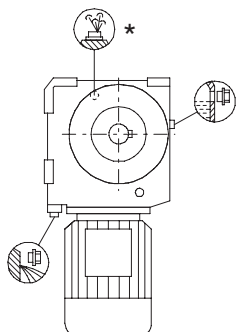




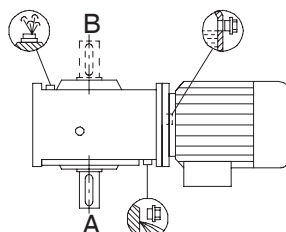
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

C **B6-00 (IM B6-00)**  
**B8-01 (IM B8-01)**



C **V5-00 (IM V5-00)**  
**V5-01 (IM V5-01)**



C **V6-00 (IM V6-00)**  
**V6-01 (IM V6-01)**

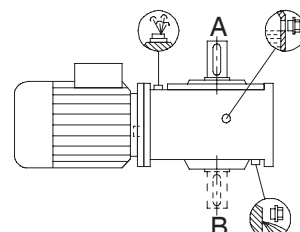
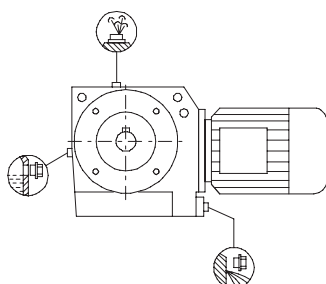
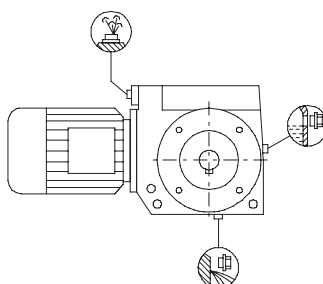


Figure 3.5.4–4: Mounting positions for C18 - C122

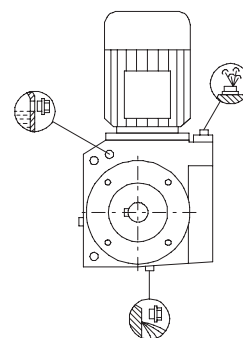
CZ, CF **B5-01 (IM B5-01)**  
CA. **H-01**



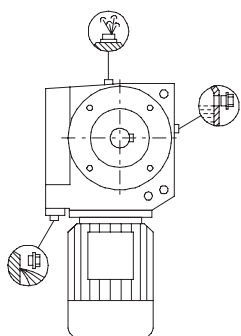
CZ, CF **B5-03 (IM B5-03)**  
CA. **H-02**



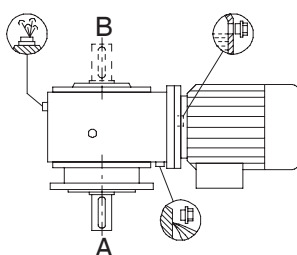
CZ, CF **B5-02 (IM B5-02)**  
CA. **H-03**



CZ, CF **B5-00 (IM B5-00)**  
CA. **H-04**



CZ, CF **V1-00 (IM V1-00)**  
CA. **H-05**



CZ, CF **V3-00 (IM V3-00)**  
CA. **H-06**

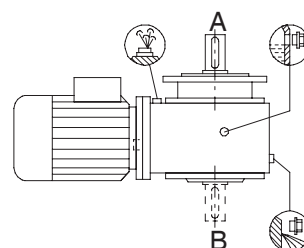


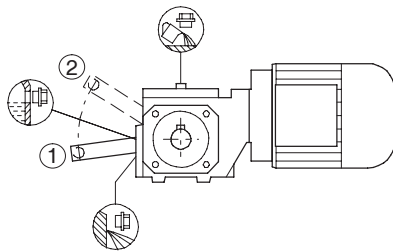
Figure 3.5.4–5: Mounting positions for C.18 - C.122

### 3.5.5 Self-powered trolley systems

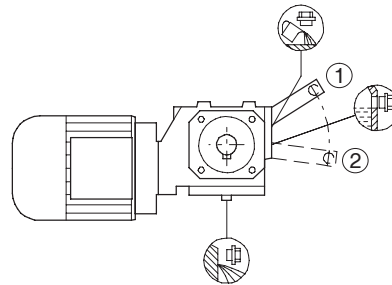


Note.  
For key to diagram symbols, see section 3.5 “Mounting positions”.

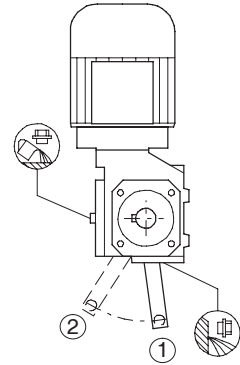
CF15 B5-01 (IM B5-01)



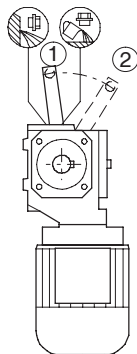
CF15 B5-03 (IM B5-03)



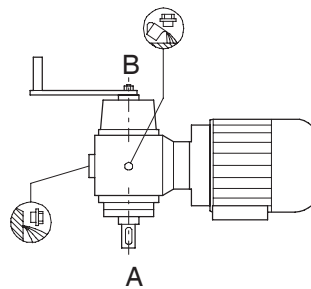
CF15 B5-02 (IM B5-02)



CF15 B5-00 (IM B5-00)



CF15 V1-00 (IM V1-00)



CF15 V3-00 (IM V3-00)

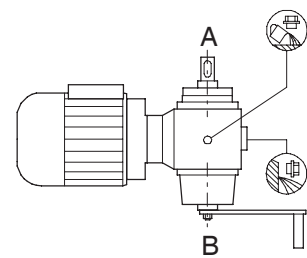


Figure 3.5.5–1: Mounting positions for CF15

CF25 B5-01 (IM B5-01)

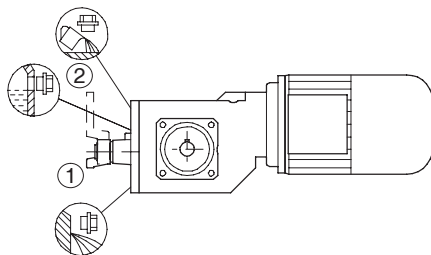


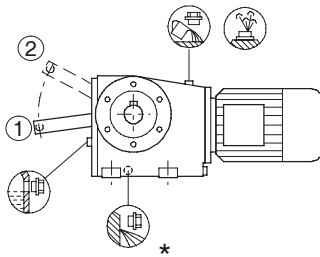
Figure 3.5.5–2: Mounting position CF25



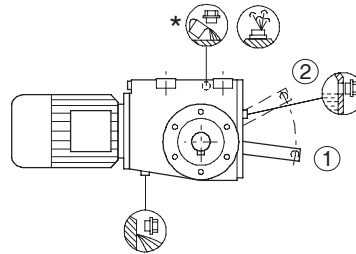
Note.

For key to diagram symbols, see section 3.5 “Mounting positions”.

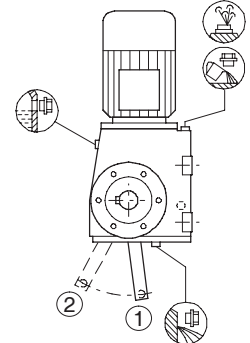
KF **B5-01 (IM B5-01)**



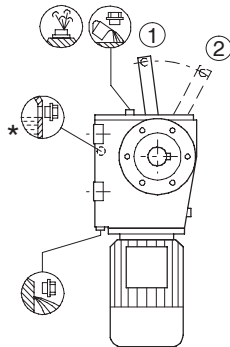
KF **B5-03 (IM B5-03)**



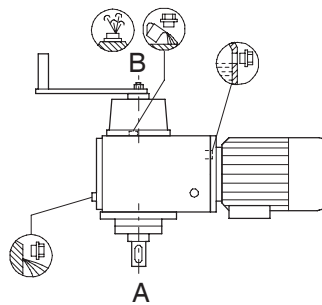
KF **B5-02 (IM B5-02)**



KF **B5-00 (IM B5-00)**



KF **V1-00 (IM V1-00)**



KF **V3-00 (IM V3-00)**

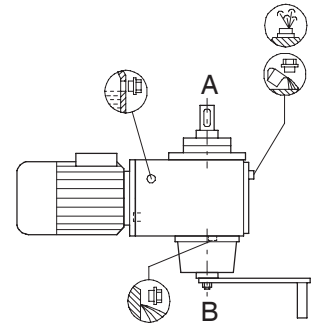


Figure 3.5.5–3: Mounting positions for KF34, KF45 - KF85

### 3.5.6 Tandem gear unit - compound helical gear unit



Note.

In a horizontal operating position the bulging part of the housing of the 2nd gear unit generally faces downwards.



Note.

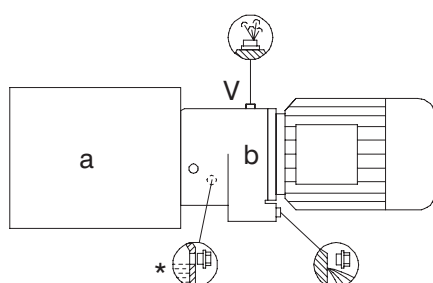
In case of double gear units every single unit is to be considered separately.



Note.

For key to diagram symbols, see section 3.5 "Mounting positions".

horizontal operating position



vertical operating position

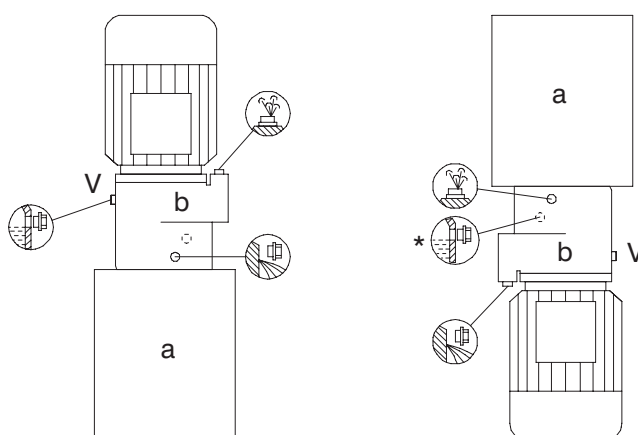


Figure 3.5.6: Operating position for dual gear unit

a Main gear unit

b 2. Gear unit

## 3.6 Oil quantities



Caution.

Incorrect oil quantities cause damage to the drive.

The exact oil quantities are specified on the rating plates of the drives.

The oil quantities listed in the tables are approximate values. They serve for the storage and procurement of lubricant.

### 3.6.1 Helical gear units

Type	Mounting position								
	B3	B5	B6	B7	B8	V1	V3	V5	V6
<b>E.20</b>	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.4
<b>E.40</b>	0.6	0.4	0.7	0.7	0.7	1.0	0.7	1.1	0.7
<b>E.60</b>	1.0	0.8	1.4	1.4	1.5	2.0	1.4	2.3	1.4
<b>E.80</b>	1.3	1.2	2.5	2.3	2.8	3.1	2.1	3.5	2.4
<b>E.100</b>	3.0	2.0	3.5	3.0	4.0	4.0	3.5	4.5	3.5
<b>E.120</b>	4.0	3.0	5.0	5.0	5.5	8.0	6.0	8.5	6.0
<b>E.140</b>	5.0	4.0	7.0	7.0	10.0	14.5	8.0	15.0	9.0

Table 3.6.1–1: Oil quantities for E. Size 20 - 140

Type	Mounting position								
	B3	B5	B6	B7	B8	V1	V3	V5	V6
<b>Z.10</b>	0.15	0.15	0.3	0.3	0.25	0.4	0.25	0.4	0.3
<b>Z.30/31</b>	0.6	0.5	0.7	0.8	0.8	1.05	0.8	1.2	0.8
<b>Z.40/41</b>	1.1	1.0	1.5	1.6	1.6	2.0	1.7	2.2	1.8
<b>Z.60/61</b>	1.8	1.4	2.4	2.7	2.7	3.6	2.7	3.8	3.0
<b>Z.80/81</b>	3.5	2.5	4.7	5.2	4.9	6.3	6.0	7.4	6.3
<b>Z.100/101</b>	6.0	4.5	9.5	10.0	9.0	13.0	12.0	13.5	12.0
<b>Z.120/121</b>	10.5	6.5	14.5	15.0	13.5	18.0	15.0	21.5	17.5
<b>Z.142</b>	16.0	10.0	21.0	23.0	22.0	30.0	24.0	34.0	26.0
<b>Z.162</b>	18.0	12.0	22.0	24.0	23.0	32.0	27.0	36.0	30.0
<b>Z.181</b>	35.0	21.0	50.0	53.0	51.0	64.0	54.0	80.0	54.0
<b>D.30/31</b>	0.5	0.5	0.7	0.8	0.8	1.0	0.8	1.1	0.8
<b>D.40/41</b>	1.1	0.8	1.4	1.6	1.8	2.0	1.7	2.2	1.7
<b>D.60/61</b>	1.7	1.3	2.3	2.5	2.5	3.4	2.6	3.7	2.9
<b>D.80/81</b>	3.4	2.4	4.5	5.0	4.6	6.2	5.5	7.3	6.1
<b>D.100/101</b>	6.0	4.0	8.5	9.5	9.0	12.5	11.0	13.0	11.5
<b>D.120/121</b>	10.0	6.0	14.0	14.5	12.5	17.5	14.5	20.5	16.0
<b>D.142</b>	15.0	10.0	20.0	22.0	21.0	29.0	23.0	33.0	25.0
<b>D.162</b>	25.0	15.0	28.0	30.0	29.0	41.0	35.0	50.0	41.0
<b>D.181</b>	41.0	24.0	47.0	49.0	48.0	77.0	64.0	98.0	70.0

Table 3.6.1–2: Oil quantities for Z10, D./Z. Size 30/31 - 181

### 3.6.2 Bevel-helical gear units

Type	Mounting position					
	B3-00/B32 B5-01 H-01 H-012	B8-00/B82 B5-03 H-02 H-022	B6-02/B72 B5-02 H-03 H-032	B6-00/B62 B5-00 H-04 H-042	V5-00/V52 V1-00 H-05 H-052	V6-00/V62 V3-00 H-06 H-062
K.30	0.5	0.7	0.8	0.7	0.6	0.6
K.40	0.7	1.0	1.5	1.0	1.0	1.0
K.60	1.3	2.3	3.0	2.2	2.1	2.1
K.80	3.3	3.8	6.0	4.2	4.5	4.5
K.100	5.0	6.0	10.0	7.0	7.0	7.0
K.120	7.5	15.0	21.0	14.0	14.0	14.0
K.140	11.0	26.0	32.0	23.0	23.0	24.0
K.160	19.0	45.0	61.0	42.0	40.0	42.0
K.180	38.0	81.0	100.0	74.0	73.0	68.0
K.200	36.0	91.0	119.0	89.0	94.0	94.0

Table 3.6.2: Oil quantities for K. Size 30 - 200

### 3.6.3 Parallel shaft helical gear units

Type	Mounting position					
	B3 B5-01 H-01	B8 B5-03 H-02	B7 B5-02 H-03	B6 B5-00 H-04	V5 V1-00 H-05	V6 V3-00 H-06
FZ.31	1.0	0.7	0.8	0.8	1.1	1.2
FD.31	0.9	0.7	0.8	0.8	1.0	1.1
FZ.41	1.4	0.85	1.1	1.1	1.7	1.7
FD.41	1.3	0.75	1.1	1.1	1.6	1.6
FZ.61	3.3	1.5	2.4	2.2	3.3	3.5
FD.61	3.2	1.4	2.3	2.2	2.9	3.3
FZ.81	6.5	2.8	5.0	4.3	7.5	7.1
FD.81	6.4	2.8	4.5	4.4	6.5	6.1
FZ.101	11.0	5.0	8.0	8.0	10.5	11.5
FD.101	9.5	5.0	7.5	7.5	10.5	11.5
FZ.121	19.0	11.0	16.0	16.0	22.5	21.0
FD.121	19.0	11.0	15.5	15.5	20.0	18.5
FZ.141	29.0	24.0	24.0	24.0	34.0	37.0
FD.141	26.0	16.0	21.0	21.0	31.0	35.0
FZ.161	52.0	35.0	45.0	48.0	69.0	63.0
FD.161	48.0	35.0	42.0	45.0	66.0	58.0
FD.181	84.0	45.0	61.0	68.0	109.0	88.0
FD.201	102.0	110.0	106.0	97.0	184.0	176.0

