

## Operation Manual

# Planetary gear unit AG2210-+LPxxx

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**BECKHOFF**



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# 1 Foreword

## 1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.

It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

### Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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## 1.2 Documentation issue status

Version	Comment
1.6	<b>Chapter update:</b> Disposal <b>4.5</b> , Important notes <b>9.1</b> ; Guide for commissioning of the gear units <b>9.2</b>
1.5	<b>Chapter update:</b> 1.0 Foreword; 3.0 Safety
1.4	<b>Chapter update:</b> 11.2; 13.1  <b>Deleted chapters:</b> 9.0; 10.0; 11.0; 12.0
1.3	<b>Chapter update:</b> 8.1; 8.2; 8.3; 8.4; 8.5; 12.1; 12.2; 12.3; 12.4; 12.5; 12.6; 12.7
1.2	<b>Chapter update:</b> 7.2; 11.3.1; Layout revision
1.1	General revision
1.0	First edition

## 1.3 Intended use

The gear unit is used for transforming torques and speeds. It is suitable for all industrial applications that are not covered by Article 2 of EC Directive 2002/95/EC (restriction of the use of certain hazardous substances in electrical and electronic equipment).

The gear unit must not be operated in potentially explosive atmospheres. In food processing applications, the gear unit may only be used beside or below the food area.

The gear unit is intended for mounting on motors that:

- match type B5 (if different, please contact our service department);
- have a radial and axial run-out tolerance of at least "N" according to DIN 42955;
- have a smooth shaft.

### NOTE

#### Damage from improper use

Any use exceeding the maximum permissible speeds, torques and temperature is considered improper and is therefore not permitted.

## 2 Guidelines and Standards

In addition to the safety instructions mentioned in this manual, the general statutory and other rules and regulations for the prevention of accidents (e.g. personal protective equipment) and for environmental protection must be followed.

### CAUTION

#### **Personal injuries!**

The gear units are **not** products under the terms of the EC Machinery Directive. Operation of the gear units in machines or systems is only permitted once the machine or system manufacturers has provided evidence of CE conformity of the complete machine or system.

## 3 Safety

### 3.1 Safety instructions

#### Safety regulations

Please note the following safety instructions and explanations!  
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

#### Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

#### Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

#### Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

#### **DANGER**

##### **Serious risk of injury!**

Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

#### **WARNING**

##### **Risk of injury!**

Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

#### **CAUTION**

##### **Personal injuries!**

Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

#### **NOTE**

##### **Damage to the environment or devices**

Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.



#### **Tip or pointer**

This symbol indicates information that contributes to better understanding.



#### **UL pointer**

This symbol indicates important information about the UL-compliant.

## 3.2 Special safety instructions

The safety instructions are designed to avert danger and must be followed during installation, commissioning, production, troubleshooting, maintenance and trial or test assemblies.

The gear units of the AG2210 series are not designed for stand-alone operation and must always be installed in a machine or system. After installation the additional documentation and safety instructions provided by the machine manufacturer must be read and followed.

### CAUTION

#### Personal injuries

- Carefully read this manual before using the gear unit thoroughly, paying particular attention to the safety instructions. In the event of any uncertainties please notify your sales office immediately and refrain from working on the gear unit.
- Only trained, qualified personnel with good knowledge of drive technology may work on this gear unit.
- If a gear unit is installed in a machine it must not be commissioned until proof of compliance of the machine with the latest version of the EC Machinery Directive has been provided. This includes all relevant harmonized standards and regulations required for implementation of this Directive in national legislation.

### WARNING

#### Serious risk of injury through hot surfaces!

- The surface temperature may exceed 50 °C, resulting in a risk of burns.
- Avoid touching the housing during or shortly after operation.
- Allow the gear unit to cool down for at least 15 minutes after switching off.
- Use a thermometer to check whether the surface has cooled down sufficiently.

### WARNING

#### Objects flung out by rotating components can cause serious injuries.

- Remove any items and tools in the vicinity of the gear unit before starting up the unit.
- Remove/secure the feather key (if present), if the gear unit is operated without attachments on the output/drive side.

### WARNING

#### Rotating components on the gear unit can pull in parts of the body and cause serious injury or death.

- When the gear unit is running, keep sufficient distance to rotating machine parts.
- During assembly and maintenance work, secure the machine against restarting and unintentional movements (such as uncontrolled lowering of lifting axes).

### WARNING

#### A damaged gear unit can lead to accidents with risk of injury.

- Do not operate a gear unit that has been overloaded due to incorrect operation or a machine crash.
- Replace affected gear units, even if no external damage is visible.

### NOTE

#### Loose or overloaded screw connections can damage the gear unit.

- Install and check all screw connections for which tightening torques are specified, using a calibrated torque wrench.

**⚠ WARNING****Lubricants are flammable.**

- Do not use a water jet for extinguishing flames.
- Suitable extinguishing media are powder, foam, water spray or carbon dioxide.
- Follow the safety instructions of the lubricant manufacturer.

**⚠ CAUTION****Solvents and lubricants can cause skin irritations.**

- Avoid direct skin contact.

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

- Cleaning solvents and lubricants must be used and disposed of properly.

## 4 Handling

### 4.1 Transport

- No special mode of transport is prescribed for the gear unit.
- Only by qualified personnel
- Only in the manufacturer's original packaging
- For weights refer to the Beckhoff website.
- Avoid shocks.
- Temperature: 0 °C to +40 °C
- If the packaging is damaged check the gear unit and any accessories for visible damage. Inform the transport company and, if necessary, the manufacturer.

#### **WARNING**

**Suspended loads may fall and cause serious injury or death.**

- Never stand under suspended loads.
- Secure the gear unit with suitable fastenings (e.g. straps) prior to transport.

#### **NOTE**

**Hard impacts, e.g. due to falling or dropping, may damage the gear unit.**

- Use only lifting gear and load handling devices with sufficient load-bearing capacity.
- Do not exceed the permitted lifting weight.
- Set the gear unit down slowly.

