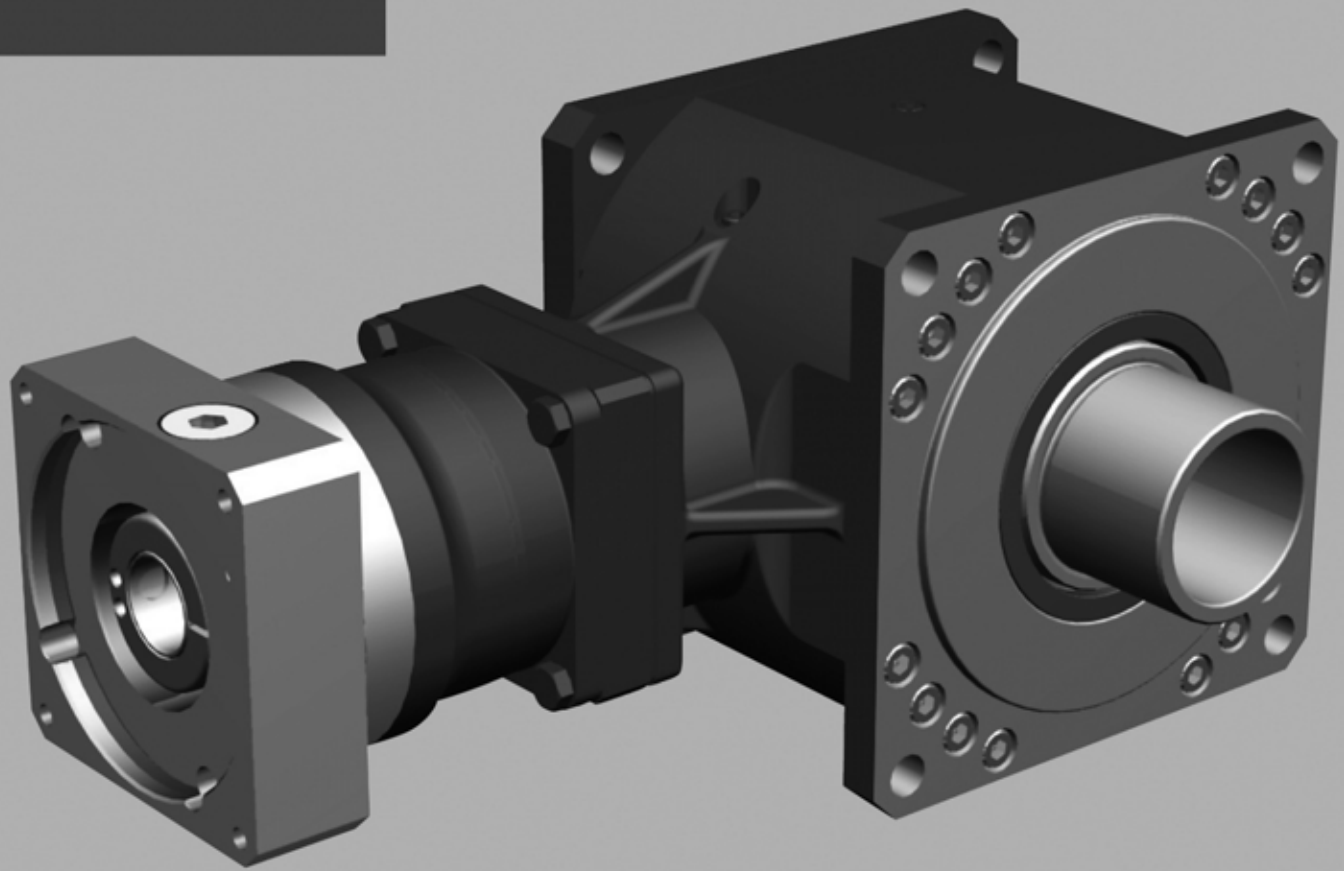
WITTENSTEIN | alpha

PKF

with SP+ input stage

Assembly Instructions



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Revision: 02

Revision	Date	Comment	Chapter
01	28.06.12	New version	All
02	26.06.13	Techncal Data; Shrink disk	All

Service

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Contents

1 About this manual

These instructions contain the necessary information to safely use the low-backlash planetary bevel gearhead PKF, hereinafter referred to as the gearhead.

If this manual is supplied with an amendment (e.g. for special applications), then the information in the amendment is valid. Contradictory specifications in this manual thereby become obsolete.

The operator must ensure that this operating manual is read through by all persons assigned to install, operate, or maintain the gearhead, and that they fully comprehend them.

Store these instructions within reach of the gearhead.

Inform your colleagues who work in the area around the machine about the **safety instructions** so that no-one is hurt.

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

1.1 Signal words

The following signal words are used to indicate possible hazards, prohibitions, and important information:

	⚠ DANGER **This signal word indicates an imminent danger that could cause serious injuries and even death.**
	⚠ WARNING **This signal word indicates a potential hazard that could cause serious injuries and even death.**
	⚠ CAUTION **This signal word indicates a potential hazard that could cause minor or serious injuries.**
	NOTICE **This signal word indicates a potential hazard that could lead to material damage.**
	A note without a signal word indicates application hints or especially important information for handling the gearhead.