Table 3.6.3: Oil quantities for F. Size 31 - 201

### 3.6.4 Helical worm gear units

Type	Mounting position				
S01 SC01 SP01	B3-00 B6-01 B6-03 B8-00	-	B3-01 B6-00 B6-02 B8-01	V5-00 V5-01 V6-00 V6-01	-
SF01	B5-01 B5-03	B5-00 B5-02	-	V1-00/ B V3-00/ A	V1-00/ A V3-00/ B
SA01	H-01 H-02	H-03 H-04	-	H-05 H-06	-
SAF01	H-01 H-02	-	H-03 H-04	H-05/ B H-06/ A	H-05/ A H-06/ B
S.01	0.1	0.11	0.11	0.11	0.11

Table 3.6.4–1: Oil quantities for S.01

Type	Mounting position					
	S	SC	SF		SAF	
	B3-00 B6-00 B6-02 B8-00 V5-00 V6-00	B3-01 B6-01 B6-03 B8-01 V5-01 V6-01	V1-00/ A V3-00/ B	B5-00 B5-01 B5-02 B5-03 V1-00/ B V3-00/ A	H-05/ B H-06/ A	H-01 H-02 H-03 H-04 H-05/ A H-06/ B
S.06	0.16	0.16	0.16	0.2	0.16	0.16
S.11	0.25	0.25	0.25	0.3	0.25	0.25

Table 3.6.4–2: Oil quantities for S.06, S.11

Type	Mounting position					
C10 CP10	B3-00 B6-00 B6-01 B8-01	B6-03 B8-00	-	-	B3-01 B6-02 V5-00 V5-01 V6-00 V6-01	-
CC10	B6-01 B8-01	B6-02	-	-	B3-01 V5-01 V6-01	-
CF10	-	-	B5-00 B5-01 B5-03		B5-02 V1-00/ B V3-00/ A	V1-00/ A V3-00/ B
CA10	H-01 H-02 H-04	-	-	H-03 H-05 H-06	-	-
CAF10	H-01 H-02 H-04	-	-	H-05/ B H-06/ A	H-03 H-05/ A H-06/ B	-
C.10	0.15	0.16	0.18	0.2	0.22	0.25

Table 3.6.4–3: Oil quantities for C.10

Type	Mounting position					
	B3-00 B6-01	B8-00 B6-03	B3-01 B6-02	B6-00 B8-01	V5-00 V5-01	V6-00 V6-01
C18	0.3	0.4	0.6	0.5	0.5	0.5
C21	0.6	0.7	0.9	0.8	0.7	0.7
C41	0.8	1.2	1.4	1.1	0.9	0.9
C61	1.6	2.7	3.1	2.5	2.1	2.1
C81	2.7	3.8	5.3	3.7	3.1	3.1
C102	5.5	8.0	11.5	8.5	7.0	7.0
C122	13.0	15.5	25.0	15.0	13.0	13.0

Table 3.6.4–4: Oil quantities for C Size 18 - 122

Type	Mounting position					
	B5-01	B5-03	B5-02	B5-00	V1-00/ A V1-00/ B	V3-00/ A V3-00/ B
CF18	0.4	0.5	0.7	0.6	0.6	0.6
CF21	0.6	0.7	0.9	0.8	0.7	0.7
CF41	0.8	1.2	1.4	1.2	0.9	0.9
CF61	1.6	2.7	3.6	2.5	2.2	2.2
CF81	2.7	3.9	5.5	5.4	3.2	3.2
CF102	4.0	8.5	10.0	8.5	6.3	6.3
CF122	8.5	16.0	21.0	15.5	13.0	13.0

Table 3.6.4–5: Oil quantities for CF Size 18 - 122

Type	Mounting position					
	H-01	H-02	H-03	H-04	H-05	H-06
CA.18	0.4	0.5	0.6	0.5	0.5	0.5
CA.21	0.6	0.7	0.9	0.8	0.7	0.7
CA.41	0.7	1.2	1.4	1.2	0.9	0.9
CA.61	1.6	2.4	3.1	2.4	2.0	2.0
CA.81	2.7	3.8	5.3	5.2	3.2	3.2
CA.102	4.0	6.5	8.5	7.0	5.5	5.5
CA.122	8.5	12.5	19.5	15.0	12.5	12.5

Table 3.6.4–6: Oil quantities for CA. Size 18 - 122

### 3.6.5 Self-powered trolley systems

Type	Mounting position					
	B5-01	B5-03	B5-02	B5-00	V1-00	V3-00
CF15	0.28	0.28	0.39	0.23	0.28	0.28
CF25	0.6	-	-	-	-	-
KF34	0.5	0.7	0.8	0.7	0.6	0.6
KF45	0.7	1.0	1.5	1.0	1.0	1.0
KF65	1.3	2.3	3.0	2.2	2.1	2.1
KF85	3.3	3.8	6.0	4.2	4.5	4.5

Table 3.6.5: Oil quantities for Self-powered trolley systems

### 3.6.6 Tandem gear unit - compound helical gear unit

#### 3.6.6.1 Two and three-stage helical gear units

Type	Mounting position								
	B3	B5	B6	B7	B8	V1	V3	V5	V6
<b>Z40/41-Z10</b>	1.1+0.15 <b>1.25</b>	0.8+0.15 <b>0.95</b>	1.5+0.2 <b>1.7</b>	1.6+0.15 <b>1.75</b>	1.6+0.15 <b>1.75</b>	2.0+0.4 <b>2.4</b>	1.7+0.25 <b>1.95</b>	2.2+0.4 <b>2.6</b>	1.8+0.25 <b>2.05</b>
<b>Z60/61-Z30</b>	1.8+0.5 <b>2.3</b>	1.6+0.5 <b>2.1</b>	2.4+0.5 <b>2.9</b>	2.7+0.5 <b>3.2</b>	2.7+0.5 <b>3.2</b>	3.6+1.2 <b>4.8</b>	2.7+0.8 <b>3.5</b>	3.8+1.2 <b>5.0</b>	3.0+0.8 <b>3.8</b>
<b>Z80/81-D/Z40</b>	3.5+0.8 <b>4.3</b>	2.5+0.8 <b>3.3</b>	4.7+0.8 <b>5.5</b>	5.2+0.8 <b>6.0</b>	4.9+0.8 <b>5.7</b>	6.3+2.0 <b>8.3</b>	6.0+1.7 <b>7.7</b>	7.4+2.0 <b>9.4</b>	6.3+1.7 <b>8.0</b>
<b>Z100/101-D/Z40</b>	6.0+0.8 <b>6.8</b>	4.5+0.8 <b>5.3</b>	9.5+0.8 <b>10.3</b>	10.0+0.8 <b>10.8</b>	9.0+0.8 <b>9.8</b>	13.0+2.0 <b>15.0</b>	12.0+1.7 <b>13.7</b>	13.5+2.0 <b>15.5</b>	12.0+1.7 <b>13.7</b>
<b>Z120/121-D/Z60</b>	10.5+1.2 <b>11.7</b>	6.5+1.2 <b>7.7</b>	14.5+1.2 <b>15.7</b>	15.0+1.2 <b>16.2</b>	13.5+1.2 <b>14.7</b>	18.0+3.4 <b>21.4</b>	15.0+2.6 <b>17.6</b>	21.4+3.4 <b>24.8</b>	17.5+2.6 <b>20.1</b>
<b>Z142-D/Z60</b>	16.0+1.2 <b>17.2</b>	10.0+1.2 <b>11.2</b>	21.0+1.2 <b>22.2</b>	23.0+1.2 <b>24.2</b>	22.0+1.2 <b>23.2</b>	30.0+3.6 <b>33.6</b>	24.0+2.7 <b>26.7</b>	34.0+3.6 <b>37.6</b>	26.0+2.7 <b>28.7</b>
<b>Z181-D/Z100</b>	35.0+4.5 <b>39.5</b>	21.0+4.5 <b>25.5</b>	50.0+4.5 <b>54.5</b>	53.0+4.5 <b>57.5</b>	51.0+4.5 <b>55.5</b>	64.0+12.5 <b>76.5</b>	54.0+11.0 <b>65.0</b>	80.0+12.5 <b>92.5</b>	54.0+11.0 <b>65.0</b>

Table 3.6.6.1 – 1: Oil quantities for Z. Size 40/41 - 181

Type	Mounting position								
	B3	B5	B6	B7	B8	V1	V3	V5	V6
<b>D30/31-Z101</b>	0.5+0.15 <b>0.65</b>	0.5+0.15 <b>0.65</b>	0.7+0.2 <b>0.9</b>	0.8+0.15 <b>0.95</b>	0.8+0.15 <b>0.95</b>	1.0+0.4 <b>1.4</b>	0.8+0.25 <b>1.05</b>	1.1+0.4 <b>1.5</b>	0.8+0.25 <b>1.05</b>
<b>D40/41-Z10</b>	1.1+0.15 <b>1.25</b>	0.8+0.15 <b>0.95</b>	1.4+0.2 <b>1.6</b>	1.6+0.15 <b>1.75</b>	1.5+0.15 <b>1.65</b>	2.0+0.4 <b>2.4</b>	1.7+0.25 <b>1.95</b>	2.2+0.4 <b>2.6</b>	1.7+0.25 <b>1.95</b>
<b>D60/61-Z30</b>	1.7+0.5 <b>2.2</b>	1.2+0.5 <b>1.7</b>	2.3+0.5 <b>2.8</b>	2.5+0.5 <b>3.0</b>	2.5+0.5 <b>3.0</b>	3.4+1.2 <b>4.6</b>	2.6+0.8 <b>3.4</b>	3.7+1.2 <b>4.9</b>	2.9+0.8 <b>3.7</b>
<b>D80/81-D/Z40</b>	3.4+0.8 <b>4.2</b>	2.4+0.8 <b>3.2</b>	4.5+0.8 <b>5.3</b>	5.0+0.8 <b>5.8</b>	4.6+0.8 <b>5.4</b>	6.2+2.0 <b>8.2</b>	5.5+1.7 <b>7.2</b>	7.3+2.0 <b>9.3</b>	6.1+1.7 <b>7.8</b>
<b>D100/101-D/Z40</b>	5.5+0.8 <b>6.3</b>	4.5+0.8 <b>5.3</b>	8.5+0.8 <b>9.3</b>	9.5+0.8 <b>10.3</b>	9.0+0.8 <b>9.8</b>	12.5+2.0 <b>14.5</b>	11.0+1.7 <b>12.7</b>	13.0+2.0 <b>15.0</b>	11.5+1.7 <b>13.2</b>
<b>D120/121-D/Z60</b>	9.5+1.2 <b>10.7</b>	6.0+1.2 <b>7.2</b>	14.0+1.2 <b>15.2</b>	14.5+1.2 <b>15.7</b>	12.5+1.2 <b>13.7</b>	17.5+3.4 <b>20.9</b>	14.5+2.6 <b>17.1</b>	20.5+3.4 <b>23.9</b>	16.0+2.6 <b>18.6</b>
<b>D142-D/Z60</b>	15.0+1.2 <b>16.2</b>	10.0+1.2 <b>11.2</b>	20.0+1.2 <b>21.2</b>	22.0+1.2 <b>23.2</b>	21.0+1.2 <b>22.2</b>	29.0+3.4 <b>32.4</b>	23.0+2.6 <b>25.6</b>	33.0+3.4 <b>36.4</b>	25.0+2.6 <b>27.6</b>
<b>D162-D/Z80</b>	25.0+2.4 <b>27.4</b>	15.0+2.4 <b>17.4</b>	28.0+2.4 <b>30.4</b>	30.0+2.4 <b>32.4</b>	29.0+2.4 <b>31.4</b>	41.0+6.2 <b>47.2</b>	35.0+5.5 <b>40.5</b>	50.0+6.2 <b>56.2</b>	40.5+5.5 <b>46.0</b>
<b>D181-D/Z100</b>	41.0+4.5 <b>45.5</b>	24.0+4.5 <b>28.5</b>	47.0+4.5 <b>51.5</b>	49.0+4.5 <b>53.5</b>	47.5+4.5 <b>52.0</b>	74.0+12.5 <b>86.5</b>	64.0+11.0 <b>75.0</b>	98.0+12.5 <b>110.5</b>	70.0+11.0 <b>81.0</b>

Table 3.6.6.1 – 2: Oil quantities for D. Size 30/31 - 181

### 3.6.6.2 Bevel-helical gear units

Type	Mounting position					
	B3-00/B32 B5-01 H-01 H-012	B8-00/B82 B5-03 H-02 H-022	B6-02/B72 B5-02 H-03 H-032	B6-00/B62 B5-00 H-04 H-042	V5-00/V52 V1-00 H-05 H-052	V6-00/V62 V3-00 H-06 H-062
<b>K.30-Z10</b>	0.5+0.2 <b>0.7</b>	0.7+0.2 <b>0.9</b>	0.8+0.4 <b>1.2</b>	0.7+0.3 <b>1.0</b>	0.6+0.2 <b>0.8</b>	0.6+0.2 <b>0.8</b>
<b>K.40-Z10</b>	0.7+0.2 <b>0.9</b>	1.0+0.2 <b>1.2</b>	1.5+0.4 <b>1.9</b>	1.0+0.3 <b>1.3</b>	1.0+0.2 <b>1.2</b>	1.0+0.2 <b>1.2</b>
<b>K.60-Z10</b>	1.3+0.2 <b>1.5</b>	2.3+0.2 <b>2.5</b>	3.0+0.4 <b>3.4</b>	2.2+0.3 <b>2.5</b>	2.1+0.2 <b>2.3</b>	2.1+0.2 <b>2.3</b>
<b>K.60-D/Z30</b>	1.3+0.5 <b>1.8</b>	2.3+0.5 <b>2.8</b>	3.0+1.2 <b>4.2</b>	2.2+0.8 <b>3.0</b>	2.1+0.5 <b>2.6</b>	2.1+0.5 <b>2.6</b>
<b>K.80-D/Z30</b>	3.3+0.5 <b>3.8</b>	3.4+0.5 <b>3.9</b>	6.0+1.2 <b>7.2</b>	4.2+0.8 <b>5.0</b>	4.5+0.5 <b>5.0</b>	4.5+0.5 <b>5.0</b>
<b>K.100-D/Z40</b>	5.0+0.8 <b>5.8</b>	6.0+0.8 <b>6.8</b>	10.0+2.0 <b>12.0</b>	7.0+1.7 <b>8.7</b>	7.0+0.8 <b>7.8</b>	7.0+0.8 <b>7.8</b>
<b>K.120-D/Z40</b>	7.5+0.8 <b>8.3</b>	15.0+0.8 <b>15.8</b>	21.0+2.0 <b>23.0</b>	14.0+1.7 <b>15.7</b>	14.0+0.8 <b>14.8</b>	14.0+0.8 <b>14.8</b>
<b>K.140-D/Z60</b>	11.0+1.6 <b>12.6</b>	26.0+1.6 <b>27.6</b>	32.0+3.6 <b>35.6</b>	23.0+2.7 <b>25.7</b>	23.0+1.6 <b>24.6</b>	24.0+1.6 <b>25.6</b>
<b>K.160-D/Z80</b>	19.0+2.5 <b>21.5</b>	45.0+2.5 <b>47.5</b>	61.0+6.3 <b>67.3</b>	42.0+6.0 <b>48.0</b>	40.0+2.5 <b>42.5</b>	42.0+2.5 <b>44.5</b>
<b>K.180-D/Z100</b>	38.0+4.5 <b>42.5</b>	81.0+4.5 <b>85.5</b>	100.0+13.0 <b>113.0</b>	74.0+12.0 <b>86.0</b>	73.0+4.5 <b>77.5</b>	68.0+4.5 <b>72.5</b>
<b>K.200-D/Z100</b>	36.0+4.5 <b>40.5</b>	91.0+4.5 <b>95.5</b>	119.0+13.0 <b>132.0</b>	89.0+12.0 <b>101.0</b>	94.0+4.5 <b>98.5</b>	94.0+4.5 <b>98.5</b>

