

## LP<sup>+</sup>/LPB<sup>+</sup> Generation 3

Assembly Instructions



## Revision history

Revision	Date	Comment	Chapter
01	28.03.2011	New version	All
02	16.05.2012	Generation 3	All
03	28.11.2012	Safety	All

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LP<sup>+</sup>

Motor mounting video



LPB<sup>+</sup>

Motor mounting video

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# 1 Regarding this manual

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

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.

## 1.1 Information symbols

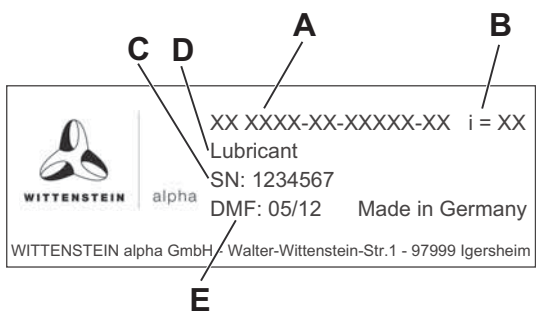
The following information symbols are used:

- Indicates an action to be performed
- ➔ Indicates the results of an action
- ① Provides additional information on handling

# 2 General safety instructions

## 2.1 Identification plate

The type plate is attached to the gearhead housing as well input flange.

		Designation
	A	Ordering code (see Chapter 3.13 "Supplementary information")
	B	Ratio
	C	Serial number
	D	Lubricant
	E	Production date

Tbl-1: Identification plate (template)

## 2.2 Intended use

The gearhead serves to convert torques and speeds in industrial applications.

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.

## 2.3 Reasonably predictable misuse

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









## 2.4 Guarantee and liability

Guarantee and liability claims are excluded for personal injury and material damage in case of

- 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**

## 2.5 General safety instructions

	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>Suspended loads can fall and can cause serious injuries and even death.</b></p> <ul style="list-style-type: none"> <li>• Only use hoisting equipment and transports with sufficient capacity.</li> <li>• Do not stand under suspended loads.</li> </ul>
	<p><b>Objects flung out by rotating components can cause serious injury and death.</b></p> <ul style="list-style-type: none"> <li>• Remove objects and tools from the gearhead before putting it into operation.</li> <li>• Remove/Secure the shaft key (if available) if the gearhead is operated without attachments on the output/drive side.</li> </ul>
	<p><b>Rotating components on the gearhead can pull in parts of the body and cause serious injuries and even death.</b></p> <ul style="list-style-type: none"> <li>• Keep a sufficient distance to rotating machinery while the gearhead is running.</li> <li>• Secure the machine against restarting and unintentional movements during assembly and maintenance work (e.g. uncontrolled lowering of lifting axes).</li> </ul>
	<p><b>A damaged gearhead can cause accidents and injury.</b></p> <ul style="list-style-type: none"> <li>• Never use a gearhead that has been overloaded to due misuse or a machine crash (see chapter 2.3 "Reasonably predictable misuse").</li> <li>• Replace the concerned gearhead, even if external damage is visible.</li> </ul>
	<p><b>Lubricants are flammable.</b></p> <ul style="list-style-type: none"> <li>• Do not spray with water to extinguish.</li> <li>• Suitable extinguishing agents are powder, foam, water mist, and carbon dioxide.</li> <li>• Observe the safety instructions of the lubricant manufacturer.</li> </ul>
	<p style="text-align: center;"><b>⚠ CAUTION</b></p> <p><b>Hot gearhead housing can cause serious burns.</b></p> <ul style="list-style-type: none"> <li>• Touch the gearhead housing only when wearing protective gloves or after the gearhead has been at standstill for some time.</li> </ul>
	<p><b>Solvents and lubricants can cause skin irritations.</b></p> <ul style="list-style-type: none"> <li>• Avoid direct skin contact.</li> </ul>
	<p style="text-align: center;"><b>NOTICE</b></p> <p><b>Loose or overloaded screw connections can damage the gearhead.</b></p> <ul style="list-style-type: none"> <li>• Use a calibrated torque wrench to tighten and check all screw connections for which a tightening torque has been specified.</li> </ul> <p><b>All gearheads are permanently lubricated by the manufacturer with synthetic gear oil (polyglycols) or with a grease (see identification plate).</b></p> <ul style="list-style-type: none"> <li>• Do not mix polyglycols with mineral oils.</li> </ul>



**Solvents and lubricants can pollute soil and water.**

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

**2.6 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.

**2.7 Checking the tightening torques**

- Check the tightening torque of the fastening screws on the gearhead housing.  
For LPB<sup>+</sup> –gearheads, also check the fastening screws on the toothed belt pulley.
- Check the tightening torque of the threaded pin on the motor mounting.  
① The prescribed tightening torque can be found in 3 "Technical data sheets" in this manual.