### 4.2 Packaging

- Recyclable cardboard with inserts
- Dispose of the packaging materials at designated disposal sites.  
Observe the relevant national disposal regulations

### 4.3 Storage

- The gear units must not be stored outdoors. The storage space must be adequately ventilated and dry.
- The gear units may only be stored in the original recyclable manufacturer's packaging.
- The gear units may only be stored in a horizontal position.
- Storage temperature: 0 °C to +40 °C in the original packaging
- Storage time: 2 years max.

## 4.4 Maintenance / Cleaning

### 4.4.1 Maintenance schedule

Maintenance tasks	During commis- sioning	After 500 hours of operation or 3 months	Every 3 months	Annually
Visual inspection	X	X	X	
Check the tightening torques	X	X		X

### 4.4.2 Maintenance tasks

#### 4.4.2.1 Visual inspection

- Check the entire gear unit for external damage.
- The radial shaft-sealing rings are wear parts. Therefore, check the gear unit for leaks during each visual inspection.
  - For further general information on radial shaft-sealing rings please refer to the website of our partner <http://www.simrit.de>.
  - In the installation position, check that no foreign media (e.g. oil) accumulate on the drive shaft.

#### 4.4.2.2 Check the tightening torques

- Check the tightening torque of the fastening screws on the gear housing.
  - The specified tightening torques can be found in Section 7 "Mechanical installation".
- Check the tightening torque of the set screws on the motor mounting.
  - The specified tightening torques can be found in Section 7 "Mechanical installation".

### 4.4.3 Commissioning after maintenance

- Clean the gear unit externally.
- Attach all safety devices.
- Perform a test run before releasing the gear unit again for operation.



#### 4.4.4 Notes on the lubricant used



##### Lubricant used

All gear units are lubricated for life at the factory with a lithium soap grease based on mineral oil or a food-grade synthetic grease (hydrocarbon oil, aluminum complex soap) (see name plate). All bearings are lubricated for life at the factory.

Further information on the lubricants is available directly from the manufacturer:

Standard lubricants	Lubricants for the food industry (USDA-H1 registered)
Castrol Industrie GmbH, Mönchengladbach Phone: + 49 2161 909-30 <a href="http://www.castrol.com">www.castrol.com</a>	Klüber Lubrication München KG, München Phone: + 49 89 7876-0 <a href="http://www.klueber.com">www.klueber.com</a>

## 4.5 Disposal



##### National regulations

Observe the relevant national disposal regulations.

Supplementary information on replacing the adapter plate and disassembly and disposal of the gear unit is available from our service department.

- The device should be disposed of by a certified disposal company. Addresses can be obtained from our service department.
- Metal parts can be sent for metal recycling.

In accordance with the WEEE 2012/19/EU directives we take old devices and accessories for professional disposal, if the transport costs are paid by the consignor. Pack the equipment bearing the words "for disposal" to:

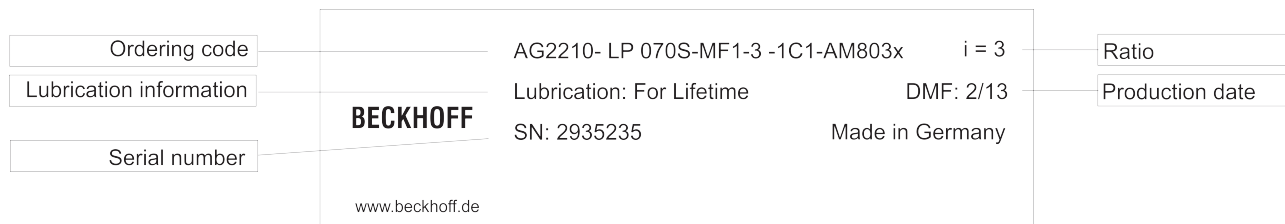
Beckhoff Automation GmbH & Co. KG  
 Hülshorstweg 20  
 33415 Verl

## 5 Product identification

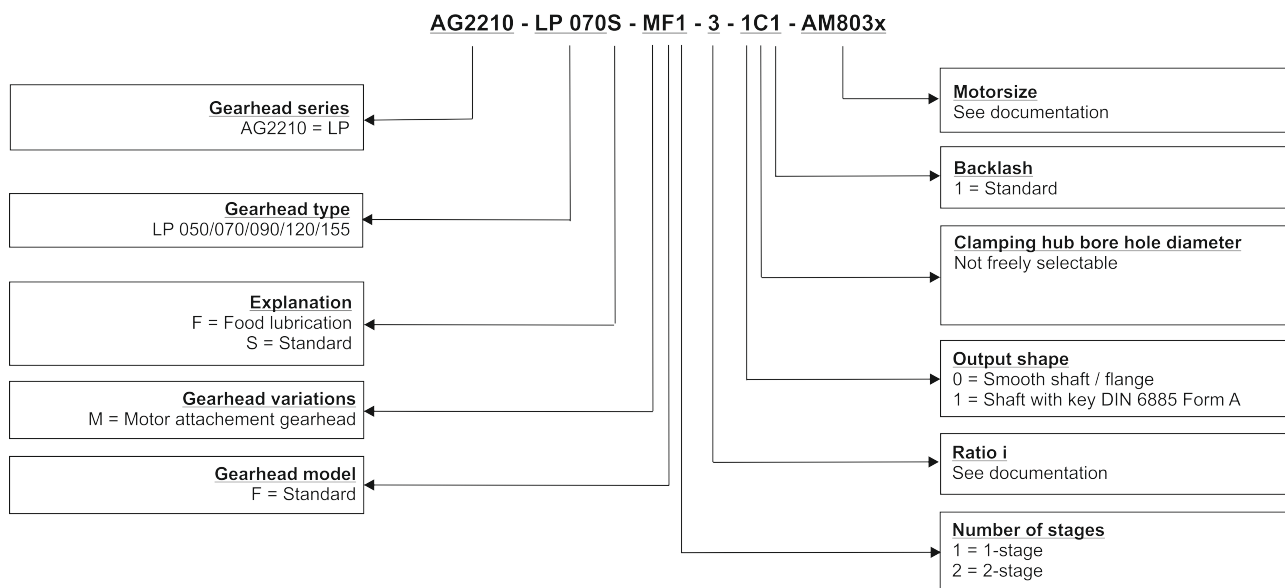
### 5.1 AG2210-LP scope of supply

- Check the completeness of the delivery against the delivery note.
- Missing parts or damage should be reported immediately in writing to the carrier, the insurance company and / or Beckhoff Automation.

