

G...

Gearboxes / geared motors



GST, GFL, GKS/GKL, GKR, GSS

Operating Instructions

EN



13502911

Lenze



Please read these instructions before you start working!
Follow the enclosed safety instructions.

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Contents

- This documentation serves for safety-relevant operations on and with the gearboxes. It contains safety instructions which must be observed.
- All personnel working on and with the gearboxes must have the documentation available during the work and observe the information and notes relevant for them.
- The documentation must always be complete and in a perfectly readable state.



Tip!

Information and tools concerning the Lenze products can be found in the download area at www.lenze.com

Validity

This documentation applies to the gearbox types:

Type	Name
GST	Helical gearbox
GFL	Shaft-mounted helical gearbox
GKS/GKL	Helical-bevel gearbox
GKR	Bevel gearbox
GSS	Helical-worm gearbox

Target group

This documentation is directed at qualified skilled personnel according to IEC 60364.

Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

1 About this documentation

Document history

1.1 Document history

Material number	Version			Description
00 390 375	1.0	11/1995	TD09	First edition for pilot series
00 393 076	1.0	03/1997	TD09	Complete editorial revision
00 393 076	1.0	04/2000	TD09	Supplement for chapter 5.3.1 "Preparatory work" Update of the illustrations for chapter 5.3.10 "Gearbox with ventilation"
00 407 986	1.0	12/2000	TD09	Complete editorial revision Revision of the product key and position of the system blocks Supplemented by gearbox size 03 Chapter 5.3.12 "Gearbox with compensation container" in mounting position C Chapter Spare parts list for compensation reservoirs Change of lubricant amounts
00 425 604	1.0	08/2001	TD09	Chapter 5.3.8 "Mounting of shrink disc covers": new Chapter 5.3.9 "Mounting of hollow shaft covers hoseproof": new Supplemented by GKR 05
00 425 604	2.0	11/2001	TD09	Changes to lubricant amounts
00 460 708	1.0	12/2002	TD09	Changes with regard to nameplates Supplemented by GKR 06 Change of name
00 460 708	2.0	02/2003	TD09	Supplement - warning in chapter 5
00 476 711	2.1	10/2003	TD09	Changes: product key and position of the system blocks Supplemented by chapter 8.2.2, "Roller bearing grease" and chapter 8.2.3, "Lubricant table"
13124908	3.0	11/2005	TD09	New nameplate "Geared motor" included. Revision of the lubricant table
13166718	4.0	08/2006	TD09	Revision of the nameplate designation New nameplate: CSA/UL type Supplemented by chapter "Mounting of the shrink disc with a rotating cover" Revision of the chapter "Position of the ventilation unit, oil filler plug and oil drain plug" Supplemented by drive sizes: 3F; 4E; 6C, and 7C
13290892	5.0	03/2009	TD09	Complete revision
13321528	6.0	11/2009	TD09	Conversion from G-motion to L-force Geared Motors Chapter "Condensation drain hole" supplemented
13404748	7.0	11/2011	TD09	Update of the lubricant table Change of lubricant amounts for GST Transport weights supplemented Table of roller bearing greases supplemented
13477846	8.0	12/2014	TD09	Supplement to nameplate - geared motor standard type Note "Geared motors for deep-freeze application" inserted in "Safety instructions" chapter Values in Tab. 3 added Values in table of chapter 8.2.6 added for GST
13502911	9.0	11/2015	TD09	Operating condition: "Mechanical" deleted Supplement: encoder code, 22 "Auxiliary tool" table updated

1.2 Conventions used

This documentation uses the following conventions to distinguish different types of information:

Type of information	Writing	Example/notes
Spelling of numbers		
Decimal	Normal spelling	Example: 1234
Decimal separator	Point	The decimal point is always used. For example: 1234.56
Icons		
Page reference		Reference to another page with additional information For instance:  16 = see page 16
Documentation reference		Reference to another documentation with additional information Example:  EDKxxx = see EDKxxx documentation
Wildcard		Wildcard for options, selection data

1.3 Terminology used

Term	Describes the following
Gearboxes	Gearbox of product range G□□
Drive system	Drive systems with gearboxes G□□ and other Lenze drive components

1 About this documentation

Notes used

1.4 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Layout of the safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure trouble-free operation
 Tip!	Useful tip for easy handling
	Reference to another document

2.1 General safety instructions for drive components

(in compliance with Low-Voltage Directive 2006/95/EC)

At the time of dispatch, the drive components are in line with the latest state of the art and can be regarded as operationally safe.

Scope

The following general safety instructions apply to all Lenze drive and automation components.

The product-specific safety and application notes given in this documentation must be observed!

General hazards



Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

- Lenze drive and automation components ...
 - ... must only be used for the intended purpose.
 - ... must never be operated if damaged.
 - ... must never be subjected to technical modifications.
 - ... must never be operated unless completely assembled.
 - ... must never be operated without the covers/guards.
 - ... can - depending on their degree of protection - have live, movable or rotating parts during or after operation. Surfaces can be hot.
- All specifications of the corresponding enclosed documentation must be observed.

This is vital for safe and trouble-free operation and for achieving the specified product features.
- Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.

According to IEC 60364 or CENELEC HD 384, these are persons ...

 - ... who are familiar with the installation, assembly, commissioning and operation of the product,
 - ... possess the appropriate qualifications for their work,
 - ... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.

2 Safety instructions

General safety instructions for drive components

Temperatures

The permissible temperature range is determined by the following:

- The lubricant specifications in connection with the expected oil temperatures in operation (see chapter 8.1 and nameplate).
- The thermal class of the motor considering the motor temperature expected during operation (see nameplate and/or Operating Instructions of the motor).

The operating temperature is determined by the power loss, the ambient temperature and the cooling system!



Stop!

With mineral oil, the upper temperature limit for continuous operation is 80°C, with synthetic oil and shaft sealing rings made of FP (Viton) 100°C. If these temperatures are exceeded, measures are necessary to reduce the temperature, see chapter 9.



Danger!

Depending on the operating conditions, surfaces may be hot, provide protection against accidental contact.

Ambient media

- Gearboxes are protected against dust and spray water.
- Motors according to their enclosure (see nameplate and/or Operating Instructions for the motor).
- Ambient media - especially chemically aggressive - can destroy shaft seals and coatings (plastic). Abrasive media endanger shaft seals.
- The installation site of the drive must be free of shocks and vibration.
- Dirt or dust deposits impede the heat dissipation (cooling).

Transport, storage

- Transport and storage in a dry, low-vibration environment without aggressive atmosphere; preferably in the packaging provided by the manufacturer.
 - Protect against dust and impacts.
 - Observe climatic conditions according to the technical data.
- Use load carrying equipment for transport! (📖 25)

Before transport

- check that all component parts are safely mounted;
- check that all component parts with a loose fastening are secured or removed;
- tighten all transport aids (eye bolts or support plates).

Use an appropriate means of transport and lifting equipment! (📖 25)

If you do not install the motor immediately, ensure proper storage conditions.

- Up to one year:
 - Shafts and uncoated surfaces are delivered in a protected against rust status. Aftertreatment is required where the corrosion protection has been damaged.
 - Remove the plug for motors with condensation drain holes (special version).
- More than one year, up to two years:
 - Apply a long-term corrosion preventive (e.g. Anticorit BW 366 from the Fuchs company) to the shafts and uncoated surfaces before storing the motor away.

Corrosion protection

Lenze offers paints with different resistance characteristics for drive systems. Since the resistance may be reduced when the paint coat is damaged, defects in paint work (e.g. through transport or assembly) must be removed professionally to reach the required corrosion resistance.

Mechanical installation

- Provide for careful handling and avoid mechanical overload. During handling neither bend components, nor change the insulation distances.

Electrical installation

- Carry out the electrical installation according to the relevant regulations (e. g. cable cross-sections, fusing, connection to the PE conductor). Additional notes are included in the documentation.
- The Instructions contain notes concerning wiring according to EMC regulations (shielding, earthing, filters and cable routing). The compliance with limit values required by the EMC legislation is the responsibility of the manufacturer of the machine or system.

Warning: The inverters are automation components which can be used in industrial environment according to EN 61000-6-4. These products may cause radio interference in residential areas. If this happens, the operator may need to take appropriate action.

- Only plug in or remove pluggable terminals in the deenergised state!

Commissioning

- If required, you have to equip the system with additional monitoring and protective devices in accordance with the respective valid safety regulations (e. g. law on technical equipment, regulations for the prevention of accidents).
- Before commissioning remove transport locking devices and keep them for later transports.

2 Safety instructions

Application as directed

Geared motors for deep-freeze applications

- Geared motors for deep-freeze applications are specially optimised to operation at very low temperatures. Observe that for operation outside the temperature range specified (e.g. during commissioning) increased wear or even failures may occur.
- We recommend loading the gearbox with a maximum of 50 % of the rated output torque if it is outside the specified temperature range during commissioning.

2.2 Application as directed

All products which this documentation applies to are no household appliances but are exclusively intended as components for re-utilisation for commercial use or professional use in terms of IEC/EN 61000-3-2. They meet the requirements of the Low-Voltage Directive 2006/95/EC and the requirements of the harmonised standards of the IEC/EN 60034 series.

Only use the products under the operating conditions and power limits specified in this documentation.

Do not use the brakes installed as fail-safe brakes. It cannot be ruled out that the braking torque is reduced by disruptive factors which cannot be influenced.

- Drives
 - ... must only be operated under the operating conditions and power limits specified in this documentation.
 - ... comply with the protection requirements of the EU Low-Voltage Directive.

Any other use shall be deemed inappropriate!

2.3 Foreseeable misuse

- Do not operate the motors
 - ... in explosion-protected areas
 - ... in aggressive environments (acid, gas, vapour, dust, oil)
 - ... in water
 - ... in radiation environments



Note!

Increased surface and corrosion protection can be achieved by using adapted coating systems.

2.4 Residual hazards

Protection of persons

- Risk of burnst!
 - Hot surfaces up to 140 °C during operation! Provide protection against contact.
- High-frequency voltages can be capacitively transferred to the motor housing through the inverter supply.
 - Earth motor housing carefully.
- Risk of injury due to rotating shaft!
 - Before working on the motor ensure that the motor is at standstill.
- Danger of unintentional starting or electrical shocks!
 - Connections must only be made when the equipment is deenergised and the motor is at standstill.
 - Installed brakes are no fail-safe brakes.
- Dangerous voltages at the power terminals, even if the plug is removed: residual voltage >60 V!

Motor protection

- Installed thermal detectors do **not offer full protection** to the machine.
 - If required, limit the maximum current, parameterise the inverter so that it will be switched off after some seconds of operation with $I > I_N$, especially if there is the danger of blocking.
 - Installed overload protection does not prevent an overload under any conditions.
- Installed brakes are **no fail-safe brakes**.
 - The torque can be reduced due to disruptive factors that cannot be influenced, e.g. by ingressing oil due to a defect shaft sealing ring on the A side.
- Fuses are no motor protection.
 - Use current-dependent motor protection switches at an average operating frequency.
 - Use installed thermal detectors at a high operating frequency.
- Excessive torques lead to a break of the motor shaft or demagnetisation.
 - The maximum torques according to catalogue must not be exceeded.
- Lateral forces from the motor shaft may occur.
 - Align shafts of motor and driving machine exactly to each other.
- If deviations from normal operation occur, e.g. increased temperature, noise, vibration, determine the cause and, if necessary, contact the manufacturer. If in doubt, switch off the motor.
- Design with plug:
 - Never disconnect plug when energised! Otherwise, the plug can be destroyed.
 - Switch off power supply and inhibit controller prior to disconnecting the plug.

2 Safety instructions

Disposal

Fire protection

- Fire hazard
 - Prevent contact with flammable substances.

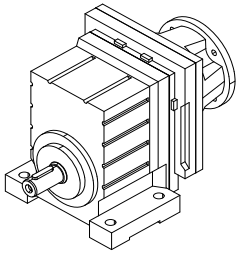
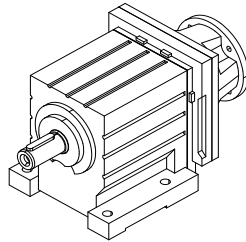
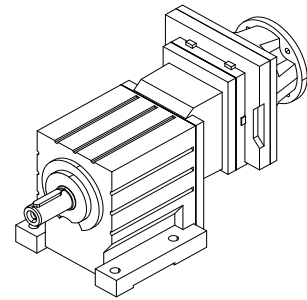
2.5 Disposal

Sort individual parts according to their properties. Dispose of them as specified by the current national regulations.

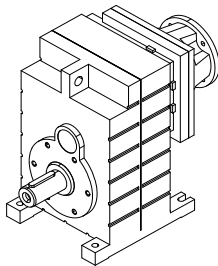
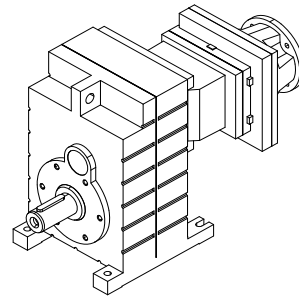
- The most important technical data is given on the nameplate.
- The product catalogues contain further technical data.