**2.8 Maintenance schedule**

Maintenance work	At startup	First time after 500 operating hours or 3 months	Every 3 months	Yearly
Visual inspection	X	X	X	
Checking the tightening torques	X	X		X

Tbl-2: Maintenance schedule

**2.9 Malfunctions**

Unusual operating behavior (noise, heat, vibration) can be an indication of faulty assembly, improper dimensioning, or technical defects.

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

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.	
	Toothed belt pretension too great (if it exists).	

Fault	Possible cause	Solution
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-3: Malfunctions


### 3 Technical data sheets

- Be informed of the general safety instructions before beginning work. (see Chapter 2.5 "General safety instructions").
- ① The gearhead can be used in any mounting position.  
If your application has to meet special safety requirements (e.g. vertical axes, tensioned drives), we recommend using exclusively our alpheno<sup>®</sup>, RP<sup>+</sup>, TP<sup>+</sup>, TP<sup>+</sup> HIGH TORQUE products or contact WITTENSTEIN alpha for advice.

#### 3.1 Transport of gearheads up to and including size LP<sup>+</sup>/LPB<sup>+</sup> 155

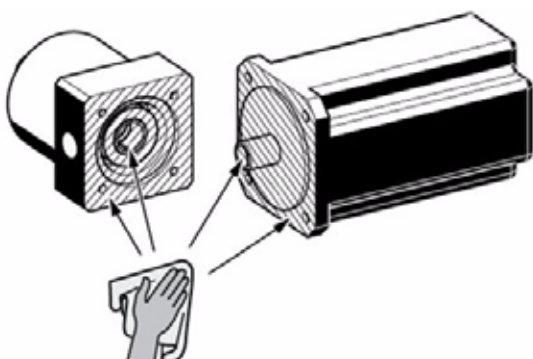
No special transport mode is prescribed for transporting the gearhead.

#### 3.2 Preparations

	NOTICE
	<p><b>Pressurized air can damage the gearhead seals.</b></p> <ul style="list-style-type: none"> <li>● Do not use pressurized air to clean the gearhead.</li> </ul>
	<p><b>Directly sprayed cleaning agents can alter the frictional values of the clamping hub.</b></p> <ul style="list-style-type: none"> <li>● Only spray cleaning agents onto a cloth for wiping off the clamping hub.</li> </ul>

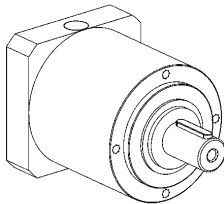
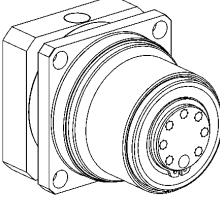
	<p><b>In rare situations, for a gearhead with grease lubrication (see identification plate), a leak can occur at the drive (seeping).</b></p> <p>To avoid seeping, we recommend that between the following surfaces:</p> <ul style="list-style-type: none"> <li>- Adapter plate and drive housing (gearhead) as well as</li> <li>- Adapter plate and motor</li> </ul> <p>be sealed with a surface sealing adhesive (e.g. Loctite<sup>®</sup> 573 or 574).</p> <ul style="list-style-type: none"> <li>● For more information, please contact our Customer Service department.</li> </ul>
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- Clean/De-grease 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 inner diameter of the plug receptacle
  - The bushing inside and out
  - the toothed belt pulley (only applies to LPB<sup>+</sup>)
- Check the fitting surfaces additionally for damage and impurities.
- Ensure that the bushing included in the delivery may be slid on the motor shaft with a tight sliding fit.

The different assembly order of LP<sup>+</sup> and LPB<sup>+</sup> is listed in table "Tbl-4".