### 5.2 Name plate AG2210-LP



### 5.3 Type key AG2210-LP

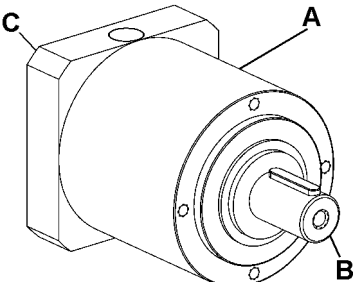


## 6 Technical description

### 6.1 Gear unit configuration

The devices of the AG2210 - LPxxx series are single- or multi-stage, low-backlash planetary gear units. They can be used in any installation position. All gear units are manufactured in version "M" (motor mounting) as standard. The design of the output shaft bearings ensures that high breakdown torques and axial forces can be absorbed. The motor can be centered via the bearing socket (not via the adapter plate). This avoids radial distortion of the motor. Various motors can be adapted via an adapter plate and spacer sleeve.

### 6.2 Overview of gear components LP

	Gear components	
	A	Gear housing
	B	Output shaft
	C	Adapter plate

### 6.3 General technical data



The maximum permissible speeds and torques can be found in our catalog or on our website at <http://www.beckhoff.de>.

### 6.4 Transport, assembly and disassembly

No special mode of transport is prescribed for the gear unit.

## 7 Mechanical installation

### 7.1 Important notes

#### ⚠ CAUTION

##### Damage to persons and devices

Observe the general and special safety instructions.

The gear unit can be used in any gear unit.

#### NOTE

##### Assembly sequence

Always follow the assembly sequence described below in order to avoid damage.

The fastening screws are not included and must be provided by the customer. Pertinent information can be found in the individual assembly steps.

#### NOTE

##### Compressed air may damage gear unit seals.

Do not use compressed air for cleaning the gear unit.

#### NOTE

##### In rare cases, leaks ("sweating") may occur at the drive in gear units with grease lubrication (see name plate).

- To avoid "sweating", we recommend sealing the areas between
  - ⇒ adapter plate and drive housing (gear unit) and
  - ⇒ adapter plate and motor
  - ⇒ with a surface seal adhesive (e.g. Loctite® 573 or 574).
- For further information please contact our customer service.

Clean the following components with a clean, lint-free cloth and a grease-dissolving, non-aggressive cleaning agent:

- all surfaces in contact with adjacent components
- Centering
- the motor shaft
- the internal diameter of the socket
- the spacer sleeve inside and outside

**In addition, check the contact surfaces for damage and foreign particles.**

## 7.2 Mounting the motor on the gear unit

The standard delivery of a gear unit does not include a motor.

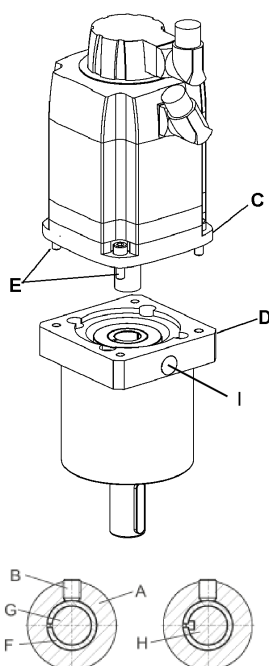


If a motor is included, it is already installed (no assembly required).

### NOTE

#### Observe the safety instructions

- Observe the information and safety instructions of the motor manufacturer.
- Observe the safety and processing instructions for the threadlocker.



#### Procedure:

- Mount the motor in vertical direction, if possible.
- If the motor shaft has a feather key, remove it.
- Insert a half wedge, if recommended by the manufacturer.
- Turn the socket (A) until the set screw (B) is accessible via the mounting hole.
- Push the motor shaft into the socket of the gear unit.



The maximum permitted axial loads must not be exceeded.  
The motor shaft must slide easily. If this is not the case, the set screw should be loosened further.

For grooved shafts (H) the slot of the spacer sleeve (F) must be in line with the groove of the motor shaft and at right angles with the set screw (B).

There must be no gap between the motor (C) and the adapter plate (D)

- Coat the four screws (E) with a threadlocker (e.g. Loctite 243).
- Attach the motor (C) to the adapter plate (D) with the four screws (E).
- Tighten the set screw (B) of the socket (A).
- Push the enclosed sealing plug into the mounting hole (I) of the adapter plate (D) up to the end stop.

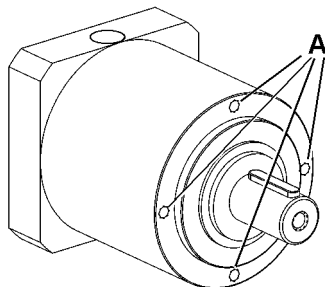
AG2210	Internal socket diameter (standard / large) [mm]	Width across flats of the set screw (B) [mm]	Tightening torque [Nm]	Max. axial force [N]
050	11 / 14	3	5.6	45
070	16 / 19	4	14	80
090	24 / 28	5	23	100
120	32 / 38	6	45	150
155, single-stage	42	8	78	180
155, double-stage	32 / 38	6	45	150

## 7.3 Mounting the gear unit at the machine

### ● Assembly sequence



Before proceeding with the assembly, decide whether to install the attachments on the drive side first, or the gear unit to the machine first.



#### Procedure:

The gear housing features four threaded holes for connection with your machine.

- Thoroughly clean the drive shaft, centering and contact surface.

Screws must be provided by the customer. The specified screw sizes and tightening torques can be found in the following table.

- Coat the four screws with a threadlocker (e.g. Loctite 243).
- Attach the gear unit to the machine with the four mounting screws through the screw holes.