3.1 Identification

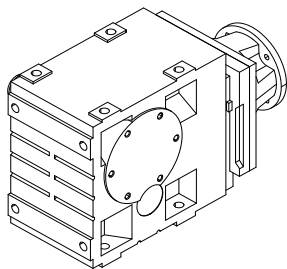
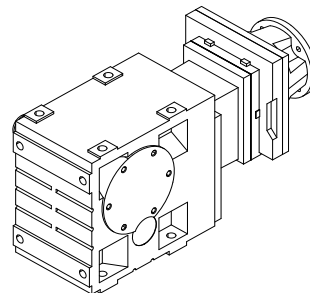
GST

**1-stage****2-stage****3-stage**

GFL

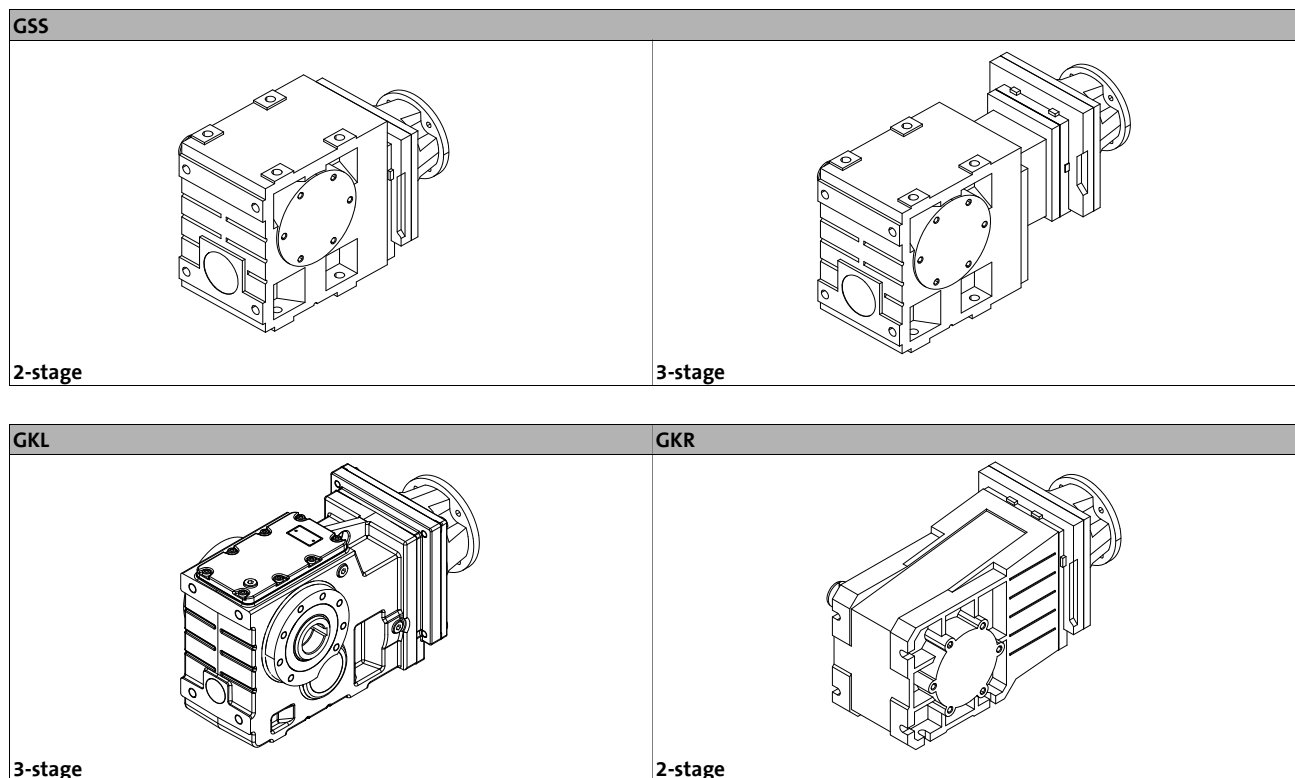
**2-stage****3-stage**

GKS

**3-stage****4-stage**

3 Product description

Product features



3.2 Product features

Design

Drive systems have a modular design.

They consist of:

- Reduction gearboxes
 - Helical gearboxes
 - Shaft-mounted helical gearboxes
 - Helical-worm gearboxes
 - Helical-bevel gearboxes
 - Bevel gearbox
- Variable speed drives
- Motors

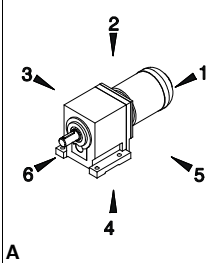
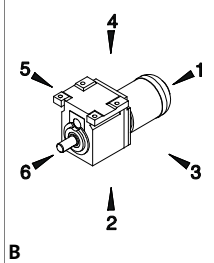
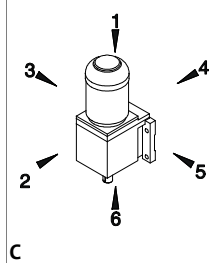
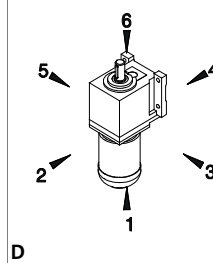
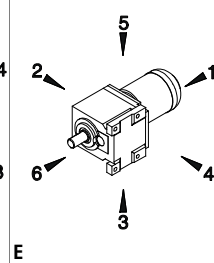
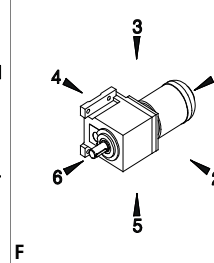
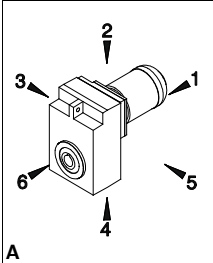
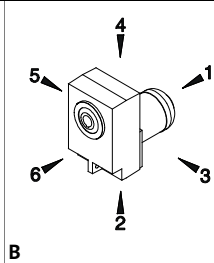
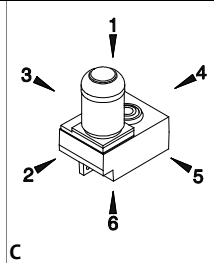
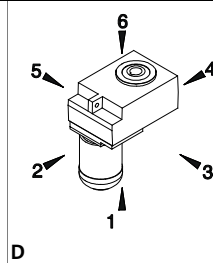
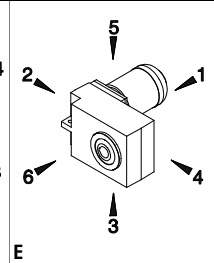
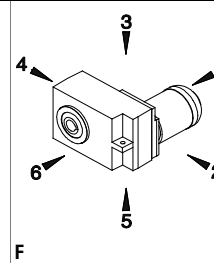
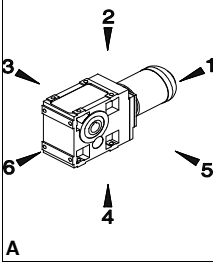
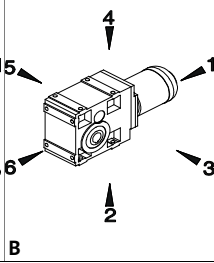
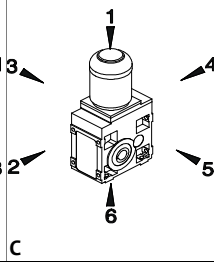
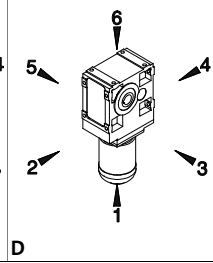
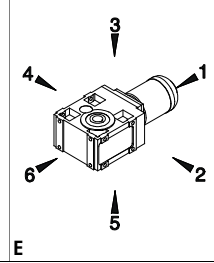
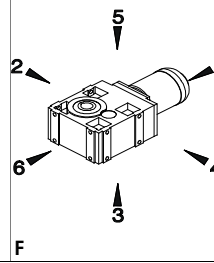
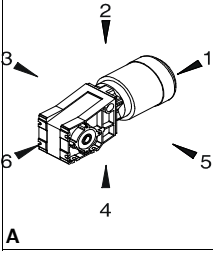
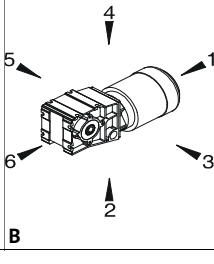
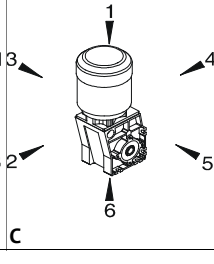
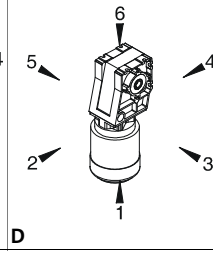
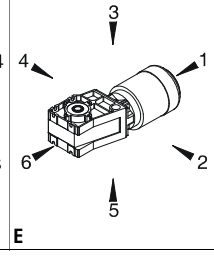
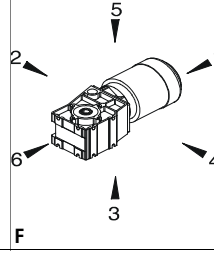
Mode of operation

- Torque and speed conversion

Product family	Pre-stage	1. stage	2. stage	3. stage
Helical gearbox	Spur gear	Spur gear	Spur gear	---
Shaft-mounted helical gearbox				---
Helical-bevel gearbox			Bevel gear	Spur gear
Bevel gearbox	---			---
Helical-worm gearbox	Spur gear		Worm	---

- The torque reaction must be supported in a suitable manner.

Mounting position (A-F) and position of system modules (1-6)

GST					
Terminal box, Motec, plug: 2, 3, 4, 5 Without terminal box, Motec, plug: 0					
					
GFL					
Solid shaft: 6 Hollow shaft: 0 Hollow shaft with shrink disc: 1, 6					
Foot: 3, 4 Without foot: 0					
Terminal box, Motec, plug: 2, 3, 4, 5 Without terminal box, Motec, plug: 0					
					
GKS/GSS/GKL					
Solid shaft: 3, 5, 8 (3+5) Hollow shaft: 0 Hollow shaft with shrink disc: 3, 5					
Flange: 3, 5, 8 (3+5) Without flange: 0					
Terminal box, Motec, plug: 2, 3, 4, 5 Without terminal box, Motec, plug: 0					
					
GKR					
Solid shaft: 3, 5, 8 (3+5) Hollow shaft: 0 Hollow shaft with shrink disc: 3, 5					
Flange: 3, 5, 8 (3+5) Without flange: 0					
Terminal box, Motec, plug: 2, 3, 4, 5 Without terminal box, Motec, plug: 0					
					

3 Product description

Nameplate

3.2.1 Nameplate

Three-phase AC motor for direct gearbox attachment

Lenze			1		15			
2		21			Hz	16.1		26
3		18			kW	16.2		15
4		17			V	Y	16.4	19
						Δ	16.4	
5.1		5.2			25			23
5.3		5.4			A	Y	16.5	13
6		7.1		7.2		Δ	16.5	14.1
8.1		8.2		8.3	r/min	16.3		14.2
9					η %	16.7		14.3
20.2					cos φ	16.6		27
10.1		10.2			C86	22	22	29
11					20.1			

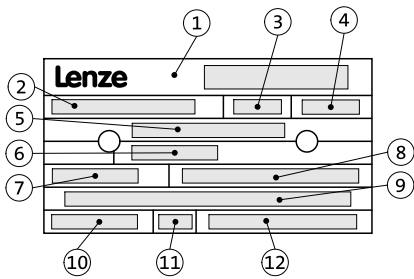
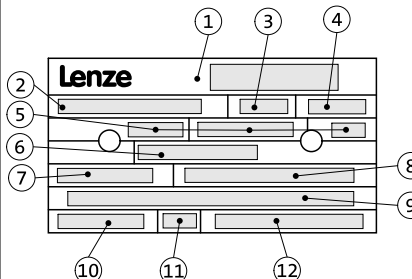
Three-phase AC motor with standard output flange

Lenze			1		15			
2	14.2	14.1	23	26	Hz	16.1		
4			22		kW	16.2		
21	13		14.3		r/min	16.3		
8.1	8.2	8.3	27		V	Y	16.4	
9			29			Δ	16.4	
24					A	Y	16.5	
10.1	20.1					Δ	16.5	
10.2	10.3		18		cos φ	16.6		
11					η %	16.7		

Pos.	Contents
1	Manufacturer / production location
2	Type of motor / standard
3	Gearbox type
4	Motor type
5	Technical data
5.1	Ratio
5.2	Rated torque
5.3	Rated speed
5.4	Rated frequency
5.10	Number of poles
6	Mounting position / position of the system blocks
7	Lubricant details
7.1	Lubricant amount
7.2	Lubricant type
8	Brake data
8.1	Type
8.2	AC/DC brake voltage
8.3	Braking torque, electrical power input
9	For feedback / pulse encoder or resolver data,  22
10	Production data
10.1	Order number
10.2	Material number
10.3	Serial number
11	Bar code
12	Motor number
13	Information with regard to the operating mode
14	Additional motor specifications
14.1	Temperature class
14.2	Enclosure
14.3	Motor protection
15	Applicable conformities, approvals and certificates
16	Rated data for various frequencies
16.1	Hz = frequency
16.2	kW = motor power
16.3	rpm = motor speed
16.4	V = motor voltage
16.5	A = motor current
16.6	$\cos \varphi$ = motor power factor
16.7	η = motor efficiency: at a rated power of 100%
16.8	η = motor efficiency: at a rated power of 75%
16.9	η = motor efficiency: at a rated power of 50%
17	Application factor (specified if <1.0) / load capacity
18	Year of manufacture / week of manufacture
19	UL file number
20	Customer data
20.1	Additional customer data
20.2	Customer order number
21	UL category (e.g. inverter duty motor)
22	C86 = motor code for controller parameterisation (code 0086)
23	Efficiency class
24	Partial load efficiencies for 50Hz operation at a rated power of 50% and 75%
26	CC number Department of Energy (optional)
27	Permissible ambient temperature (e.g. $T_a \leq 40^\circ\text{C}$)
29	Standstill current (ampere locked rotor ALR)
31	Plug design (number of poles)

3 Product description

Gearbox

N and W design	M and N design with motor
 Diagram of gearbox nameplate N and W design. The nameplate is a rectangular plate with the 'Lenze' logo on the left. It features 12 numbered callouts: 1 (Production location), 2 (Gearbox type), 3 (Year / week of manufacture), 4 (Mounting position), 5 (Rated torque/speed), 6 (Lubricant amount / type of lubricant), 7 (Ratio), 8 (Material number / serial number), 9 (Bar code), 10 (Order number), 11 (Additional information), and 12 (Additional customer data). Nameplate GST-004.iso	 Diagram of gearbox nameplate M and N design with motor. The nameplate is a rectangular plate with the 'Lenze' logo on the left. It features 12 numbered callouts: 1 (Production location), 2 (Gearbox type), 3 (Year / week of manufacture), 4 (Mounting position), 5 (Rated torque/speed), 6 (Lubricant amount / type of lubricant), 7 (Ratio), 8 (Material number / serial number), 9 (Bar code), 10 (Order number), 11 (Additional information), and 12 (Additional customer data). Nameplate GST-005.iso

Design	N and W design	M and N design with motor
Pos.		
1	Production location / country; www.Lenze.com	
2	Gearbox type	Gearbox and motor type
3	Year / week of manufacture	
4	Mounting position / position of the system blocks	
5	Rated torque/speed	Rated torque Rated speed/rated frequency Operating factor (indicated when <1.0)
6	Lubricant amount / type of lubricant	
7	Ratio	
8	Material number / serial number	
9	Bar code	
10	Order number	
11	Additional information	
12	Additional customer data	