1.2 Safety symbols

The following safety symbols are used to indicate possible hazards, prohibitions, and important information:


General danger


Hot surface


Suspended loads


Danger of being pulled in


Environment protection

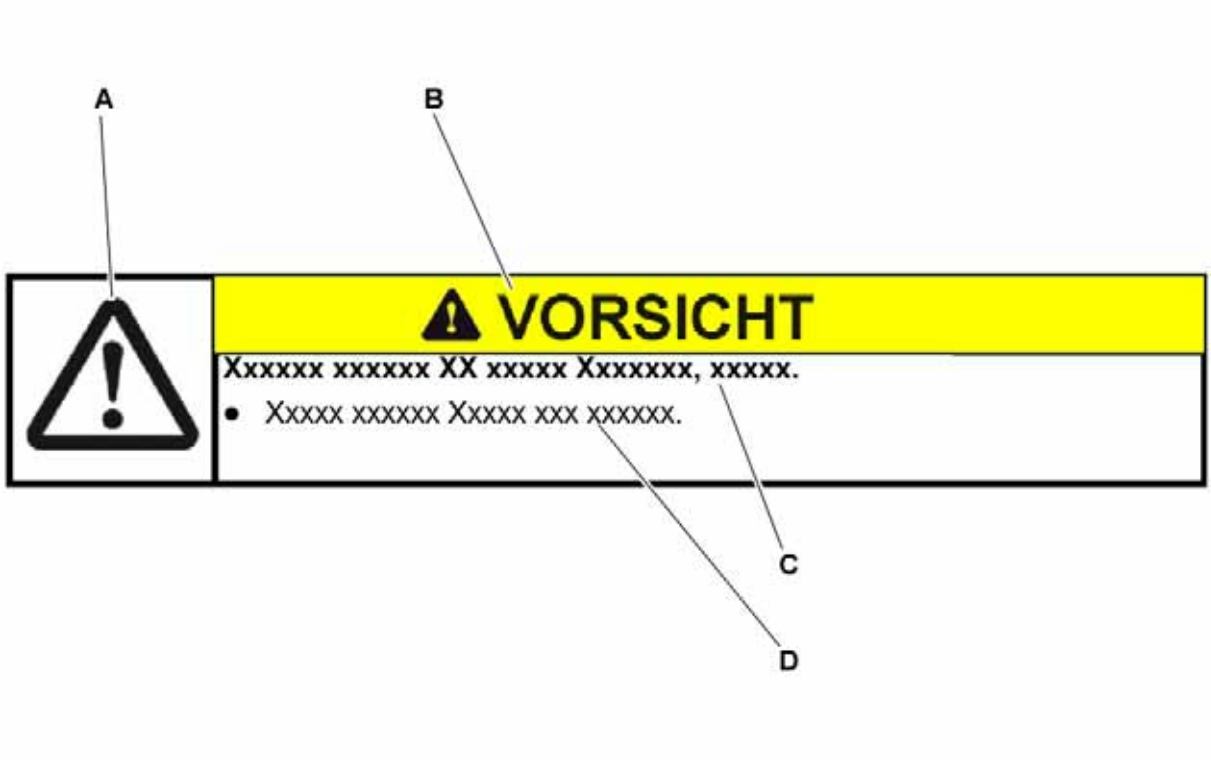

Information


Flammable materials


Crush hazard

1.3 Design of the safety instructions

The safety instructions in these instructions are designed according to the following pattern:



A = Safety symbol (see Chapter 1.2 "Safety symbols")
B = Signal word (see Chapter 1.1 "Signal words")
C = Type and consequence of the danger
D = Avoiding danger

1.4 Information symbols

The following information symbols are used:

- Indicates an action to be performed
  ➲ Indicates the results of an action

ⓘ Provides additional information on handling

2 Safety

These instructions, especially the safety instructions and the rules and regulations valid for the operating site, must be observed by all persons working with the gearhead.

In addition to the safety instructions in this manual, also observe any (legal and otherwise) applicable environmental and accident prevention rules and regulations (e.g. personal safety equipment).

2.1 EC machinery directive

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

Startup is prohibited within the scope of the EC directive until it has been determined that the machine in which this gearhead is installed corresponds to the regulations within this directive.

2.2 Dangers

The gearhead has been constructed according to current technological standards and accepted safety regulations.

To avoid danger to the operator or damage to the machine, the gearhead may be put to use only for its intended usage (see chapter 2.4 "Intended use") and in a technically flawless and safe state.

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

2.3 Personnel

Only persons who have read and understood these disassembly instructions may carry out work on the gearhead.

2.4 Intended use

The gearhead serves to convert torques and speeds. It is built for industrial applications that do not fall under article 2 of the directive 2002/95/EU (usage restriction of certain dangerous materials on electro and electronic equipment).

The gearhead may not be operated in areas with explosion hazards. In food processing, the gearhead may be used only next to or under the foodstuff area.

The gearhead is specified for installment on motors that:

- Correspond to the design B5 (for any deviations, consult our Customer Service department [technical Customer Service department]).
- Show a radial and axial runout tolerance of at least “N” according to DIN 42955.
- Have a smooth shaft.

2.5 Reasonably predictable misuse

Any usage that exceeds the maximum permitted speeds, torques and temperature is considered a misuse and is therefore prohibited.

2.6 Guarantee and liability

Any of the following will void guarantee and liability claims for personal injury or material damage:

- Ignoring the information on transport and storage
- Improper use (misuse)
- Improper or neglected maintenance and repair
- Improper assembly / disassembly or improper operation (e.g. test run without secure attachment)
- Operation of the gearhead when safety devices and equipment are defective
- Operation of the gearhead without lubricant
- Operation of a heavily soiled gearhead
- Modifications or reconstructions that have been carried out without the approval of **WITTENSTEIN alpha GmbH**.

2.7 General safety instructions

⚠ WARNING

Objects flung out by rotating components can cause serious injuries.

- Remove objects and tools from the gearhead before putting it into operation.
- Remove/Secure the shaft key (if available) if the gearhead is operated without attachments on the output/drive side.

⚠ WARNING

Rotating components on the gearhead can pull in parts of the body and cause serious injuries and even death.