Install the gear unit such that the name plate remains readable.

Do not use washers or toothed washers

Gear size AG2210	Pitch circle Ø [mm]	Screw size / Strength 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

### 7.3.1 Fittings on the output side

#### NOTE

**Distortions during mounting can damage the gear unit.**

- Mount gearwheels and toothed belt pulleys on the output shaft without using force.
- Never use a reaming or hitting action during mounting.
- Use only suitable tools and equipment for the installation.
- During fitting or shrink-fitting of a toothed gear onto the output shaft, ensure that the maximum permitted static axial forces for the output bearing are not exceeded.

Table 1: Maximum permissible static axial forces at static load rating ( $s_0$ ) = 1.8 and radial load ( $F_r$ ) = 0

	050	070	090	120	155
$F_{a \max}$ [N]	1800	4300	5100	11300	18500

# 8 Technical data

## 8.1 LP050 MF 1 and MF 2

LP50		1-stage				2-stage							
Ratio		4	5	7	10	16	20	25	35	40	50	70	100
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	13	14		13	13		14		13	14		13
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	6	6,5		6	6		6,5		6	6,5		6
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	26											
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	4000											
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	8000											
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	0,05											
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard ≤ 10				Standard ≤ 13							
Torsional rigidity [C <sub>T12</sub> ] (arcmin)		1,5	1,2		0,9	1,5		1,2		1,5	1,2		0,9
Max. axial force [F <sub>2A</sub> ]	N	700				700							
Max. radial force [F <sub>2R</sub> ]	N	650				650							
Efficiency at full load	%	97				95							
Service Life [L <sub>h</sub> ]	h	> 20.000											
Weight incl. adapter plate [m]	kg	0,75				0,95							
Noise level (At n1=3000 rpm without load) [L <sub>PA</sub> ]	dB	< 62											
Max. permissible housing temperature	°C	+ 90											
Ambient temperature	°C	- 15 to + 40											
Lubrication		Lubricated for life											
Paint		Grey RAL 7016											
Direction of rotation		Motor and gearhead same direction											
Type of protection		IP 64											

LP50					1-stage				2-stage							
Ratio					4	5	7	10	16	20	25	35	40	50	70	100
Mass moment of in- ertia <sup>3)</sup>	B	11	J <sub>1</sub>	kgcm <sup>2</sup>	0,05											
	C	14	J <sub>1</sub>	kgcm <sup>2</sup>	0,2											
Clamping hub diameter (mm)																

<sup>1)</sup>(Permissible 1000 times during the life span of the gear reducer)

<sup>2)</sup>(at n<sub>1</sub>=3000 rpm and 20°C gearhead temperature )

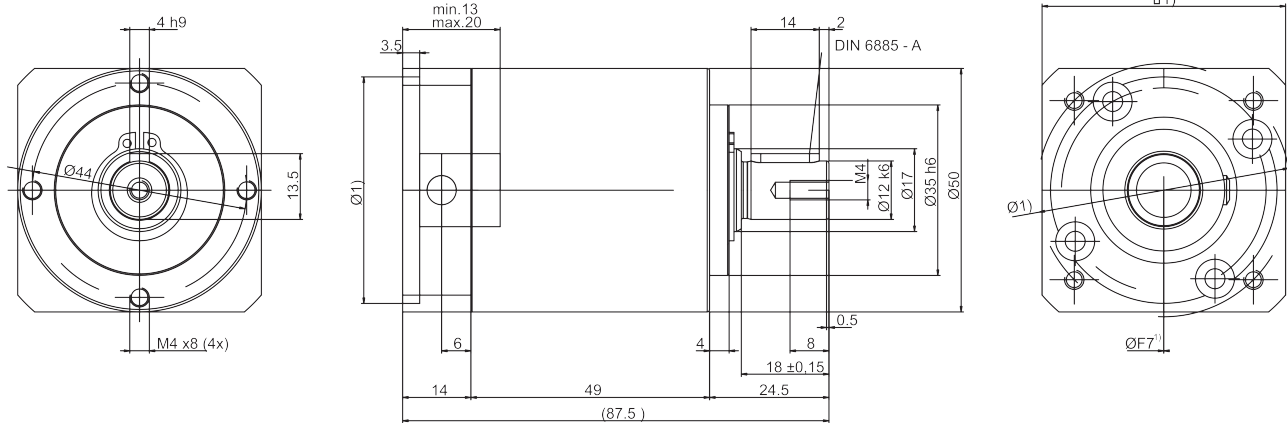
<sup>3)</sup>(referring to the drive)

## 8.1.1 Dimensional drawing LP050 MF 1 and MF 2

1-stepped:

Power takeoff side

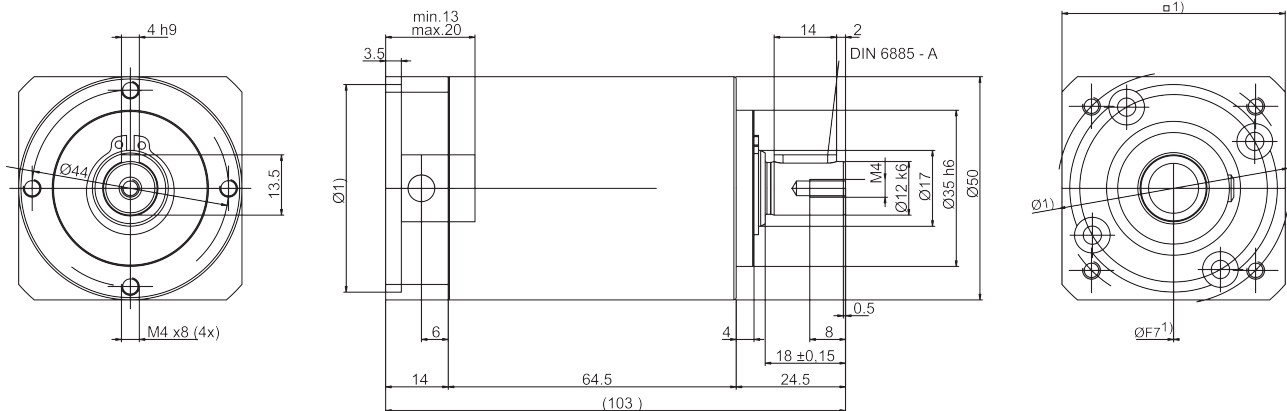
Drive side



2-stepped:

Power takeoff side

Drive side



1) Dimensions depend of the motor  
 Technical modifications reserved  
 Dimension without tolerance  $\pm 1\text{mm}$



## 8.2 LP070 MF 1 and MF 2

LP70		1-stage				
Ratio		3	4	5	7	10
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	55	42	40	40	37
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	29	22	21	21	19
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	65	75	75	75	75
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	3700				
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	6000				
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	0,30	0,25	0,20	0,15	0,15
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard ≤ 8				
Torsional rigidity [C <sub>112</sub> ] (arcmin)		4,0	4,0	3,3	3,3	2,8
Max. axial force [F <sub>2A</sub> ]	N	1550				
Max. radial force [F <sub>2R</sub> ]	N	1450				
Efficiency at full load	%	97				
Service Life [L <sub>h</sub> ]	h	> 20.000				
Weight incl. adapter plate [m]	kg	2				
Noise level (At n <sub>1</sub> =3000 rpm without load) [L <sub>PA</sub> ]	dB	< 64				
Max. permissible housing temperature	°C	+ 90				
Ambient temperature	°C	- 15 to + 40				
Lubrication		Lubricated for life				
Paint		Grey RAL 7016				
Direction of rotation		Motor and gearhead same direction				
Type of protection		IP 64				

LP70		2-stage											
Ratio		9	12	15	16	20	25	30	35	40	50	70	100
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	55	55	55	42	42	40	55	40	42	40	40	37
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	29	29	29	22	21	21	22	21	22	21	21	19
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	75	75	75	75	75	75	75	75	75	75	75	75
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	3700											
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	6000											
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,15	0,10
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard ≤ 10											
Torsional rigidity [C <sub>112</sub> ] (arcmin)		4,0	4,0	4,0	4,0	4,0	3,3	4,0	3,3	4,0	3,3	3,3	2,8
Max. axial force [F <sub>2A</sub> ]	N	1550											
Max. radial force [F <sub>2R</sub> ]	N	1450											
Efficiency at full load	%	97											
Service Life [L <sub>h</sub> ]	h	> 20.000											
Weight incl. adapter plate [m]	kg	2											
Noise level (At n1=3000 rpm without load) [L <sub>PA</sub> ]	dB	< 64											
Max. permissible housing temperature	°C	+ 90											
Ambient temperature	°C	- 15 to + 40											
Lubrication		Lubricated for life											
Paint		Grey RAL 7016											
Direction of rotation		Motor and gearhead same direction											
Type of protection		IP 64											

LP70					1-stage					2-stage											
Ratio					3	4	5	7	10	9	12	15	16	20	25	30	35	40	50	70	100
Mass moment of inertia <sup>3)</sup>	D	16	J <sub>1</sub>	kgcm <sup>2</sup>	0,3		0,2			0,2											
Clamping hub diameter (mm)	E	19	J <sub>1</sub>	kgcm <sup>2</sup>	0,6	0,5			0,5												

<sup>1)</sup>(Permissible 1000 times during the life span of the gear reducer)

<sup>2)</sup>(at n<sub>1</sub>=3000 rpm and 20°C gearhead temperature )

<sup>3)</sup>(referring to the drive)



## 8.3 LP090 MF 1 and MF 2

LP90		1-stage					2-stage												
Ratio		3	4	5	7	10	9	12	15	16	20	25	30	35	40	50	70	100	
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	125	115	100		90	125			115		100	125	100	115	100		90	
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	63	58	50		45	63			58	58	50	63	50	58	50		45	
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	185	190			190													
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	3400																	
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	6000																	
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	0,6	0,6	0,5	0,4	0,4	0,3												
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard < 8					Standard < 10												
Torsional rigidity [C <sub>T12</sub> ] (arcmin)		12,0		9,5		8,5	12,0				9,5	12,0	9,5	12,0	9,5		8,5		
Max. axial force [F <sub>2A</sub> ]	N	1900																	
Max. radial force [F <sub>2R</sub> ]	N	2400																	
Efficiency at full load	%	97					95												
Service Life [L <sub>n</sub> ]	h	> 20.000																	
Weight incl. adapter plate [m]	kg	4,0					5,0												
Noise level (At n1=3000 rpm without load) [L <sub>PA</sub> ]	dB	< 66																	
Max. permissible housing temperature	°C	+ 90																	
Ambient temperature	°C	- 15 to + 40																	
Lubrication		Lubricated for life																	
Paint		Grey RAL 7016																	
Direction of rotation		Motor and gearhead same direction																	
Type of protection		IP 64																	

LP90					1-stage					2-stage											
Ratio					3	4	5	7	10	9	12	15	16	20	25	30	35	40	50	70	100
Mass moment of inertia <sup>3)</sup>	G	24	J <sub>1</sub>	kgcm <sup>2</sup>	1,9	1,7	1,6	1,5	1,4	1,5			1,6		1,5	1,4	1,5	1,4			
Clamping hub diameter (mm)	H	28	J <sub>1</sub>	kgcm <sup>2</sup>	2,2	2,0	1,9	1,8	1,7	1,8			1,9		1,8	1,7	1,8	1,7			

<sup>1)</sup>(Permissible 1000 times during the life span of the gear reducer)

<sup>2)</sup>(at n<sub>1</sub>=3000 rpm and 20°C gearhead temperature )

<sup>3)</sup>(referring to the drive)



