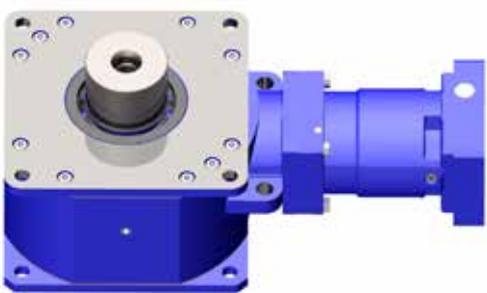


PKF

(closed design)



M-Version

Operating Manual

PKF Low-backlash planetary bevel gear reducer with hollow output shaft



WITTENSTEIN

alpha

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1.1 Service Contact

Please contact our Customer Service Department if you have any technical questions:

WITTENSTEIN alpha GmbH

Customer Service
Walter-Wittenstein-Str. 1
D-97999 Igersheim

Tel.: +49 (0) 79 31 / 493-10900
Fax: +49 (0) 79 31 / 493-10903

E-Mail: service-alpha@wittenstein.de

2 General Information

The original instructions were prepared in German; all other language versions are translations of these instructions.

2.1 Description, Designations

The low-backlash planetary bevel gear reducer PKF (henceforth designated gear reducer) is available in designs "S" (self-contained) and "M" (motor-mounted).

2.2 Whom does this manual concern?

This manual concerns all persons who install, operate, or maintain this gear reducer. They may only carry out work on the gear reducer, if they have read and understood this operating manual. Please pass the safety instructions on to other persons as well.

2.3 Which signs and symbols are referred to in this manual?

Ü An "action instruction", which requires you to carry out an action.

Ñ With a "check" you can specify whether the device is ready for the next work stage.

J A "usage tip" shows you an option of facilitating or improving operations.

The safety instructions symbols are described in the "Safety" section.

2.4 Exclusion of liability

The manufacturer does not accept liability for damage or injury ensuing from improper handling of the gear reducer.

2.5 Modifications, Reconstructions

Modifications or reconstructions of the gear reducer may only be carried out with the express written authorisation of **WITTENSTEIN alpha**.

2.6 EC Machinery Directive

The gearhead is considered a "machine component" and is therefore not subject to the EC Machinery Directive 2006/42/EC.

Operation is prohibited within the area of validity of the EC directive, until it has been determined that the machine, in which this product is installed, corresponds to the regulations within this directive.

2.7 Technical Modifications

WITTENSTEIN alpha reserves the right of carrying out technical modifications to improve the product.

2.8 Copyright

© 2013, **WITTENSTEIN alpha GmbH**

3 Safety

3.1 Intended Use

The gear reducer is designed for industrial applications. Its purpose is the transmission and conversion of speeds and torques. Please refer to our catalogue or our Internet page for the maximum permitted speeds and torques: www.wittenstein-alpha.de.

Ü Please consult our Customer Service Department ([see 1.1](#)), if your gear reducer is older than a year. In this way you receive valid data.

3.2 Improper Use

Every usage which exceeds the limits stated above (especially higher torques and speeds) is not compliant with the regulations, and is thus prohibited.

The operation of the gear reducer is prohibited if:

- it was not mounted according to regulations (e.g., securing the motor),
- it was not installed according to regulations (e.g., securing screws),
- the gear reducer is very soiled,
- it is operated without lubricant.

3.3 Safety Instructions

The following symbols are used in this operating manual to warn you of hazards:



DANGER!

This symbol warns you of danger of injury to yourself and others.



Attention

This symbol warns you of the risk of damage to the gear reducer.



Environment

This symbol warns of environmental pollution risk.

In addition to the safety specifications mentioned in this operating manual, the general and also the local regulations on the prevention of accidents (for instance, personal safety equipment) and on environmental protection should be observed.

3.3.1 General Safety Instructions

Working on the gear reducer



DANGER!

Inappropriately executed work can lead to injury and damage.

- Ü Make sure that the gear reducer is only installed, maintained, and dismantled by trained technicians.



DANGER!

Foreign bodies spinning through the air can cause grave injury.

- Ü Before putting the gear reducer into operation, check that there are no foreign bodies or tools near the gear reducer.



Attention

Loose or overloaded screwed connections can cause damage.

- Ü Tighten and check all screwed connections for which a tightening torque is specified, on principle with a calibrated torque wrench.

Operation



DANGER!

Touching hot surfaces can lead to burns.

- Ü Do not touch the gear reducers if their operating temperatures are too high, or use suitable safety equipment (e.g. gloves).



DANGER!

A damaged gearhead can cause accidents and injury.

- Ü Never use a gearhead that has been overloaded to due misuse or a machine accident (see chapter 3.2 „Improper Use“).
- Ü Replace the affected gearhead, even if no external damage is visible.



DANGER!

Rotating machinery can lead to injury. There is danger of being trapped or pulled in!

- Ü Keep a sufficient distance to rotating machinery.

Maintenance**DANGER!**

An unintentional start of the machine during maintenance work can lead to serious accidents.

- Ü Make sure no one can start the machine while you are working on it.
- Ü Secure the machine against restarting and unintentional movements during assembly maintenance work.