- Keep a sufficient distance to rotating machinery while the gearhead is running.
- Perform assembly and maintenance work only when the machine is shut down.
- Secure the machine against restarting and unintentional movements during assembly and maintenance work (e.g. uncontrolled lowering of lifting axes).

⚠ WARNING

A damaged gearhead can cause accidents and injury.

- Never use a gearhead that has been overloaded due to misuse or a machine crash (see Chapter 2.5 "Reasonably predictable misuse").
- Replace the affected gearhead, even if no external damage is visible.

⚠ WARNING

Lubricants are flammable.

- Do not spray with water to extinguish.
- Suitable extinguishing agents are powder, foam, water mist, and carbon dioxide.
- Observe the safety instructions of the lubricant manufacturer (see Chapter 7.4 "Notes on the lubricant used").

⚠ CAUTION

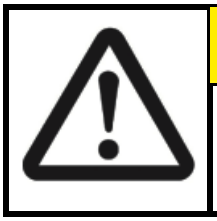
Hot gearhead housing can cause serious burns.

- Touch the gearhead housing only when wearing protective gloves or after the gearhead has been idle for some time.

⚠ CAUTION

Injury hazard on toothed parts due to sharp parts.

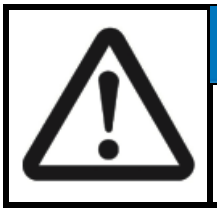
- Wear protective gloves when working on the gearhead.



⚠ CAUTION

Solvents and lubricants can cause skin irritations.

- Avoid direct skin contact.
- Observe the safety data sheets of the lubricants used.



NOTICE

Loose or overloaded screw connections can damage the gearhead.

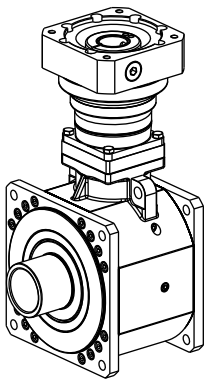
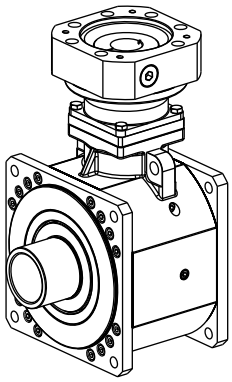
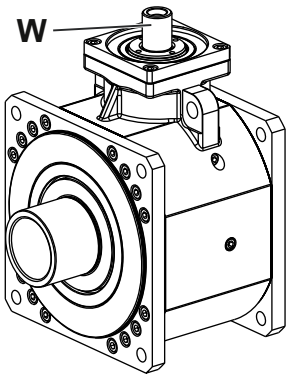
- Use a calibrated torque wrench to tighten and check all screw connections for which a tightening torque has been specified.

Solvents and lubricants can pollute soil and water.

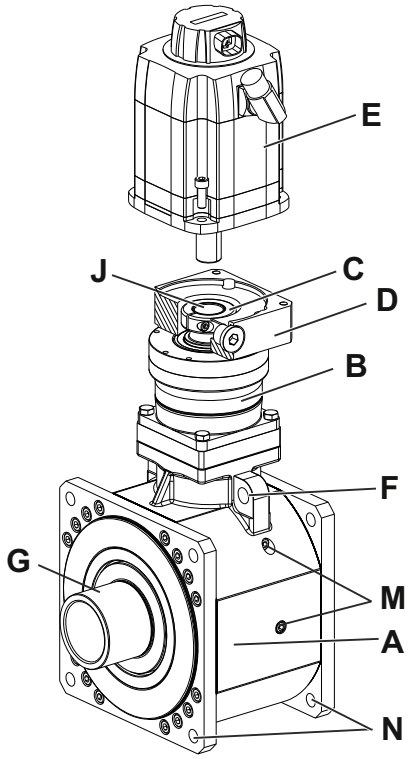
- Use and dispose of cleaning solvents as well as lubricants appropriately.

3 Description of the gearhead

The gearhead is a multi-stage, low-backlash planetary bevel gearhead that is manufactured as standard in the following versions:

	**3-stage and 4-stage motor-mounted gearhead "M"** Motor centering of the 3-stage and 4-stage motor-mounted gearhead is performed: - Up to gearhead size PKF 300 and a motor shaft diameter ≤ 28 mm by the clamping hub (plug receptacle) - From gearhead size PKF 600 and a motor shaft diameter of > 28 mm by the centering collar of the motor A radial distortion of the motor is avoided. Various types of motors can be accommodated using an adapter plate and a bushing. The output shaft bearing is designed to withstand high tilting moments and axial forces.
	**2-stage motor-mounted gearhead "M"** Motor centering of the 2-stage motor-mounted gearhead is performed by the centering collar of the motor. A radial distortion of the motor is avoided. Various types of motors can be accommodated using an adapter plate and a bushing. The output shaft bearing is designed to withstand high tilting moments and axial forces. The gearhead is equipped with a linear length compensation to compensate for the expansion of the motor shaft when heated up.
	**Self-contained gearhead "S"** The self-contained gearhead is based on the PKF output stage and the drive shaft (W). The drive shaft makes it possible to directly drive the gearhead using a belt pulley or coupling, for instance. The drive and output shaft bearing is designed to withstand high tilting moments and axial forces.