3.2.2 Gearbox code

Example		GST	03	-	1	M	VAR	071N32; 080-12 1C
Meaning	Variant	Gearbox code						
Gearbox type	Helical gearbox	GST						
	Shaft-mounted helical gearbox	GFL						
	Helical-bevel gearbox	GKS/GKL						
	Bevel gearbox	GKR						
	Helical-worm gearbox	GSS						
Gearbox size	Depending on the gearbox type		XX					
Number of stages	1-stage		-	1				
	2-stage		-	2				
	3-stage		-	3				
Drive design	Servo motor, asynchronous; totally enclosed fan-cooled					A		
	Disco variable speed drive					D		
	Three-phase AC motor with 8400 motec					E		
	Three-phase AC motor SDS					G		
	Servo motor, asynchronous, with internal cooling					I		
	Compact unit					K		
	Three-phase AC motor					M		
	Gearbox with mounting flange for IEC standard motor					N		
	DC permanent-magnet motor 13.12x/SGS					P		
	DC motor, smooth housing MGFQU/MGFQK					Q		
	DC motor, ribbed housing MGFRK					R		
	Servo motor, synchronous; totally enclosed fan-cooled					S		
	DC shunt-wound motor 13.5xx					T		
	Three-phase AC motor 13.71x/13.75x					V		
	Gearbox with free drive shaft					W		
Output design	Solid shaft smooth (without keyway)					G		
	Solid shaft (with keyway)					V		
	Hollow shaft					H		
	Hollow shaft with shrink disk					S		
	Foot mounting, with centering						A	
	Foot mounting, without centring						B	
	Without foot, with centering						C	
	Without foot, without centering						D	
	Without flange							R
	With flange (through holes)							K
	With flange (threaded holes)							L
Drive size								
Example	Motor							071N32; 080-12
	Mounting flange/free drive shaft							1C

3 Product description

Encoder code

3.2.3 Encoder code

Example		SFC	1024	-	8V	-	K	2
Meaning	Type	Encoder code						
Product line	Resolver	RS						
	Resolver for safety function	RV						
	Incremental encoder	IG						
	Incremental encoder with commutation signal	IK						
	Singleturn absolute value encoder	SFC						
	Multiturn absolute value encoder	AM						
Number	2-pole resolver for servo motors		0					
	2-pole resolver for three-phase AC motors		1					
	Number of pole pairs for resolvers		2, 3, 4, ...					
	Number of steps / increments per revolution		32, 128, 512, 1024, 2048, ...					
Voltage	Medium supply voltage			-	5V, 8V, 15V, 24V, ...			
Interface or signal level	Standard							
	TTL						T	
	HTL (for incremental encoders)						H	
	Hiperface (for absolute value encoders)						H	
	EnDat						E	
	sin/cos 1 V _{SS}						S	
	For safety function							
	TTL						U	
	HTL (for incremental encoders)						K	
	Hiperface (for absolute value encoders)						K	
	EnDat						F	
	sin/cos 1 V _{SS}						V	
	Safety integration level (SIL)							1
								2
								3
								4



Note!

If feedback systems for safety functions are used, the manufacturer's documentation must be observed!

3.3 Transport weights

Gearbox size	Geared motors Motor frame sizes					
	063-□□	071-□□	080-□□	090-□□	100-□□	112-□□
G□□03	< 10	< 10				
G□□04	< 30	< 30	< 40	< 50		
G□□05	< 50	< 50	< 60	< 60	< 70	
G□□06	< 70	< 70	< 80	< 90	< 100	< 125
G□□07		< 125	< 125	< 150	< 150	< 175
G□□09		< 200	< 200	< 225	< 225	< 250
G□□11			< 350	< 375	< 375	< 400
G□□14				< 625	< 650	< 650

Gearbox size	Geared motors Motor frame sizes					Gearboxes
	132-□□	160-□□	180-□□	200-□□	225-□□	
G□□04						< 30
G□□05						< 50
G□□06	< 150					< 70
G□□07	< 200	< 250				< 150
G□□09	< 275	< 325	< 475	< 550		< 250
G□□11	< 425	< 450	< 600	< 700	< 850	< 400
G□□14	< 700	< 750	< 850	< 950	< 1100	< 625

Tab. 1 Transport weights in [kg]; values may differ from table value

4 Technical data

General data and operating conditions

4.1 General data and operating conditions

General data

Conformity and approval			
CE	2006/42/EC	Machinery Directive	
	2014/35/EU	Low-Voltage Directive	
	2009/125/EC	ErP Directive	
EAC	TP TC 004/2011 (TR CU 004/2011)	On safety of low voltage equipment	Eurasian Conformity TR CU: Technical Regulation of Customs Union
	TP TC 020/2011 (TR CU 020/2011)	Electromagnetic compatibility of technical means	Eurasian Conformity TR CU: Technical Regulation of Customs Union

The applicable approvals for the product you have ordered are specified on the nameplate.

Protection of persons and devices		
Enclosure	IEC/EN 60034-5	See nameplate
		Degrees of protection only apply to horizontal installation
		All unused connectors must be closed with protection covers or blanking plugs.
Temperature class	F (155 °C) IEC/EN 60034-1	Exceedance of the temperature limit weakens or destroys the insulation
Permissible voltage		As specified by limiting curve A of the pulse voltage from IEC / TS 60034-25:2007 (corresponds to IVIC C/B/B@500V)

EMC		
Noise emission	IEC/EN 61800-3	Depending on the controller, see documentation for the controller.
Noise immunity		

Operating conditions

Ambient conditions			
Climatic			
Transport	IEC/EN 60721-3-2	2K3 (-20 °C ... +70 °C)	
Storage	IEC/EN 60721-3-1	1K3 (-20 °C ... +60 °C)	< 3 months
		1K3 (-20 °C ... +40 °C)	> 3 months
Operation	IEC/EN 60721-3-3	3K3 (-20 °C ... +40 °C) MCA, MCS, MD□KS	Without brake
		3K3 (-15 °C ... +40 °C) MCM, MQA	
		3K3 (-10 °C ... +40 °C)	With brake
		3K3 (-15 °C ... +40 °C)	With blower
		> +40 °C	With power reduction, see catalogue
Site altitude		< 1000 m amsl - without power reduction > 1000 m amsl < 4000m amsl with power reduction, see catalogue	
Humidity		Relative humidity ≤ 85 %, without condensation	
Electrical			
The motor connection type depends on the controller			
Length of the motor cable	④ inverter instructions		
Length of cable for speed feedback			



Danger!

Only transport the drive with transport equipment or hoists which are suitable for this load (☞ 23). Ensure a safe fixing. Avoid shocks!

The motors attached to the gearbox are partially equipped with eyebolts. These are **exclusively** determined for motor/gearbox mounting and dismounting and must **not** be used for the complete geared motor!

5.1 Transport equipment for gearboxes

As of size 05, Lenze GST, GKS and GSS gearboxes are as standard available with a transport thread for eye bolts according to DIN 580. The thread position can be seen from the below figures. The eye bolts are not contained in the delivery package.

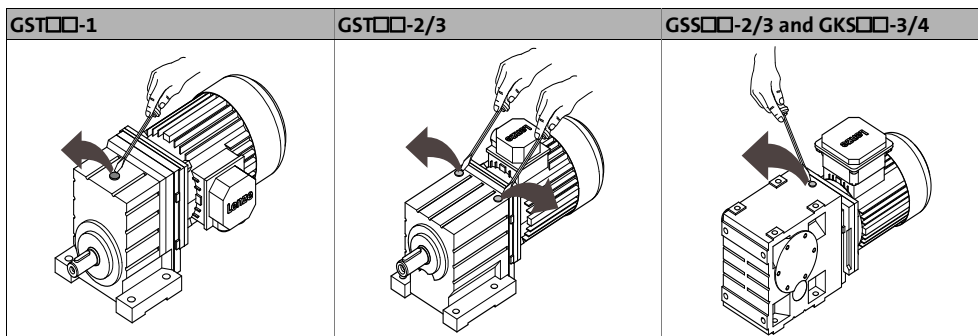


Fig. 1 Eye bolt position

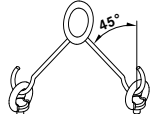


Note!

As standard, threads are delivered with plug screws. The plug can be easily removed, e.g. by using a screwdriver blade. For the thread size and load carrying capacity of the eye bolt, please see Tab. 2.

5 Mechanical installation

Transport equipment for gearboxes

Gearbox size	Thread	Max. load carrying capacity of the eye bolt as specified by DIN 580	
		One-leg	Two-leg (45°)
			 GT-GNG-005.iso/dms
05	M8	140	100
06	M8	140	100
07	M12	340	240
09	M16	700	500
11	M20	1200	860
14	M20	1200	860

Tab. 2 Load carrying capacity of eye bolt in kg



Danger!

Completely screw in transport aids (such as eye bolts or bearing plates), they must be flat and applied over their entire surface!

If possible, the transport aids (such as eye bolts or bearing plates) must be stressed vertically in the direction of the screw axis! Angular tension or tension to the sides reduces the payload! Observe the information provided in DIN 580!

Use additional appropriate lifting aids, if required, to achieve a direction of loading which is as vertical as possible (highest payload). Secure lifting aids against shifting!



Stop!

Observe load carrying capacity!

Standing beneath floating loads is prohibited!

5.2 Storage

If you do not install the gearbox immediately, provide for proper storage conditions.

- Generally
 - Store gearboxes indoors in a dry, clean (low-dust) and sunlight-protected environment.
 - The storage location must be free from vibrations and shocks ($V_{\text{eff}} < 0.2 \text{ mm/s}$) in order to prevent roller bearing standstill damage.
 - Temperature changes with condensate formation are to be avoided.
 - Do not activate ventilation unit, in order to prevent air exchange with the ambient air.
- Up to one year:
 - Store gearboxes with a ventilation unit with the vent plug on top.
 - Shafts and uncoated surfaces are delivered in a protected against rust status. Aftertreatment is required where the corrosion protection has been damaged.
 - Remove the plug for motors with condensation drain holes (option) (see 28).
- More than one year, up to two years:
 - Apply a long-term corrosion preventive (e.g. Anticorit BW 366 from the Fuchs company) to the shafts and uncoated surfaces before storing the motor away.
 - Install gearbox in mounting position A.
 - Fill gearbox up to the top vent hole / oil hole with the oil grade specified (see nameplate). Then mount the locking screw and ventilation unit (do not activate) again.

5 Mechanical installation

Mounting
Specification of the direction of rotation

5.2.1 Specification of the direction of rotation

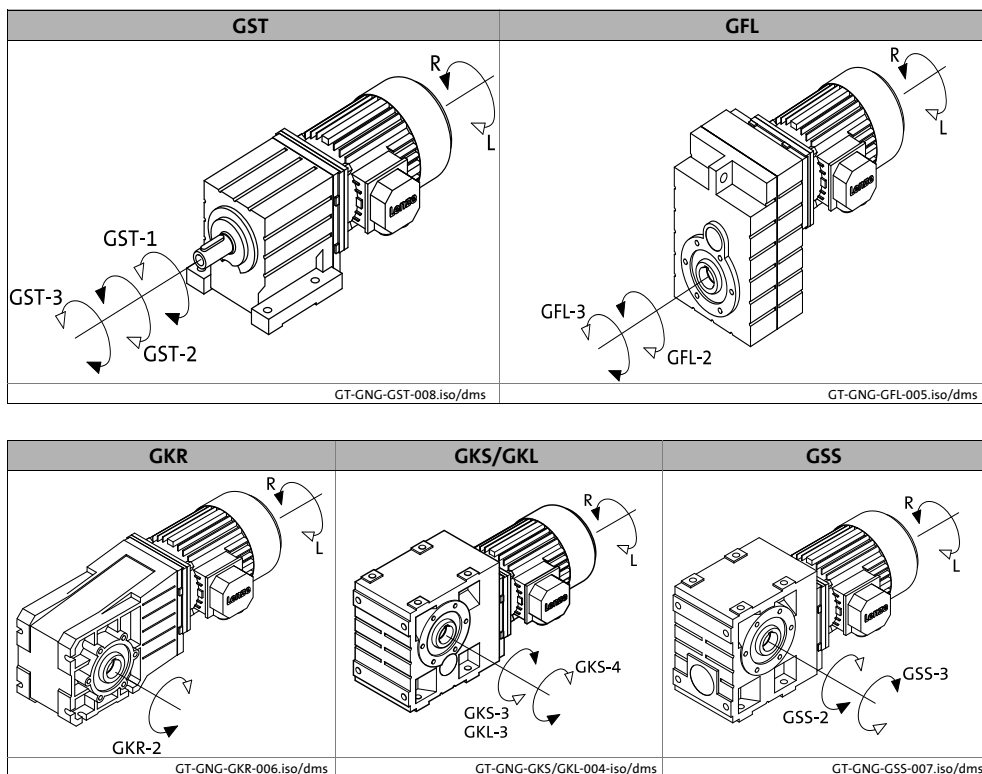


Fig. 2 Direction of rotation of the drive

5.3 Mounting

5.3.1 Preparation



Note!

Thoroughly remove anticorrosion agents from output shafts and flange faces.

Correcting the oil quantity

If the amount of oil in the gearbox has been increased for the purpose of longtime storage (see chapter 5.2), the oil must be drained completely and then refilled for the mounting position provided. The following steps have to be observed:

1. Place receptacle under oil drain plug.
2. Remove breathing / oil filler plug.
3. Completely drain lubricant.
4. Screw in oil drain plug.
5. Fill in amount of oil for the mounting position provided (according to nameplate).
6. Screw in breathing / oil filler plug.

Condensation drain hole



Note!

Lenze delivers motors with condensation drain holes with sealed condensation drain holes. The holes are sealed with a plastic plug or a locking screw. This does not affect the type of protection and the motor is protected against the ingress of foreign substances during transport and operation. Further information, (📖 57).

5.3.2 General information about the assembly of drive systems



Stop!

The lubricant fill quantity of the gearboxes is matched to the mounting position. The mounting position indicated on the nameplate must be observed to avoid damage to the gearbox.

- Take safety measures prior to any operation:
 - Disconnect the machine from the mains, ensure standstill of the drive system and avoid any machine movement.
 - Check faultless state of the drive system. Never install and commission damaged drive systems.
 - Check drive function - machine function assignment. Check direction of (📖 28)rotation.
- The mounting surfaces must be plane, torsionally rigid and free from vibrations.
- Align drive system on mounting surfaces exactly with the machine shaft to be driven.
 - Be sure to carry out mounting in a manner free from distortion, in order to avoid additional loads.
 - Even out slight inaccuracies by the use of suitable flexible couplings.
- Support reaction torque by suitable measures.
- Be absolutely sure to secure fastenings of accessories and built-on accessories so that they won't come loose.
We recommend glueing screwed connections.