**DANGER!**

Even a brief running of the machine during maintenance work can lead to accidents if the safety devices are not operating.

- Ü Make sure that all safety devices are mounted and active.

Lubricants**DANGER!**

Extended, intensive contact with synthetic oils can lead to skin irritations.

- Ü Avoid extended contact with oil, and clean oil off skin thoroughly.

**DANGER!**

Hot oil may cause scalding.

- Ü When changing oil, protect yourself against contacting hot oil.

**Attention**

Mixing different lubricants can impair the lubricant properties. This can destroy the gear reducer.

- Ü Only re-fill with the lubricant type that is in the gear reducer.
- Ü If you wish to use another lubricant, carry out a complete oil change (with flushing).

**Environment**

Lubricants (oils and greases) are hazardous substances, which can contaminate soil and water.

- Ü Collect drained lubricant into suitable receptacles and dispose of it according to the valid national guidelines.

3.4 In case of fire

The gear reducer itself is not combustible. However, it usually contains a synthetic gear oil (polyglycol).

- Ü Please observe the following instructions, if the gear reducer is situated in a burning environment.

3.4.1 Suitable extinguishing agents, Protective equipment

Carbon dioxide, powder, foam, fog

**DANGER!**

High temperatures produce irritating steam.

- Ü Use a protective breathing apparatus.

3.4.2 Unsuitable extinguishing agents

Do not spray with water!

3.4.3 Additional Information**Environment**

Ü Prevent the penetration of the lubricant in drains, sewers, and water resources.

For additional information on RENOLIN PG 220 gear reducer oil, refer to:

FUCHS MINERALOELWERKE GmbH, Mannheim Tel.: +49 (0) 621 / 3701-333

4 Technical Specifications

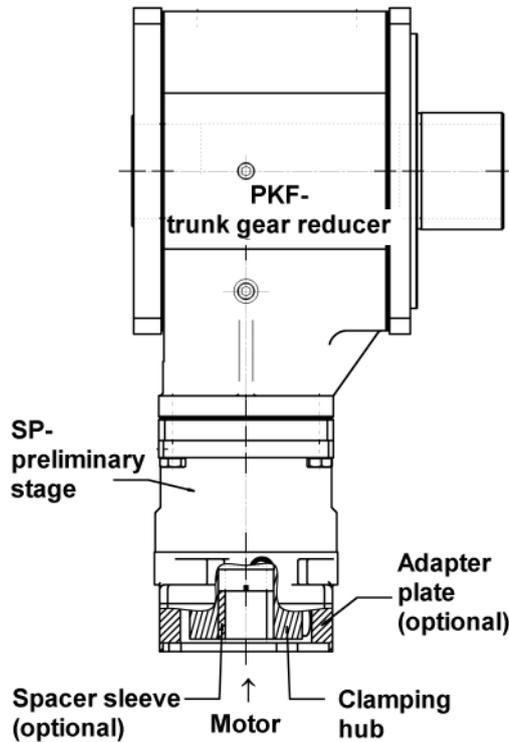
4.1 Design

The gear reducers are realised as bevel-angle gears with planetary gear reducers on the drive side. For larger ratios, multistage planetary gear reducers may be used.

The gear is available in the following designs for different applications:

- Motor-mounted version “M” and
- Self-contained version “S”.

4.1.1 Motor-mounted version “M”



The clamping hub enables a quick and easy mounting of the motor:
 The motor is centered using the clamping hub and not with the adapter plate. The motor can thus be mounted without radial distortion.
 The reducer can be adapted to various motors using the adapter plate and spacer sleeve. The gear reducer has been designed to compensate for thermal linear expansion of the motor shaft.

Fig. 4.1

4.1.2 Self-contained “S”

It is possible to drive the gear reducer directly at the drive shaft, for instance, using a belt pulley.

4.2 Weight

The weight of the gear reducer ranges from 18 to 190 kg.

J The weight can be determined more precisely using the table in [chapter 5.2](#).

4.3 Quantity of lubricant and types

All gear reducers are filled with synthetic gear oil of viscosity class ISO VG 220 (Fuchs, Renolin PG 220) by the manufacturer. Renolin PG 68 or PG 100, for example, may be used in special cases.

The following tables specify all permitted oils of the viscosity class ISO VG 220. You can find additional information from the manufacturer at the specified Internet addresses.

Manufacturer	Lubricant	Internet address
Aral	Degol GS 220	www.aral.de
BP	Energol SG-XP 220	www.bp.com
DEA	Polydea CLP 220	www.dea.de
Fuchs	Renolin PG 220	www.fuchs-oil.de
Klüber	Klübersynth GH 6-220	www.klueber.com
	Syntheso HT 220/ Syntheso D 220 EP	-
Mobil	Glygoyle 30 / Glygoyle HE220	www.mobil.com
Molyduval	Syntholube G 220 EP	www.molyduval.com
Optimol	Optiflex 220	www.optimol.com
Shell	Tivela Öl WB (PG 220)	www.shell.com
Tribol	800/220	www.castrol-industrie.com/

Table 4.1

The filled lubricant and the required lubricant quantities are specified on the identification plate. These apply for a typical positioning operating mode, and for the mounting position stated with the order.



Attention

Changing the mounting position can destroy the gear reducer.