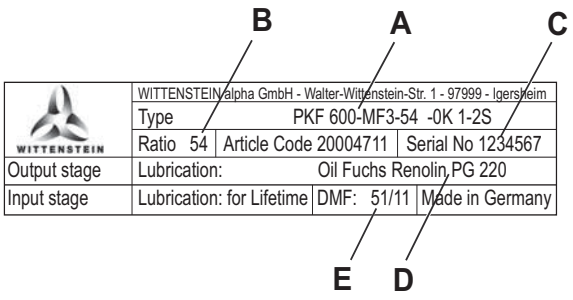
3.1 Overview of the gearhead components

		Gearhead components
	A	PKF output stage
	B	SP+ input stage
	C	Clamping hub (plug receptacle / coupling)
	D	Adapter plate (optional)
	E	Motor
	F	Torque support
	G	Output shaft
	J	Bushing (optional)
	M	Oil filler and drain plug (5x in the output stage)
	N	Through-holes for attaching to a machine

Tbl-1: Overview of the gearhead components

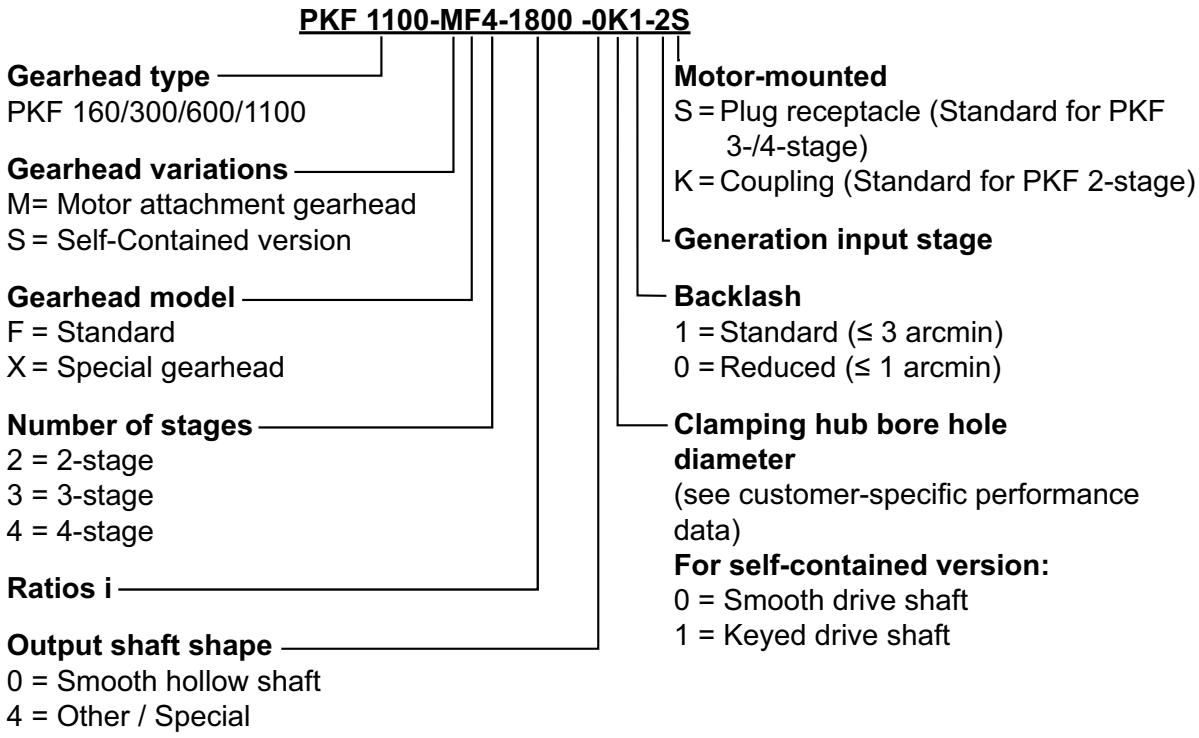
3.2 Identification plate

The identification plate is attached to the output stage for motor-mounted and self-contained gearheads. For 3-stage and 4-stage gearheads, there is an additional identification plate located on the output stage.

		Designation
	A	Ordering code (see chapter 3.3 "Ordering code")
	B	Ratio
	C	Serial number
	D	Lubricant
	E	Production date

Tbl-2: Identification plate (sample values)

3.3 Ordering code



3.4 Performance statistics

For the maximum permitted speeds and torques, refer to the respective customer-specific performance data (1093–D... or 2093–D...).

Consult our Customer Service department if the gearhead is older than a year. You will then receive the valid performance data.

3.5 Weight

The table "Tbl-3" specifies the gearhead dimensions with medium-sized adapter plate. If a different adapter plate is mounted, the actual dimensions can deviate by up to 10%.

Gearhead size PKF		160	300	600	1100
Design	**Stages**				
M	**2**	30	44.5	96	181
	3	37.5	50.2	102	194
	4	38	51	101	197
S	**2**	26	42,6	92	171

Tbl-3: Weight [kg]

3.6 Noise emission

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

ⓘ Specifications for your special product can be found in the corresponding customer-specific performance data (1093-D... or 2093-D...) or by contacting our customer service department.

- Observe the total noise pressure level of the machine.

4 Transport and storage

4.1 Scope of delivery

- Check the completeness of the delivery against the delivery note.

  ⓘ Missing parts or damage must be notified immediately in writing to the carrier, the insurance, or **WITTENSTEIN alpha GmbH**.

4.2 Packaging

The gearhead is delivered packed in foil and on a pallet and/or in cardboard boxes.

- Dispose of the packaging materials at the recycling sites intended for this purpose. Observe the locally valid regulations for disposals.

4.3 Transport

⚠ WARNING

Suspended loads can fall and can cause serious injuries and even death.

- Do not stand under suspended loads.
- Secure the gearhead before transport with suitable fasteners (e.g. belts).

⚠ CAUTION

An unsecured gearhead can pose a crushing or shearing hazard.

- When transporting the gearhead, wear, protective gloves and safety shoes.

NOTICE

Hard knocks, for instance because of falling or hard dropping, can damage the gearhead.

- Only use hoisting equipment and transports with sufficient capacity.
- The maximum permitted lift capacity of a hoist may not be exceeded.
- Lower the gearhead slowly.