Table 3.6.6.2: Oil quantities for K. Size 30 - 200

### 3.6.6.3 Parallel shaft helical gear units

Type	Mounting position					
	B3 B5-01 H-01	B8 B5-03 H-02	B7 B5-02 H-03	B6 B5-00 H-04	V5 V1-00 H-05	V6 V3-00 H-06
<b>FZ.31-Z10</b>	1.0+0.2 1.2	0.7+0.2 0.9	0.8+0.2 1.0	0.8+0.2 1.0	1.1+0.4 1.5	1.2+0.3 1.5
<b>FD.31-Z10</b>	0.9+0.2 1.1	0.7+0.2 0.9	0.8+0.2 1.0	0.8+0.2 1.0	1.0+0.4 1.4	1.1+0.3 1.4
<b>FZ.41-Z10</b>	1.4+0.2 1.6	0.85+0.2 1.05	1.1+0.2 1.3	1.1+0.2 1.3	1.7+0.4 2.1	1.7+0.3 2.0
<b>FD.41-Z10</b>	1.3+0.2 1.5	0.75+0.2 0.95	1.1+0.2 1.3	1.1+0.2 1.3	1.6+0.4 2.0	1.6+0.3 1.9
<b>FZ.61-Z10</b>	3.3+0.2 3.5	1.5+0.2 1.7	2.4+0.2 2.6	2.2+0.2 2.4	3.3+0.4 3.7	3.5+0.3 3.8
<b>FD.61-Z10</b>	3.2+0.2 3.4	1.4+0.2 1.6	2.3+0.2 2.5	2.2+0.2 2.4	2.9+0.4 3.3	3.3+0.3 3.6
<b>FZ.61-D/Z30</b>	3.3+0.5 3.8	1.5+0.5 2.0	2.4+0.5 2.9	2.2+0.5 2.7	3.3+1.2 4.5	3.5+0.8 4.3
<b>FD.61-D/Z30</b>	3.2+0.5 3.7	1.4+0.5 1.9	2.3+0.5 2.8	2.2+0.5 2.7	2.9+1.2 4.1	3.3+0.8 4.1
<b>FZ.81-D/Z30</b>	6.5+0.5 7.0	2.8+0.5 3.3	5.0+0.5 5.5	4.3+0.5 4.8	7.5+1.2 8.7	7.1+0.8 7.9
<b>FD.81-D/Z30</b>	6.4+0.5 6.9	2.8+0.5 3.3	4.5+0.5 5.0	4.4+0.5 4.9	6.5+1.2 7.7	6.1+0.8 6.9
<b>FZ.101-D/Z40</b>	11.0+0.8 11.8	5.0+0.8 5.8	8.0+0.8 8.8	8.0+0.8 8.8	10.5+2.0 12.5	11.5+1.7 13.2
<b>FD.101-D/Z40</b>	9.5+0.8 10.3	5.0+0.8 5.8	7.5+0.8 8.3	7.5+0.8 8.3	10.5+2.0 12.5	11.5+1.7 13.2
<b>FD.121-D/Z40</b>	19.0+0.8 19.8	11.0+0.8 11.8	15.5+0.8 16.3	15.5+0.8 16.3	20.0+2.0 22.0	18.5+1.7 20.2
<b>FZ.141-D/Z60</b>	29.0+1.6 30.6	24.0+1.6 25.6	24.0+1.6 25.6	24.0+1.6 25.6	34.0+3.6 37.6	37.0+2.7 39.7
<b>FD.141-D/Z60</b>	26.0+1.6 27.6	16.0+1.6 17.6	21.0+1.6 22.6	21.0+1.6 22.6	31.0+3.6 34.6	35.0+2.7 37.7
<b>FD.161-D/Z80</b>	48.0+2.5 50.5	35.0+2.5 37.5	42.0+2.5 44.5	45.0+2.5 47.5	66.0+6.3 72.3	58.0+6.0 64.0
<b>FD.181-D/Z100</b>	84.0+4.5 88.5	45.0+4.5 49.5	61.0+4.5 65.5	68.0+4.5 72.5	109.0+13.0 122.0	88.0+12.0 100.0
<b>FD.201-D/Z100</b>	102.0+4.5 106.5	110.0+4.5 114.5	106.0+4.5 110.5	97.0+4.5 101.5	184.0+13.0 197.0	176.0+12.0 188.0

Table 3.6.6.3: Oil quantities for F. Size 31 - 201

### 3.6.6.4 Helical worm gear units

Type	Mounting position					
	B3-00 B6-01	B8-00 B6-03	B3-01 B6-02	B6-00 B8-01	V5-00 V5-01	V6-00 V6-01
<b>C21-Z10</b>	0.6+0.2 <b>0.8</b>	0.7+0.2 <b>0.9</b>	0.9+0.4 <b>1.3</b>	0.8+0.3 <b>1.1</b>	0.7+0.2 <b>0.9</b>	0.7+0.2 <b>0.9</b>
<b>C41-Z10</b>	0.8+0.2 <b>1.0</b>	1.4+0.2 <b>1.6</b>	1.4+0.4 <b>1.8</b>	1.1+0.3 <b>1.4</b>	0.9+0.2 <b>1.1</b>	0.9+0.2 <b>1.1</b>
<b>C41-D/Z30</b>	0.8+0.5 <b>1.3</b>	1.4+0.5 <b>1.9</b>	1.3+1.2 <b>2.5</b>	1.1+0.8 <b>1.9</b>	0.9+0.5 <b>1.4</b>	0.9+0.5 <b>1.4</b>
<b>C61-Z10</b>	1.6+0.2 <b>1.8</b>	2.7+0.2 <b>2.9</b>	3.1+0.4 <b>3.5</b>	2.5+0.3 <b>2.8</b>	2.1+0.2 <b>2.3</b>	2.1+0.2 <b>2.3</b>
<b>C61-D/Z30</b>	1.6+0.5 <b>2.1</b>	2.7+0.5 <b>3.2</b>	3.1+1.2 <b>4.3</b>	2.5+0.8 <b>3.3</b>	2.1+0.5 <b>2.6</b>	2.1+0.5 <b>2.6</b>
<b>C81-D/Z30</b>	2.7+0.5 <b>3.2</b>	3.8+0.5 <b>4.3</b>	5.3+1.2 <b>6.5</b>	3.7+0.8 <b>4.5</b>	3.1+0.5 <b>3.6</b>	3.1+0.5 <b>3.6</b>
<b>C102-D/Z40</b>	5.5+0.8 <b>6.3</b>	8.0+0.8 <b>8.8</b>	11.5+2.0 <b>13.5</b>	8.5+1.7 <b>10.2</b>	7.0+0.8 <b>7.8</b>	7.0+0.8 <b>7.8</b>
<b>C122-D/Z40</b>	13.0+0.8 <b>13.8</b>	15.5+0.8 <b>16.3</b>	25.0+2.0 <b>27.0</b>	15.0+1.7 <b>16.7</b>	13.0+0.8 <b>13.8</b>	13.0+0.8 <b>13.8</b>

Table 3.6.6.4–1: Oil quantities for C Size 21 - 122

Type	Mounting position					
	B5-01	B5-03	B5-02	B5-00	V1-00/ A V1-00/ B	V3-00/ A V3-00/ B
<b>CF21-Z10</b>	0.6+0.2 <b>0.8</b>	0.7+0.2 <b>0.9</b>	0.9+0.4 <b>1.3</b>	0.8+0.3 <b>1.1</b>	0.7+0.2 <b>0.9</b>	0.7+0.2 <b>0.9</b>
<b>CF41-Z10</b>	0.8+0.2 <b>1.0</b>	1.2+0.2 <b>1.4</b>	1.4+0.4 <b>1.8</b>	1.2+0.3 <b>1.5</b>	0.9+0.2 <b>1.1</b>	0.9+0.2 <b>1.1</b>
<b>CF41-D/Z30</b>	0.8+0.5 <b>1.3</b>	1.2+0.5 <b>1.7</b>	1.6+1.2 <b>2.8</b>	1.2+0.8 <b>2.0</b>	0.9+0.5 <b>1.4</b>	0.9+0.5 <b>1.4</b>
<b>CF61-Z10</b>	1.6+0.2 <b>1.8</b>	2.7+0.2 <b>2.9</b>	3.6+0.4 <b>4.0</b>	2.5+0.3 <b>2.8</b>	2.2+0.2 <b>2.4</b>	2.2+0.2 <b>2.4</b>
<b>CF61-D/Z30</b>	1.6+0.5 <b>2.1</b>	2.7+0.5 <b>3.2</b>	3.6+1.2 <b>4.8</b>	2.5+0.8 <b>3.3</b>	2.2+0.5 <b>2.7</b>	2.2+0.5 <b>2.7</b>
<b>CF81-D/Z30</b>	2.7+0.5 <b>3.2</b>	3.9+0.5 <b>4.4</b>	5.5+1.2 <b>6.7</b>	5.4+0.8 <b>6.2</b>	3.2+0.5 <b>3.7</b>	3.2+0.5 <b>3.7</b>
<b>CF102-D/Z40</b>	4.0+0.8 <b>4.8</b>	8.5+0.8 <b>9.3</b>	10.0+2.0 <b>12.0</b>	8.5+1.7 <b>10.2</b>	6.3+0.8 <b>7.1</b>	6.3+0.8 <b>7.1</b>
<b>CF122-D/Z40</b>	8.5+0.8 <b>9.3</b>	16.0+0.8 <b>16.8</b>	21.0+2.0 <b>23.0</b>	15.5+1.7 <b>17.2</b>	13.0+0.8 <b>13.8</b>	13.0+0.8 <b>13.8</b>

Table 3.6.6.4–2: Oil quantities for CF Size 21 - 122

Type	Mounting position					
	H-01	H-02	H-03	H-04	H-05	H-06
<b>CA.21-Z10</b>	0.6+0.2 <b>0.8</b>	0.7+0.2 <b>0.9</b>	0.9+0.4 <b>1.3</b>	0.8+0.3 <b>1.1</b>	0.7+0.2 <b>0.9</b>	0.7+0.2 <b>0.9</b>
<b>CA.41-Z10</b>	0.7+0.2 <b>0.9</b>	1.2+0.2 <b>1.4</b>	1.4+0.4 <b>1.8</b>	1.2+0.3 <b>1.5</b>	0.9+0.2 <b>1.1</b>	0.9+0.2 <b>1.1</b>
<b>CA.41-D/Z30</b>	0.7+0.5 <b>1.2</b>	1.2+0.5 <b>1.7</b>	1.6+1.2 <b>2.8</b>	1.2+0.8 <b>2.0</b>	0.9+0.5 <b>1.4</b>	0.9+0.5 <b>1.4</b>
<b>CA.61-Z10</b>	1.6+0.2 <b>1.8</b>	2.4+0.2 <b>2.6</b>	3.1+0.4 <b>3.5</b>	2.4+0.3 <b>2.7</b>	2.0+0.2 <b>2.2</b>	2.0+0.2 <b>2.2</b>
<b>CA.61-D/Z30</b>	1.6+0.5 <b>2.1</b>	2.4+0.5 <b>2.9</b>	3.1+1.2 <b>4.3</b>	2.4+0.8 <b>3.2</b>	2.0+0.5 <b>2.5</b>	2.0+0.5 <b>2.5</b>
<b>CA.81-D/Z30</b>	2.7+0.5 <b>3.2</b>	3.8+0.5 <b>4.3</b>	5.3+1.2 <b>6.5</b>	5.2+0.8 <b>6.0</b>	3.2+0.5 <b>3.7</b>	3.2+0.5 <b>3.7</b>
<b>CA.102-D/Z40</b>	4.0+0.8 <b>4.8</b>	6.5+0.8 <b>7.3</b>	8.5+2.0 <b>10.5</b>	7.0+1.7 <b>8.7</b>	5.5+0.8 <b>6.3</b>	5.5+0.8 <b>6.3</b>
<b>CA.122-D/Z40</b>	8.5+0.8 <b>9.3</b>	12.5+0.8 <b>13.3</b>	19.5+2.0 <b>21.5</b>	15.0+1.7 <b>16.7</b>	12.5+0.8 <b>13.3</b>	12.5+0.8 <b>13.3</b>

Table 3.6.6.4–3: Oil quantities for CA. Size 21 - 122

## **4. Technical description**

### **4.1 General description**

The gear units are supplied with one, two or three transmission stages.

The self-powered trolley systems are delivered as helical worm gear units (Type CF) or as three-stage bevel gear units (Type KF). They are equipped with a mechanical coupling.

The gear units are suitable for use as drives for self-powered trolley systems in accordance with VDI Guideline 3643. Gear unit types CF15, CF25 and KF34 conform to VDI Guideline 3643.

The field of application is goods transport in roofed-over industrial environments. Use out of doors is possible by contractual agreement (increase of protection level, etc.).

The gear units are suitable for the different mounting positions, taking into consideration the oil level.

### **4.2 Housing**

The gear unit housings of grey cast iron are designed for continuous operation.

### **4.3 Toothed components**

The toothed components of the gear unit are hardened. In the case of helical-gear units the worm is hardened and ground and the gear manufactured from bronze.

### **4.4 Lubrication**

The toothed components are adequately supplied with lubricant by dip lubrication.

### **4.5 Shaft bearing**

All shafts are mounted in rolling bearings. The rolling bearings are lubricated by dip lubrication or oil spray lubrication. Bearings that are not supplied with lubricant are closed and grease-lubricated.

### **4.6 Shaft seals**

Radial shaft sealing rings at the shaft outlets prevent lubricant from escaping from the housing and dirt from entering. Where (by contractual agreement) housings are subjected to high temperatures, shaft sealing rings of temperature-resistant material are used.

## 4.7 Cooling



Caution.  
Dirt deposits impair cooling.

The gear units normally require no additional cooling. The generously dimensioned housing surface is sufficient for conducting away dissipated heat where there is free convection. If the difference between the temperature of the housing and the ambient temperature (max. +40 °C) exceeds 70 K, please contact the **FLENDER TÜBINGEN GMBH** customer service.

## 4.8 Couplings

### 4.8.1 Flexible couplings

As a rule, flexible couplings are provided for the input and output drive sides of the gear unit.

If rigid couplings or other input or output elements which generate additional radial and / or axial forces (e.g. gear wheels, belt pulleys) are to be used, this must be agreed by contract.



Caution.  
Couplings with peripheral velocities on the outer diameter of up to 30 m/s must be statically balanced. Couplings with peripheral velocities over 30 m/s must be dynamically balanced.

The special operating instructions should be observed for operation of the couplings.

### 4.8.2 Coupling

#### for self-powered trolley systems

Shifting the coupling lever breaks the force flow in the positive claw coupling on the output shaft. The output shaft can then be freely rotated, while the motor is stationary or idling.

## 4.9 Backstop

For certain requirements, the gear units can be fitted with a mechanical backstop. It permits only the correct direction of rotation during the operation of the unit. This is marked by a corresponding direction arrow.



**Caution.**

Damage or destruction of the backstop through wrong direction of rotation.  
Do not run motor against the backstop.  
Observe information on the gear unit.

The backstop is fitted with centrifugally operated sprags. When the gear unit is running in the specified direction, the inner ring and the cage with the sprags also rotate while the outer ring remains stationary.

Where the backstop is used in the coupling housing, lifting of the sprags is ensured at speeds above 1000 rpm. The backstop is wear-free. These need no maintenance.



**Caution.**

In the case of applications at speeds under 1000 rpm or frequent starting and stopping operations ( $\geq 20$  starts / stops an hour) the service life is limited.  
Ensure that the backstop is replaced in good time.

## 4.10 Paint coats

### 4.10.1 General

All paint finishes are sprayed on.



**Note.**

Information on repaintability is not a guarantee of the quality of the paint material supplied by your supplier.  
Only the paint manufacturer is liable for the quality and compatibility.

#### 4.10.2 Painted version

Paint system	Plastic	2K-PUR	2K-epoxide
<b>Colours</b>	RAL 1007, 1012, 1023, 2000, 2004, 3000, 5007, 5009, 5010, 5012, 5015, 6011, 7001, 7011, 7030, 7032, 7035, 9005, 9006, black-mat	RAL 1003, 1018, 2004, 5002, 5015, 6011, 7000, 7031, 9010, 9011, 9016	RAL 5015, 6018, 7031, 7035
<b>Typical area of application</b>	Standard-1-layer paint finish for interior areas	Standard 2-layer paint finish, especially for outside installation or higher corrosion protection requirements	high-quality paint finish in the outside area or where exposed to dilute acid and alkaline solution ( $\leq 5\%$ )
<b>Repaintability</b>	after prior rubbing down with: Plastic or synthetic resin paint; overpaintable after a setting time of 3 days	after prior rubbing down with: 2K-PUR paint, 2K-epoxide paint	after prior rubbing down with: 2K-PUR paint, 2K-epoxide paint, 2K-AC paint
<b>Chem. phys. resistance</b>	good resistance to: cleaning agent, oil and petrol; resistant to: exposure to dilute acid and alkaline solution for a short time ( $\leq 3\%$ ); not solvent-resistant; not steam-resistant	very good resistance to: oil, grease, petrol, water, seawater and cleaning agent; good resistance to: weather action and dilute acid and alkaline solution ( $\leq 3\%$ ); good mechanical resistance to: abrasion	excellent resistance to: weak acid and alkaline solution ( $\leq 5\%$ ), oil, grease, petrol, cooling emulsion, salt, solvent; tough and scratchproof paint film
<b>Temperature resistance</b>	$-40\text{ }^{\circ}\text{C} \dots +100\text{ }^{\circ}\text{C}$ temporarily up to $+140\text{ }^{\circ}\text{C}$	$-40\text{ }^{\circ}\text{C} \dots +150\text{ }^{\circ}\text{C}$	$-40\text{ }^{\circ}\text{C} \dots +150\text{ }^{\circ}\text{C}$
<b>Remark</b>	Standard paint finish with very good adhesive property, not suitable for: storage or installation outside	Standard paint finish for cooling tower and agitator drives or, if requested, resistance to sea water below deck, etc.	2K-epoxide paint becomes chalky when installed outside (without effect on quality), high gloss with good mechanical resistance

Table 4.10.2: Painted version

#### 4.10.3 Primed version

Paint system	primed	unpainted
Standard colour	RAL 7032	-
Typical area of application	for repainting: adhesion promoter for all common paint systems, temporary corrosion prevention	for repainting: temporary corrosion prevention
Repaintability	very good with: plastic paint, synthetic resin paint, 2K-PUR paint, 2K-epoxide paint, SH paint, 2K-AC paint	very good with: Plastic paint, synthetic resin paint, oil paint, bitumen paint, 2K-PUR paint, 2K-epoxide paint
Chem. phys. resistance	good resistance to: cleaning agent, good salt-spray resistance; resistant to: oil and petrol	-
Temperature resistance	-40 °C ... +150 °C	(-40 °C ... +150 °C)
Remark	Adhesion promoter with very good adhesive property and good corrosion prevention	GCI parts, dip-primed, steel parts primed or galvanised, aluminium and plastic parts untreated

Table 4.10.3: Primed version

## 5. Incoming goods, Handling and Storage

### 5.1 Incoming goods



**Note.**

Inspect the delivery immediately after arrival for completeness and any transport damage.