Ü Please consult our Customer Service Department (see 1.1) if you wish to change the mounting position.

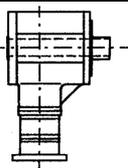
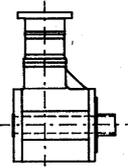
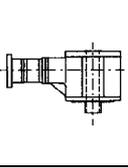
The ambient temperature may not be under -15°C and not over +40°C. Operating temperature may not exceed +90°C.

Divergent operating conditions may make different lubricant quantities and different lubricants necessary.

Ü In these cases, please consult our Customer Service Department (see 1.1).

You can find the lubricant quantities for your gear reducer in the following sections. Please note the design version (e.g. M or S), the mounting position (e.g. B5/B5), and the stage number of the gear unit.

4.3.1 Lubricant quantities

Lubricant quantities [cm ³]		Two-stage					Three-stage									
Type	Side	PKF 60 M2	PKF 160 M2	PKF 300 M2	PKF 600 M2	PKF 1100 M2	PKF 60 M3	PKF 160 M3	PKF 300 M3	PKF 600 M3	PKF 1100 M3					
							Output	Drive	Output	Drive	Output	Drive				
	B5/V3 output shaft horizontal, motor shaft upwards	350	700	700	2000	6500	350	)^{*2}	700	75	700	75	2000	320	6500	1000
	B5/V1 output shaft horizontal, motor shaft downwards	650	1250	1500	3000	7000	650	)^{*2}	1250	150	1500	150	3000	320	7000	1000
	V1/B5 output shaft vertical downwards, motor shaft horizontal	650	1250	1500	3000	6500	650	)^{*2}	1250	75	1500	75	3000	)^{*2}	6500	550

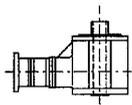
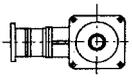
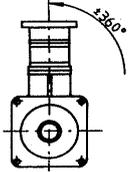
	V3/B5 output shaft vertically upwards, motor shaft horizontal	650	1250	1500	3000	6500	650	)^{*2}	1250	75	1500	75	3000	)^{*2}	6500	550
	B5/B5 output shaft horizontal, motor shaft horizontal) ^{*2}	450	0 ^{*4}	800	0 ^{*4}	1300	0 ^{*4}	2500	0 ^{*4}	4800	0 ^{*4}				
	S can swivel 360°	650	1250	1500	3000	7000	650	)^{*2}	1250	150	1500	150	3000	320	7000	1000

Table 4.2

)^{*2} = on demand

*⁴ = at this mounting position, lubrication circuits are open between gear input and output.

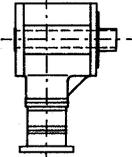
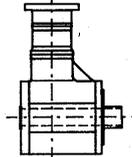
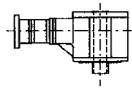
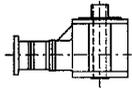
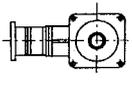
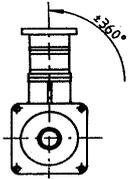
Lubricant quantities [cm ³]											
Stages		Four-stage									
Type		PKF 60 M4		PKF 160 M4		PKF 300 M4		PKF 600 M4		PKF 1100 M4	
Side		Output	Drive	Output	Drive	Output	Drive	Output	Drive	Output	Drive
	B5/V3 output shaft horizontal, motor shaft upwards	350	)^{*2}	700	180	700	180	2000	450	6500	500
	B5/V1 output shaft horizontal, motor shaft downwards	650	)^{*2}	1250	210 ^{*5}	1500	210 ^{*5}	3000	450	7000	1200
	V1/B5 output shaft vertical downwards, motor shaft horizontal	650	)^{*2}	1250	150	1500	150	3000	300	6500	500
	V3/B5 output shaft vertically upwards, motor shaft horizontal	650	)^{*2}	1250	150	1500	150	3000	300	6500	500
	B5/B5 output shaft horizontal, motor shaft horizontal	)^{*2}	)^{*2}	800	0 ^{*4}	1300	0 ^{*4}	2500	0 ^{*4}	5000	0 ^{*4}
	S can swivel 360°	650	)^{*2}	1250	210	1500	210 ^{*5}	3000	450	7000	)^{*2}

Table 4.3

)^{*2} = on demand

*⁴ = at this mounting position, lubrication circuits are open between gear input and output.

*⁵ = 250cm³ at i=3

4.4 Performance Statistics

Please refer to our catalogue or our Internet page for the maximum permitted torques and speeds: www.wittenstein-alpha.de.

Ü Please consult our Customer Service Department ([see 1.1](#)) if your gear reducer is older than a year. In this way you receive valid data.

4.5 Noise emission

Depending on the gearhead type and product size, the continuous sound pressure level is between 70 and 75 dB(A).

Please contact our Customer Service Department ([see 1.1](#)) if you need information regarding your particular product.

4.6 Identification Plate, Ordering Key

The identification plate is located on the angled housing.

With the “M” version, the mounting position plate is located on the adapter plate. This plate indicates the mounting position of the motor.

With the “M” version (except mounting position B5/B5), an additional mounting plate is located on the adapter plate.