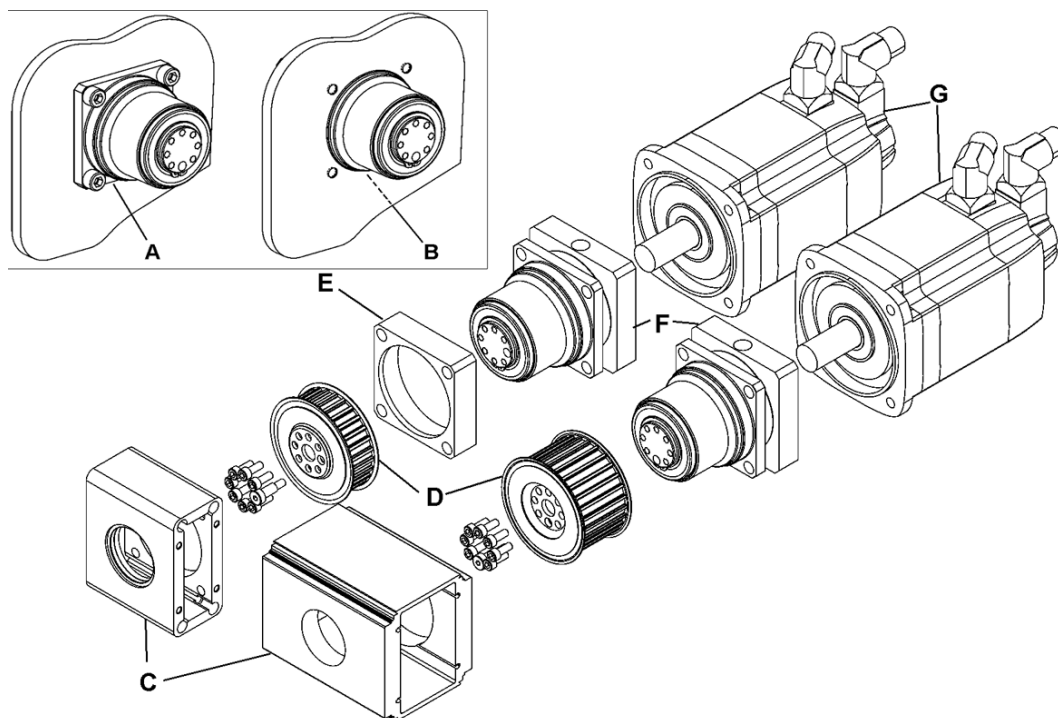
① If you have any questions, get in touch with our Customer Service department.

LP <sup>+</sup>		LPB <sup>+</sup>	
	—	<b>1.)</b> 3.3 "Attaching a gearhead to a machine (LPB <sup>+</sup> )"	
	<b>1.)</b> 3.4 "Mounting the motor onto the gearhead"	<b>2.)</b> 3.4 "Mounting the motor onto the gearhead"	
	<b>2.)</b> 3.5 "Mounted components on the gear output side"	<b>3.)</b> 3.5 "Mounted components on the gear output side"	
	<b>3.)</b> 3.6 "Mounting the gearhead to a machine (LP <sup>+</sup> )"	—	

Tbl-4: Assembly order

### 3.3 Attaching a gearhead to a machine (LPB<sup>+</sup>)

The gearhead exhibits two centering means for the attachment to the machine (A=motor side; B=gear output side).



① A spacer (E) must be assembled between the gearhead and your machine for the dimensionally accurate positioning of the gearhead if required. This spacer is **not** included in the scope of delivery and must be provided by the customer.

Fastening screws must be provided by the customer.

① You may find the required screw sizes and tightening torques in chapter 3.10 "Specifications on mounting onto a machine", table "Tbl-13".

① When using hollow profiles (C): Position the toothed belt pulley (D) in the hollow profile prior to attaching the gearhead.

- Coat the fastening screws with a threadlocker (e.g. Loctite 243).

- Mount the gearhead with the fastening screws via the through-holes at the machine.

① Install the gearhead in such a manner that the type plate remains readable if possible.

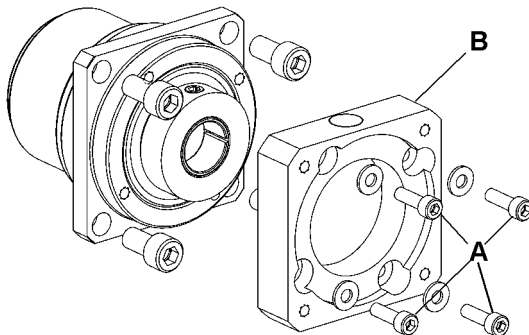
① Do not use washers (e.g. flat washers, lock washers).