Notify the freight company of any damage caused during transport immediately, as otherwise it is not possible to have damage rectified free of charge.



**Caution.**

Ensure that damaged drives are not put into operation.

The drive unit is delivered in the fully assembled condition. Additional items are delivered separately packaged.

The products supplied are listed in the despatch papers.

## 5.2 Handling

Different forms of packaging may be used, depending on the size of the drive and method of transport. Unless otherwise agreed, the packaging complies with the **HPE Packaging Guidelines** (German Federal Association for wooden packaging means, pallets and export packaging).

Note the symbols applied to the packing. These have the following meanings:

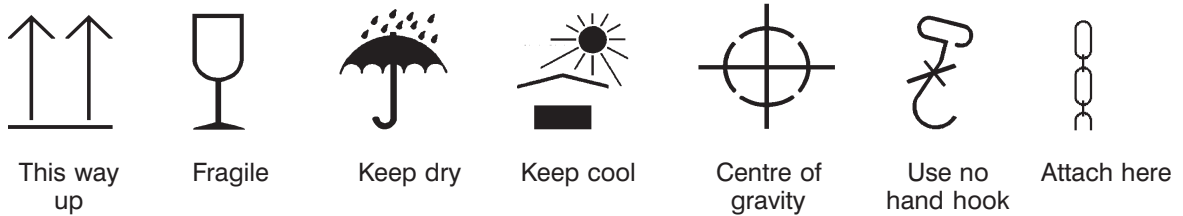


Figure 5.2–1: Symbols on packaging

### Fasten drive for suspended transport

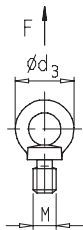


#### Danger.

Adhere to the maximum load in direction F of the eye bolt axis see picture and table 5.2–2 “Max. load in kg from drive to be attached”.

Use eye bolt on motor only for transporting the unmounted or demounted motor or as auxiliary support for the drive, e.g. to achieve a horizontal mounting position.

If necessary, use additional, suitable carrying means for transport or on installation. When attaching by a number of chains and ropes just two strands must be sufficient to bear the entire load. Secure carrying means against slipping.



$d_3$ [mm]	36	45	54	63	72	90	108
M	M 8	M 10	M 12	M 16	M 20	M 24	M 30
m [kg]	140	230	340	700	1200	1800	3600

Figure and Table 5.2–2: Max. load in kg from drive to be attached, with pull  $\uparrow$  in direction F of the bolt axis.



#### Caution.

Do not use the front threads at the shaft ends to attach eye bolts for transport.



**Caution.**

The use of force causes damage to the drive unit.

Transport drive carefully. Avoid knocks.

Remove any transport fixtures fitted before putting into operation and keep them safe or render them ineffective. Use them again for further transport or render them ineffective again.

- 1) Mount the drive on the transport device by the heaviest permissible weight to be attached. This will normally be on the main gear unit.
- 2) Check that the eye bolt is firmly seated.
- 3) Drive is slung for transport.

### 5.3 Storage

The gear unit must be stored in its position of use on a horizontal wooden support in a dry place not subject to high temperature fluctuations and covered over. The storage place must be free from vibration and shaking.



**Danger.**

Do not stack drive units one on top of another.



**Caution.**

Mechanical damage (scratches), chemical damage (acids, alkalis) and thermal damage (sparks, welding beads, heat) cause corrosion which may cause failure of the external protective coating.

Ensure that the paint is not damaged.

The drive units are provided with an interior preservative agent; the free shaft ends and flanges are painted for protection.



**Note.**

The guarantee period for the standard preservative lasts 6 months and, unless otherwise agreed, begins at the date of delivery of the gear unit.

In the case of longer periods of storage (> 6 months) special arrangements must be made for preservation. Contact the **FLENDER TÜBINGEN GMBH** customer service.

## 6. Installation

### 6.1 General information on installation



**Danger.**

When working with solvents, ensure adequate ventilation. Do not inhale vapours.  
Do not smoke!



**Caution.**

Overheating of the drives through exposure to direct sunlight.  
Provide suitable safety equipment, such as covers and roofs.



**Caution.**

Irreparable damage to toothed components and bearings from fusing.  
Do not carry out any welding work on the drive. The drives must not be used as an earthing point for welding operations.



**Note.**

Use headless bolts of strength class 8.8 or higher to fasten the drives.

Exercise particular care when assembling and installing. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

Ensure that there is sufficient space around the drive for assembly, maintenance and repair.

On drives with a fan leave sufficient free space for the entry of air.

Provide sufficient lifting gear at the start of assembly and fitting work.

Use all the fastening means which have been assigned to the relevant assembly option.

Cap screws cannot be used in some cases, as there is insufficient space available for inserting them.  
In case of doubt please contact the **FLENDER TÜBINGEN GMBH** customer service, quoting the type of gear unit.

## 6.2 Fastening in the case of high shock loads

In the case of high shock loads provide additional suitable positive fastenings such as cylindrical taper pins or spring pins.



### Caution.

Do not use spring washers, serrated lock washers, spring or toothed lock washers, cup washers or conical spring washers as a substitute for the above mentioned positive fastenings.

Do not subject the gear unit housing to excessive stress when tightening the fastening bolts.

## 6.3 Drives with foot mounting

### 6.3.1 Foundation

The foundation must be level and free from dirt.



### Note.

The levelness of the gear unit support must not exceed the following values:

for gear units up to size 80/81  $\leq 0.1$  mm

for gear units from size 100/101  $\leq 0.2$  mm.

The foundation should be designed in such a way that no resonance vibrations are created and that no vibrations are transmitted from adjacent foundations.

Steel structures on which the unit is to be mounted must be rigid. They must be designed according to the weight and torque, taking into account the forces acting on the gear unit.

When fastening the gear unit to concrete foundations by means of foundation blocks, suitable recesses should be made in the foundation.

Align and grout the slide rails into the foundation.

### 6.3.2 Installing gear units with foot mounting

Use stud bolts or headless bolts of strength class 8.8 or higher for the foot mounting.

## 6.4 Drives with flange mounting



### Caution.

Do not subject gear housings to overstress from add-on elements.  
Add-on elements must not transmit forces, torques and vibration to the drives.



### Caution.

Drives with B14 flanges according to the following table should be pinned together with the machine to be driven in order to be able to transmit the permissible forces and torques.



### Caution.

Observe maximum drilling depth (A-A).

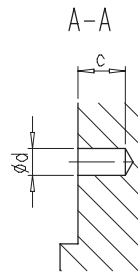
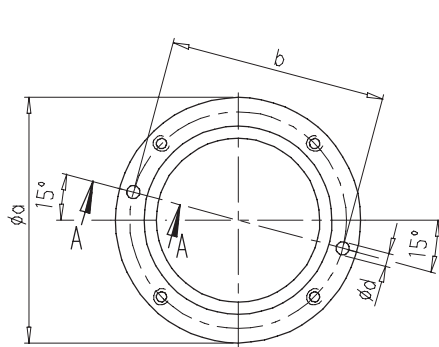


Figure 6.4–1

<b>a</b>	205	250	300
<b>b</b>	175	215	265
<b>c</b>	17	19	19
<b>d</b>	12	16	16

Table 6.4–1

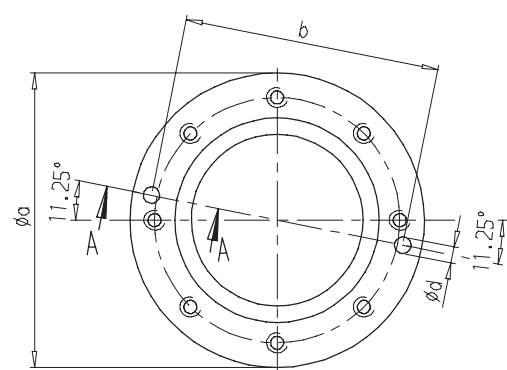


Figure 6.4–2

<b>a</b>	360	410
<b>b</b>	310	355
<b>c</b>	22	24
<b>d</b>	20	20

Table 6.4–2

## 6.5 Installation of input drive and output drive elements on gear unit shafts

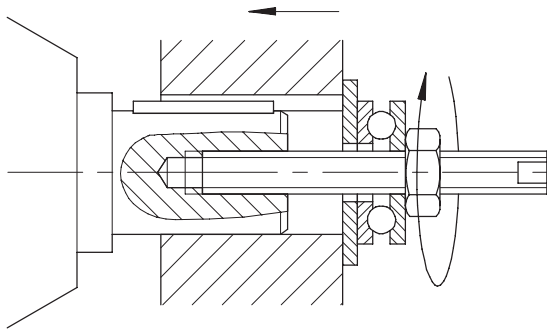
Use a fitting device to fit the drive or output elements.

Located in the shaft end faces are centring holes to DIN 332 which can be used for this.



**Note.**

Deburr the parts of elements to be fitted in the area of the hole or keyways.  
Recommendation:  $0.2 \times 45^\circ$



Example of a fitting device for fitting couplings or hubs on the ends of gear unit or motor shafts. If necessary, the axial thrust bearing on the fitting device can be dispensed with.

Figure 6.5–1: Fitting device

## Mount in- or output elements



**Caution.**

Damage to shaft sealing ring through solvent or benzine.  
Protect against contact at all time.

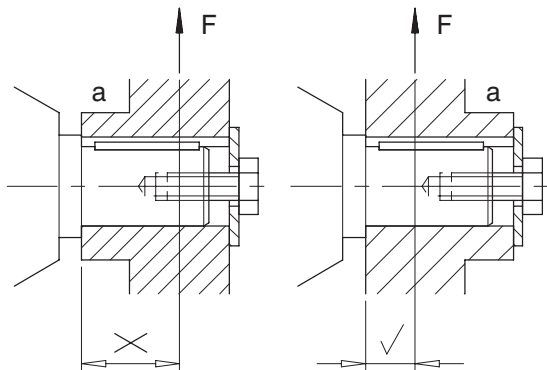
- 1) Using petrol ether or solvent, remove the corrosion-preventive paint coat on the shaft ends and flanges or remove any protective skin provided.



**Caution.**

Damage to bearings, housing, shaft and locking rings.  
Do not use a hammer to force the drive and output elements to be mounted onto the shaft.

- 2) Fit the drive and output elements onto the shafts and, if necessary, secure them.



Correct mounting arrangement of running wheel, gear or chain wheel, belt pulley, etc., to keep the shaft and bearing load exerted by transverse forces as low as possible.

Figure 6.5–2: Mounting arrangement

a Hub

✗ wrong

✓ right

Where couplings are to be fitted in a heated condition, please observe the specific operating instructions for the coupling.

## 6.6 Shaft-mounting gear unit with hollow shaft and parallel key, hollow shaft and splines, hollow shaft and shrink disk

### 6.6.1 Mounting the hollow shaft



#### Caution.

Damage to shaft sealing ring through solvent or benzine.  
Protect against contact at all time.

- 1) Using petrol or a solvent, remove the corrosion-preventive paint coat from the shaft ends and flanges.
- 2) Check the seats or edges of the hollow and machine shaft for damage. In case of damage contact the **FLENDER TÜBINGEN GMBH** customer service.



#### Note.

Coat with the mounting paste which comes with the delivery or any suitable lubricant, e.g. Calypsol type H 443 HD88 grease, to prevent frictional corrosion of the contact surfaces.



#### Caution in the case of shrink disks.

Lubricants in the area of the shrink disk seat impair torque transmission.  
Keep bore in hollow shaft and machine shaft completely grease-free.  
Do not use impure solvents and cleaning cloths.

- 3) Fit the drive with the aid of nut and threaded spindle. The counterforce is provided by the hollow shaft.



#### Caution.

The hollow shaft must be precisely aligned with the machine shaft to avoid misalignment.  
Do not overstress hollow shaft axially and radially.  
Failure to adhere to these may result in a failure of the bearings through excessive load.

- 4) Secure the hollow shaft axially on the machine shaft with e.g. a locking ring, washer or set screw at a tightening torque  $T_A$  acc. to table 6.6.1 "Tightening torque  $T_A$  set screw".

Size	KA.30 F.A.31	KA.40 F.A.41	KA.60 KA.80 F.A.61 F.A.81	KA.100 KA.120 KA.140 F.A.101 F.A.121 F.A.141	KA.160 KA.180 F.A.161 F.A.181	KA.200 F.A.201
$T_A$ [Nm]	16	28	69	138	237	480
Size	CA.21	CA.41	CA.61	CA.81	CA.102	CA.122
$T_A$ [Nm]	16	16/28	69	69/138	138	138/237

Table 6.6.1: Tightening torque  $T_A$  set screw



#### Note for shrink disks.

The hollow shaft is axially secured on the machine shaft by means of a shrink disk connection.

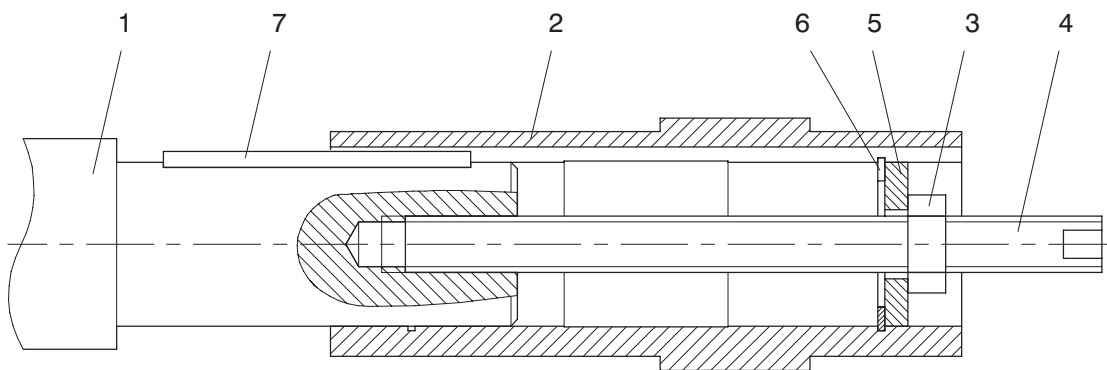


Figure 6.6.1–1: Mounting hollow shaft and parallel key

Part. 3 - Part 4 are not included in scope of delivery.

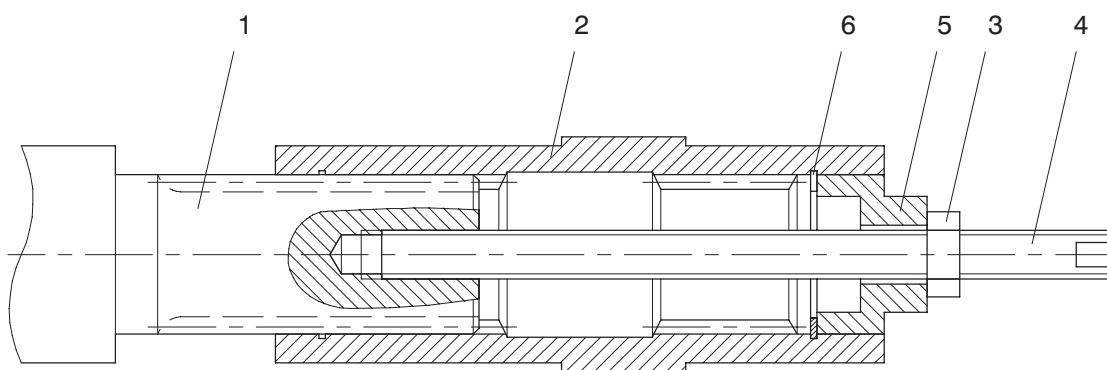


Figure 6.6.1–2: Mounting hollow shaft and splines

Part. 3 - Part 4 are not included in scope of delivery.