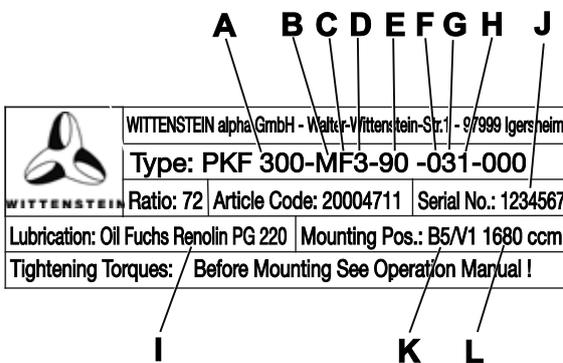


Fig. 4.2

The following specifications can be found on the identification plate:

- A Gear reducer type:**
PKF 060/160/300/600/1100
- B Gear reducer variants:**
M = motor-mounted gear reducer
S = self contained
- C Gear reducer design:**
F = standard design , FPM sealings
X = special gear reducer
- D Stage number:**
2 = 2 stage
3 = 3 stage
4 = 4 stage
- E Ratio:** e.g. 90
- F Form of the output hollow shaft:**
(index numbers)
- G Bore diameters of the clamping hub:**
(index numbers)
- H Clearance specification:**
1 = Standard
0 = Reduced
- I Lubricant:**
e.g. Renolin PG220
- J Serial number:** e.g. 1234567
- K Mounting position:** e.g. B5/V1
- L Lubricant quantity for the designated mounting position:** e.g. 1680 ccm

5 Delivery Status, Transport, Storage

5.1 Delivery Status

Within Europe, the gear reducers are packed in cardboard boxes with paper padding. The paper padding is re-usable and can be recycled.

To ship overseas, the gear reducers are wrapped in foil (PE) and foamed into the cardboard box (diphenylmethane). Please dispose of packing material according to the valid national regulations.

All gear reducers are treated with an anti-corrosion agent at the gear input and output. All gear reducers are filled with lubricants during manufacture.

5.2 Transport

No special direction or position is prescribed to transport the gear reducer. The following tables are designed to help you specify the weights of your gear reducer.

Weight [kg]			
Stages	2	3	4
PKF 060	18	20	)^{*1}
PKF 160	34	36	)^{*1}
PKF 300	)^{*1}	49	52
PKF 600	100	110	110
PKF1100	)^{*1}	190	)^{*1}

Table 5.1

)^{*1} = on demand

5.2.1 Transport using hoisting equipment



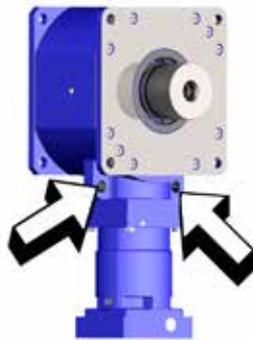
DANGER!

- Ü Falling loads or breakage of fastening equipment can cause injury.
- Ü Do not stand under suspended loads.
- Ü Keep as safe a distance as possible from securing equipment.



Attention

- Ü Falling or hard placement can damage the gear reducer.
- Ü Only use hoisting and securing equipment which is permitted for the size / weight of your gear reducer.
- Ü Ensure that the load is slowly and carefully handled and placed.



Gear reducers from the PKF 300 size upwards have bores for transporting in the gear unit housing.

Fig. 5.1

5.3 Storage

The gear reducer can be stored dry and in a horizontal position in the original packing for a maximum of 2 years at a temperature between 0°C and +40°C. As storage logistic, we recommend the “first in - first out” principle.

6 Mounting, Putting into Operation

- Ü Please observe the instructions in the [„General Safety Instructions” in section 3.3.1.](#)

6.1 Preparing the Mounting

All gear reducers are treated with an anti-corrosion agent at the gear input and output.

- Ü Remove all traces of the anti-corrosion agent before mounting the gear reducer.



Attention

- Ü Pressurised air can damage the gear reducer seals, and thus lead to leakage.
- Ü Do not blow out the flanges with pressurised air when cleaning.

Four through-holes are available in the gear unit housing for bolting it to your machine (refer to table 6.1).

Through-holes in gear unit housing				
Gear reducer size	Bore Ø	Quantity x Diameter	For bolt size / property class	Tightening torque
	[mm]	[] x [mm]		[Nm]
PKF 060	175	4 x 11	M10 / 12.9	81
PKF 160	230	4 x 14	M12 / 12.9	140
PKF 300	265	4 x 14	M12 / 12.9	140
PKF 600	320	4 x 17	M16 / 12.9	340
PKF 1100	410	4 x 17	M16 / 12.9	340

Table 6.1

6.2 Motor-mounting

6.2.1 General Information about the Motor-mounting

Version “M” is intended for motor-mounting.

The motors to be mounted must:

- correspond to the B5 or B14 design,
- have a radial and axial runout tolerance of “N” according to DIN 42955, and,
- if possible, have a smooth shaft.



Attention

Distortion can damage the motor and the gear reducer.

Ü Ensure that the motor is mounted in a vertical position.

6.2.2 Tools for tightening the clamping hub

The clamping bolts M4 to M8 can be tightened through the mounting bores of the adapter plate using a square ¼ inch socket spanner.