### 3.4 Mounting the motor onto the gearhead

#### 3.4.1 Pre-mounting adapter plate (only LPB<sup>+</sup>)

The following information is valid for only the LPB<sup>+</sup>. On the LP<sup>+</sup>, the adapter plate is already mounted.



The adapter plate (B) along with the four fastening screws (A) are included in the scope of delivery of the gearhead.

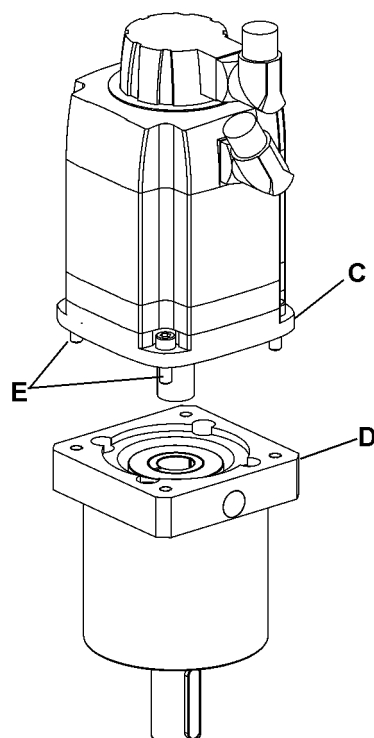
- Place the adapter plate onto the gearhead housing and hand-tighten the screws at first.
- Tighten the screws in diagonal order in at least two passes to the required tightening torque. See table "Tbl-5"

Gearhead size LPB <sup>+</sup>	Size	Tightening torque [Nm]
070	M4	2,6
090	M6	9,0
120	M6	9,0

Tbl-5: Fastening screws adapter plate

#### 3.4.2 Mounting the motor (LP<sup>+</sup>/ LPB<sup>+</sup>)

- Observe the specifications and safety instructions of the motor manufacturer.
- Observe the safety and processing instructions of the screw-bonding agents 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.
  - ① If recommended by the motor manufacturer, insert a half wedge.
- Turn the plug receptacle (A) so that the threaded pin (B) can be reached through the mounting bore, see table "Tbl-6"
- Push the motor shaft into the plug receptacle of the gearhead.
  - ① The maximum permitted axial forces may not be exceeded, see Chapter 3.9 "Specifications for fastening to a motor", table "Tbl-11". The motor shaft should slip in easily. If this is not the case, the threaded pin needs to be loosened more.
  - ① The slit of the bushing has to line up with the groove (if existing) of the motor shaft and be turned by 90° to the threaded pin, see table "Tbl-6".

① No gap is permitted between motor (C) and the adapter plate (D).

		Designation
	A	Plug receptacle
	B	Threaded pin
	F	Bushing
	G	Smooth shaft
	H	Keyed shaft

Tbl-6: Arrangement of motor shaft, plug receptacle and bushing

- Coat the four screws (E) with a threadlocker (e.g. Loctite 243).
- Fasten the motor (C) onto the adapter plate (D) with the four screws (E).
- Tighten the threaded pin (B) of the plug receptacle (A).
  - ① For screw sizes and prescribed tightening torques refer to Chapter 3.9 "Specifications for fastening to a motor", Tables "Tbl-11".
- Press the enclosed stopper plugs up to their stop in the mounting bores of the adapter plate (D).

### 3.5 Mounted components on the gear output side

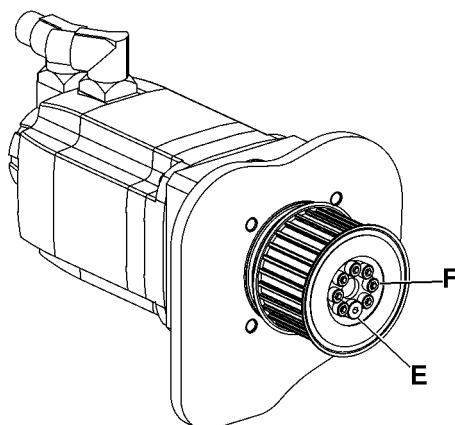
	NOTICE
	<p><b>Distortions during mounting operations can damage the gearhead.</b></p> <ul style="list-style-type: none"> <li>• Mount gearwheels and toothed belt pulleys onto the output shaft without forcing.</li> <li>• Do not on any account attempt an assembly by force or hammering!</li> <li>• Only use suitable tools and equipment for assembly.</li> <li>• If a gear wheel is pulled or shrink-fit onto the output shaft, make sure that the maximum permitted static axial forces of the output bearing (see table "Tbl-7") are not exceeded.</li> </ul>