## 8.4 LP120 MF 1 and MF 2

LP120		1-stage				
Ratio		3	4	5	7	10
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	305	305	250	250	220
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	155	155	125	125	110
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	400	480	480	480	480
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	2600				
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	4800				
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	1,1	1,0	0,9	0,8	0,8
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard ≤ 8				
Torsional rigidity [C <sub>112</sub> ] (arcmin)		30	30	25	25	22
Max. axial force [F <sub>2A</sub> ]	N	4000				
Max. radial force [F <sub>2R</sub> ]	N	4600				
Efficiency at full load	%	97				
Service Life [L <sub>h</sub> ]	h	> 20.000				
Weight incl. adapter plate [m]	kg	8,6				
Noise level (At n <sub>1</sub> =3000 rpm without load) [L <sub>PA</sub> ]	dB	< 68				
Max. permissible housing temperature	°C	+ 90				
Ambient temperature	°C	- 15 to + 40				
Lubrication		Lubricated for life				
Paint		Grey RAL 7016				
Direction of rotation		Motor and gearhead same direction				
Type of protection		IP 64				

LP120		2-stage											
Ratio		9	12	15	16	20	25	28	30	40	50	70	100
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	305	305	305	305	305	250	305	305	305	250	250	220
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	155	155	155	155	155	125	155	155	155	125	125	110
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	480											
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	2600											
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	4800											
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	0,6	0,6	0,6	0,6	0,5	0,5	0,5	0,4	0,5	0,4	0,4	0,4
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard ≤ 10											
Torsional rigidity [C <sub>112</sub> ] (arcmin)		30	30	30	30	30	25	30	30	30	25	25	22
Max. axial force [F <sub>2A</sub> ]	N	4000											
Max. radial force [F <sub>2R</sub> ]	N	4600											
Efficiency at full load	%	95											
Service Life [L <sub>n</sub> ]	h	> 20.000											
Weight incl. adapter plate [m]	kg	11											
Noise level (At n1=3000 rpm without load) [L <sub>PA</sub> ]	dB	< 68											
Max. permissible housing temperature	°C	+ 90											
Ambient temperature	°C	- 15 to + 40											
Lubrication		Lubricated for life											
Paint		Grey RAL 7016											
Direction of rotation		Motor and gearhead same direction											
Type of protection		IP 64											

LP120					1-stage					2-stage											
Ratio					3	4	5	7	10	9	12	15	16	20	25	28	30	40	50	70	100
Mass moment of inertia <sup>3)</sup>	I	32	J <sub>1</sub>	kgcm <sup>2</sup>	7,2	6,1	5,6	5,2	5,1	5,4			5,5		5,3	5,3	5,0				
Clamping hub diameter (mm)	K	38	J <sub>1</sub>	kgcm <sup>2</sup>	8,1	6,9	6,4	6,1	5,9	6,2			6,4		6,2		5,9				

<sup>1)</sup>(Permissible 1000 times during the life span of the gear reducer)

<sup>2)</sup>(at n<sub>1</sub>=3000 rpm and 20°C gearhead temperature )

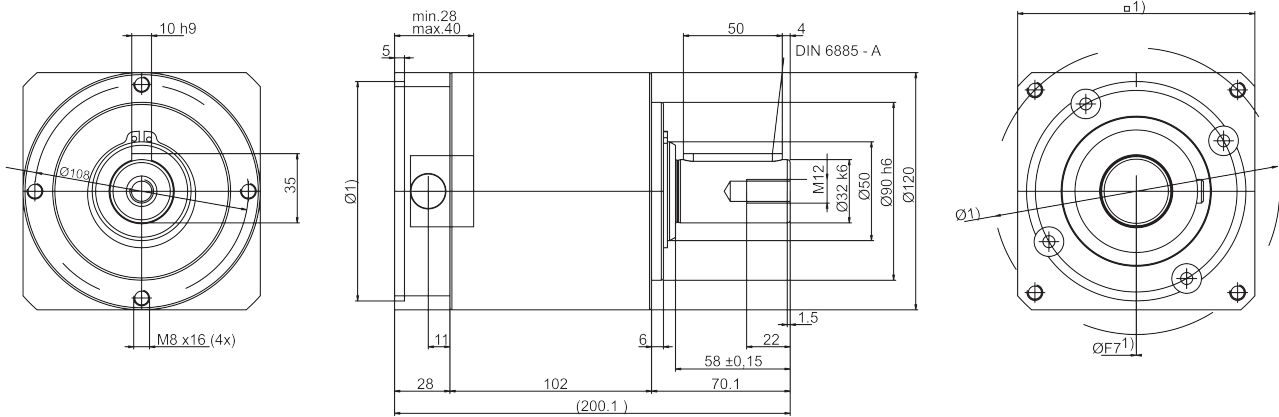
<sup>3)</sup>(referring to the drive)

#### 8.4.1 Dimensional drawing LP120 MF 1 and MF 2

1-stepped:

Power takeoff side

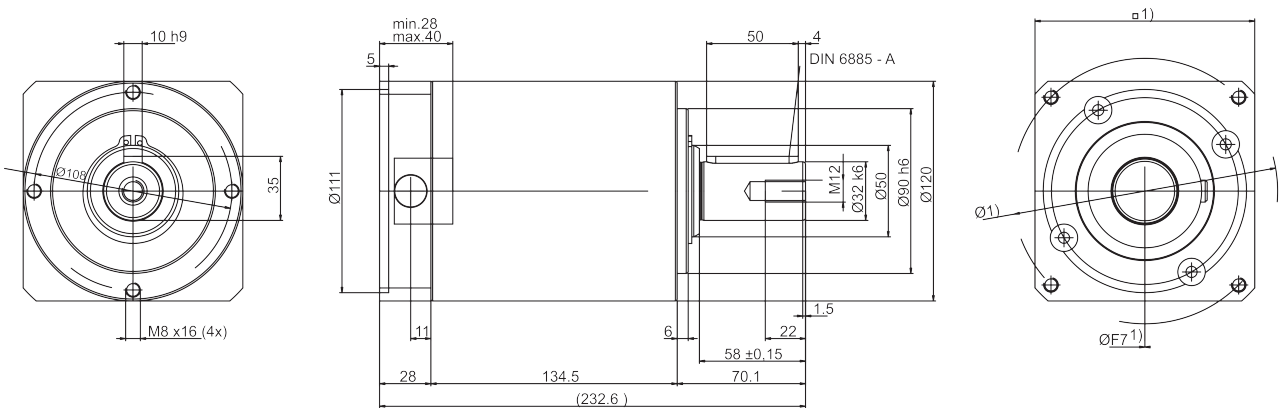
Drive side



2-stepped:

Power takeoff side

Drive side



1) Dimensions depend of the motor

Technical modifications reserved

Dimension without tolerance  $\pm 1\text{mm}$



## 8.5 LP155 MF 1 and MF 2

LP155		1-stage		2-stage		
Ratio		5	10	25	50	100
Maximum acceleration torque (max. 1000 cycles per hour) [T <sub>2B</sub> ]	Nm	500	400	500	500	400
Nominal output torque (at n <sub>1N</sub> ) [T <sub>2N</sub> ]	Nm	350	200	350	350	200
Emergency stop torque <sup>1)</sup> [T <sub>2NOT</sub> ]	Nm	1000	1000	1000	1000	1000
Nominal input speed [n <sub>1N</sub> ]	min <sup>-1</sup>	2000	2000	2000	2000	2000
Max. continuous speed [n <sub>1Max</sub> ]	min <sup>-1</sup>	3600	3600	3600	3600	3600
Average no-load running torque <sup>2)</sup> [T <sub>012</sub> ]	Nm	2,8	2,5	1,0	0,8	0,7
Torsional backlash [j <sub>T</sub> ] (arcmin)		Standard ≤ 8 (1-stage) / 10 (2-stage)				
Torsional rigidity [C <sub>112</sub> ] (arcmin)		55	44	55	55	44
Max. axial force [F <sub>2A</sub> ]	N	6000				
Max. radial force [F <sub>2R</sub> ]	N	7500				
Efficiency at full load	%	97		95		
Service Life [L <sub>h</sub> ]	h	> 20.000				
Weight incl. adapter plate [m]	kg	17		21		
Noise level (At n1=3000 rpm without load) [L <sub>PA</sub> ]	dB	< 69				
Max. permissible housing temperature	°C	+ 90				
Ambient temperature	°C	- 15 to + 40				
Lubrication		Lubricated for life				
Paint		Grey RAL 7016				
Direction of rotation		Motor and gearhead same direction				
Type of protection		IP 64				

LP155					1-stage		2-stage		
Ratio					5	10	25	50	100
Mass moment of inertia <sup>3)</sup>	L	42	J <sub>1</sub>	kgcm <sup>2</sup>	17	16	-	-	-
	I	32	J <sub>1</sub>	kgcm <sup>2</sup>	-	-	5,4	5,0	5,0
Clamping hub diameter (mm)	K	38	J <sub>1</sub>	kgcm <sup>2</sup>	-	-	6,3	5,9	5,9

<sup>1)</sup>(Permissible 1000 times during the life span of the gear reducer)

<sup>2)</sup>(at n<sub>1</sub>=3000 rpm and 20°C gearhead temperature )

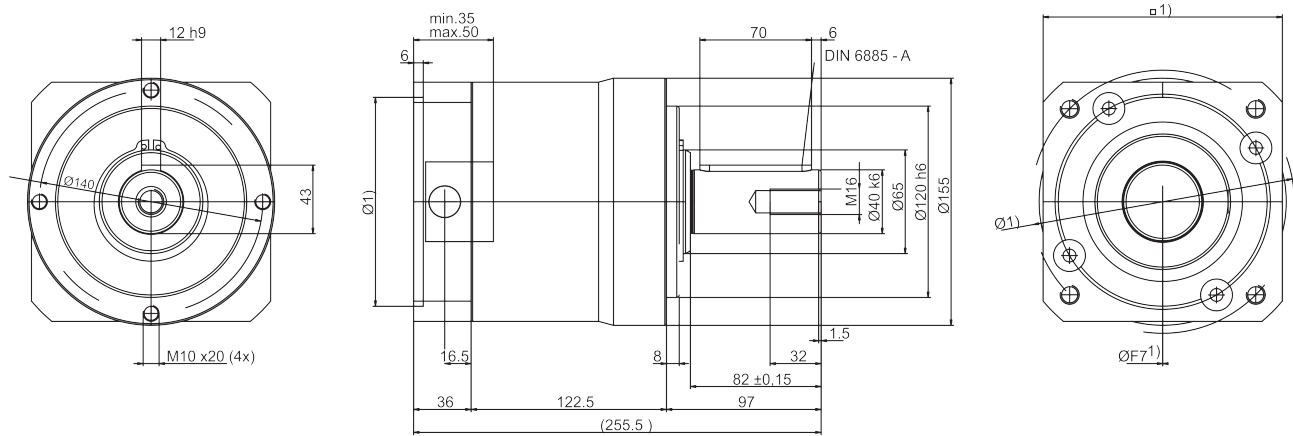
<sup>3)</sup>(referring to the drive)

## 8.5.1 Dimensional drawing LP155 MF 1 and MF 2

1-stepped:

Power takeoff side

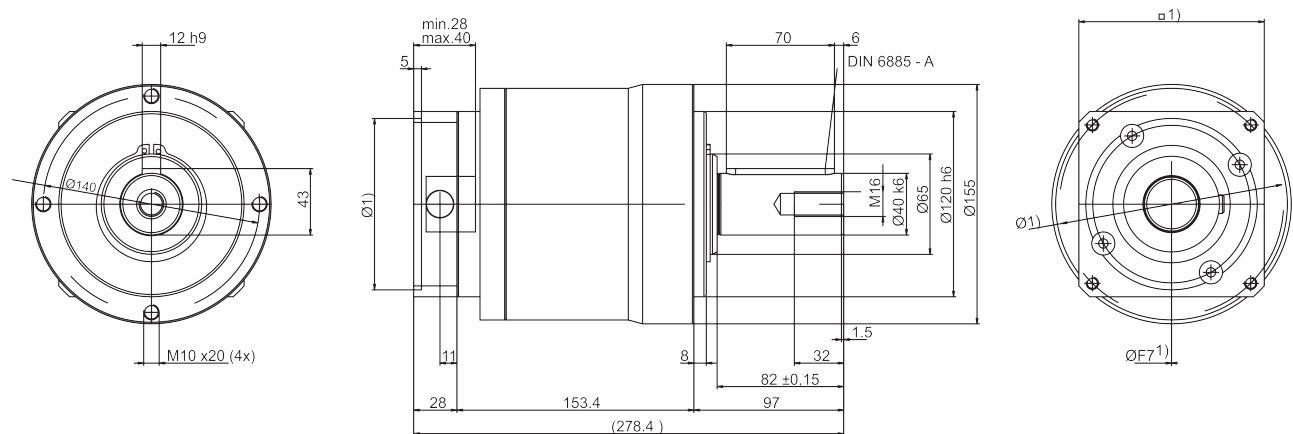
Drive side



2-stepped:

Power takeoff side

Drive side



1) Dimensions depend of the motor  
 Technical modifications reserved  
 Dimension without tolerance  $\pm 1\text{mm}$

## 9 Commissioning

### 9.1 Important notes

#### ⚠ CAUTION

##### Damage to persons and devices

- Read up on the general and special safety instructions before starting the work.

#### NOTE

##### Improper operation may result in damage to the gear unit.

- Please ensure that
  - ⇒ the **ambient temperature** is not below -15 °C and not above +40 °C, and
  - ⇒ the **operating temperature** does not exceed +90 °C.
- Avoid icing, which can damage the seals.
- For other operating conditions please contact our customer service.
- Only use the gear unit up to its maximum limits (see Section "General technical data").
- Only use the gear unit in a clean, dust-free and dry environment.

#### ⚠ DANGER

##### Serious risk of injury!

- Only specialist personnel with extensive knowledge in the areas of electrical engineering / drive technology are allowed to install and commission the equipment.
- Check that all live connection points are protected against accidental contact. Dangerous voltages can occur, up to 875 V<sub>DC</sub>.
- Due to the DC link capacitors, the DC link contacts "ZK+ and ZK- (DC+ and DC-)" and "RB+ and RB-" may be subject to dangerous voltages exceeding 875 V<sub>DC</sub>, even after the servo drive was disconnected from the mains supply. Wait 5 minutes for the AX5101 - AX5125 and AX520x; 15 minutes for the AX5140/AX5160/AX5172; 30 minutes for the AX5190/AX5191; 45 minutes for the AX5192/AX5193 after disconnecting, and measure the voltage at the DC links "ZK+ and ZK- (DC+ and DC-)". The device is safe once the voltage has fallen below 50 V.
- The surface temperature of the motor can exceed 90 °C in operation. Check (measure) the temperature of the motor. Wait until the motor has cooled down below 40 °C before touching it.
- Make sure that, even if the drive starts to move unintentionally, no danger can result for personnel or machinery.

#### NOTE

##### Overloading of the gear!

With motor / gear combinations can in case of failure (mechanical blockage of the power train) due to high ratio, the gear will be overloaded.

**To prevent this, make sure that the motor rated torque and the motor peak torque is limited in the servo drive.**

Example:

- Motor rated torque / motor peak torque: 1 Nm / 5 Nm
- Gear rated torque / gear peak torque: 15 Nm / 24 Nm
- Gear ratio:  $i = 10$
- The motor rated torque is not limited. The motor peak torque is limited to 2,4 Nm.

## 9.2 Guide for commissioning the gear units

The procedure for commissioning is described as an example.

A different method may be appropriate or necessary, depending on the application of the equipment.

- Check the assembly and alignment of the motor and the gear unit.
- Check the drive components such as clutch, gear unit, belt pulley and gear unit for correct seating and setting (observe the permissible radial and axial forces).
- Check the wiring and connections at the motor, servo drive and gear unit. Check that the earthing is correct.
- Test the function of the holding brake, if used. (Apply  $24V_{DC}$ , the brake must release).
- Check whether the rotor of the motor revolves freely (release the brake, if necessary). Listen out for grinding noises from the motor and the gear unit.
- Check that all the required measures against accidental contact with live and moving parts have been carried out.
- Carry out any further checks which are specifically required for your system.
- Now commission the drive according to the commissioning instructions for the servo drive.
- In multi-axis systems, individually commission each drive unit (servo drive/motor(s)).
- During the installation and commissioning look out for chips or similar contaminants that may penetrate into the gear unit. Keep the work area clean and protect the gear unit from foreign objects. Penetration of dirt reduces the service life of the gear unit.

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### **● Destruction of the gear unit due to maximal engine torque!**

**i** Before commissioning, check that your configured max. engine torque does not destroy the gear unit. For further information, please refer to chapter 9.1: "[Important notes \[► 31\]](#)".

---

## 9.3 Troubleshooting

### NOTE

#### Changed operating behavior

A change in operating behavior may indicate existing damage of the gear unit or result in damage to the gear unit.

- Do not recommission the gear unit until the fault has been rectified.

### ⚠ CAUTION

#### Personal injuries

Troubleshooting may only be performed by trained personnel.

Error	Possible cause	Remedy
Increased operating temperature	The gear unit is not suitable for the purpose.	Check the technical data.
	Motor heats up the gear unit.	Check the wiring of the motor.
		Ensure adequate cooling.
	Ambient temperature too high.	Change the motor.
Increased operating noises	Distorted motor mounting	Ensure adequate cooling.
	Bearing damage	
	Gear tooth damage	
	Toothed belt tension too high	
Lubricant loss	Lubricant quantity too high	Wipe off the leaking lubricant and continue to monitor the gear unit. Lubricant discharge should stop after a short time.
	Leaks	Contact our service department.

## 10 Decommissioning

### CAUTION

#### **Damage to persons and devices**

- Read up on the general and special safety instructions before starting the work.

# 11 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

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