The M10 clamping bolt requires a square ⅜ inch socket spanner, the M12 and M16 clamping bolts require a ½ inch socket spanner. In addition, calibrated torque wrenches are needed for the respective torque range.

6.2.3 Preparations for motor design B14



Fig. 6.1

When assembling motors of design B5 (see also [Fig. 6.3](#)), ignore the steps described in chapter 6.2.3

During transport, the adapter plate is fastened to the gear unit using stud bolts and nuts.

- Ü Dismantle the adapter plate from the gear reducer.
- Ü Clean the plane fitting surfaces of the motor and adapter plate.
- Ü Coat the bolts with screw-bonding agent (e.g. Loctite 243), and screw the motor to the adapter plate.

6.2.4 Mounting the motor

Ü If the motor shaft has a feather key, remove the feather key.

A clamping hub connects the motor shaft and the gear drive shaft. A slotted spacer sleeve is used extra for certain motor shaft diameters and applications (see fig. 6.2).

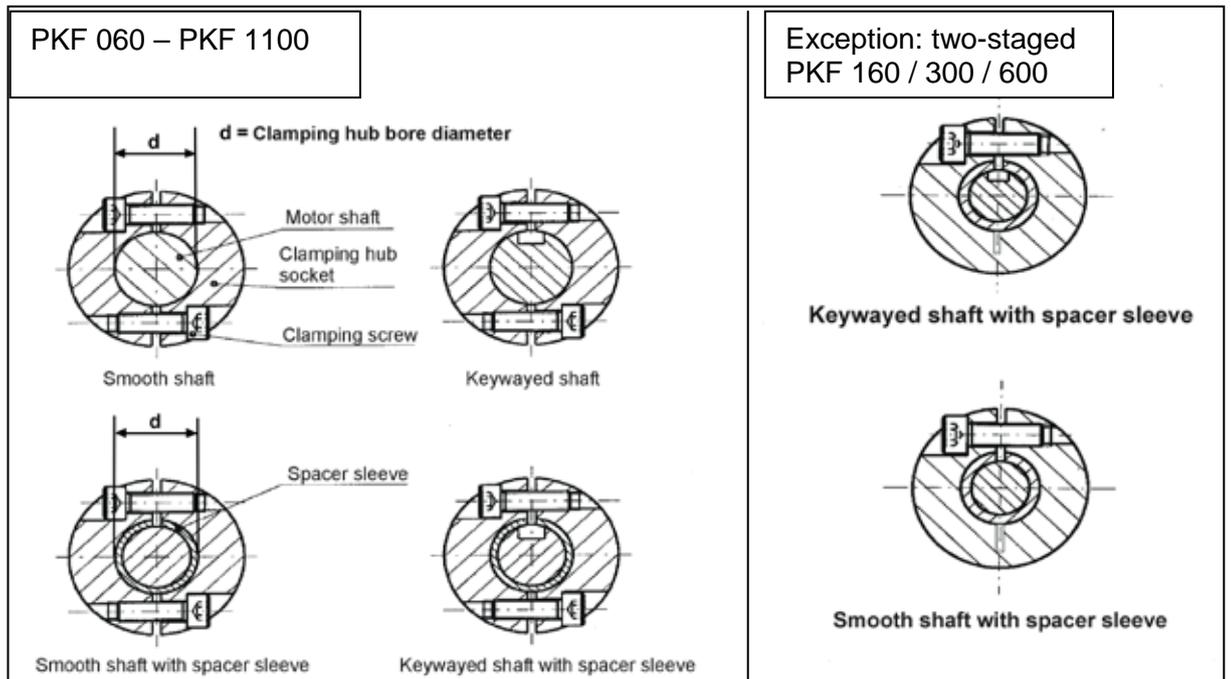


Fig. 6.2

- Ü Clean the plane fitting surfaces of the motor and gear reducer.
- Ü Clean the motor shaft, the clamping hub bore hole, and, if required, the spacer sleeve.
- Ñ Take care that the slot of the spacer sleeve is positioned coincident to the slot of the clamping hub.
- Ü Turn the clamping hub so that the clamping screws are positioned coincident to the mounting holes in the adapter plate.



Attention

Excessively high axial forces can damage the motor and gear reducer.

- Ü Ensure that the axial forces that occur are not higher than the values specified in table 6.2.

Gear reducer size	SP preliminary stage	Clamping hub interior \varnothing [mm]	Clamping screw DIN 912-12.9	Width across flats [mm]	Tightening torque [Nm]	max. axial force [N]
PKF 060 - M2	-	)^{*1}	)^{*1}	)^{*1}	)^{*1}	)^{*1}
- M3 / M4	SP 060	£ 14	M 4	3	5.0	80
PKF 160 - M2	-	)^{*1}	)^{*1}	)^{*1}	)^{*1}	)^{*1}
- M3 / M4	SP 100	£ 32	M 8	6	39.0	100
PKF 300 - M2	-	)^{*1}	)^{*1}	)^{*1}	)^{*1}	)^{*1}
- M3 / M4	SP 100	£ 32	M 8	6	39.0	100
PKF 600 - M2	-	³ 30 £ 60	M 12	10	135.0	30
- M3 / M4	SP 140	£ 38	M 10	8	77.0	150
PKF 1100 - M2	-	³ 40 £ 70	M 16	14	330	30
- M3	SP 180	£ 48	M 10	8	77.0	190
- M4	SP 140	£ 38	M 10	8	77.0	150

Table 6.2

)^{*1} = on demand



Attention

Motors with

- shaft shoulder,
- distinctive chamfer radius, or
- longer shafts than are permitted for the relevant gear reducer

lead to distortions in mounting, which damage the motor and the gear reducer.