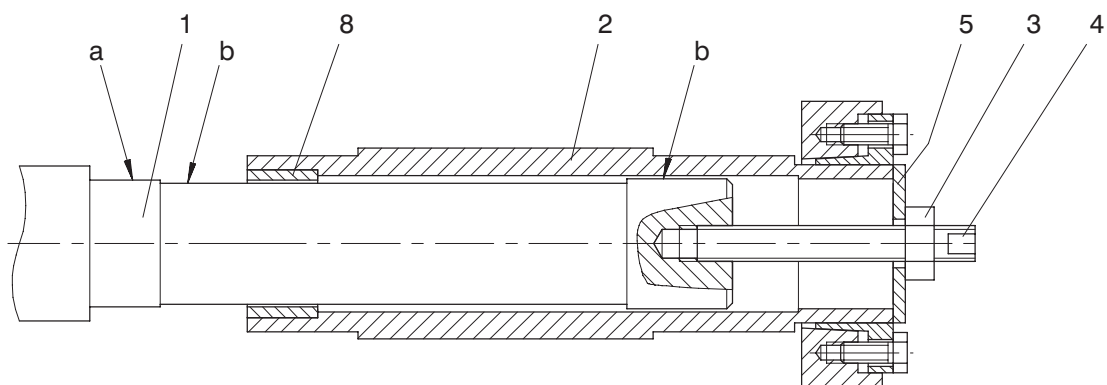


Figure 6.6.1–3: Mounting hollow shaft and shrink disk

Part 3 - Part 5 are not included in scope of delivery.

- a greased
- b absolutely free of grease
- 1 Machine shaft
- 2 Hollow shaft
- 3 Hexagon nut
- 4 Threaded spindle
- 5 Washer
- 6 Locking ring
- 7 Parallel key
- 8 Bronze bush



**Note.**

Coat with a suitable lubricant, e.g. Calypsol type H 443 HD88 grease, to prevent frictional corrosion of the contact surfaces of the customer's machine shaft in the vicinity of the bronze bush.

Instead of the nut and threaded spindle shown in the diagram, other types of equipment such as hydraulic lifting equipment may be used.

## 6.6.2 Remove hollow shaft and parallel key



**Caution.**

Before driving out the machine shaft fasten a suitably dimensioned means of absorbing load to the drive.

Slightly pretension the drive element so that the drive does not drop into the drive element when the insert-shaft is released.

If frictional corrosion has occurred on the seat surfaces, use rust solvent to enable the gear unit to be pulled off. Allow the rust solvent to work in sufficiently.

- 1) Remove the axial fastening of the hollow shaft.



**Caution.**

It is essential to prevent misalignment when removing the gear unit.

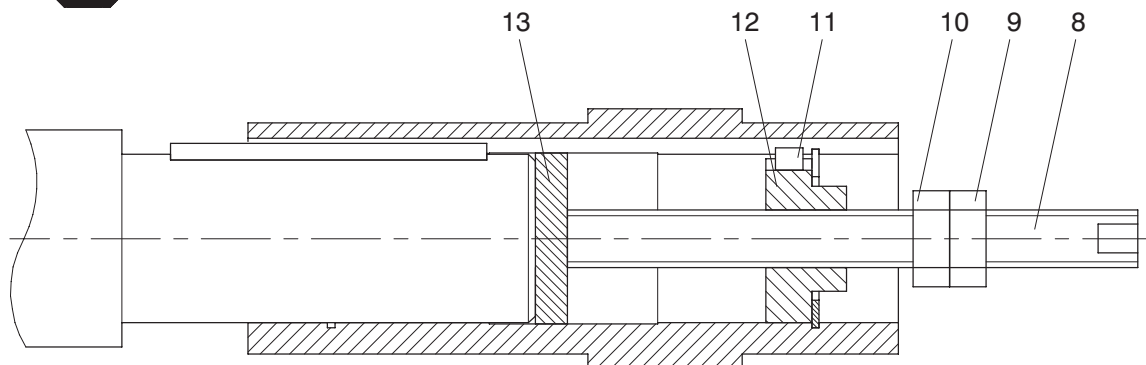


Figure 6.6.2: Remove hollow shaft and parallel key

- 8 Threaded spindle
- 9 Hexagon nut
- 10 Hexagon nut
- 11 Parallel key
- 12 Threaded block
- 13 Washer

Part 8 - Part 13 are not included in scope of delivery.

Suggested design for threaded piece and disc see figure 6.6.3 and table 6.6.3.

- 2) Drive out the machine shaft with the aid of the disk, part 13, threaded block, part 12, parallel key, part 11, and threaded spindle, parts 8 - 10.
- 3) When the rust solvent has sufficiently worked in, pull off the gear unit, using the device, see figure 6.6.2 "Remove hollow shaft and parallel key" .

### 6.6.3 Suggested design for threaded piece and disc

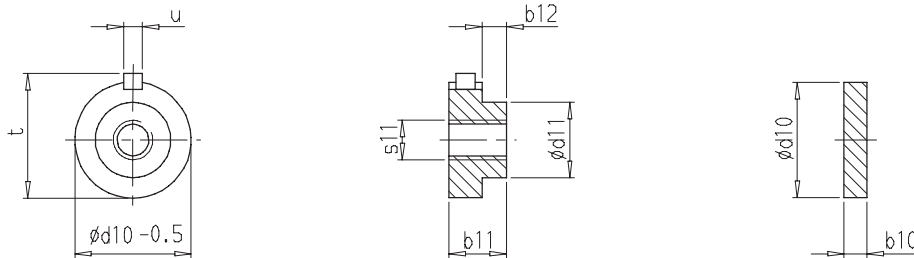


Figure 6.6.3: Suggested design for threaded piece and disc

Size	b10 [mm]	b11 [mm]	b12 [mm]	d10 [mm]	d11 [mm]	s11	t <sub>max</sub> [mm]	u [mm]
KA.30, F.A.41	6	15	10	29.9	18	M10	33	8
KA.40, F.A.41	6	15	5	34.9	24	M12	43	10
KA.60, F.A.61	7	20	7	39.9	28	M16	48.5	12
KA.80, F.A.81	7	20	10	49.9	36	M16	64	14
KA.100, F.A.101	10	24	10	59.9	45	M20	74.5	18
KA.120, F.A.121	10	24	5	69.9	54	M20	85	20
KA.140, F.A.141	10	24	7	79.9	62	M20	95	22
KA.160, F.A.161	10	30	8	99.9	80	M24	106	28
KA.180, F.A.181	10	30	11	119.9	95	M24	127	32
KA.200, F.A.201	12	35	19	139.9	115	M30	148	36
CA.21	6	15	10	24.9	15	M10	28	8
				29.9	20		33	
CA.41	6	15	10	29.9	20	M10	33	8
			5	34.9	24	M12	38	10
CA.61	7	20	7	39.9	28	M16	43	12
				44.9	34		48.5	14
CA.81	7	20	10	49.9	36	M16	53.5	14
	10	24		59.9	45	M20	64	18
CA.102	10	24	10	59.9	45	M20	64	18
			5	69.9	54		74.5	20
CA.122	10	24	5	69.9	54	M20	74.5	20
				89.9	70	M24	95	25

Table 6.6.3: Suggested design for threaded piece and disc

## 6.7 Shrink disc

### 6.7.1 Mounting the shrink disc

The shrink disc is delivered ready for installation.



**Caution.**

Do not dismantle shrink disc before initial fitting.



**Caution.**

Lubricants in the area of the shrink disc seat impair torque transmission.  
Keep bore in hollow shaft and machine shaft completely grease-free.  
Do not use impure solvents and cleaning cloths.



**Note.**

Lightly grease the shrink disc seat on the hollow shaft.



**Caution.**

Plastic deformation of the hollow shaft when tightening the tensioning bolts before fitting the machine shaft.  
First fit machine shaft. Then tighten tensioning bolts.

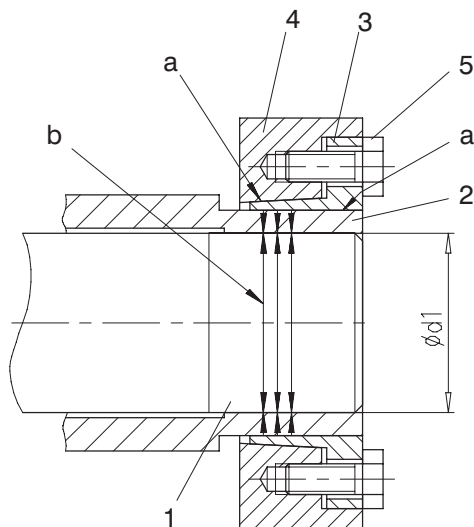


Figure 6.7.1–1: Shrink disc

- a greased
- b absolutely free of grease
- 1 Machine shaft
- 2 Hollow shaft
- 3 Inner ring
- 4 Outer ring
- 5 Tensioning bolt

- 1) Tighten the tension bolts, item 5, handtight initially.
- 2) Working round several times, evenly tighten the tension bolts, item 5, 1/4 turn each time.



**Caution.**

Avoid overloading the individual bolts.

Do not exceed the maximum torque acc. to table 6.7.1 "Tightening torque  $T_A$  clamping screw" at  $\mu = 0,1$ .

Of prior importance is the alignment of the end faces. If this squareness is not achieved during tensioning, check the tolerance of the insert shaft.

Tensioning bolt	d1 [mm]	strength class	
		10.9 [Nm]	12.9 [Nm]
M 6	12 - 30	12	-
M 8	36 - 68	29	35
M 10	75 - 100	58	70
M 12	105 - 125	100	121
M 14	135 - 155	160	193
M 16	160 - 200	240	295
M 20	220 - 280	470	570

Table 6.7.1: Tightening torque  $T_A$  clamping screw

## 6.7.2 Pulling off the shrink disc

- 1) Working round several times, loosen the tensioning bolts one after the other a 1/4 turn each time.
- 2) Pull the shrink disc from the hollow shaft.

If the outer ring does not release from the inner ring, several clamping screws can be removed and then screwed into adjacent forcing threads.

The rings can then be released without difficulty.

### 6.7.3 Cleaning and greasing the shrink disc

Loosened shrink discs need not be dismantled and re-greased before being re-tensioned.

If the shrink disc is dirty, clean and relubricate it.

Before reassembly grease only the inner sliding surfaces of the shrink disc.

Use for this a solid lubricant with a friction coefficient of  $\mu = 0,04$  in accordance with table 6.7.3 "Lubricants for shrink disc cleaning".

Grease the bolts on the thread and the part below the head with a paste containing  $\text{MoS}_2$ , e.g. Molykote BR2.

Lubricant	Commercial form	Manufacturer
Molykote 321 R (lubricating paint)	Spray	DOW Corning
Molykote Spray (Powder spray)		
Molykote G Rapid	Spray or Paste	Klüber Lubrication
Molykombin UMFT 1	Spray	
Unimily P 5	Powder	
Aemasol MO 19 P	Spray or Paste	A. C. Matthes

Table 6.7.3: Lubricants for shrink disc cleaning

## 6.8 Attachment of standard motors



#### Caution.

If drives are inadequately sealed, moisture may find a way in

If installing the drive outside or in the case of a higher type of protection ( $\geq \text{IP } 55$ ): Seal flange, screws, part 505, and any plugs, part 502, and part 503, or fitted elements such as proximity switch, with suitable sealing compound.

Flange-mounted motors must generate a sealing surface running all the way round.



#### Note.

Dimension z12 applies to standard assignment of the coupling. In the case of a special assignment, refer for the dimension to the relevant special dimension diagram.

## 6.8.1 Fit standard motor on coupling bell housing with BIPEX coupling

IEC B5 63-315, NEMA TC 42-145

NEMA TC 182-365

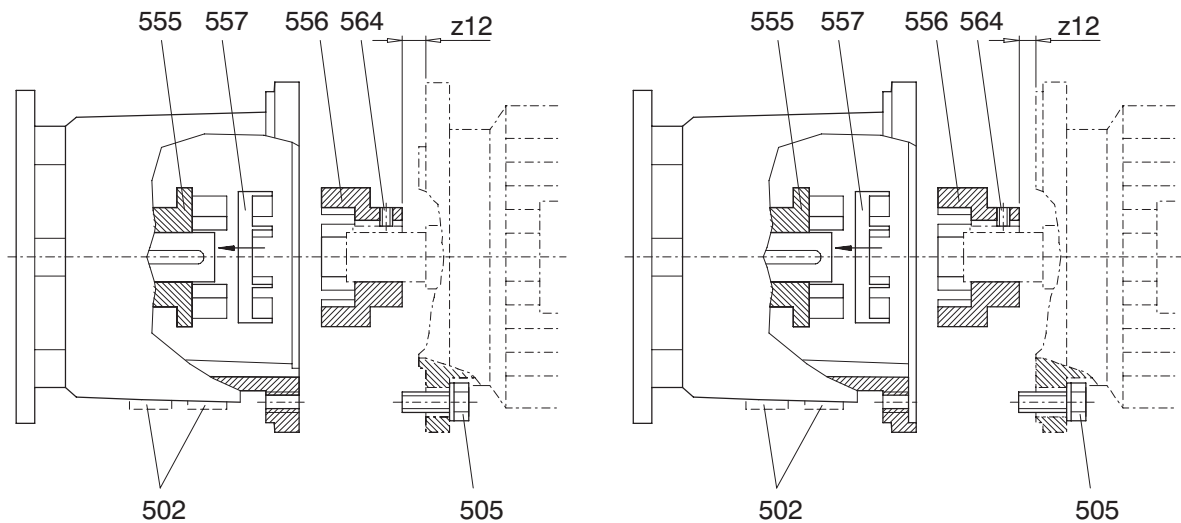


Figure 6.8.1: Coupling housing with torsionally flexible coupling

- 502 Plug
- 505 Hexagon head screw
- 555 Coupling half
- 556 Coupling half
- 557 flexible element
- 564 Set screw

- 1) Fit the coupling half, part 556, onto the end of the motor shaft in accordance with section 6.5 "Installation of input drive and output drive elements on gear unit shafts".
- 2) Adhere to the spacing dimension z12 acc. to table 6.8.1–1 "Distance dimension z12".

IEC B5	63	71	80	90	100	112	132	160	180	200	225	280	280	315
<b>z12 [mm]</b>	4	4	19	25	33	21	40	56	56	45	73	73	63	62

NEMA TC	42C	48C	56C	143TC / 145TC	182TC / 184TC	213TC / 215TC	254TC / 256TC	284TC / 286TC	324TC / 326TC	364TC / 365TC
<b>z12 [mm]</b>	14	14	30	30	37	40	46	56	68	68

Table 6.8.1–1: Distance dimension z12

- 3) Using the set screw, part 564, secure the coupling half, part 556, against axial displacement.
- 4) In the case of motors which are balanced with a half parallel key (symbol "H") machine off projecting and visible parts of the parallel key.
- 5) Insert the flexible element part 557 into the coupling half part 555.

- 6) Flange-mount the motor on the coupling housing and fasten it with the bolts, part 505, to the prescribed torque acc. to table 6.8.1–2 “Tightening torque  $T_A$  fitted motor”.

Thread size	Tightening torque $T_A$ strength class min. 8.8 [Nm]	Thread size	Tightening torque $T_A$ strength class min. 8.8 [Nm]
M 4	3	M 16	210
M 5	6	M 20	450
M 6	10	M 24	750
M 8	25	M 30	1500
M 10	50	M 36	2500
M 12	90		

Table 6.8.1–2: Tightening torque  $T_A$  fitted motor

## 6.8.2 Using a clamp ring, attach standard motor to coupling housing



### Caution.

Set screw, part 564, must not be in contact, of hexagon socket screw, part 561, has been tightened.



### Caution.

Do not overstress the motor shaft axially when flange-mounting the motor. Keep the motor shaft completely grease-free in the area of the clamp ring. In the case of brake motors release the brake while flange-mounting.



### Caution.

When pushing the motor onto the coupling, the motor bearing on the ventilation side may become overstressed. When fitting the motor in a vertical position from size 100 upwards the weight of the rotor shaft prevents the bearing from being overstressed. When fitting the motor in a horizontal position and for motors up to size 90, see work steps 5) - 7).