Specifications on the weights, refer to Chapter 3.5 "Weight".

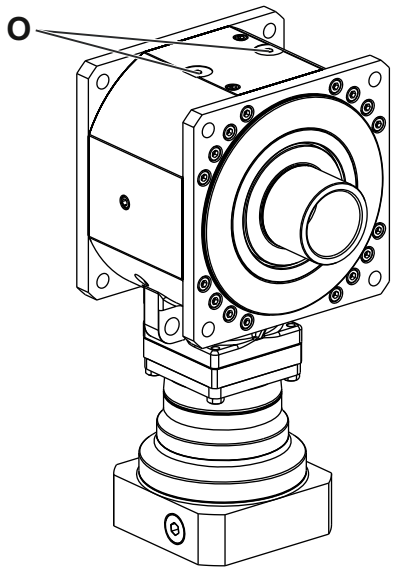
4.3.1 Transport of gearheads up to and including size PKF 160

No special transport mode is prescribed for transporting the gearhead.

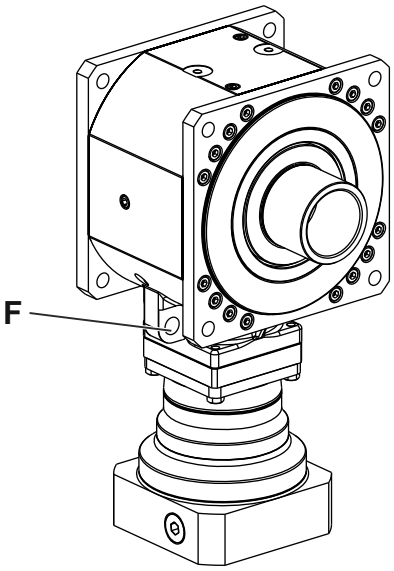
4.3.2 Transport of gearheads starting from size PKF 300

For gearheads starting from size PKF 300, support bores (O) are provided for ring screws. The ring screw is used for attaching the gearhead securely to the hoisting equipment.

The torque supports (F) can also be used for transport.

	Gearhead size PKF	Support bore (O) [Ø]
	300	M8
	600	M8
	1100	M10

Tbl-4: Support bore on the gearhead

	Gearhead size PKF	Torque support (F) [mm]
	300	Ø 16H7
	600	Ø 16H7
	1100	Ø 20H7

Tbl-5: Torque support on the gearhead

4.4 Storage

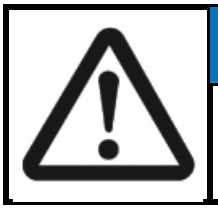
Store the gearhead in horizontal position and dry surroundings at a temperature of 0 °C to +40 °C in the original packaging. Store the gearhead for a maximum of 2 years.

For storage logistics, we recommend the "first in - first out" method.

5 Assembly

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

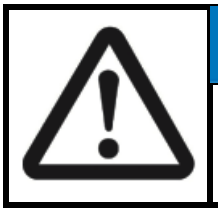
5.1 Preparations



NOTICE

Pressurized air can damage the gearhead seals.

- Do not use pressurized air to clean the gearhead.



NOTICE

Directly sprayed cleaning agents can alter the frictional values of the clamping hub.

- Only spray cleaning agents onto a cloth for wiping off the clamping hub.

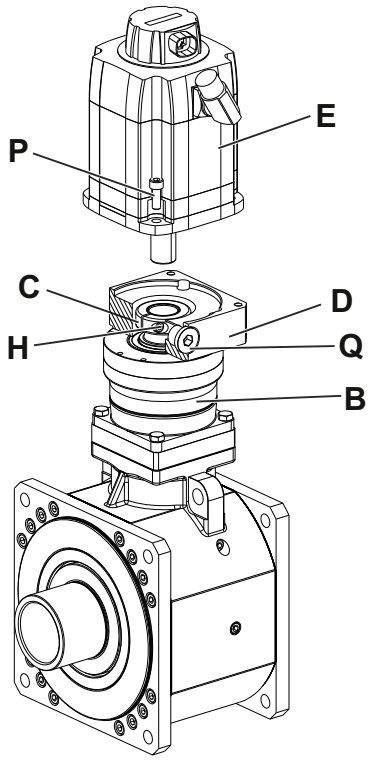
- Check that the motor meets the specifications in Chapter 2.4 "Intended use".
- Clean/De-grease and dry the following components with a clean and lint-free cloth and grease-dissolving, non-aggressive detergent:
  - All fitting surfaces to neighboring components
  - Centering
  - The motor shaft
  - The inside diameter of the clamping hub
  - The bushing inside and out
- Dry all fitting surfaces to neighboring components in order to achieve the proper friction values of the screw connections.
- Check the fitting surfaces additionally for damage and impurities.
- Select screws for fastening the motor to the adapter plate according to the motor manufacturer's specifications. Observe the minimum screw depth as determined by the property class (see Table "Tbl-6").

Property class of the screws for fastening the motor	8.8	10.9
Minimum screw-in depth	1.5 x d	1.8 x d
d = Screw diameter		

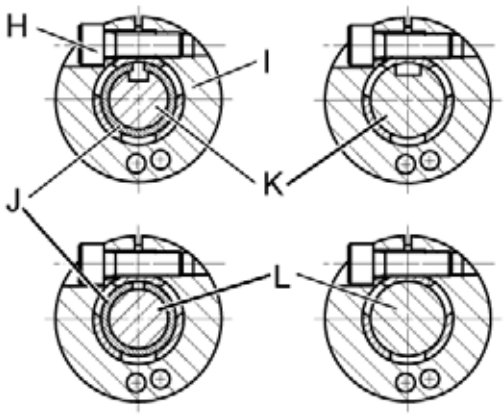
Tbl-6: Minimum screw depth of the screws for fastening the motor to the adapter plate

5.2 Mounting the motor onto the gearhead

	● Observe the specifications and safety instructions of the motor manufacturer. ● Observe the safety and processing instructions for the threadlockers to be used.