- Ü Check the interfering edges by measuring, or by a measurement check based on our catalogue specifications, and the information of the motor manufacturer.
- Ü Please consult our service department, in order to obtain a wider adapter plate, or an intermediary flange.

- Ü Position the motor so that the plane surfaces fit together. (Fig. 6.3)
- Ñ Ensure that the motor allows itself to be moved into position “easily”.

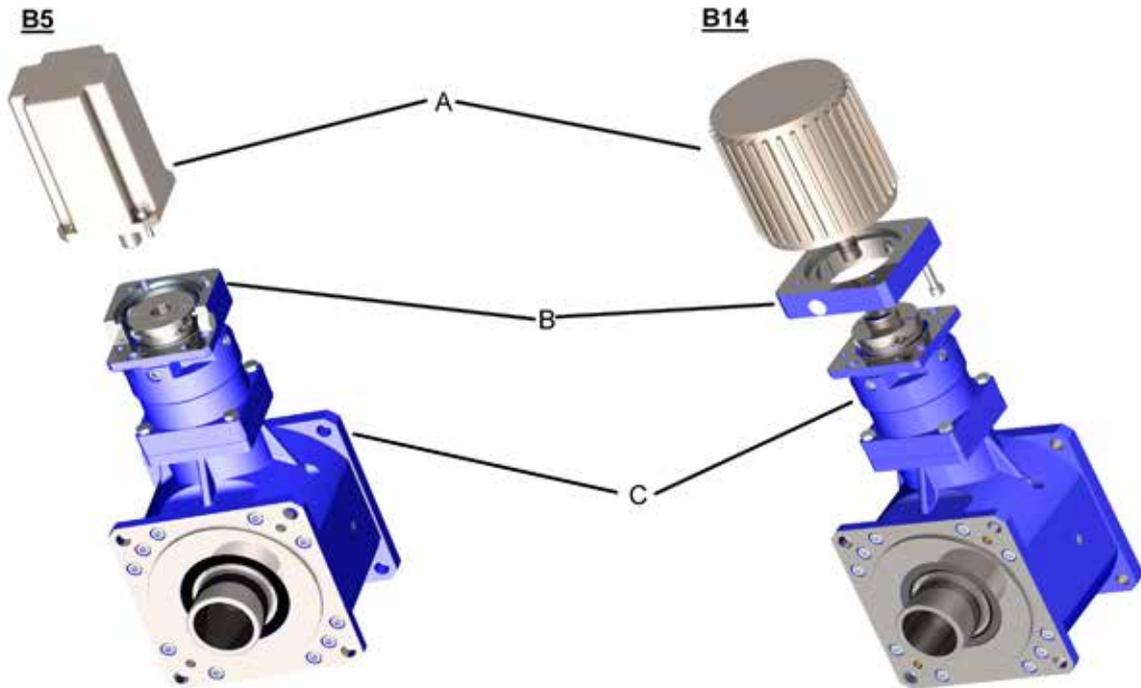


Fig. 6.3

- Ñ There is to be no gap between the motor (A), gear unit (C) and adapter plate (B).
- Ü Insert the screws in the clamping hub without tightening to the required torque.
- Ü The next step depends on the motor design:
 - Motor design B5: Coat the bolts with screw-bonding agent (e.g. Loctite 243), and screw the motor (A) to the adapter plate (B).
 - Motor design B14: Coat the stud bolts with screw-bonding agent (e.g. Loctite 243), and screw the gear reducer (C) to the adapter plate (B).
- Ü For clamping hubs with two screws, tighten the screws alternately in at least three stages (15%, 50%, and 100%) until the tightening torque ([table 6.2](#)) is reached.
- Ü For clamping hubs with one screw, tighten the screw until the tightening torque has been reached ([table 6.2](#)).
- Ü Press the enclosed stopper plugs up to their stops into the mounting bores of the adapter plate (B).

6.3 Components fastened to gear output side

- Ü Thoroughly clean the output shaft, centring, and fitting surface.



Attention

Distortions during mounting operations can damage the gear reducer.

- Ü Mount gearwheels and toothed belt pulleys onto the output shaft without forcing.
- Ü Do not on any account attempt an assembly by force or hammering.
- Ü Only use suitable tools and equipment.
- Ü When shrink-fitting a gear onto the output shaft: Ensure that the maximum static axial forces of the output bearing ([table 6.4](#)) are not exceeded.

	F _{amax} [N]
PKF 060	40000
PKF 160	85000
PKF 300	54000
PKF 600	110000
PKF 1100	160000

$s_0 = 1,8 \quad F_r = 0$

Table 6.4

6.3.1 Installing the shrink disk

- J The removed shrink disk does not need to be disassembled and regreased prior to bracing again. It is only necessary to disassemble and clean the shrink disk when it is dirty.