5.3.3 Assembly of transmission elements on solid shafts

Draw the transmission elements onto the output shaft only by using the centering thread.



Stop!

Shocks and blows to the shafts damage the roller bearings.

5 Mechanical installation

Mounting

Attachment of motors to gearboxes with bearing housing (input design N)

5.3.4 Attachment of motors to gearboxes with bearing housing (input design N)

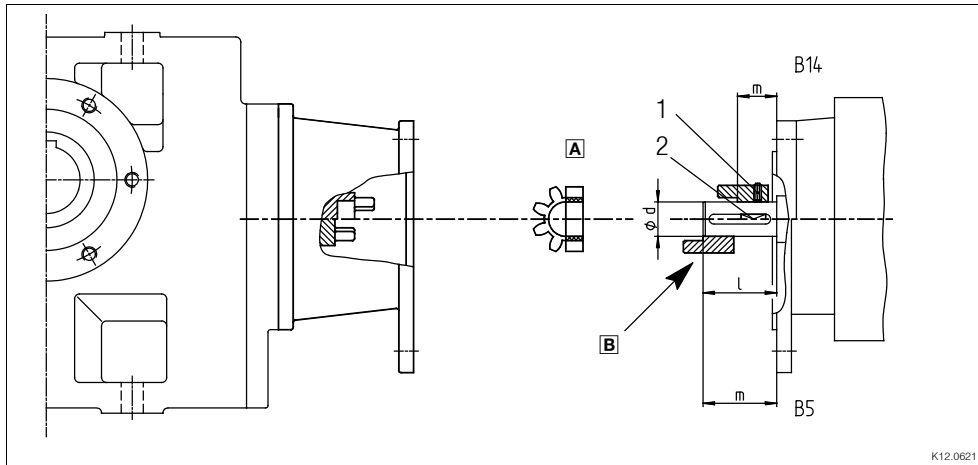


Fig. 3 Input side design N

- | | | | |
|----------|-------------------|----------|---------------|
| A | Spider / gear rim | 1 | Locking screw |
| B | Coupling hub | 2 | Keyway |

Drive size	Motor shaft		Assembly dimension m [mm]	Standard hub Locking screw		Clamping hub		Keyway 1)	Clamping ring hub					
	d [mm]	max. l [mm]		Thread [mm]	Tightenin g torque [Nm]	Thread [mm]	Tightenin g torque [Nm]	DIN 6885/1 [mm]	Thread [mm]	Tightenin g torque [Nm]				
1 A	11	23	23	M4	1.5	M3	1.34	*	M3	1.34				
1B	14	30	30											
2B	11	23	23											
1C	19	40	25	M5	2.0	M6	10.5	B6 x 6 x 16	M4	2.9				
2C	14	40	25					B5 x 5 x 16						
3C	14	40	25					*						
4C	14	40	25					B6 x 6 x 16						
6C	11	40	25	M5	2.0	M4	2.9	B6 x 6 x 16	M4	2.9				
7C	19	40	25					*	---	---				
1D	24	50	50					B6 x 6 x 16	M4	2.9				
2D	19	40-50	50					*	---	---				
1E	28	30-60	30			M6	10.5	M6	10.5	B8 x 7 x 18	M5	6		
2E	24	30-60	30							B6 x 6 x 18				
3E	19	30-60	30							*				
4E	24	50	50							B8 x 7 x 18				
1F	28	30-60	30							M8			25	*
2F	24	30-60	30	M10	69									
3F	24	50	50			M12	120	M12	120					
1G	38	80	80							M8	10	M8	35	
2G	28	60	60	M10	69									M10
3G	38	80	80			M12	120	M12	120					
1H	42	110	110							M8	10	M8	35	
2H	48	110	110	M10	69									M10
3H	38	80	80			M12	120	M12	120					
1K	55	110	110							M8	10	M8	35	
2K	60	140	140	M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
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				M10	69									M10
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				M10	69									M10
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										M8	10	M8	35	
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						M12	120	M12	120					
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						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
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				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M12	120	M12	120					
										M8	10	M8	35	
				M10	69									M10
						M1								

Tab. 3 Attachment of motors to gearboxes with mounting flange

* Use original key for the motor

1) Key for standard hub and clamping hub

5.3.5 Coupling hubs

General

**Note!**

Standard hubs, clamping hubs and clamping ring hubs are maintenance-free. We recommend checking the star-shaped spider and system components when inspecting the drive.

5.3.5.1 Assembly of standard hub / clamping hub

1. Fit motor key (2).
 - Fit enclosed key for drive sizes □C, □E, □F.
2. Push the coupling hub over the motor shaft, mounting dimension m (see Fig. 3 and Tab. 3) must be observed.
3. Secure coupling hub against axial movement using the fixing screw or clamping screw (1).
4. Lay spider in the coupling claw on the gearbox side.
5. Align claws of the motor-side coupling hub with its counterpart.
6. Slowly push on motor, and bolt on to the gearbox flange.

5 Mechanical installation

Mounting
Coupling hubs

5.3.5.2 Assembly of clamping ring hub

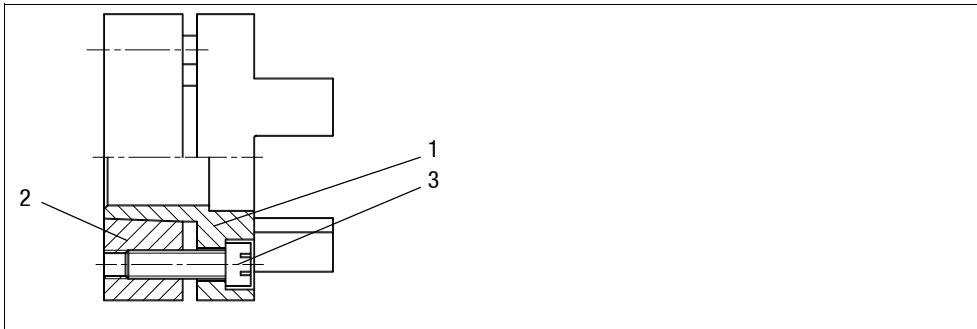


Fig. 4

Coupling

- 1 Clamping ring hub
- 2 Clamping ring
- 3 Clamping screws (DIN912)



Note!

The motor shaft must be designed with fit k6.

1. Grease the contact surfaces of the motor shaft using a thin-bodied oil, e. g. "Castrol 4 in 1" or "Klüber Quitsch Ex"!



Stop!

Do not use oil or grease with molybdenum-disulphide or high-pressure additives, or grease pastes!

2. Push the coupling hub over the motor shaft, mounting dimension "m" (see Fig. 3 and Tab. 3) must be observed.
3. Align the hub and tighten the clamping screws until they have contact.
4. Tighten the clamping screws evenly and crosswise with gradually rising torque until the indicated tightening torque (see Tab. 3) is reached at all clamping screws. In the intermediate steps, this procedure should also be repeated until the indicated tightening torque is reached at all clamping screws.
5. Lay spider in the coupling claw on the gearbox side.
6. Align claws of the motor-side coupling hub with its counterpart.
7. Slowly push on motor, and bolt on to the gearbox flange.

5.3.5.3 Disassembly of clamping ring hub

1. Loosen the clamping screws evenly one after the other.



Stop!

Each screw must only be loosened by half a revolution per pass! Unscrew all clamping screws by 3 - 4 threads.

2. Remove the screws next to the forcing threads and screw them into the other threads until they have contact.
3. Tighten the screws in the forcing threads crosswise and step-by-step so that the clamping ring is loosened.
4. Clean and grease all contact surfaces including threads and head of the clamping screws before reassembly.

5.3.6 Attachment of gearboxes with hollow shafts and keyway

Mounting

1. Draw the gearbox with hollow shaft onto the machine shaft to be driven:
 - Apply fitting grease (Fig. 5) to the shaft and into the hollow shaft bore.

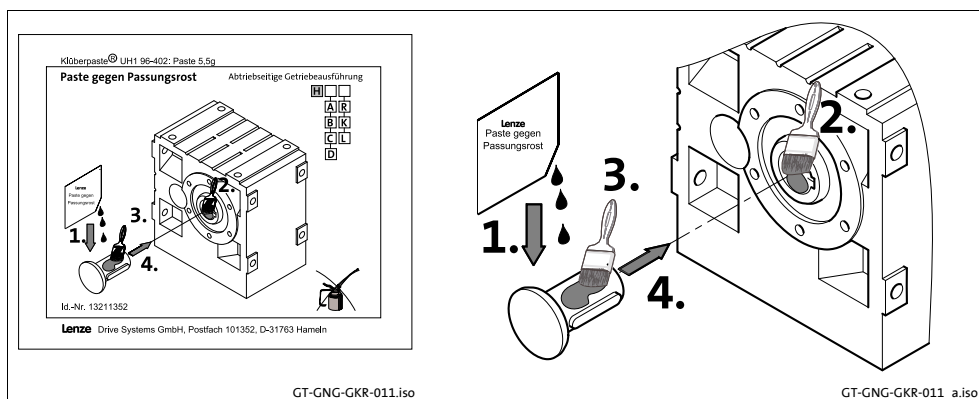


Fig. 5 Application of fitting grease against fretting corrosion (can be ordered optionally)



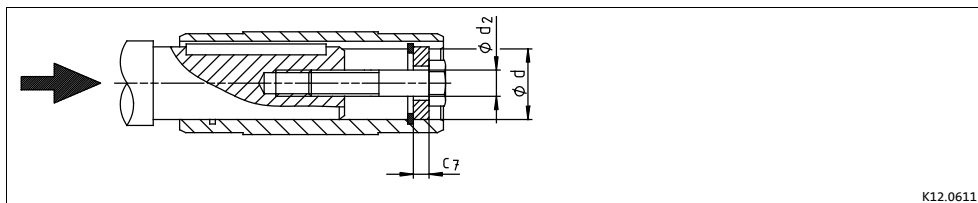
Stop!

Take up forces only via the hollow shaft, and not via gearbox housing.

2. Secure the gearbox axially:
 - The hollow shaft has snap ring grooves for axial securing. Parts used to fix the shaft are not included in the scope of supply.

5 Mechanical installation

Mounting Attachment of gearboxes with hollow shafts and keyway



K12.0611

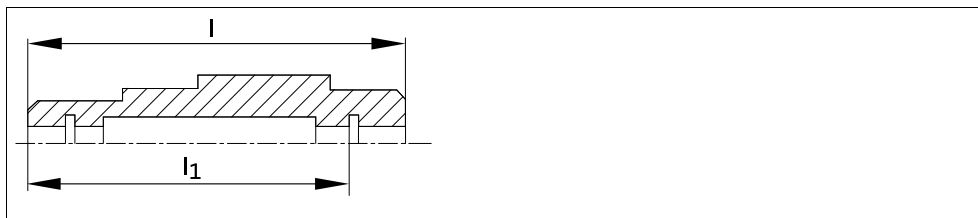
Auxiliary tool (recommended dimensions)		
ϕd^{H7}	d_2	c_7
18	M6	4
20		
25	M10	5
30		6
35	M12	7
40	M16	8
45		9
50	M16	10
55	M20	11
60	M20	13
70		14
80	M20	16
100	M24	24

Tab. 4 Dimensions in mm



Note!

With the bevel gearbox, the hollow shafts are turned free in the middle of the hollow shaft, i.e. the bore diameter is 0.1 mm higher here! A sufficient length of the machine shaft must be observed.



GKR size	l_1 min	l max.
03	85	100
04	105	120
05	127	143
06	150	170

Tab. 5 Dimensions in mm

Dismounting

1. Undo axial gearbox locking in the hollow shaft.
2. Remove/extract the gearbox from the motor shaft using an appropriate auxiliary tool (Fig. 6).

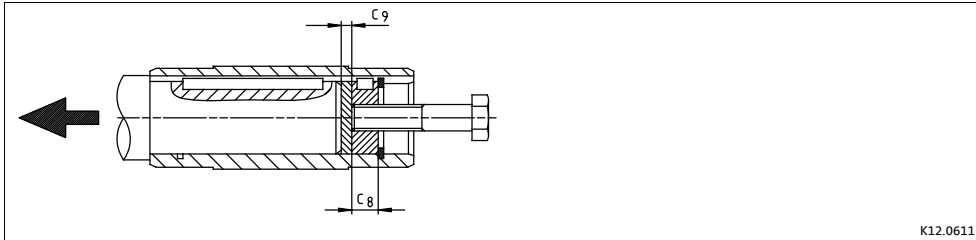


Fig. 6 Disassembly of gearboxes with a hollow shaft, with auxiliary tool; not for GKR

Auxiliary tool (recommended dimensions)		
Ø d ^{H7}	c ₈	c ₉
25	10	3
30	10	3
35	12	3
40	16	4
45	16	5
50	20	5
55	20	6
60	20	8
70	20	8
80	24	8
100	24	8

Tab. 6 Dimensions in [mm]

5.3.7 Mounting the shrink disc with a rotating cover



Stop!

Do not dismantle new shrink disc.
Never tighten clamping screws before the machine shaft is pushed in.
Otherwise the hollow shaft may be deformed plastically. Protect the shrink disc against contact while in operation by appropriate measures (e.g. cover).
Degrease hollow shaft bore and machine shaft!

5.3.7.1 Mounting the shrink disc

Depending on the design, the shrink discs may be equipped with a rotating cover (protective cap, pos. 1).



Note!

This cover is fitted to the shrink disc on delivery.

5 Mechanical installation

Mounting Mounting the shrink disc

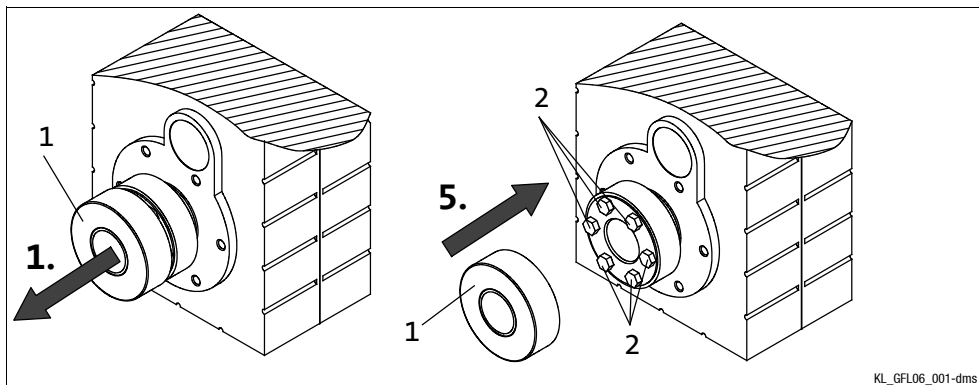


Fig. 7

- 1 Protection cover
- 2 Clamping screws

1. Remove protective cap (1), if available.
2. Check machine shaft
 - Diameter in fit tolerance h6
 - Surface roughness $R_z \leq 15 \mu\text{m}$
3. Thoroughly clean and **degrease** hollow shaft bore and machine shaft.