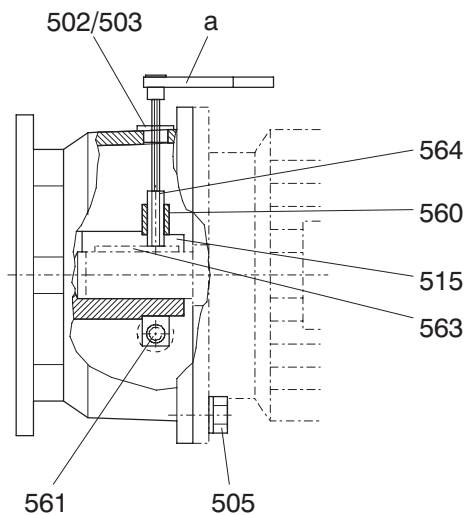


Figure 6.8.2–1: Coupling lantern with clamping ring

- a Torque wrench
- 502 Mounting plug
- 503 Mounting plug
- 505 Hexagon head screw
- 515 Drive shaft
- 560 Clamp ring
- 561 Hexagon socket head screw
- 563 Parallel key
- 564 Set screw

- 1) Remove the mounting plugs part 502 and part 503.
- 2) Align drive shaft, part 515, and clamp ring, part 560, of the gear unit by turning to the mounting holes for mounting plugs, part 502 and part 503.
- 3) Fix clamp ring, part 560.
- 4) Flange-mount the motor on the coupling housing and fasten it with the bolts, part 505, to the prescribed torque acc. to table 6.8.1–2 “Tightening torque  $T_A$  fitted motor”.
- 5) Remove the fan cover.

- 6) Ease the overstress on the bearing by lightly pressing the shaft end by hand, see figure 6.8.2–2 “Pressure on motor shaft”.

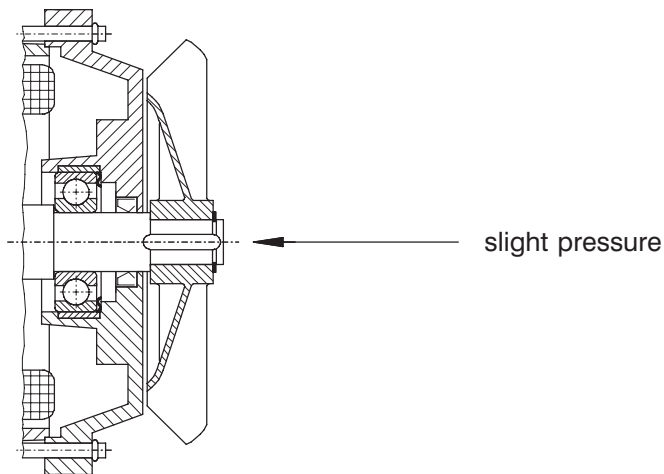


Figure 6.8.2–2: Pressure on motor shaft

- 7) Mount the fan cowl.
- 8) Screw the set screw, part 564, onto parallel key, part 563, until slight resistance is felt, then unscrew the set screw half a turn.
- 9) Insert the Allen key into set screw, part 564, through the hole for part 503. This prevents the shaft turning.
- 10) Tighten the hexagon socket screw, part 561, to tightening torque  $T_A$  and using wrench width  $S_{W2}$  in acc. with table 6.8.2 “ $T_A$  and  $SW$ ”.
- 11) Tighten the set screw part 564 to tightening torque  $T_A$  and using with wrench width  $S_{W1}$  in acc. with table 6.8.2 “ $T_A$  and  $SW$ ”.

IEC B5	63	71	80	90	100	112	132	160	180	200
$T_A$ [Nm]	6	6	6	6	10	10	10	25	25	50
$SW1$ [mm]	2	2	2	2.5	3	3	3	3	3	4
$SW2$ [mm]	4	4	4	4	5	5	5	6	6	8

NEMA TC	56C	143TC / 145TC	182TC / 184TC	213TC / 215TC	254TC / 256TC	284TC / 286TC
$T_A$ [Nm]	6	6	10	10	25	25
$SW1$ [mm]	2	2	3	3	3	3
$SW2$ [mm]	4	4	5	5	6	6

Table 6.8.2:  $T_A$  and  $SW$

- 12) Seal the mounting holes with the plugs, part 502 and part 503.

## 6.9 Motor base plate



### Danger.

Rotating drive parts.

Always fit suitable safety equipment to cover the belt, chain or other open drives.



### Caution.

Belt breakage and bearing damage through incorrect belt tension.

Observe operating instructions for V-belt drives.

Fit belt pulleys onto the drive shaft, part 515, in accordance with section 6.5 "Installation of input drive and output drive elements on gear unit shafts".



### Caution.

On completing installation and adjusting work protect bright parts against corrosion.

Use a suitable, durable corrosion-preventive medium.

The motor bedplate serves to mount an IEC-B3 foot-mounted motor used mainly to drive a V-belt drive. Fit the motor in accordance with the manufacturer's operating instructions.

For other types of drive, e.g. chain drive, please observed the relevant operating instructions or manufacturer's information.

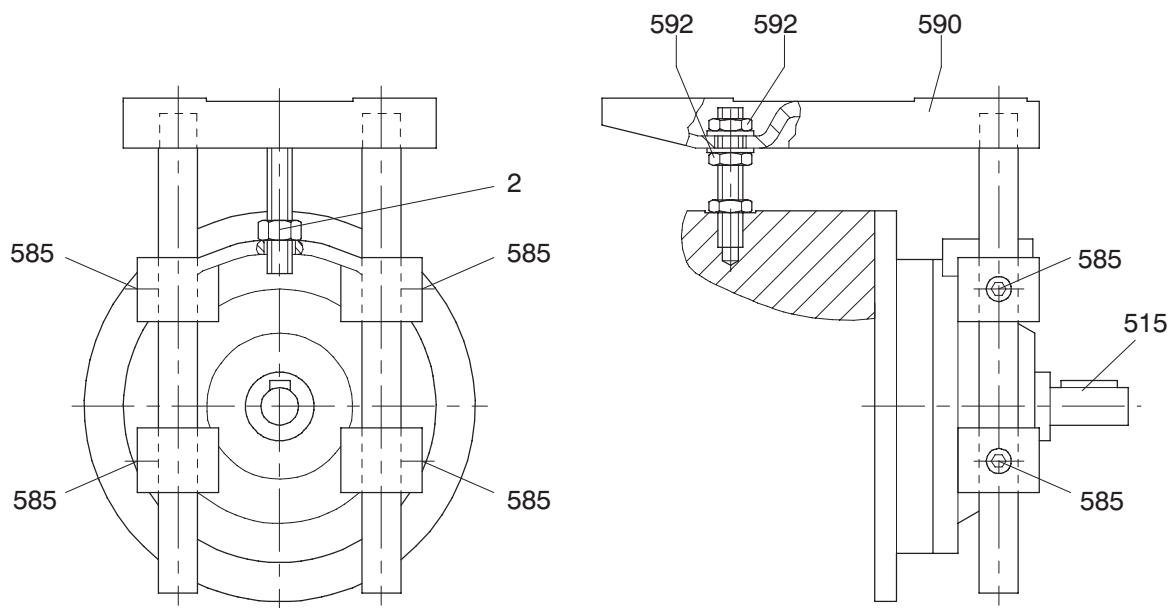


Figure 6.9: Mounting motor bedplate

- 2 Hexagon nut
- 515 Drive shaft
- 585 Set screw
- 590 Motor plate
- 592 Hexagon nut

- 1) Loosen the set screws Pos. 585 (4x).  
From motor size 225:
- 2) Undo the hexagon nuts, part 592, of the support.
- 3) Adjust the height of the motor plate, part 590, by evenly turning the screw, part 588, and adjust e.g. the belt tension.
- 4) After setting the correct height tighten the set screws, part 585, (4x).



**Caution.**

When tightening the hexagon nuts, part 592, do not force or twist the motor plate, part 590, into a different position.

From motor size 225:

- 5) Tighten the hexagon nuts, part 592, of the support.

## 6.10 Clutch lever

When dismantling or changing the Clutch lever it is to be observed, that during loosening or tightening of fixation nut Pos.1, the threaded stud Pos.2 does not turn.  
Use hexagon socket wrench for fixation.

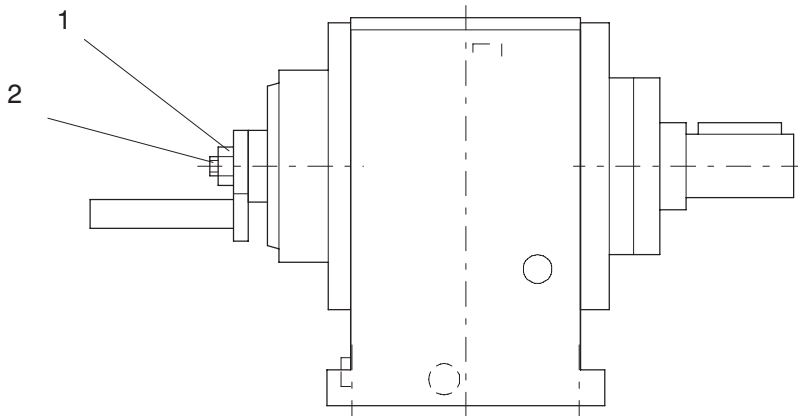


Figure 6.10: Clutch lever

- 1 Hexagon nut
- 2 Set screw

## 6.11 Torque arm with shaft-mounted gear units

The torque arm serves to absorb the reaction torque and, if necessary, the weight of the drive.



**Caution.**

Dangerously high impact moments due to too high backlash.  
Ensure that the torque support does not give rise to excessive constraining forces (e.g. through the driven shaft running out of true).



**Caution.**

Keep solvents, oils, greases and fuels away from the rubber elements.

### 6.11.1 Fit torque arm on bevel-helical gear unit and helical gear unit



**Danger.**

The torque arm bush must be mounted in bearings on both sides.

Suggestion for fitting the gear unit with torque arm:

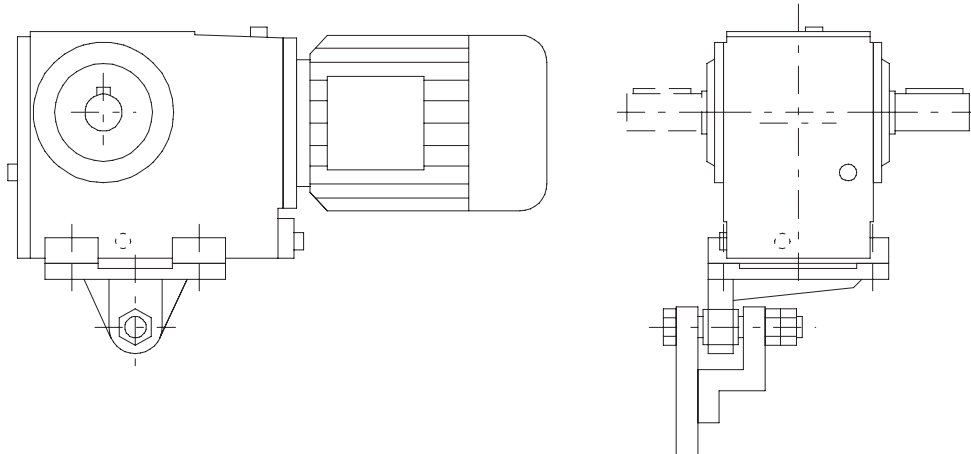


Figure 6.11.1 – 1: Torque arm on foot

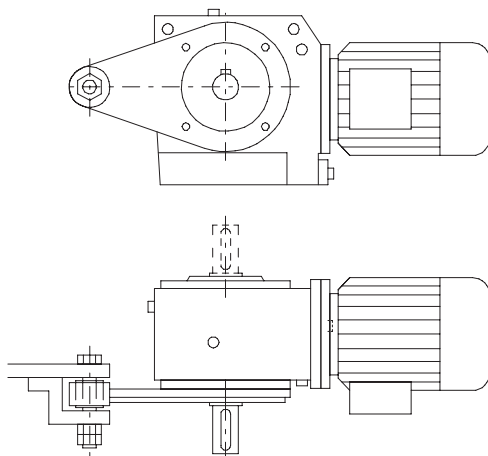


Figure 6.11.1 – 2: Torque arm on flange

The torque arm may be fitted in various positions, depending on the hole circle pitch.

Properties of the rubber elements:

Basic material natural rubber	60 Shore A
thermal resistance	–45 °C ... +70 °C

- 1) Clean the contact surfaces between housing and torque arm.
- 2) Tighten the bolts to the prescribed torque acc. to table 6.11.1 “Tightening torque  $T_A$  Fitting torque arm”.

Thread size	Tightening torque $T_A$ strength class min. 8.8 [Nm]	Thread size	Tightening torque $T_A$ strength class min. 8.8 [Nm]
M 8	25	M 20	450
M 10	50	M 24	750
M 12	90	M 30	1500
M 16	210		

Table 6.11.1: Tightening torque  $T_A$  Fitting torque arm

## 6.11.2 Mounting torque arm on parallel shaft helical gear unit



### Note.

We recommend using pretensioned, damping rubber elements.

Suggestion for fastening the rubber elements ordered from and supplied by us:

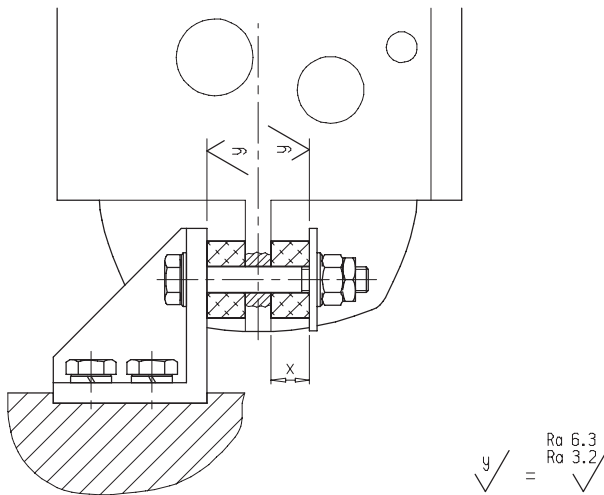


Figure 6.11.2: Torque arm on parallel shaft helical gear unit

Fixings such as angle, screw, nut etc. are not included in the delivery.

Type	F. 31	F. 41	F. 61	F. 81	F. 101	F. 121	F. 141	F. 161	F. 181
x [mm]	14.2	18.9	18.6	28.7	28.1	37.8	37.7	48.3	47.7

Table 6.11.2: Setting dimension x

Properties of the rubber elements:

Basic material natural rubber 70 Shore A  
thermal resistance -40 °C ... +80 °C

## 7. Start-up



**Danger.**

Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch.



**Danger.**

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

### 7.1 Oil level check before start-up

Check the oil level before starting up, rectify the oil level, if necessary.



**Note.**

Description of the work see section 10.2.1 "Oil level".

### 7.2 Fill in oil

If the gear unit has been delivered without oil, put in lubricant before starting up.



**Note.**

Description of the work see section 10.2.3 "Oil change".

### 7.3 Ventilation of the gear unit

#### 7.3.1 Filter for ventilation or pressure relief valve without securing clip

In the case of gear units with required housing ventilation the necessary ventilation filter or pressure relief valve without a securing clip is delivered separately. They must be replaced with the appropriate screw plug before starting up the gear unit.



- 1) Unscrew the sealing element at the point marked with this symbol, see section 3.5 "Mounting positions".

- 2) Seal the gear unit with the ventilation filter or the pressure relief valve without securing clip.

## 7.4 Start-up after long-term preservation

### 7.4.1 Long-term preservation up to 18 months

The gear unit is preserved internally, but delivered without oil.



**Caution.**

Before starting up fill the gear unit with lubricant, see section 10.2.3 “Oil change”.

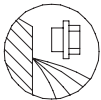
### 7.4.2 Long-term preservation up to 36 months

The gear unit is delivered with a complete oil filling.



**Caution.**

Before starting up adjust oil level in accordance with the assembly option, see section 3.5 “Mounting positions”.



- 1) Unscrew the sealing element at the point marked with this symbol, see section 3.5 “Mounting positions” and drain the oil.

- 2) Check the oil level.

- 3) Rectify the oil level, if necessary, see section 10.2.3 “Oil change”, and check it again.

## 7.5 Drive with backstop (special version)



**Caution.**

Before starting up check direction of rotation.

Turn drive side or motor over manually.

Check direction of motor rotation with the aid of the phase sequence. If necessary, exchange two outer conductors.

## 8. Operation



### Caution.

In case of changes during operation the drive must be switched off immediately. Determine the cause of the fault with the aid of the fault table in section 9. "Faults, causes and remedy".