- Ensure that the motor is mounted if possible in a vertical direction.
- If the motor shaft has a shaft key, remove the shaft key.
  - ⓘ If recommended by the motor manufacturer, insert a half wedge.
- Remove the plug from the mounting hole (Q) in the adapter plate (D).
- Turn the clamping hub (C) until the clamping bolt (H) can be reached by the mounting bore.
- Loosen the clamping bolt (H) of the clamping hub (C) by one revolution.
- Push the motor shaft into the clamping hub (C) of the gearhead (B).
  - ⓘ The motor shaft should slip in easily. If this is not the case, the clamping bolt (H) needs to be loosened some more.
  - ⓘ A slotted bushing has to be installed extra for certain motor shaft diameters and applications.
  - ⓘ The slot of the bushing (if provided) and clamping hub have to be flush with the groove (if provided) of the motor shaft, see table "Tbl-7".
  - ⓘ No gap is permitted between motor (E) and the adapter plate (D).

		Designation
	H	Clamping bolt
	I	Clamping ring [part of the clamping hub (C)]
	J	Bushing
	K	Keyed motor shaft
	L	Smooth motor shaft

Tbl-7: Arrangement of motor shaft, clamping hub, and bushing

ⓘ Motor centering of the 3-stage and 4-stage motor-mounted gearhead is performed:
- Up to gearhead size PKF 300 and a motor shaft diameter ≤ 28 mm by the clamping hub (plug receptacle)
- From gearhead size PKF 600 and a motor shaft diameter of > 28 mm by the centering collar of the motor

ⓘ Motor centering of the 2-stage motor-mounted gearhead is performed by the centering collar of the motor.

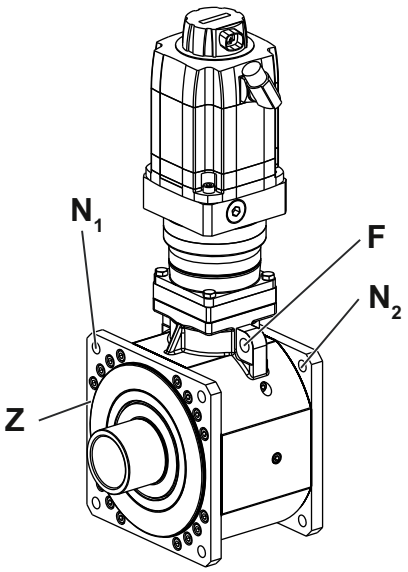
- Coat the four screws (P) with a threadlocker (e.g. Loctite® 243).
- Fasten the motor (E) onto the adapter plate (D) with the four screws (P).
- Tighten the clamping bolt (H) of the clamping hub (C).
  ⓘ For screw sizes and specified torques refer to Chapter 9.1 "Specifications for fastening to a motor", table "Tbl-17".
- Screw in the plug (Q) of the adapter plate (D).
  ⓘ For screw sizes and specified torques refer to table "Tbl-8".

Width across flats [mm]	5	8	10	12
Tightening torque [Nm]	10	35	50	70

Tbl-8: Tightening torque for the plugs

5.3 Mounting the gearhead to a machine

	● Observe the safety and processing instructions for the threadlockers to be used. ● Optionally, the gearhead can have a second centering (Z) on the PKF output stage. Always only secure the gearhead on one side (N_1 or N_2).



- Center the gearhead in the machine base.
- Coat the fastening screws with a threadlocker (e.g. Loctite® 243).
- Fasten the gearhead on the machine with the fastening screws through the through-holes (N_1) or (N_2).
  ⓘ We recommend attaching through the through-holes (N_1).
  ⓘ Mount the gearhead in such a way that the identification plate remains legible.
  ⓘ Use washers ISO 7090 with hardness class 300 HV (tempered).
  ⓘ For screw sizes and specified torques refer to Chapter 9.2 "Specifications on fastening to a machine", table "Tbl-18".

5.3.1 Additional securing of gearheads starting from size PKF 300

Gearhead starting from size PKF 300 have an additional torque support (F), which can also be used for attaching it to a machine.

- Ream the factory painted through-holes into the torque support (F) with a hand reamer.
- Fasten the gearhead to the machine with the screws/bolts through the through-holes.
  ⓘ Bore diameter, see Chapter 4.3 "Transport", table "Tbl-5".

5.4 Components fastened to gear output side

5.4.1 Installing the shrink disk

ⓘ 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.

NOTICE

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

- Lubricate the inner smooth surfaces of the shrink disk using a solid lubricant with a coefficient of friction of μ = 0.04.

ⓘ 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	Powder	Klüber Lubrication

Tbl-9: Lubricants for relubricating the shrink disk

- Push the shrink disk onto the hollow output shaft.

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

- Observe the further instructions given in Chapter 5.4.2 "Mounting on the hollow output shaft with shrink disk".

5.4.2 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.

- 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/mm]^2]	≥ 260
Surface roughness Rz [µm]	≤ 16
Tolerance	h6

Tbl-10: Features of the load shaft

NOTICE

Dirt can inhibit transmission of the torque.