Attention

Cleaned shrink disks can have other coefficients of friction. This can lead to damage during mounting.

- Ü Lubricate the inner smooth surfaces of the shrink disk using a solid lubricant with a coefficient of friction of $\mu = 0.04$.

J The following lubricants are permissible for relubricating the shrink disk:

Lubricant	Commercial form	Manufacturer
Molykote 321 R (lubricating varnish)	spray	DOW Corning
Molykote Spray (powder spray)	spray	DOW Corning
Molykote G Rapid	spray or paste	DOW Corning
Aemasol MO 19 P	spray or paste	A. C. Matthes
Unimoly P 5	powderr	KlüberLubrication

Table 6.5

- Ü Push the shrink disk onto the hollow shaft.
- J Only the exterior surface of the hollow shaft may be greased in the area of the shrink disk seat.
- Ü Observe the further instructions given in Chapter 6.3.2 „Mounting on the hollow output shaft with shrink disk“.

6.3.2 Mounting on the hollow output shaft with shrink disk

The hollow output shaft has a smooth design (without keyway). The hollow output shaft is axially secured to the load shaft by means of a shrink disk connection.

- Ü If a different shrink disk is used, observe the instructions of the manufacturer.

The load shaft has to fulfill the following conditions:

Minimum yield stress [N/mm²]	≥ 260
Surface roughness Rz [µm]	≤ 16
Tolerance	h6

Table 6.6



Attention

Dirt can inhibit transmission of the torque.

- Ü Do not disassemble the shrink disk prior to installation.
- Ü De-grease the load shaft and the hollow output shaft's bore leaving no residual traces in the area of the shrink disk seat.

J Only the exterior surface of the hollow output shaft may be greased in the area of the shrink disk seat.



Attention

The forces of the shrink disk can deform the hollow output shaft.

- Ü Always install the load shaft first before tightening the clamping screws of the shrink disk.

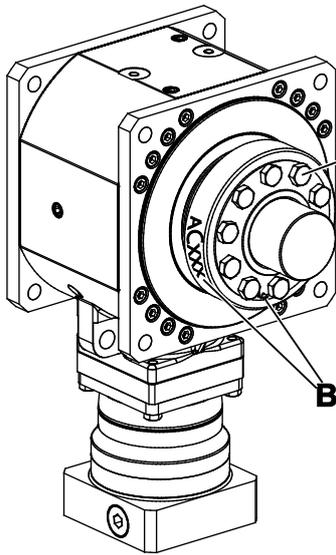
Ü Push the hollow output shaft onto the load shaft by hand.



Attention

Incorrectly aligned shafts can lead to damage.

- Ü Ensure that the hollow output shaft is aligned with the load shaft.
- Ü Mount the hollow output shaft onto the load shaft without using force.
- Ü Do not on any account attempt an assembly by hammering or applying pressure.



The article code (B) is located, depending on the design, on the front side or the circumference of the shrink disk.

- Ü Tighten the clamping screws (A) of the shrink disk evenly distributed in multiple circular passes.
- Ü Tighten the individual clamping screws only up to the maximum permitted tightening torque.
- J For screw sizes and prescribed tightening torques, see Table "6.7".

Fig. 6.4

Gearhead size PKF	Material of the shrink disk: Standard		
	Article code (AC)	Tightening torque	Clamping screw thread
060	20001392	30 Nm	M8
160	20001396	30 Nm	M8
300	20001397	59 Nm	M10
600	20003159	59 Nm	M10
1100	20023267	100 Nm	M12

Table 6.7

- Ü Check that the clamping screws (A) have the maximum tightening torque, going through in sequence twice.
- J If a separately supplied shrink disk should be installed, read the information in Chapter 6.3.1 „Installing the shrink disk “.

6.4 Mounting the gear reducer onto your machine

- Ü Please observe the instructions in the [„General Safety Instructions“](#) in section [3.3.1](#).

Check the lubricant quantity

The gear reducers are compliant for every mounting position; the lubricant quantity, however, is dependent on the mounting position.

The filled lubricant and the required lubricant quantities are specified on the identification plate. These apply for the mounting position stated with the order.



Attention

Changing the mounting position can destroy the gear reducer.

- Ü Please consult our Customer Service Department ([see 1.1](#)) if you wish to change the mounting position.

Mounting the gear reducer

- J Mount the gear reducer in such a way that the identification plate remains legible.
- Ü Coat the four screws with screw-bonding agent (e.g. Loctite 243), and screw the gear unit housing and your machine together.
- J You can find the prescribed screw sizes and tightening torques in [table 6.1](#).

6.5 Putting into operation

- Ü Please observe the instructions in the [„General Safety Instructions“](#) in section [3.3.1](#).

7 Operation

7.1 Operating conditions

Ü Please observe the instructions in the [„General Safety Instructions” in section 3.3.1.](#)

The gear reducer must be installed in a clean and dry environment. Coarse dust and liquids of all kinds impair its function.

The specifications for lubricants and operating temperatures can be found in [section 4.3.](#)

Ü Avoid icing, which can damage the seals.

Divergent operating conditions may make different lubricant quantities and different lubricants necessary.

Ü In these cases, please consult our Customer Service Department (see 1.1).