Remedy faults or have faults remedied.

Check the gear unit during operation for:

- excessive operating temperature
- changes in gear noise
- possible oil leakage at the housing and shaft seals.

### Operating the coupling



### Danger.

The motor brake is disabled after disengagement.



### Caution.

Gear unit damage through acceleration surges.

Avoid acceleration surges when disengaging.

When starting up, ensure by checking the coupling that the motor brake is released.

The gear unit can be disengaged under load during operation.

The coupling is suitable for engagement when:

- the motor and output shaft are stationary
- output speeds and weights are low
- speed differences are low before and after shifting, e.g. when driving into and out of a drag conveyor or similar conveyor systems at a low speed, if the coupling is shifted via switching edges.

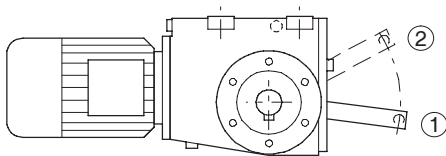


Figure 8.: Clutch lever

Engaging: Move coupling lever until stop in direction 1, see section 3.5.5 "Assembly options for self-powered trolley systems".

Disengaging: Move coupling lever until stop in direction 2, see section 3.5.5 "Assembly options for self-powered trolley systems".

### Shifting force required on coupling lever

The shifting force specifications  $F$  relate to the stationary state. The values shown in the table 8. "Shifting force required on coupling lever" are guide values. If, when shifting, a torque is transmitted on the output shaft, the required forces can be increased manyfold.

Type	CF15	CF25	KF34	KF45	KF65	KF85
<b>F</b> [N]	60	75	100		120	

Table 8.: Shifting force required on coupling lever

## 9. Faults, causes and remedy



### Note.

Faults and malfunctions occurring during the guarantee period and requiring repair work on the drive must be carried out only by **FLENDER TÜBINGEN GMBH** Customer Service. In the case of faults and malfunctions occurring after the guarantee period and whose cause cannot be precisely identified, we advise our customers to contact our customer service.

If you need the help of our customer service, please state the following:

- data on the rating plate
- kind and extent of the fault
- suspected cause.

Malfunctions	Causes	Remedy
Unusual noises on the gear unit	oil level too low	check oil level, see section 10.2.1 "Oil level".
	foreign bodies in oil (irregular noise)	stop drive. Check oil quality. Clean drive. Change oil, see section 10.2.2 "Oil quality".
	excessive bearing play and/or bearing defective	check and, if necessary, replace bearings.
	teeth defective	check teeth and, if necessary, replace.
	fastening bolts loose	tighten bolts / nuts, see section 10.2.10 "Checking tightness of fastening bolts".
	excessive load on drive and output	check load on rating data. E.g. adjust belt tension.
	transport damages	check drive for transport damage.
	damage through blocking during start-up	contact customer service.
Unusual noises on the drive unit	bearing of drive unit not lubricated (from motor size 160 upwards)	relubricate bearing, see section 10.2.5 "Relubrication of the rolling bearings in drive units".
	excessive bearing play and/or bearing defective	check and, if necessary, replace bearings.
	fastening bolts loose	tighten bolts / nuts, see section 10.2.10 "Checking tightness of fastening bolts".

Malfunctions	Causes	Remedy
Unusual noises on the motor	excessive bearing play and/or bearing defective	check and, if necessary, replace bearings.
	motor brake rubbing	check, and if necessary adjust lifting gap.
	inverter parametrisation	correct parametrisation.
Oil leak	incorrect oil level for assembly option used	check assembly option, see section 3.5 "Mounting positions". Check oil level, see section 10.2.1 "Oil level".
	overpressure due to lack of ventilation	mount ventilation acc. to mounting position, see section 3.5 "Mounting positions".
	overpressure due to soiled ventilation	clean ventilation system, see section 10.2.8 "Clean ventilation filter".
	shaft sealing rings defective	replace shaft sealing rings.
	cover / flange bolts loose	tighten bolts / nuts, see section 10.2.10 "Checking tightness of fastening bolts". Continue observation of drive unit.
	surface sealing defective (e.g. on cover, flange)	reseal.
	transport damage (e.g. microcracks)	check drive for transport damage.
Oil leakage on gear-unit ventilation	incorrect oil level for the assembly option used and/or incorrect ventilation position	check position of ventilation and assembly option, see section 3.5 "Mounting positions". Check oil level, see section 10.2.1 "Oil level".
	frequent cold starts, during which the oil foams up	contact customer service.
Gear unit overheating	motor fan cover and/or drive badly soiled	clean fan cover and surface of drive, see section 10.2.9 "Clean drive".
	incorrect oil level for assembly option used	check assembly option, see section 3.5 "Mounting positions". Check oil level, see section 10.2.1 "Oil level".
	incorrect oil being used (e.g. incorrect viscosity)	check oil used, see section 10.2.2 "Oil quality".
	oil too old	check date of last oil change. Change oil, see section 10.2.3 "Oil change".
	excessive bearing play and/or bearing defective	check and, if necessary, replace bearings.
	backstop not running freely	replace backstop.

Malfunctions	Causes	Remedy
Output shaft does not turn when motor is running	force flow interrupted by breakage in the gear unit	contact customer service.
Drive does not run or starts with difficulty	incorrect oil level for assembly option used	check assembly option, see section 3.5 "Mounting positions". Check oil level, see section 10.2.1 "Oil level".
	incorrect oil being used (e.g. incorrect viscosity)	check oil used, see section 10.2.2 "Oil quality".
	excessive load on drive and output	check load on rating data. E.g. adjust belt tension.
	motor brake is not lifted	check switching/connection of brake. Check brake for wear. If necessary, readjust brake.
	drive runs against backstop	change direction of motor or backstop rotation.
	gear unit is disengaged	engage coupling.
Excessive play on drive and output	flexible elements worn (e.g. with couplings)	replace flexible elements.
	positive connection disrupted by overload	contact customer service.
Excessive play on coupling lever	coupling lever has worked loose	tighten fixing nut of coupling lever.
	after disengaging the coupling is set tooth to tooth	turn output shaft until coupling engages.
When the coupling lever is operated, the coupling does not disengage or engage	coupling has got out of adjustment	contact customer service. Coupling must be readjusted or serviced.
Drop of speed or torque	belt tension too low (in case of belt drive).	check belt tension, replace belt, if necessary.

Table 9.: Faults, causes and remedy

## 10. Maintenance and repair

### 10.1 General information for maintenance

All inspection, maintenance and repair work must be done with care by trained and qualified personnel only. Observe the instructions given in section 2. "Safety instructions".



**Note.**

Maintenance and servicing must be carried out only by properly trained, authorised personnel. Only parts supplied by **FLENDER TÜBINGEN GMBH** must be used for servicing.

Measure	Interval	Description of work
Observe and check drive unit for unusual noises, vibrations or changes	daily; if possible, more frequently during operation	see section 8. "Operation".
Check housing temperature	after 3 h, 1 day, then monthly	
Checking oil level	after the 1st day, then monthly	see section 10.2.1.1 "Check the oil level in the gear housing".
Checking the oil quality	every 6 months	see section 10.2.2 "Oil quality".
First oil change after start-up	after approx. 10000 operating hours, at the latest after 2 years.	see section 10.2.3 "Oil change".
Subsequent oil changes	every 2 months or 10000 operating hours 1)	
Checking gear unit for leaks	after the 1st day, then monthly	see section 10.2.7 "Seal check".
Clean ventilation and, if necessary, replace	depending on degree of soiling, at least every 6 months.	see section 10.2.8 "Clean ventilation filter".
Clean drive		see section 10.2.9 "Clean drive".
Check, and if necessary adjust slip coupling	every 12 months at least	see section 10.2.12 "Carry out maintenance on slip coupling".

Measure	Interval	Description of work
Check coupling	for first time after 3 months	Observe the separate operating instructions.
Carrying out complete inspection of drive unit	every 12 months	see section 10.2.11 "Inspection of the drive".
Check that fastening bolts of gear unit and mounted elements are securely tightened. Check that covers and sealing plugs are securely fastened	after 3 h, then at regular intervals.	see section 10.2.10 "Checking tightness of fastening bolts".
Relubricating the rolling bearings in drive units	at least every 12 months or every 4 000 operating hours	see section 10.2.5 "Relubrication of the rolling bearings in drive units".
Change rolling bearing grease	along with oil change	see section 10.2.6 "Change rolling bearing grease".
Replace bearing	-	see section 10.2.4 "Replacing bearings".
Checking rubber buffers of torque arm	every 6 months	see section 6.11 "Torque arm with shaft-mounted gear units".

Table 10.1: Maintenance measures

- 1) In the case of synthetic oils the time intervals can be doubled.  
The specifications apply to an oil temperature of +80 °C. For oil change intervals for other temperatures, see figure 10.3 "Approximate values for oil-change intervals".

## 10.2 Description of maintenance and repair work

### 10.2.1 Oil level



**Danger.**

Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch.



**Danger.**

Danger of scalding from the hot oil emerging.  
Before starting any work wait until the oil has cooled down to +30 °C.



**Danger.**

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.



**Caution.**

The oil quantity and the position of the sealing elements depend upon the assembly option, see section 3.5 "Mounting positions".



**Note.**

As a rule, mineral oil is used as lubricant. Synthetic oils with special properties are available optionally.

For data such as oil grade, oil viscosity and oil quantity required, refer to the rating plate, see section 3.2 "General technical data".

For oil compatibility refer to, see section 10.3 "Lubricants".



**Note.**

In case of double gear units every single unit is to be considered separately.

### 10.2.1.1 Check the oil level in the gear housing

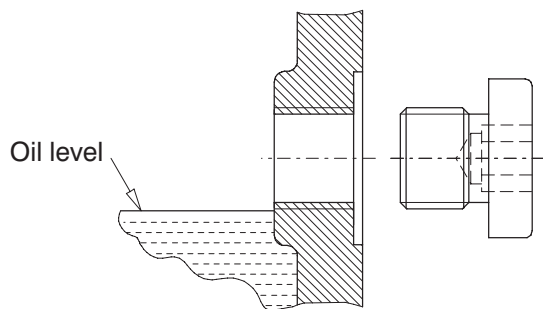
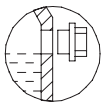


Figure 10.2.1.1–1: Oil level

- 1) Switch off the power supply to the drive.



- 2) Unscrew the sealing element at the point marked with this symbol, see section 3.5 "Mounting positions".

- 3) Check the oil level.
- 4) Rectify the oil level, if necessary, see section 10.2.3 "Oil change", and check it again.
- 5) Check the condition of the sealing ring on the sealing element; if necessary, replace the sealing ring.
- 6) Seal the gear unit with the sealing element.

### 10.2.1.2 Checking the oil level by the oil sight glass (special version)

In the case of the oil sight glass the oil level must be in the middle of the sight glass.

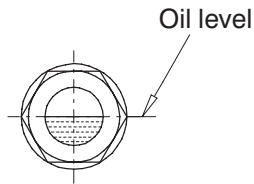


Figure 10.2.1.2: Oil level in the oil sight glass

Rectify the oil level, if necessary, see section 10.2.3 “Oil change“, and check it again.

### 10.2.1.3 Checking the oil level by the oil dipstick (special version)

Measure the oil level with the dipstick resting on the hole but not screwed in.

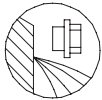
The oil level must be between the lower and upper (min. - max.) marks on the oil dipstick.

If the electric oil level monitoring system is used, the oil must be level with the upper (max.) mark on the oil dipstick.

Rectify the oil level, if necessary, see section 10.2.3 “Oil change“, and check it again.

## 10.2.2 Oil quality

1) Switch off the power supply to the drive.



2) Unscrew the sealing element at the point marked with this symbol, see section 3.5 “Mounting positions” and take a small sample of oil.

3) Check the condition of the sealing ring on the sealing element; if necessary, replace the sealing ring.

4) Seal the gear unit with the sealing element.

5) Signs of changes in the oil can be seen with the naked eye. Fresh oil is clear to the eye and has a typical smell and a specific product colour. Clouding or a flocculent appearance indicate water and/or contamination. A dark or black colour indicates residue, severe thermal decomposition or contamination. If you detect such abnormalities, the oil must be changed immediately.

6) Check the oil level.

7) Rectify the oil level, if necessary, see section 10.2.3 “Oil change“, and check it again.

### 10.2.3 Oil change



**Danger.**

Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch.



**Danger.**

Danger of scalding from the hot oil emerging.  
Before starting any work wait until the oil has cooled down to +30 °C.



**Danger.**

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.



**Caution.**

The oil quantity and the position of the sealing elements depend upon the assembly option, see section 3.5 "Mounting positions".



**Note.**

As a rule, mineral oil is used as lubricant. Synthetic oils with special properties are available optionally.

For data such as oil grade, oil viscosity and oil quantity required, refer to the rating plate, see section 3.2 "General technical data".

For oil compatibility refer to, see section 10.3 "Lubricants".



**Note.**

In case of double gear units every single unit is to be considered separately.



**Note.**

In case of ambient conditions deviating from the normal (high ambient temperatures, high relative humidity, aggressive ambient media), the intervals between changes should be shorter. In such cases contact the **FLENDER TÜBINGEN GMBH** customer service to determine the individual lubricant change intervals.

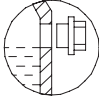
## Draining the oil



### Note.

The oil must be warm, as too cold oil will flow too sluggishly to drain properly. If necessary, allow gear unit to run for 15 - 30 minutes to warm up.

- 1) Switch off the power supply to the drive.

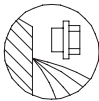


- 2) Unscrew the sealing element at the point marked with this symbol, see section 3.5 "Mounting positions".



- 3) Unscrew the sealing element at the point marked with this symbol, see section 3.5 "Mounting positions".

- 4) Place a sufficiently large, suitable receptacle under the oil drainage plug.



- 5) Unscrew the sealing element at the point marked with this symbol, see section 3.5 "Mounting positions" and completely drain off the oil into the receptacle.

- 6) Check the condition of the sealing ring on the sealing element; if necessary, replace the sealing ring.

- 7) Seal the gear unit with the sealing element.

## Fill in oil



- 1) Unscrew the sealing element at the point marked with this symbol, see section 3.5 "Mounting positions".

- 2) Fill the gear unit with fresh oil, using a filter (max. mesh 25 µm). When refilling, use the same type of oil with the same viscosity.

- 3) Check the oil level.

- 4) Rectify the oil level, if necessary, see section 10.2.3 "Oil change", and check it again.

- 5) Check the condition of the sealing ring on the sealing element; if necessary, replace the sealing ring.

- 6) Seal the gear unit with the sealing element.

## 10.2.4 Replacing bearings



### Note.

The bearing life depends very much on the operating conditions. It is therefore very difficult to calculate it reliably. If the operating conditions are specified by the operator, the bearing life can be calculated and indicated on the rating plate. If no information is given, changes in the vibration and noise pattern can serve as an indication that an immediate bearing replacement is necessary.

## 10.2.5 Relubrication of the rolling bearings in drive units



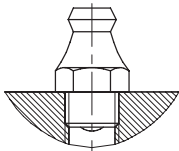
### Caution.

When relubricating, do not mix greases with different soap bases.

Relubricating the drive units is required from motor size 160 upwards.

The bearings have already been initially greased.

The standard lubricating grease used is a mineral-oil-based lithium-saponified grease of NLGI class 3, see table 10.3–2 “Rolling bearing greases”.



Using a grease gun, inject the grease into the bearing point via the lubricating nipples provided. Inject 50 g grease per lubricating point, unless otherwise specified in the vicinity of the lubricating point.

Figure 10.2.5: Grease nipple

## 10.2.6 Change rolling bearing grease

The rolling bearings have been filled with a lithium-saponified rolling bearing grease at the factory.

Clean the bearing before filling it with fresh lubricant.

In the case of the bearings of the output shaft or intermediate shafts the grease quantity must fill 2/3 and in the case of bearings on the input side 1/3 of the space between the bearing bodies.

### 10.2.7 Seal check

Oil or grease escaping in small quantities (a few drops) from the shaft sealing ring must be regarded as normal during the running-in phase (24 hours running time).

If the quantities escaping are great or leakage continues after the running-in phase, the shaft sealing ring must be replaced to prevent consequential damage.

Because of its structure and function a shaft sealing ring is subject to natural wear. The service life depends on the operating conditions. It is recommended that the shaft sealing rings be included in the periodic maintenance and servicing work on the system.

### 10.2.8 Clean ventilation filter

Clean the ventilation filter, depending on the degree of soiling - at least every 6 months.

- 1) Unscrew the ventilation filter.
- 2) Flush out the ventilation filter with petroleum ether or a similar cleaning agent.
- 3) Blow the ventilation filter out with compressed air.
- 4) Seal the gear unit with the ventilation filter.