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

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

NOTICE

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

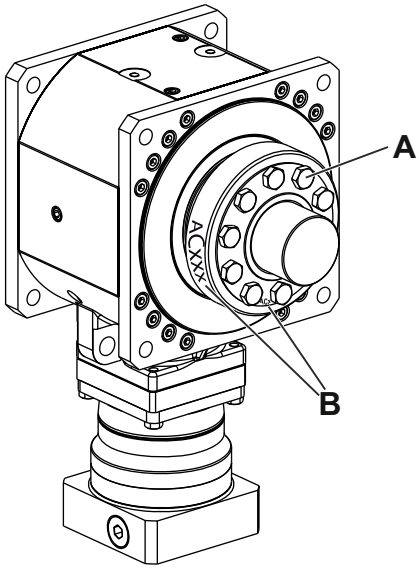
- Always install the load shaft first before tightening the clamping screws of the shrink disk.

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

NOTICE

Incorrectly aligned shafts can lead to damage.

- Ensure that the hollow output shaft is aligned with the load shaft.
- Mount the hollow output shaft onto the load shaft without using force.
- 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.

- Tighten the clamping screws (A) of the shrink disk evenly distributed in multiple circular passes.
- Tighten the individual clamping screws only up to the maximum permitted tightening torque.

  ⓘ For screw sizes and prescribed tightening torques, see Table "Tbl-11".
- Check that the clamping screws (A) have the maximum tightening torque, going through in sequence twice.

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

Tbl-11: Tightening torques for clamping screws of the supplied shrink disk

6 Startup and operation

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

	Improper use can cause damage to the gearhead. ● Ensure that - The **ambient temperature** does not drop below -15 °C or exceed +40 °C and - The **operating temperature** does not exceed +90 °C. ● Avoid icing, which can damage the seals. ● For other conditions of use, consult our Customer Service department. ● Only use the gearhead up to its maximum limit values, see Chapter 3.4 "Performance statistics". ● Use the gearhead only in a clean, dust-free and dry environment. ● Only operate the gearhead when it is screwed on and securely attached.

7 Maintenance and disposal

- Read the general safety instructions before beginning to work (see Chapter 2.7 "General safety instructions").

7.1 Maintenance work

7.1.1 Visual inspection

- Check the entire gearhead for exterior damage.
- The radial shaft seals are subject to wear. Therefore also check the gearhead for leakage during each visual inspection.
  - ⓘ More general information on radial shaft seals can be found on our partner's Internet site at http://www.simrit.de.
  - ⓘ Check the mounting position that no foreign medium (e.g. oil) has collected on the output shaft.

7.1.2 Checking the tightening torques

- Check the tightening torque of the clamping bolt on the motor mounting. If you discover while checking the tightening torque that the clamping bolt can be turned further, tighten it with the prescribed tightening torque.
  - ⓘ The prescribed tightening torques can be found in Chapter 9.1 "Specifications for fastening to a motor", table "Tbl-17".
- Check the tightening torque of the fastening screws on the gearhead housing. If, while checking the tightening torque, you discover that the fastening screw can be further tightened, follow the instructions in "Remounting the screw".
  - ⓘ The prescribed tightening torques can be found in Chapter 9.2 "Specifications on fastening to a machine", table "Tbl-18".

Remounting the screw

	● Make sure that it is possible to remount the screw on the gearhead without the risk of damage to the entire machine.

- Loosen the screw.
- Remove the residue glue from the threaded bore and from the screw.
- De-grease the screw.
- Coat the screw with a threadlocker (e.g. Loctite® 243).
- Screw in the screw and tighten it with the prescribed tightening torque.

7.1.3 Replacing lubricant

NOTICE

Faultily filled in lubricant can cause damage to the gearhead.

- Fill the gearhead only with lubricants that have been approved by **WITTENSTEIN alpha GmbH** (see Chapter 7.4 "Notes on the lubricant used").

- Observe the safety and process instructions for using the sealant and the lubricant.
- The tightening torque for the oil filler and drain plugs can be found in Chapter 9.3 "Tightening torques for oil filler and drain plugs".

ⓘ A list of approved lubricants can be found in Chapter 7.4 "Notes on the lubricant used". We recommend a lubricant change for synthetic lubricants approximately every 10,000 operating hours, as the lubricant becomes dirty, thus causing increased wear.

Draining lubricant

- Heat up the gearhead to operating temperature.
- Drain the lubricant through one of the bottom oil drain plugs.
- Open an oil filler plug situated at top, so that the gearhead is ventilated.
  ⓘ There may be lubricant and dirt residues in the gearhead. We recommend that these be flushed out.
- Flush out the gearhead with fresh lubricant. In case the lubricant cannot be completely emptied out of the gearhead, repeat the process several times.
- Screw in the lower oil drain plug.
- Fill the lubricant and tighten the top oil filler plug.
- Let the machine run briefly, and drain the lubricant off again.
- De-grease the bottom oil drain plug and coat it with a sealant (e.g. Loctite® 573).
- Tighten the bottom oil drain plug with the prescribed tightening torque.

Refill lubricant

- Open an oil filler plug situated at top.
- Fill the prescribed quantity of lubricant.
  ⓘ The prescribed lubricant quantity can be found in Chapter 7.4.1 "Lubricant quantities", table "Tbl-14".
- De-grease the top oil filler plug and coat it with a sealant (e.g. Loctite® 573).
- Tighten the top oil filler plug with the prescribed tightening torque.
- If the gearhead was dismounted, reinstall it according to the instructions in Chapter 5 "Assembly".

7.2 Startup after maintenance work

- Clean the outside of the gearhead.
- Attach all safety devices.
- Do a trial run before releasing the gearhead again for operation.

7.3 Maintenance schedule

Maintenance work	At initial startup	After 500 operating hours or 3 months	After 10,000 operating hours	Every 3 months	Yearly
Visual inspection	X	X		X	
Checking the tightening torques	X	X			X
Oil change			X		

Tbl-12: Maintenance schedule

7.4 Notes on the lubricant used

All gearheads are permanently lubricated by the manufacturer with synthetic gear oil (polyglycols) of viscosity class ISO VG 68/220 or with a high-performance lubricant (see type plate). All bearings are permanently lubricated at the factory.