Size LP <sup>+</sup> / LPB <sup>+</sup>	050	070	090	120	155
F <sub>a max</sub> [N]	1800	4300	5100	11300	18500

Tbl-7: Maximum permitted static axial forces at static bearing statistic (s<sub>0</sub>) = 1.8 and radial force (F<sub>r</sub>) = 0

#### 3.5.1 Mountings on the output flange (LPB<sup>+</sup>)

<ul style="list-style-type: none"> <li>• Observe the safety and processing instructions of the cleaning agents and screw-bonding agents to be used.</li> </ul>
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Only the version LPB<sup>+</sup> features an output flange on which a toothed belt pulley can be mounted with the bolts.

- Thoroughly clean the output flange, centering, fitting surface and toothed belt pulley. The anti-corrosion agent on the toothed belt pulley must be removed.
  - ① To remove the Aceton or Loctite 7063 anti-corrosion agent, use a clean, lint-free cloth.
- Also clean the browned toothed belt pulley with a brush and remove any salt residue between the flanged wheel and toothed belt wheel.

- Place the toothed belt pulley onto the output flange.
- Brush the screws with a screw-bonding agent (such as Loctite 243) and tighten the screws by hand initially.
- Tighten the fastening bolts (F) and the close-tolerance bolt (E) (1 piece) in diagonal order making at least two passes to the required tightening torque (see table "Tbl-8").

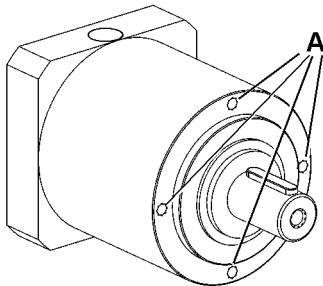
Gearhead size LPB+	Close-tolerance bolt		Fastening bolts	
	Thread x depth [mm] x [mm]	Tightening torque [Nm] (Property class 10.9)	Quantity x Thread x Depth [ ] x [mm] x [mm]	Tightening torque [Nm] (Property class 12.9)
<b>070</b>	M5 x 12	7,69	5 x M5 x 12	9
<b>090</b>	M6 x 16	13,2	7 x M6 x 16	15,4
<b>120</b>	M6 x 16	13,2	7 x M8 x 20	37,3

Tbl-8: Fastening the toothed belt pulley

The tension of the tooth belt is brought about by its construction. The toothed belt's prestressing force influences the ball bearing life of the gearhead.

- Determine the theoretical bearing life for each case using our analysis software **cymex**<sup>®</sup>.
- Set the toothed belt so that there are no lateral starting loads pressing on the toothed belt pulley.

### 3.6 Mounting the gearhead to a machine (LP+)



Four threaded bores are available in the gear unit housing for bolting it to your machine.

- Thoroughly clean the output shaft, centering, and fitting surface. The bolts need to be provided by the customer. You can find the prescribed screw sizes and tightening torques in Chapter 3.10 "Specifications on mounting onto a machine", table "Tbl-12".
  - Smear screw-bonding agent (for example Loctite 243) onto the four bolts.
- Fasten the gearhead on the machine with the fastening bolt through the holes.
    - ① Mount the gearhead in such a way that the type plate remains legible.
    - ① Do not use washers (e.g. plain washers, tooth lock washers).