### 10.2.9 Clean drive



**Note.**

Dust deposits prevent heat radiation and cause high housing temperatures.  
Keep the drive free from dirt and dust.



**Caution.**

Do not use a high-pressure cleaning appliance to clean the drive.  
Do not use tools with sharp edges.

Switch off the power supply to the drive before cleaning it.

## 10.2.10 Checking tightness of fastening bolts



**Note.**

Damaged headless screws must be replaced with new screws of the same type and strength class.

- 1) Switch off the power supply to the drive.
- 2) Using a torque wrench, check that all fastening bolts are correctly tightened for torque, acc. to table 10.2.10 "Tightening torques  $T_A$  - fastening bolts".

Thread size	Tightening torque $T_A$ strength class		Thread size	Tightening torque $T_A$ strength class	
	8.8 [Nm]	10.9 [Nm]		8.8 [Nm]	10.9 [Nm]
M 4	3	4	M 16	210	295
M 5	6	9	M 20	450	580
M 6	10	14	M 24	750	1000
M 8	25	35	M 30	1500	2000
M 10	50	70	M 36	2500	3600
M 12	90	120			

Table 10.2.10: Tightening torques  $T_A$  - fastening bolts

## 10.2.11 Inspection of the drive

Routinely inspect the drive once a year in accordance with the possible criteria listed in section 9. "Faults, causes and remedy".

Check the drive in accordance with the criteria set out in section 2. "Safety instructions".

Touch up damaged paintwork carefully.

## 10.2.12 Carry out maintenance on slip coupling



**Note.**

Check the condition of the slip clutch initially after 500 operating hours and then at least once yearly and after every blockage of the machine.

If necessary, readjust the slip torque or replace the wearing parts (friction lining and bushes). Friction linings must always be replaced in pairs. We recommend replacing worn bushes in sets.

For this, please observe the relevant operating instructions for the clutch.

### 10.3 Lubricants



**Danger.**

The listed lubricants are not approved under USDA -H1 / -H2 (United States Department of Agriculture). They are not or only conditionally approved for use in the foodstuffs or pharmaceutical industry. If lubricants with USDA -H1 / -H2 approval are required, please contact the **FLENDER TÜBINGEN GMBH** customer service.



**Caution.**

When changing oil of the same type, the quantity of oil remaining in the gear unit should be kept as low as possible. Generally speaking, a small remaining quantity will cause no particular problems.

Gear oils of different types and manufacturers must not be mixed. If necessary, the manufacturer should confirm that the new oil is compatible with residues of the used oil.

If changing very different types of oil or oils with very different additives, always flush out the gear unit with the new oil. This applies particularly when changing from polyglycols (PG) to another gear oil or vice versa. Residues of used oil must be completely removed from the gear unit.



**Caution.**

Gear oils must never be mixed with other substances. Flushing with paraffin or other solvents is not permitted, as traces of these substances always remain inside the unit.



**Caution.**

If applications are outside the temperature ranges specified in the table 10.3–1 “Oils” likewise contact the **FLENDER TÜBINGEN GMBH** customer service with regard to the choice of oil.

If due to its mounting position or load the temperature of the gear unit rises above +80 °C, contact the **FLENDER TÜBINGEN GMBH** customer service with regard to the choice of a suitable synthetic lubricant.



**Note.**

The lubricants are not or are only conditionally biodegradable. If lubricants are required in accordance with these classifications, please contact the **FLENDER TÜBINGEN GMBH** customer service.



**Note.**

These recommendations are not a guarantee of the quality of the lubricant supplied by your supplier. Each lubricant manufacturer is responsible for the quality of his own product.

The oil selected for use in the gear unit must be of the viscosity (ISO VG class) stated on the rating plate. The viscosity class indicated applies for the contractually agreed operating conditions.

In the case of different operating conditions contact with **FLENDER TÜBINGEN GMBH** is required.

The lubricants suitable for use in the gear unit are listed in table 10.3–1 “Oils” and table 10.3–2 “Rolling bearing greases”.

We are familiar with the composition of these lubricants and, as far as we are currently aware, they possess the properties acc. to state of the art with regard to load-bearing capacity, corrosion resistance (FZG-Test DIN 51354 = force level > 12), resistance to grey staining and compatibility with seals and interior paint coats which are necessary for the type of gear unit concerned.

We therefore advise our customers to select one of the lubricants listed in this table, taking into account the VG class specified on the nameplate.

If by agreement gear units are filled at the factory with special lubricants for the above mentioned special applications, this is shown on the rating plate, e.g.: CLP-H1 VG220 or CLP E VG220.

The guarantee specifications are valid only for the lubricants shown in these operating instructions.

## Service life of the lubricants



### Note.

If oil sump temperatures exceed +80 °C, the service life may also be lower than shown in figure 10.3 "Approximate values for oil-change intervals". The general rule is that an increase in temperature by 10 K will halve the service life.



### Note.

In the case of rolling bearings with grease filling we recommend changing the grease filling as well when changing the oil.

With an oil sump temperature of +80 °C the following service life with adherence to the characteristics required by **FLENDER TÜBINGEN GMBH** is expected:

- |   |                                  |
|---|----------------------------------|
| 1) Mineral oil                            |                                  |
| Biologically degradable oil               |                                  |
| Physiologically safe oil (USDA -H1 / -H2) | 10000 operating hours or 2 years |
| 2) Synthetic oil (PG)                     | 20000 operating hours or 4 years |

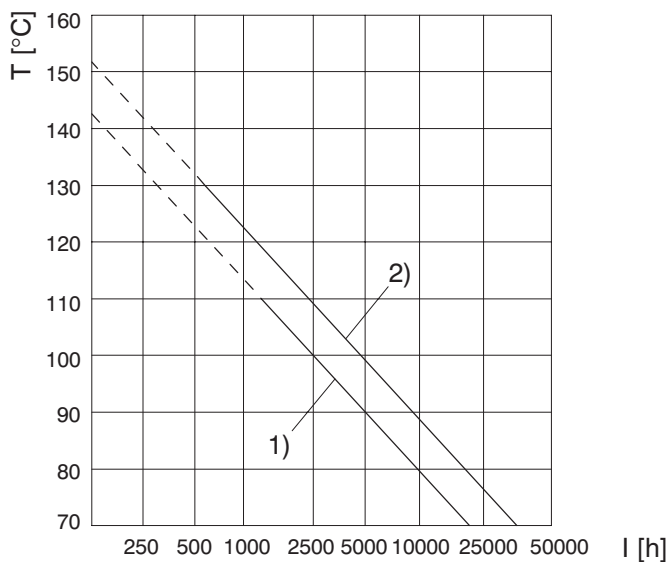


Figure 10.3: Approximate values for oil-change intervals

T Oil-bath steady-state temperature [°C]

I Oil-change interval in operating hours [h]












	Mineral oil	Synthetic oil (PG) / Polyglycol (PG)	
<b>Designation to DIN 51 502</b>	CLP ISO VG 220	CLP PG ISO VG 220	CLP PG ISO VG 460
<b>Gear-unit types</b>	E., D./Z., K., F.	E., D./Z., K., F., C.	
<b>Ambient temperatures</b>	−10 °C ... +40 °C	−20 °C ... +50 °C	0 °C ... +60 °C
	CLP 220 S		
	Degol BG 220	Degol GS 220	Degol GS 460
	Energol GR-XP 220	Enersyn SG-XP 220	Enersyn SG-XP 460
	Alpha SP 220 Alpha MAX 220 Optigear BM 220 Tribol 1100/220	Optiflex A 220 Tribol 800/220	Optiflex A 460 Tribol 800/460
	Falcon CLP 220	Polydea PGLP 220	Polydea PGLP 460
	Spartan EP 220	Glycolube 220	Glycolube 460
	Renolin CLP 220 Plus	Renolin PG 220	Renolin PG 460
	Klüberoil GEM 1-220	Syntheso D 220 EP	Syntheso D 460 EP
	Mobilgear XMP 220		
	Omala 220	Tivela WB	Tivela SD
	Ersolan 220		

Table 10.3–1: Oils



**Note.**

The service life of the grease is approx. 4000 operating hours. It is based on a max. ambient temperature of +40 °C. The service life of the grease decreases by a factor of 0,7 for every 10 K rise in temperature.

	<b>Lithium-saponified greases NLGI 3/2</b>
	Aralub HL3, HL2
	Energrease LS3, LS2
	Longtime PD2 TRIBOL 4020/220-2
	Glissando 30, 20
	Beacon 3
	Renolit FWA160, FWA220
	Centroplex GLP402
	Mobilux 3, 2
	Alvania RL3, RL2
	Wiolub LFK2

Table 10.3–2: Rolling bearing greases

## 11. Disposal

Dispose of the housing parts, gears, shafts and rolling bearings as steel scrap.

This also applies to grey cast iron parts, if no separate collection is made.

The worm wheels are made partly from non-ferrous metal. Dispose of them accordingly.



### **Danger.**

Incorrect disposal of used oil is a threat to the environment and health.

After use the oil must be taken to a used oil collection point. Any addition of foreign material such as solvents and brake and cooling fluid is prohibited.

Avoid prolonged contact with the skin.

Collect and dispose of used oil in accordance with regulations.

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

## 12. Stocking spare parts and customer service addresses

### 12.1 Stocking spare parts

By stocking the most important spare and wearing parts on site you can ensure that the drive is ready for use at any time.



### **Caution.**

Please note that spare parts and accessories not supplied by us have not been tested or approved by us.

The installation and/or use of such products may therefore impair essential characteristics of the drive, thereby posing an active or passive risk to safety.

**FLENDER TÜBINGEN GMBH** will assume no liability or guarantee for damage caused by spare parts and accessories not supplied by **FLENDER TÜBINGEN GMBH**.

We guarantee only the original spare parts supplied by us.

Please note that certain components often have special production and supply specifications and that we always supply you with spare parts which comply fully with the current state of technical development as well as current legislation.

When ordering spare parts, always state the following:

- Order no. (see rating plate [4] )
- Type designation (see rating plate [5] )
- Part no. (3-digit part no. from spare parts list, 6-digit code no. or 7-digit article no.)
- Quantity

## 12.2 Customer-service addresses

### FLENDER DRIVES & AUTOMATION Deutschland

<b>FLENDER TÜBINGEN GMBH</b>	<b>Bahnhofstraße 40 - 44</b> <b>72072 Tübingen</b>	<b>Postfach 1709</b> <b>72007 Tübingen</b>	<b>Tel.: (0 70 71) 7 07 - 0</b> <b>Fax: (0 70 71) 7 07 - 4 00</b>	<b>sales-motox@flender-</b> <b>motox.com</b> <b>www.flender.com</b>
	24h Service Hotline		+49 (0) 1 72 - 7 32 29 55	
<b>A. FRIEDR. FLENDER AG</b> Kundenservice Center Nord	Alfred-Flender-Straße 77 46395 Bocholt	Postfach 1364 46393 Bocholt	Tel.: (0 28 71) 92 - 0 Fax: (0 28 71) 92 - 14 35	ksc.nord@flender.com www.flender.com
<b>A. FRIEDR. FLENDER AG</b> Kundenservice Center Süd	Bahnhofstraße 40 - 44 72072 Tübingen	Postfach 1709 72007 Tübingen	Tel.: (0 70 71) 7 07 - 0 Fax: (0 70 71) 7 07 - 3 40	ksc.sued@flender.com www.flender.com
<b>A. FRIEDR. FLENDER AG</b> Kundenservice Center Süd (Außenstelle München)	Liebigstraße 14	85757 Karlsfeld	Tel.: (0 81 31) 90 03 - 0 Fax: (0 81 31) 90 03 - 33	ksc.sued@flender.com www.flender.com
<b>A. FRIEDR. FLENDER AG</b> Kundenservice Center Ost / Osteuropa	Schlossallee 8	13156 Berlin	Tel.: (0 30) 91 42 50 58 Fax: (0 30) 47 48 79 30	ksc.ost@flender.com www.flender.com

### FLENDER DRIVES & AUTOMATION International

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	Flender Power Transmission (Pty.) Ltd.	Sales Offices Unit 3 Marconi Park 9 Marconi Crescent, Montague Gardens, P.O. Box 37291	Cape Town Chempet 7442	Phone: +27 (0) 21 - 5 51 50 03 Fax: +27 (0) 21 - 5 52 38 24	sales@flender.co.za
	Flender Power Transmission (Pty.) Ltd.	Unit 3 Goshawk Park Falcon Industrial Estate P.O. Box 1608	New Germany - Durban New Germany 3620	Phone: +27 (0) 31 - 7 05 38 92 Fax: +27 (0) 31 - 7 05 38 72	sales@flender.co.za
	Flender Power Transmission (Pty.) Ltd.	9 Industrial Crescent, Ext. 25 P.O. Box 17609	Witbank Witbank 1035	Phone: +27 (0) 13 - 6 92 34 38 Fax: +27 (0) 13 - 6 92 34 52	sales@flender.co.za
	Flender Power Transmission (Pty.) Ltd.	Unit 14 King Fisher Park, Alton Cnr. Ceramic Curve & Alumina Allee, P.O. Box 101995	Richards Bay Meerensee 3901	Phone: +27 (0) 35 - 7 51 15 63 Fax: +27 (0) 35 - 7 51 15 64	sales@flender.co.za

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<b>BAHRAIN / IRAQ LYBIA / JORDAN UMAN / QATAR U.A.E. / YEMEN</b>	Flender Güc Aktarma Sistemleri Sanayi ve Ticaret Ltd. Sti.	Middle East Sales Office IMES Sanayi Sitesi E Blok 502, Sokak No.22	34 776 Dudullu - Istanbul	Phone: +90 (0) 2 16 - 4 99 66 23 Fax: +90 (0) 2 16 - 3 64 59 13	meso@flendertr.com

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## DRIVES & AUTOMATION

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<b>THAILAND</b>	Flender Singapore Pte. Ltd.	Representative Office Talay-Thong Tower, 53 Moo 9 10 <sup>th</sup> Floor Room 1001 Sukhumvit Rd., T. Tungskula	A. Sriracha Chonburi 20230	Phone: +66 (0) 38 - 49 51 66 - 8 Fax: +66 (0) 38 - 49 51 69	contact@flender.th.com
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### 13. Declaration by the manufacturer

#### 13.1 Declaration by the manufacturer

in accordance with EC Engineering Guideline 98/37/EC, Appendix II B

We hereby declare that the

##### Single-stage helical gear units and gear motors of the types

<b>E.20</b>	<b>E.60</b>	<b>E.100</b>	<b>E.140</b>
<b>E.40</b>	<b>E.80</b>	<b>E.120</b>	

##### Two- and three-stage helical gear units and gear motor of the types

<b>Z.10</b>	<b>D./Z.40/41</b>	<b>D./Z.80/81</b>	<b>D./Z.120/121</b>	<b>D./Z.162</b>
<b>D./Z.30/31</b>	<b>D./Z.60/61</b>	<b>D./Z.100/101</b>	<b>D./Z.142</b>	<b>D./Z.181</b>

##### Bevel-helical gear units and gear motors of the types

<b>K.30</b>	<b>K.60</b>	<b>K.100</b>	<b>K.140</b>	<b>K.180</b>
<b>K.40</b>	<b>K.80</b>	<b>K.120</b>	<b>K.160</b>	<b>K.200</b>

##### Parallel-shaft helical gear units and gear motors of the types

<b>F.31</b>	<b>F.61</b>	<b>F.101</b>	<b>F.141</b>	<b>F.181</b>
<b>F.41</b>	<b>F.81</b>	<b>F.121</b>	<b>F.161</b>	<b>F.201</b>

##### Helical worm gear units and gear motors of the types

<b>S.01</b>	<b>S.11</b>	<b>C.18</b>	<b>C.41</b>	<b>C.81</b>	<b>C.122</b>
<b>S.06</b>	<b>C.10</b>	<b>C.21</b>	<b>C.61</b>	<b>C.102</b>	

##### Gear units and geared motors for self-powered trolley systems of types

<b>CF15</b>	<b>CF25</b>	<b>KF34</b>	<b>KF45</b>	<b>KF65</b>	<b>KF85</b>
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described in these operating instructions are intended for incorporation in a machine, and that it is prohibited to put them into service before verifying that the machine into which they are incorporated complies with the EC Guidelines 98/37/EC.

This Manufacturer's Declaration takes into account all the unified standards applying to our products in part or in whole published by the European Commission in the Official Journal of the European Community.

These include in particular:

- EN 292-1
- EN 292-2
- EEN 294
- EEN 349
- EN 60204-1

Tübingen, 01.12.2005

  
(p.p. Head of Gear Unit Development)