Note!

Thoroughly degrease the bore over the **entire** hollow shaft length to make sure that remainders of the anticorrosion agent will not be carried off into the area of the shrink disc when pushing on the machine shaft.

4. Slightly loosen clamping screws (2) one after the other, do **not** unscrew!
5. Push drive onto machine shaft.
6. Slightly tighten clamping screws manually.
7. Tighten clamping screws (2) one after the other (see Fig. 8) in several passes, with rising torque, evenly until the indicated screw-tightening torque (see Tab. 7) is reached at all screws.



Fig. 8 Explanation: "one after the other"



Tip!

Several (in general more than 5) passes are necessary until the full tightening torque is reached at all screws!

The shrink disc is mounted correctly and fixed when the faces of the outer ring and the inner ring are aligned (Fig. 9). Minimum misalignments are permissible.

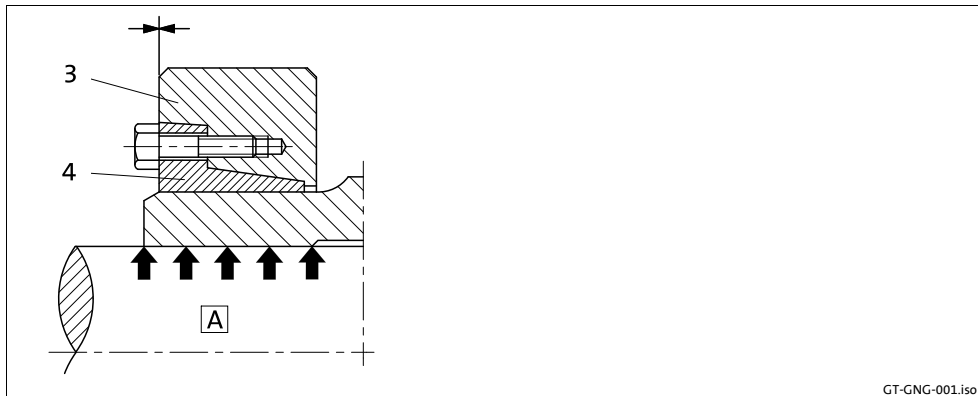


Fig. 9 Hollow shaft with shrink disc

- 3 Outer ring
4 Inner ring

A free of grease

Hollow shaft bore [mm]	20	25	28	30	35	40	45
Clamping screw thread	M6	M6	M8	M8	M6	M8	M8
Width across flats	10	10	13	13	10	13	13
Torque [Nm]	12	12	30	30	12	30	30

Hollow shaft bore [mm]	50	60	65	75	80	85	90	95	100
Clamping screw thread	M8	M10	M10	M10	M10	M10	M12	M12	M12
Width across flats	13	16	16	16	16	16	18	18	18
Torque [Nm]	30	59	70	70	70	70	125	100	100

Tab. 7 Tightening torque for the clamping screws



Note!

If a different tightening torque is indicated on the shrink disc, this tightening torque has priority over the value indicated in the table.

8. Push protective cap (1, Fig. 7) onto the shrink disc.



Tip!

For finding out the cause of non-reached torques of the shrink disc connection, please go through the troubleshooting list in chapter 9.

5 Mechanical installation

Mounting
Mounting the shrink disc

Dismounting



Danger!

Loose drive components or drive components falling down may cause injury to persons or damage to the machine. Secure the drive components **before** disassembly.

1. Remove protective cap (1).
2. Loosen clamping screws (2) evenly one after the other each by $\frac{1}{4}$ revolution in several passes. Do not unscrew clamping screws completely to prevent accidents!
3. Press off outer ring (see Fig. 9), if necessary. For this, loosen the outer ring using the forcing threads and some clamping screws (number corresponding to the forcing threads in the inner ring). For loosening the outer ring, screw in the screws evenly to prevent canting. Press off the outer ring until loosened completely.
4. Remove the drive from the machine shaft.



Stop!

Dismantle the shrink disc **only** for cleaning purposes. Afterwards, grease bevel surfaces and screws using a solid lubricant with a friction factor of $\mu = 0.04$.

- Suitable lubricants on molybdenum-disulphide lubricant (MoS₂) basis are, e.g.:
 - Molykote G Rapid (company Dow Corning)
 - Molykote BR2 Plus (company Dow Corning)
 - Molykombin UMFT1 (company Klüber Lubrication)

Usually, disassembly problems only occur if:

- the connection is spinning due to overload or a too low friction factor and fretting corrosion has occurred,
- the shrink disc has been tightened too much leading to a plastic deformation of components,
- the components are corroded.

5.3.8 Mounting the fixed cover

for size 09, 11 and 14

**Note!**

This cover can be ordered optionally and is loosely enclosed with the shipment!

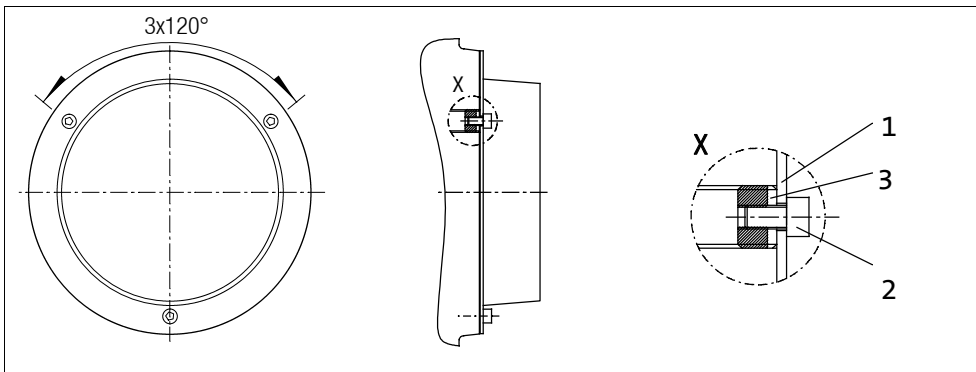


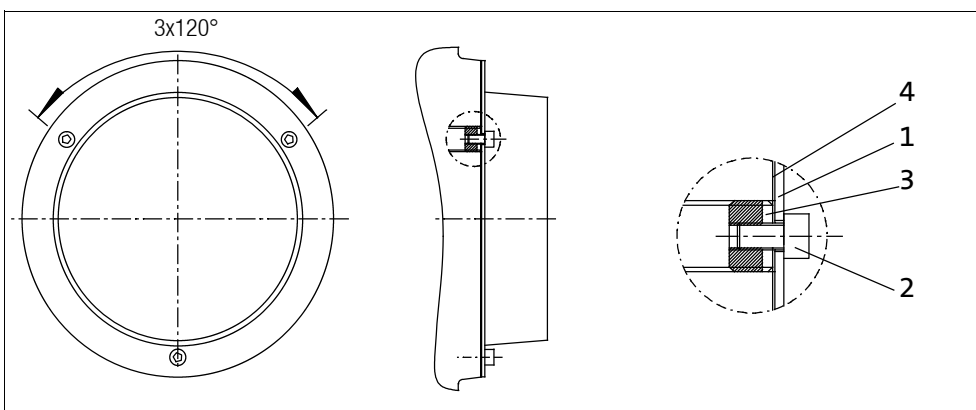
Fig. 10

- | | | | |
|---|-------------------|---|------------------------|
| 1 | Protection cover | 3 | Thread reducing sleeve |
| 2 | Cheese head screw | | |

1. Screw the three reducing bushes (3) into the flange with a screwdriver so they are **flush** and staggered by 120°.
2. Fasten the protective cap (1) over the reducing bushes (3) on the flange using three cheese head screws (2).

5.3.9 Mounting the hoseproof hollow shaft cover

for size 09, 11 and 14



- | | | | |
|---|-------------------|---|---------------|
| 1 | Protection cover | 3 | Reducing bush |
| 2 | Cheese head screw | 4 | Seal |

1. Screw the three reducing bushes (3) into the flange with a screwdriver so they are **flush** and staggered by 120°.
2. Fit seal (4) between flange and protective cap (1).
3. Fasten the protective cap (1) over the reducing bushes (3) on the flange using three cheese head screws (2).

5 Mechanical installation

Mounting
Gearboxes with breathers

5.3.10 Gearboxes with breathers



Stop!

Do not place gearbox onto breather valve!

For gearboxes of sizes 03, 04 and 05 (exception GSS 05), no ventilation measures are required.

For gearboxes of sizes 06 to 14 and GSS 05, ventilation units are mounted. However, in specific cases they may be dispensed with. For gearbox sizes 09 to 14 in mounting position C we recommend using an oil compensation reservoir (📖 52).

Gearboxes that are delivered with a ventilation unit are provided with a label.

Remove transport locking device on the vent valve.



If it deviates from standard mounting positions A - F, the ventilation unit must be checked with regard to its function. Mount ventilation units that are loosely attached (deviating from the standard) as specified in chapter 5.3.11. Gearboxes that are suitable for several mounting positions (📖 68) are delivered without ventilation units.

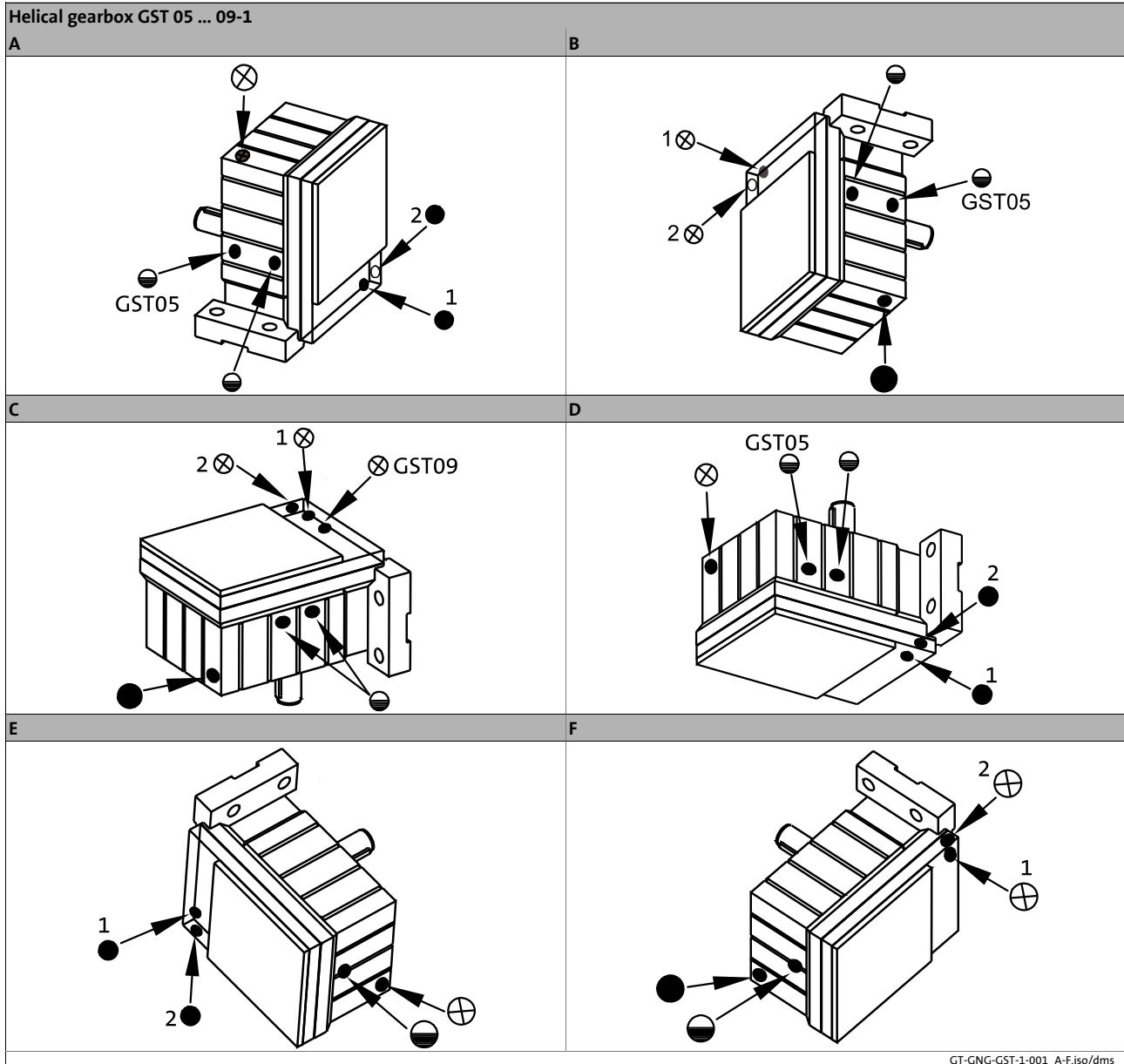
Ensure ventilation before initial commissioning!



Stop!