- Lubricant SP^+ input stage: Grease Optimol Longtime PD 1, lubricated for entire service lifetime
- Lubricant PKF output stage: Oil Renolin PG 220, lubricant change necessary

In addition to the lubricant oil Renolin PG-220, the lubricant oil Renolin PG 68 can also be used (see table "Tbl-13").

Additional information from the manufacturer can be found at the specified Internet addresses.

Lubricant	Manufacturer
Optimol Longtime PD 1	Castrol Industrie GmbH, Mönchengladbach Tel.: + 49 2161 909-30 www.castrol.com
Renolin PG 220	Fuchs Europe Schmierstoff GmbH, Mannheim Tel.: + 49 621 3701–0 www.fuchs-oil.de
Renolin PG 68	

Tbl-13: Permitted lubricants

7.4.1 Lubricant quantities

The lubricant quantities of the PKF output stage are the same for all mounting positions.

Gearhead size PKF	Lubricant quantity PKF output stage [cm^3]
160	1200
300	1750
600	3150
1100	6900

Tbl-14: Lubricant quantities

7.5 Disposal

Consult our Customer Service department for supplementary information on exchanging the adapter plate, on disassembly, and on disposal of the gearhead.

- Dispose of the gearhead at the recycling sites intended for this purpose.
  ⓘ Observe the locally valid regulations for disposals.

8 Malfunctions

NOTICE

Changed operational behavior can be an indication of existing damage to the gearhead or can cause damage to the gearhead.

- Do not put the gearhead back into operation until the cause of the malfunction has been rectified.

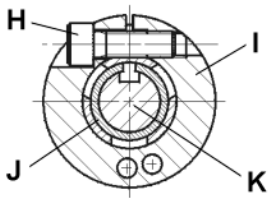
Rectifying of malfunctions may only be done by specially trained technicians.

Fault	Possible cause	Solution
Increased operating temperature	The gearhead is not suited for the task.	Check the technical specifications.
	Motor is heating the gearhead.	Check the wiring of the motor.
		Ensure adequate cooling.
		Change the motor.
	Ambient temperature too high.	Ensure adequate cooling.
Increased noises during operation	Distortion in motor mounting	Consult our Customer Service department.
	Damaged bearings	
	Damaged gear teeth	
Loss of lubricant	Lubricant quantity too high	Wipe off discharged lubricant and continue to watch the gearhead. Lubricant discharge should stop after a short time.
	Seals not tight	Consult our Customer Service department.

Tbl-15: Malfunctions

9 Appendix

9.1 Specifications for fastening to a motor

		Designation
	H	Clamping bolt
	I	Clamping ring (part of the clamping hub)
	J	Bushing
	K	Motor shaft

Tbl-16: Arrangement of motor shaft, clamping hub, and bushing

Gearhead size PKF		Clamping hub interior Ø "x" [mm]	Clamping screw (H) / DIN ISO 4762	Width across flats [mm]	Tightening torque [Nm] property class 12.9	Max. axial force clamping hub [N]	
						Plug-in terminal	Coupling
160	2-stage	38	M10	8	74	-	50
	3-stage	38	M10	8	74	150	-
	4-stage	28	M8	6	35	120	-
300	2-stage	38	M10	8	74	-	50
	3-stage	38	M10	8	74	150	-
	4-stage	28	M8	6	35	120	-
600	2-stage	38	M12	10	126	-	130
		48	M12	10	126	-	130
	3-stage	38	M10	8	74	200	-
	4-stage	38	M10	8	74	200	-
1100	2-stage	55	2 x M16	14	310	-	250
		60	2 x M16	14	310	-	250
	3-stage	48	M12	10	126	250	-
	4-stage	38	M10	8	74	200	-

Tbl-17: Specifications for fastening to a motor

9.2 Specifications on fastening to a machine

Through-holes in gearhead housing				
Gearhead size PKF	**Hole circle Ø [mm]**	**Quantity x diameter [ ] x [mm]**	**Screw size / property class**	**Tightening torque [Nm]**
160	230	4 x 13.5	M12 / 12.9	126
300	265	4 x 13.5	M12 / 12.9	126
600	320	4 x 17.5	M16 / 12.9	310
1100	410	4 x 17.5	M16 / 12.9	310

Tbl-18: Specifications on fastening to a machine

9.3 Tightening torques for oil filler and drain plugs

Gearhead size PKF	Oil filler and drain plugs DIN 906 quantity x diameter [ ] x [mm]	Tightening torque [Nm]
160	5 x M10x1	10
300	5 x M12x1.5	22
600	5 x M12x1.5	22
1100	5 x M18x1.5	43

Tbl-19: Tightening torques for oil filler and drain plugs DIN 906

9.4 Tightening torques for common thread sizes in general mechanics

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

- Calculation acc. to VDI 2230 (issue February 2003)
- Friction value for thread and contact surfaces μ=0.10
- Exploitation of the yield stress 90%

	Tightening torque [Nm] for threads												
Property class Screw/nut	**M3**	**M4**	**M5**	**M6**	**M8**	**M10**	**M12**	**M14**	**M16**	**M18**	**M20**	**M22**	**M24**
8.8 / 8	1,15	2,64	5,24	8,99	21,7	42,7	73,5	118	180	258	363	493	625
10.9 / 10	1,68	3,88	7,69	13,2	31,9	62,7	108	173	265	368	516	702	890
12.9 / 12	1,97	4,55	9,00	15,4	37,3	73,4	126	203	310	431	604	821	1042

Tbl-20: Tightening torques for headless screws and nuts

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