### 3.7 Startup and operation

	<p><b>Improper use can cause damage to the gearhead.</b></p> <ul style="list-style-type: none"> <li>● Make sure that           <ul style="list-style-type: none"> <li>- the <b>ambient temperature</b> does not drop below <math>-15\text{ °C}</math> or exceed <math>+40\text{ °C}</math> and</li> <li>- the <b>operating temperature</b> does not exceed <math>+90\text{ °C}</math>.</li> </ul> </li> <li>● Avoid icing, which can damage the seals.</li> <li>● For other conditions of use, consult our Customer Service department.</li> <li>● Only use the gearhead only up to its maximum limit values, see Chapter 3.12 "Performance statistics".</li> <li>● Only use the gearhead only in a clean, dust-free and dry environment.</li> </ul>
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### 3.8 Notes on the lubricant used

<b>i</b>	All gearheads are lubricated for their service life by the manufacturer with a mineral oil-based lithium soap grease or with a food-safe synthetic grease (carbon hydride oil, aluminum complex soap) (see identification plate). All bearings are permanently lubricated by the company.
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The manufacturer listed below will provide any further information on the lubricants:

Standard lubricants	Lubricants for the food industry (USDA-H1 registered)
Castrol Industrie GmbH, Mönchengladbach Tel.: + 49 2161 909-30 www.castrol.com	Klüber Lubrication München KG, Munich Tel.: + 49 89 7876-0 www.klueber.com

Tbl-9: Lubricant manufacturers

### 3.9 Specifications for fastening to a motor

	Designation
	A Plug receptacle
	B Threaded pin
	F Bushing
	G Smooth shaft
	H Keyed shaft

Tbl-10: Arrangement of motor shaft, plug receptacle and bushing

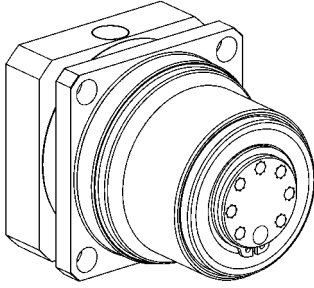
Gearhead size LP <sup>+</sup> / LPB <sup>+</sup>	Plug receptacle inside Ø (standard / large) [mm]	Width across flats, threaded pin (B) [mm]	Tightening torque [Nm]	Max. axial force [N]
050	11 / 14	3	5.6	45
070	16 / 19	4	14	80
090	24 / 28	5	23	100
120	32 / 38	6	45	150
155, 1-stage	42	8	78	180
155, 2-stage	32 / 38	6	45	150

Tbl-11: Specifications for fastening to a motor

### 3.10 Specifications on mounting onto a machine

	Gearhead size LP <sup>+</sup>	Bore Ø [mm]	Bolt size / property class	Tightening torque [Nm]
	050	44	M4 / 12.9	4.55
	070	62	M5 / 12.9	9.0
	090	80	M6 / 12.9	15.4
	120	108	M8 / 12.9	37.3
	155	140	M10 / 12.9	73.4

Tbl-12: Threaded bores in the gearhead housing LP<sup>+</sup>

	Gearhead size LPB <sup>+</sup>	Bore Ø [mm]	Bolt size / property class	Tightening torque [Nm]
	<b>070</b>	82	M8 / 12.9	37.3
	<b>090</b>	106	M10 / 12.9	73.4
	<b>120</b>	144	M12 / 12.9	126

Tbl-13: Through-holes in gearhead housing LPB<sup>+</sup>

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

Property class Screw / nut	Tightening torque [Nm] for threads												
	M3	M4	M5	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24
<b>8.8 / 8</b>	1.15	2.64	5.24	8.99	21.7	42.7	73.5	118	180	258	363	493	625
<b>10.9 / 10</b>	1.68	3.88	7.69	13.2	31.9	62.7	108	173	265	368	516	702	890
<b>12.9 / 12</b>	1.97	4.55	9.00	15.4	37.3	73.4	126	203	310	431	604	821	1042

Tbl-14: Tightening torques for headless screws and nuts

### 3.12 Performance statistics

Refer to our catalogue or our Internet page for the maximum permitted speeds and torques:  
<http://www.wittenstein-alpha.de>

	<p><b>Consult our Customer Service department if the gearhead is older than a year. You will then receive the valid performance data.</b></p>
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### 3.13 Supplementary information



The complete operating manual can be found on our website:  
[www.wittenstein-alpha.de/en/operating-manuals](http://www.wittenstein-alpha.de/en/operating-manuals)  
 or scan this code, to receive the detailed operating manual directly as a PDF (max. 1 MB).



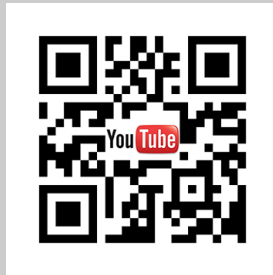
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LP<sup>+</sup>  
Motor mounting video



LPB<sup>+</sup>  
Motor mounting video