- Rotate gearbox to the mounting position shown on the nameplate ((📖 18) und (📖 41)).
- With gearbox types GST□□-3, GFL□□-3, GSS□□-3 and GKS□□-4, the pre-stage is separately ventilated! (Exception: size 06)

5.3.11 Breather position, oil filling screw and drain plug



A...F Mounting positions
* On both sides
** On the opposite side
⊗ Breathing / oil filler plug

● Oil drain plug
◐ Oil-control plug
Pos. 1 Standard
Pos. 2 only GST05-1A 080C22 with:

5 Mechanical installation

Mounting

Breather position, oil filling screw and drain plug

Helical gearbox GST 05 ... 14-2 foot mounting	
A	B
C	D
E	F

GT-GNG-GST-2-001_A-F.iso/dms

A...F

Mounting positions

*

On both sides

**

On the opposite side

⊗

Breathing / oil filler plug

●

Oil drain plug

◐

Oil-control plug

Pos. 1

Standard

Pos. 2 only
with:

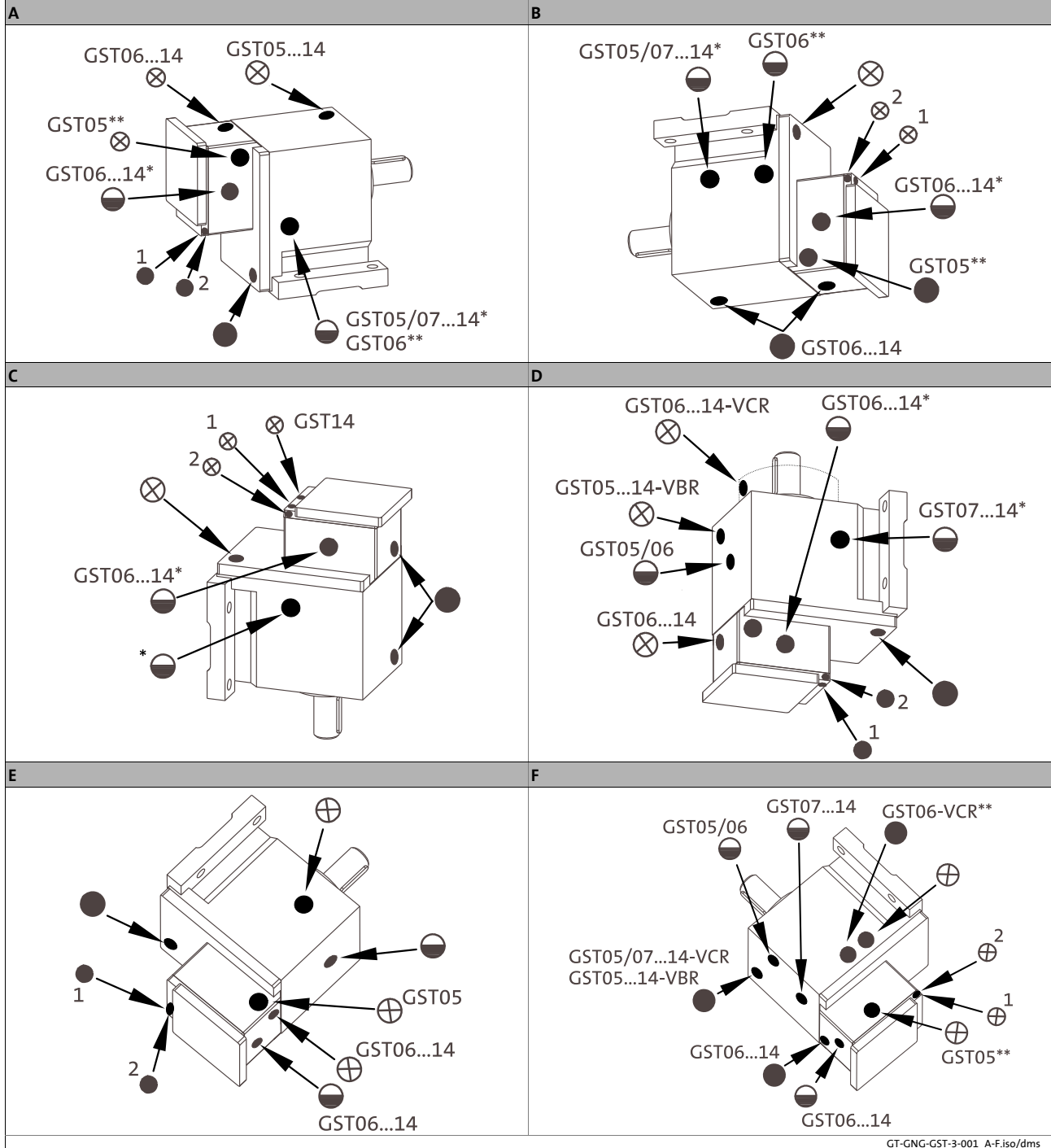
GST05-2M V□□ 090□□□

GST05-2M V□□ 100□□□

GST06-2M V□□ 112□□□

GST07-2M V□□ 160□□□

Helical gearbox GST 06 ... 14-3



GT-GNG-GST-3-001_A-F.iso/dms

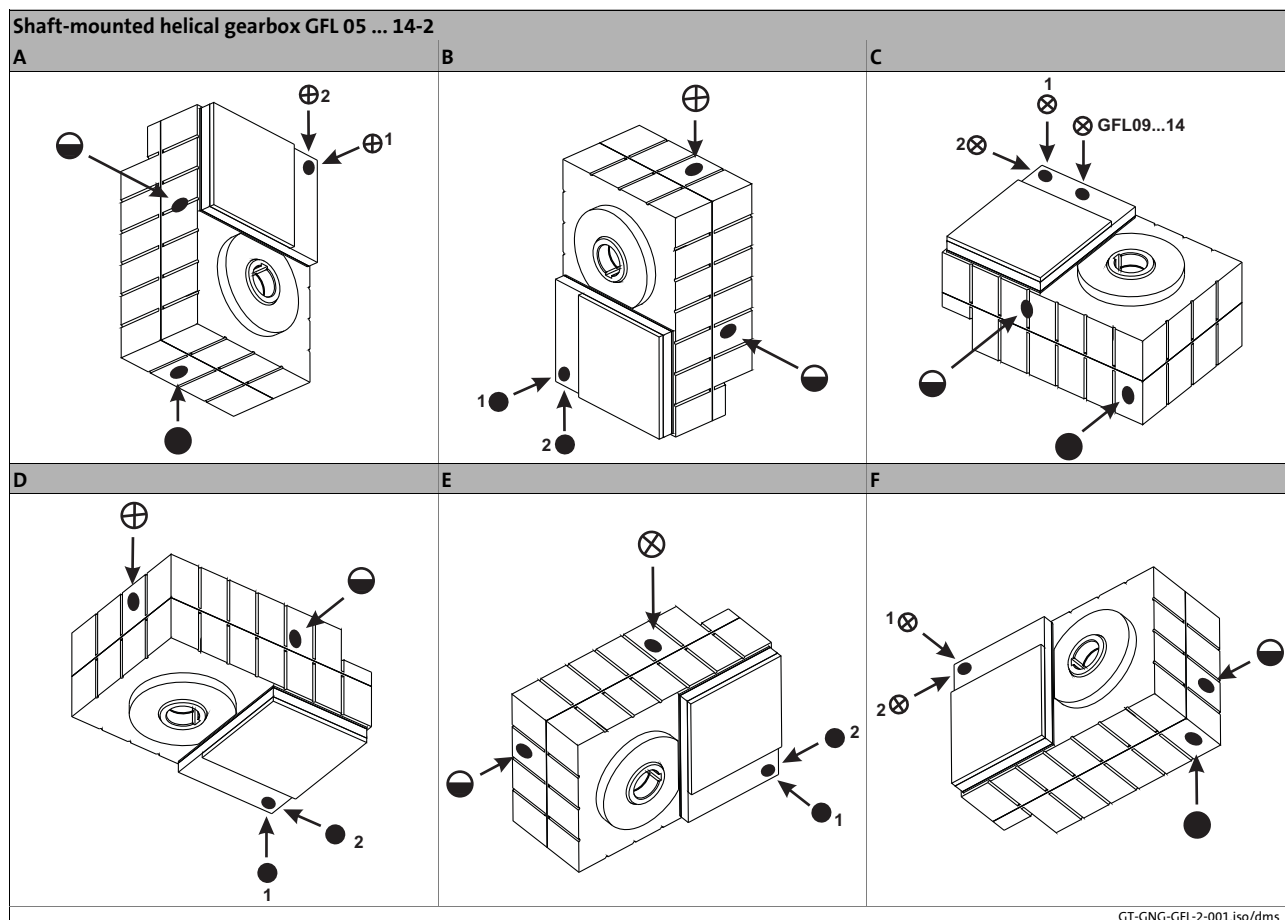
- A...F Mounting positions
- * On both sides
- ** On the opposite side
- ⊗ Breathing / oil filler plug
- Oil drain plug
- ◐ Oil-control plug

- Pos. 1 Standard
- Pos. 2 only GST05-3M V□□ 090□□□
- with: GST05-3M V□□ 100C□□□
- GST06-3M V□□ 112C□□□

5 Mechanical installation

Mounting

Breather position, oil filling screw and drain plug



A...F

Mounting positions

*

On both sides

**

On the opposite side

⊗

Breathing / oil filler plug

●

Oil drain plug

●

Oil-control plug

Pos. 1

Standard

Pos. 2 only
with:

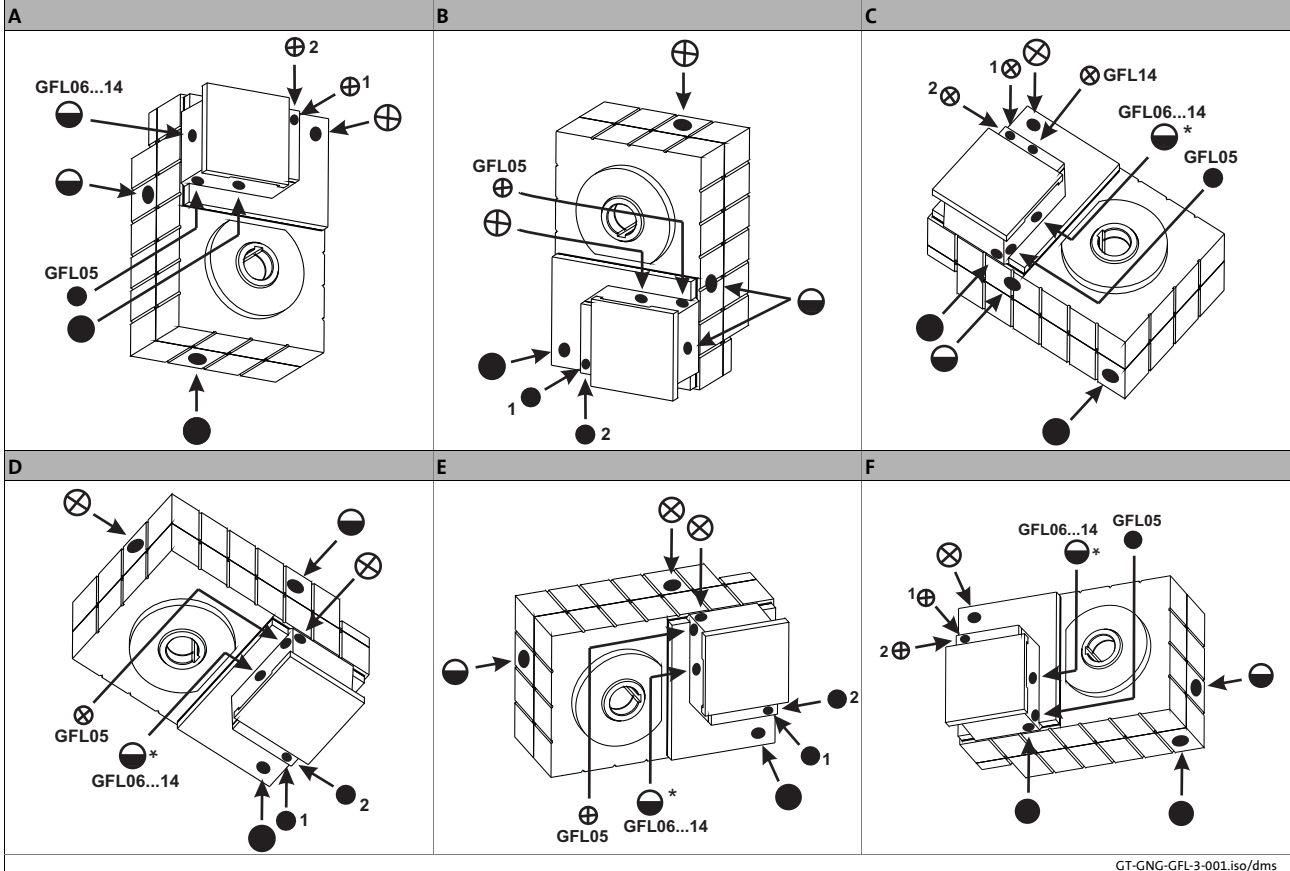
GFL05-2M □□□ 090□□

GFL05-2M □□□ 100□□

GFL06-2M □□□ 112□□

GFL07-2M □□□ 160□□

Shaft-mounted helical gearbox GFL 06 ... 14-3



GT-GNG-GFL-3-001.iso/dms

A...F

Mounting positions

*

On both sides

On the opposite side

Breathing / oil filler plug

Oil drain plug

Oil-control plug

Pos. 1

Standard

Pos. 2 only
with:

GFL07-3M □□□ 090C□□

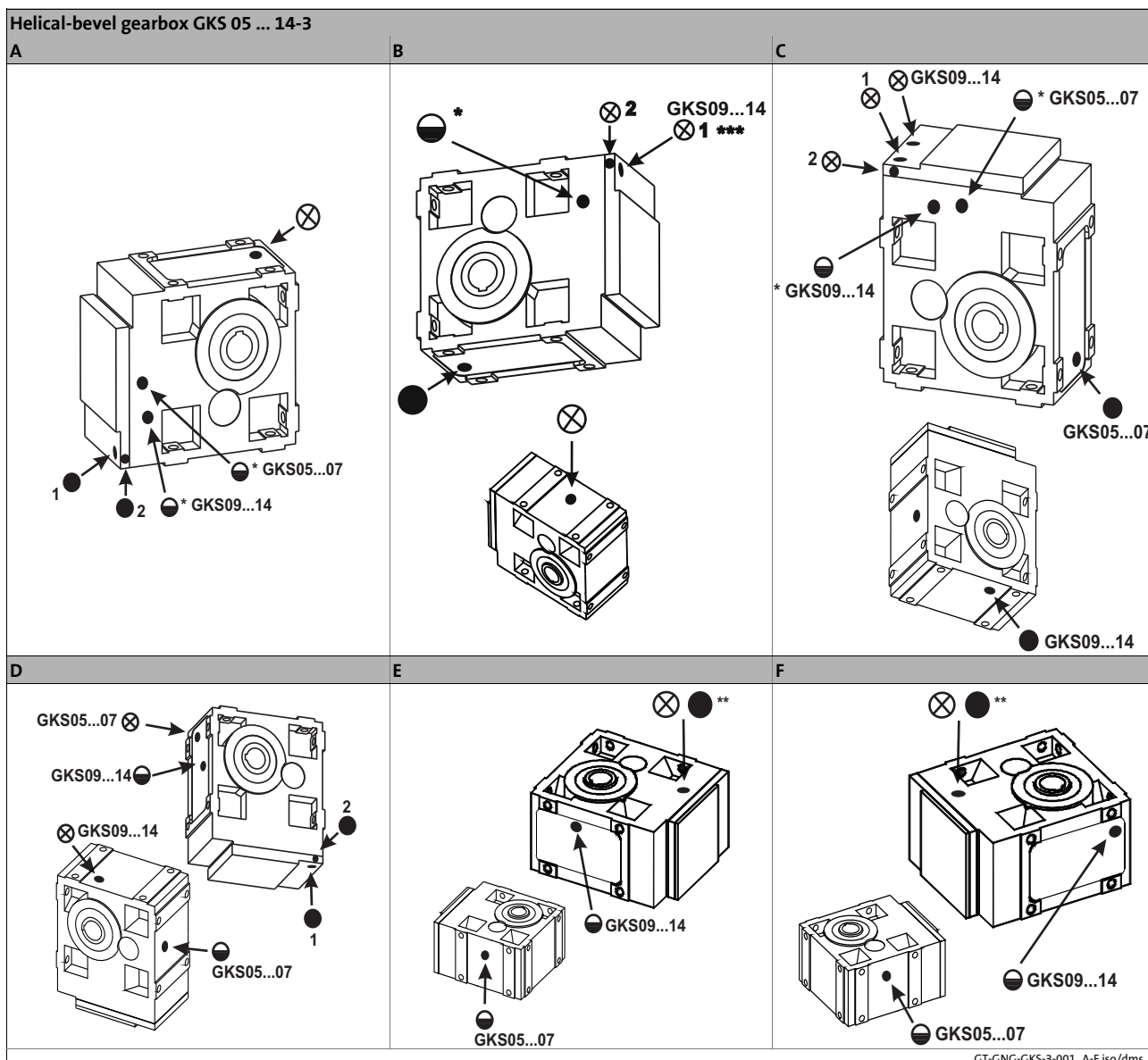
GFL07-3M □□□ 100C□□

GFL09-3M □□□ 112C□□

5 Mechanical installation

Mounting

Breather position, oil filling screw and drain plug



A...F

Mounting positions

*

On both sides

**

On the opposite side

GKS05...07 with torque plate on the foot in position 4

⊗

Ventilation / oil filler plug

●

Oil drain plug

◐

Oil control plug

Pos. 1

Standard

Pos. 2 only for:

GKS05-3M □□□ 090□□

GKS05-3M □□□ 100□□

GKS06-3M □□□ 112□□

GKS07-3M □□□ 160□□

A	B	C
D	E	F

GT-GNG-GKS-4-001_A-F.iso/dms

● Oil drain plug
● Oil control plug

Pos. 1 Standard

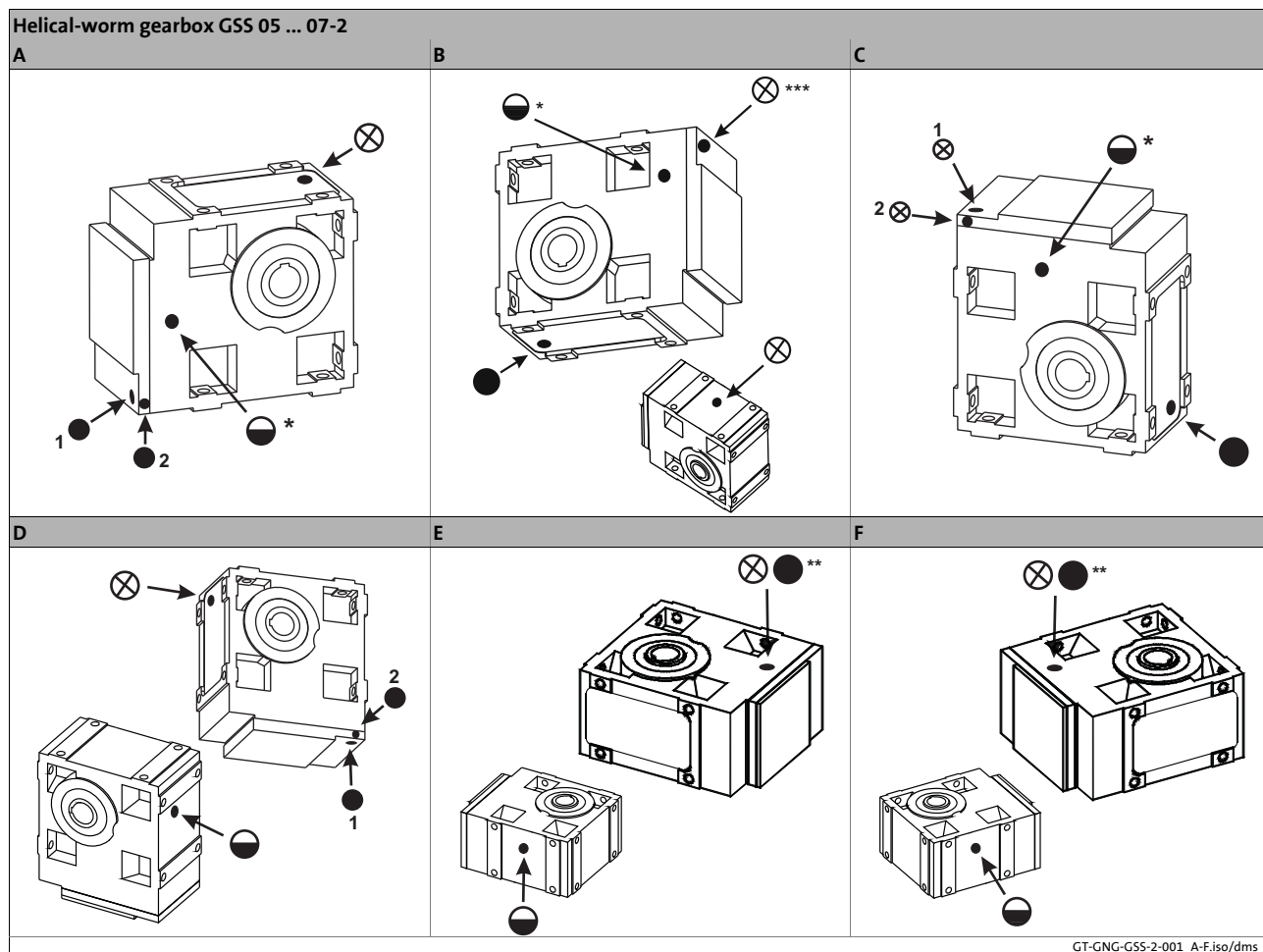
Pos. 2 only for:

GKS07-4M	□□□	090C□□
GKS07-4M	□□□	100C□□
GKS09-4M	□□□	112C□□

5 Mechanical installation

Mounting

Breather position, oil filling screw and drain plug



GT-GNG-GSS-2-001_A-F.iso/dms

A...F

Mounting positions

*

On both sides

**

On the opposite side

With torque plate on the foot in position 4

⊗

Ventilation / oil filler plug

●

Oil drain plug

◐

Oil control plug

Pos. 1

Standard

Pos. 2 only for:

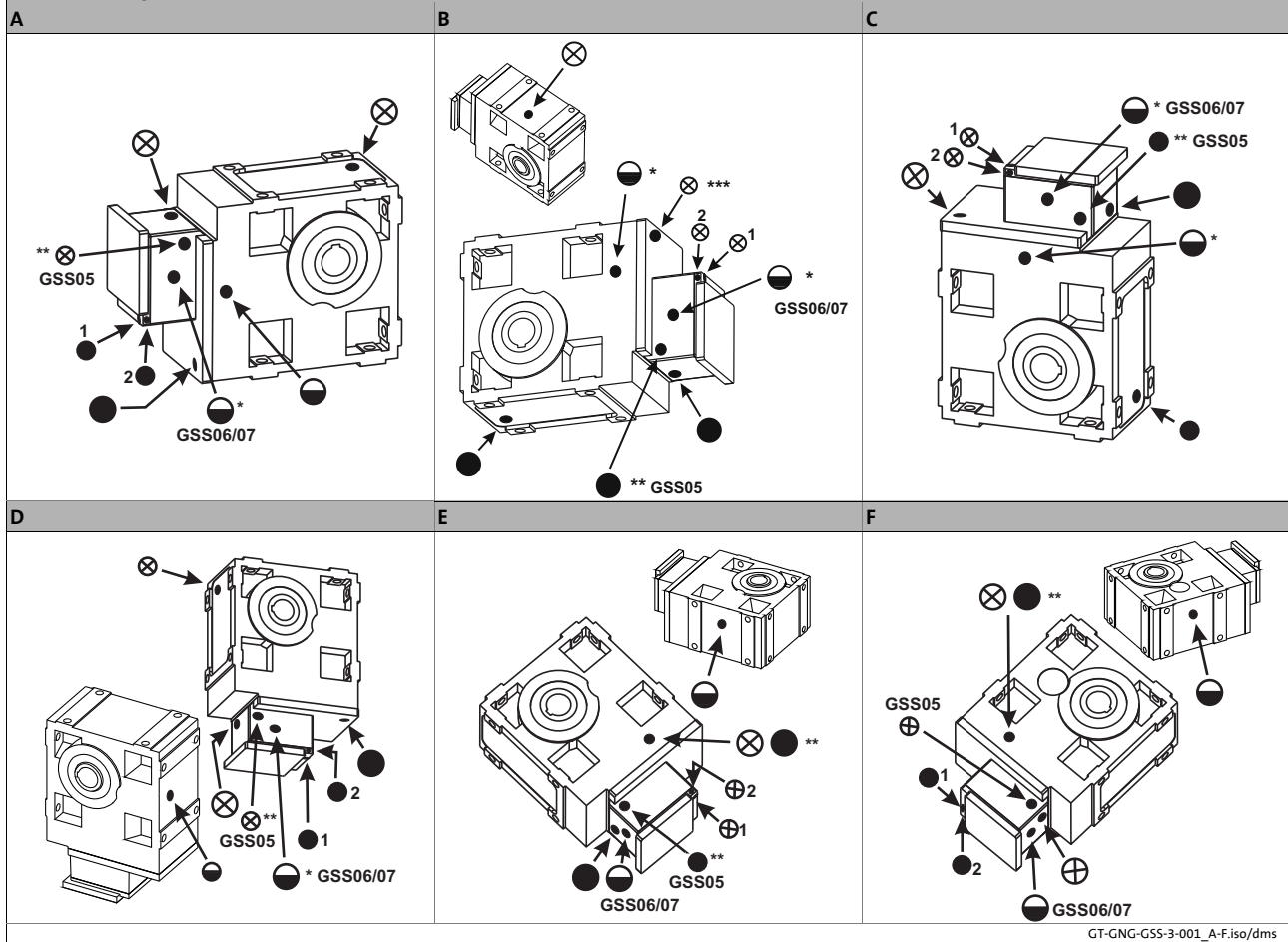
GSS05-2M □□□ 090□□

GSS05-2M □□□ 100□□

GSS06-2M □□□ 112□□

GSS07-2M □□□ 160□□

Helical-worm gearbox GSS 05 ... 07-3



GT-GNG-GSS-3-001_A-F.iso/dms

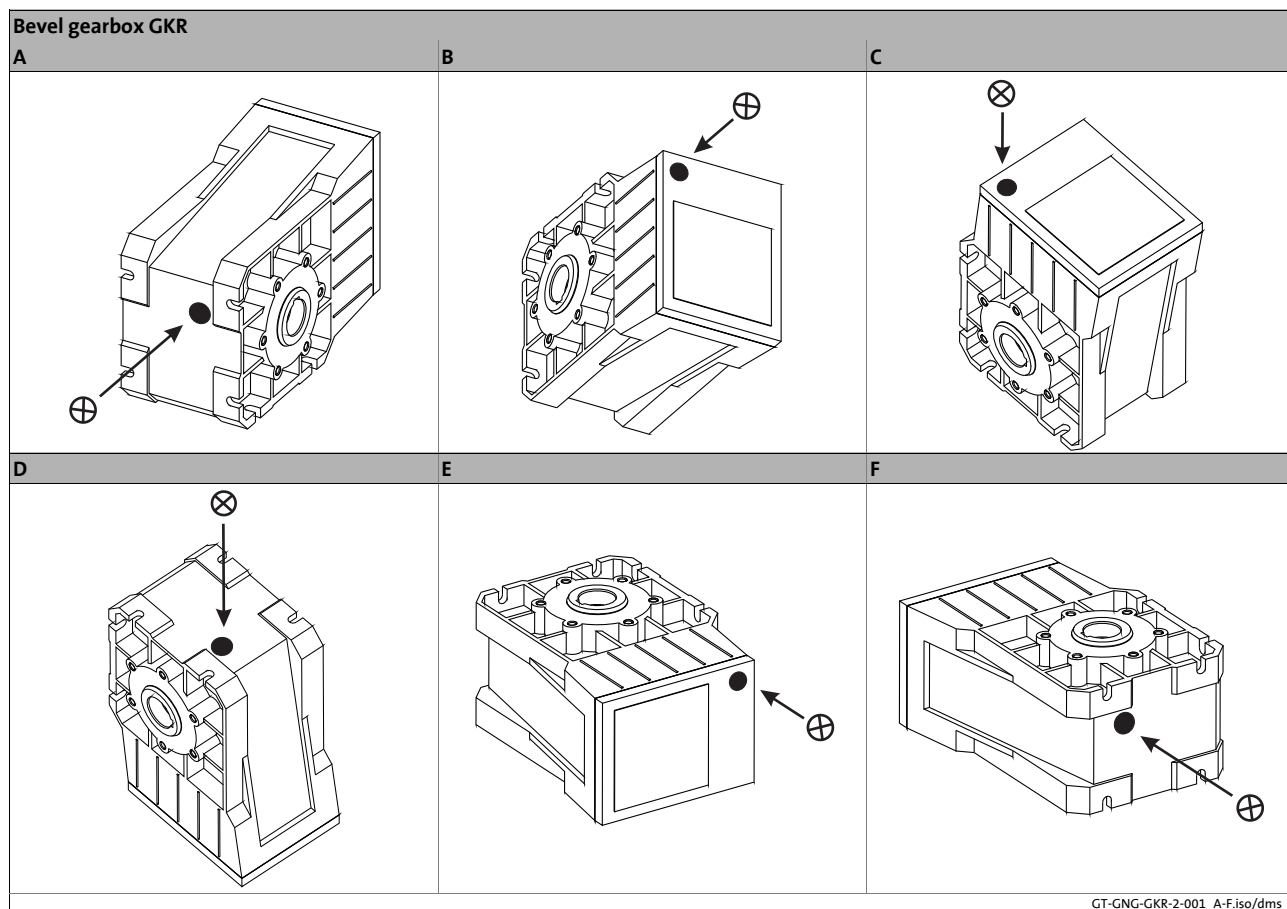
- A...F Mounting positions
 * On both sides
 ** On the opposite side
 *** With torque plate on the foot in position 4
 ⊗ Ventilation / oil filler plug