8 Maintenance

8.1 Shutdown, preparation

Ü Please observe the instructions in the [„General Safety Instructions” in section 3.3.1.](#)

Ü Shut down the machine in which the gear reducer is installed.

Ü Disconnect the machine from the mains, before starting maintenance work.

8.2 Checking Schedule

Maintenance work / See section...	Maintenance periods		
	At start-up	After 500 operating hours or 3 months	Yearly
Visual inspection / 8.3.1	X	X	X
Checking the tightening torques / 8.3.2	X	X	X
Oil change / 8.3.3	Recommended: every 10,000 operating hours		

Table 8.1

8.3 Maintenance Work

8.3.1 Visual Inspection

Ü Check the entire gear reducer by carrying out a thorough visual inspection for exterior damage and oil leakage.

8.3.2 Checking the Tightening Torques

Ü Check the tightening torques of the fastening bolts on the gear unit housing.

J You can find the prescribed tightening torques in [table 6.1](#) in chapter 6.

Ü Check the tightening torque of the clamping bolts on the motor mounting.

J You can find the prescribed tightening torques in [table 6.2](#) in chapter 6.

8.3.3 Oil Change

- Ü Please observe the instructions in the [„General Safety Instructions” in section 3.3.1.](#)
- You can find a list of permitted lubricants in [chapter 4.3.](#)
- All gear reducers are lubricated for all their working lives. However, we **recommend** an oil change approximately every 10,000 operating hours for synthetic oils as well, since oil becomes contaminated, and thus causes increased wear and tear.
- Ü Heat up the gear reducer to operating temperature.
- Ü Drain the oil off through a plug located below.
- Ü Open a plug situated at top, so that the gear reducer is ventilated.
- J There is still residual oil and dirt in the gear reducer. We recommend that these be flushed out:
 - Screw in the bottom plug, fill with oil, and screw in the top plug.
 - Let the machine run for a short time, and drain the oil off again.
- Ü De-grease the bottom plug and coat this with a bonding agent (e.g. Loctite 573).
- Ü Screw the bottom plug tight with the prescribed tightening torque.
- J Refer to [table 8.2](#) for the tightening torque.
- Ü Fill with the prescribed quantity of oil.
- J You can find the prescribed lubricant quantity in [chapter 4.3.](#)
- Ü De-grease the plug, and coat this with a bonding agent (e.g. Loctite 573).
- Ü Screw the top plug tight with the prescribed tightening torque.
- J Refer to [table 8.2](#) for the tightening torque.
- Ü Should you have to dismantle the gear reducer, remount it as described in [chapter 6.](#)

Gear reducer size	Stages	Plug in:	
		Drive housing Size / Tightening torque	Output housing Size / Tightening torque
PKF 060	2	)^{*1}	)^{*1}
	3	)^{*1}	)^{*1}
	4	)^{*1}	)^{*1}
PKF 160	2	)^{*1}	5xM10x1 / 10 Nm
	3	3xM12x1.5 / 10 Nm 1xM8x1 / 5 Nm	5xM10x1 / 10 Nm
	4	3xM12x1.5 / 10 Nm 1xM8x1 / 5 Nm	5xM10x1 / 10 Nm
PKF 300	2	)^{*1}	5xM12x1.5 / 10 Nm
	3	)^{*1}	5xM12x1.5 / 10 Nm
	4	)^{*1}	5xM12x1.5 / 10 Nm
PKF 600	2	-	5xM12x1.5 / 10 Nm
	3	3xM12x1.5 / 10 Nm 1xM8x1 / 5 Nm	5xM12x1.5 / 10 Nm
	4	3xM12x1.5 / 10 Nm 1xM8x1 / 5 Nm	5xM12x1.5 / 10 Nm
PKF 1100	2	-	5xM12x1.5 / 10 Nm
	3	4xM12x1.5 / 10 Nm	5xM12x1.5 / 10 Nm
	4	4xM12x1.5 / 10 Nm	5xM12x1.5 / 10 Nm

Table 8.2

)^{*1} = on demand

8.4 Start-up after maintenance work

- Ü Clean the outside of the gear reducer.
- Ü Assemble all safety devices.
- Ü Do a test run, before re-releasing the machine for operation.

9 Supplementary Information

- J If you should need supplementary information (e.g. disassembly, or disposal), please contact our Customer Service Department ([see 1.1](#)).

10 Appendix

10.1 Tightening torques

The specified tightening torques for headless screws and nuts are calculated values and are based on the following conditions:

- Calculation acc. VDI 2230 (Issue February 2003)
- Friction value for thread and contact surfaces $\mu = 0.10$
- Exploration of the yield stress 90 %

Property class	Tightening torque [Nm] for threads												
	M 3	M 4	M 5	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20	M 22	M 24
8.8	1.15	2.64	5.24	8.99	21.7	42.7	73.5	118	180	258	363	493	625
10.9	1.68	3.88	7.69	13.2	31.9	62.7	108	173	265	368	516	702	890
12.9	1.97	4.55	9	15.4	37.3	73.4	126	203	310	431	604	821	1042

Table 11.1



alpha

WITTENSTEIN alpha GmbH
Walter-Wittenstein-Straße 1
97999 Igersheim

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