- Oil drain plug
 ● Oil control plug
 Pos. 1 Standard
 Pos. 2 only for: GSS07-3M □□□ 090□□
 GSS07-3M □□□ 100□□

5 Mechanical installation

Mounting

Breather position, oil filling screw and drain plug



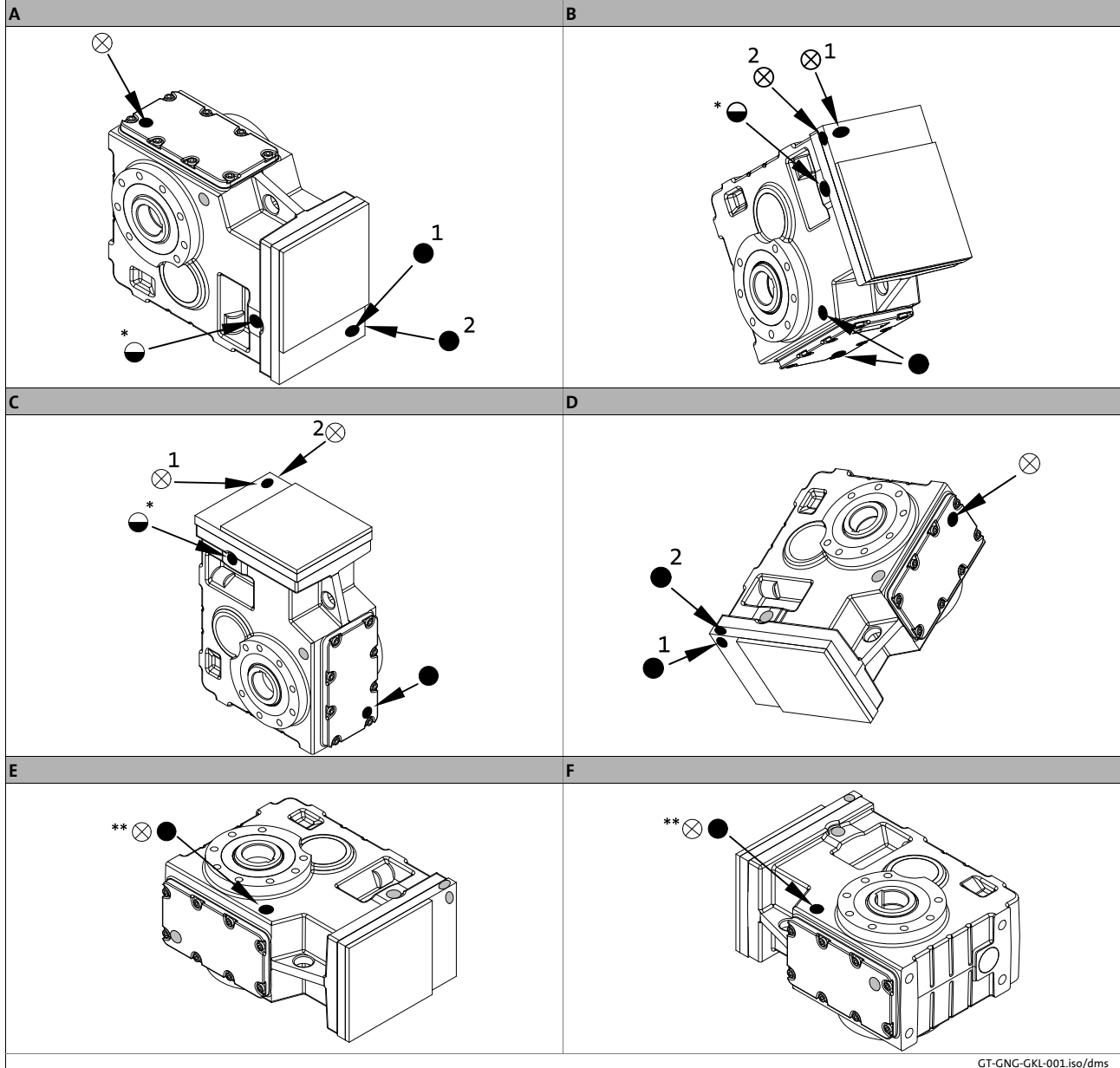
A...F

Mounting positions



Breathing / oil filler plug

Helical-bevel gearbox GKL07...09-3



GT-GNG-GKL-001.iso/dms

A...F Mounting positions
* On both sides
** On the opposite side
Pos. 1 or 2 Depending on version

⊗ Breathing / oil filler plug
● Oil drain plug
◐ Oil-control plug
● Sealing plug without function

5 Mechanical installation

Mounting

Gearbox with compensation container for mounting position C

5.3.12 Gearbox with compensation container for mounting position C

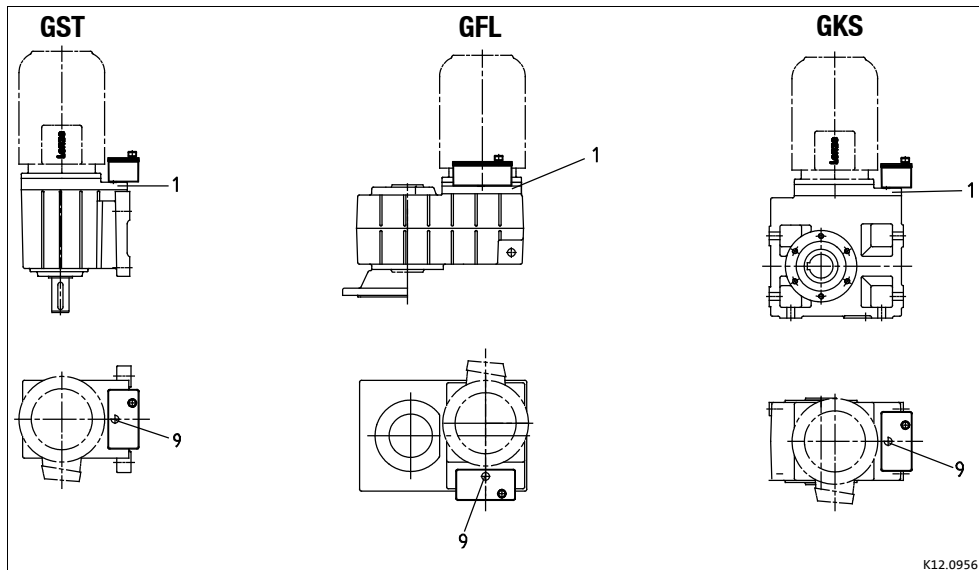


Fig. 11 Positioning of the compensation reservoir in mounting position C

1 Intermediate cover

9 Locking screw

5.3.12.1 Component parts list

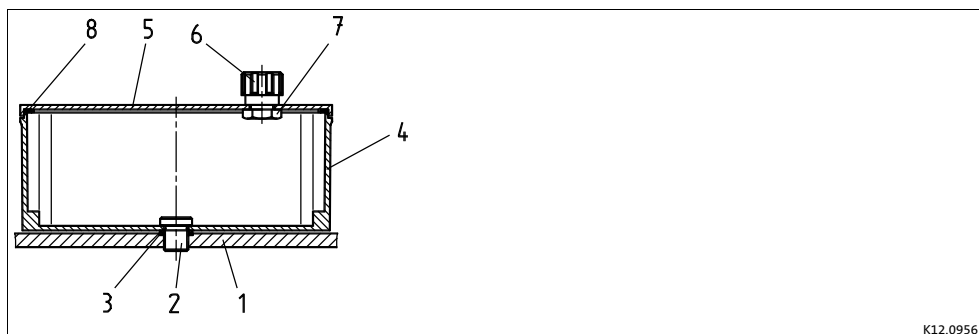


Fig. 12 List of details for compensation reservoirs

1 Intermediate cover

2 Fixing screw

3 Gaskets

4 Housing

5 Cover

6 Ventilation

7 Hexagon nut

8 Seal

Mounting

1. Mount gearbox in mounting position C (motor on top).
2. Remove the plug (9) from the intermediate cover (1).
3. Mount housing (4) using seal (3) and fixing screw (2) to intermediate cover (1) (instead of the plug (9)).
4. Use hexagon nut (7) to bolt the breather element (6) to the cover (5).
5. Mount cover (5) and seal (8) to the housing (4).



Stop!

For transport the compensation reservoir must be removed and the plug must seal the gearbox (pos. 9).

**Danger!**

Electrical connections must only be carried out by skilled personnel!

6.1 Motor connection

To correctly connect the motor, please observe:

- the notes in the terminal box of the motor
- the notes in the Operating Instructions of the motor
- the technical data on the motor nameplate.

6.2 Motor options

To correctly connect the motor options, e. g. brakes or feedback systems, please observe:

- the notes in the corresponding terminal box
- the notes in the corresponding operating instructions
- the technical data on the corresponding motor nameplate.

7 Commissioning and operation

Before switching on



Stop!

The drive may only be commissioned by skilled personnel!

7.1 Before switching on

Please check:

- Does the drive appear undamaged?
- Is the mechanical fixing o.k.?
- Has the electrical connection been carried out properly?
- Are all rotating parts and surfaces that may become hot protected against contact?
- If the oil level of the drive has been increased due to storage purposes (27), it must be reduced again to the height permissible for the intended mounting position.
- For gearboxes with breathing:
 - Has the transport locking device been removed?
- For gearboxes with backstop:
 - Will the motor start to rotate in the correct direction? (28)

7.2 During operation



Note!

The helical-worm gearboxes reach their full performance only after a short running-in period of 24...48 hours at rated torque!

During operation, check the drive periodically and take special care of:

- changes compared to normal operation, like
 - unusual noise, stronger vibrations or increased temperatures,
 - leakages,
 - loose fixing elements,
 - the condition of the electrical cables.
- In the event of faults:
 - shut down the drive,
 - check the troubleshooting table.

If the fault cannot be remedied, please contact the Lenze customer service.

When they are delivered, Lenze gearboxes and geared motors are filled with a drive and type-specific lubricant so that they are ready for production. This initial filling corresponds to a lubricant from the column of the respective Lenze gearbox type. When the order is placed, the mounting position and the design are the decisive factors for the lubricant amount.



Note!

Gearboxes of sizes 03 and 04 are lubricated for life. Due to the low thermal load, no lubricant change is required.

8.1 Maintenance intervals

- The mechanical power transmission system is free of maintenance.
- Gearboxes as of size 05 (pre-stages as of size 06) require regular lubricant replacement.
 - The type of lubricant is indicated on the nameplate. Replace the lubricant only with the same type.
 - The lubricant maintenance interval depends on the oil temperature, see Fig. 13.
- Shaft seals and roller bearings:
 - The service life depends on the operating conditions.
 - Replace seals in case of leakage to avoid consequential damage.



Note!

When changing the lubricant, Lenze recommends also changing the grease packing of the bearings and replacing the rotary shaft seals!



Stop!

For drive systems: Also observe the maintenance intervals for the other drive components!

Type	Lubricants		Note
	Specification	Ambient temperature	
CLP 460	Mineral oil with additive compounds	0 °C ... + 40 °C	
CLP PG 460	Synthetic oil (polyglycol)	-20 °C ... + 40 °C	Do not mix with mineral oils!
CLP HC 220 USDA H1	Food-compatible synthetic oil	-20 °C ... + 40 °C	Approval in compliance with USDA-H1
CLP HC 320 CLP HC 220	Synthetic oil (synthetic hydrocarbon)	-25 °C ... + 50 °C	Mixable with residual amounts of mineral oil
CLP HC 46 USDA H1	Synthetic oil (synthetic hydrocarbon)	-40 °C ... 0 °C	Good low-temperature flow characteristics Approval in compliance with USDA-H1

Tab. 8 Overview of lubricant change

8 Maintenance

Maintenance intervals



Note!

If ambient temperatures are $<-20^{\circ}\text{C}$ or $>+40^{\circ}\text{C}$, please contact Lenze!
Observe increased starting torques at low temperatures!

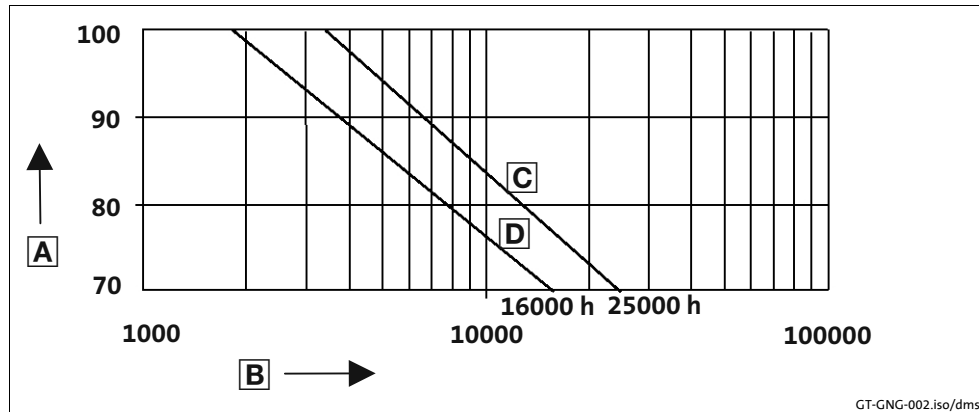


Fig. 13

Lubricant diagram

- | | |
|--|--------------------------------------|
| A Oil sump temperature [$^{\circ}\text{C}$] | C Synthetic oil CLP HC/CLP PG |
| B Oil life/changing intervals [operating hours h] | D Mineral oil CLP |

8.2 Maintenance operations

8.2.1 Opening the condensation drain hole

Depending on the mounting position, the condensation drain holes are always at the bottom of the motor!

- For condensate drainage
 - the motor must be deenergised;
 - the plugs (screws) must be removed.



Stop!

To restore the enclosure, re-insert the plugs (screws) after condensate drainage. If the condensation drain holes are not sealed again, the IP enclosure of the motor will be reduced. For horizontal motor shafts to IP23 and for vertical motor shafts to IP20.

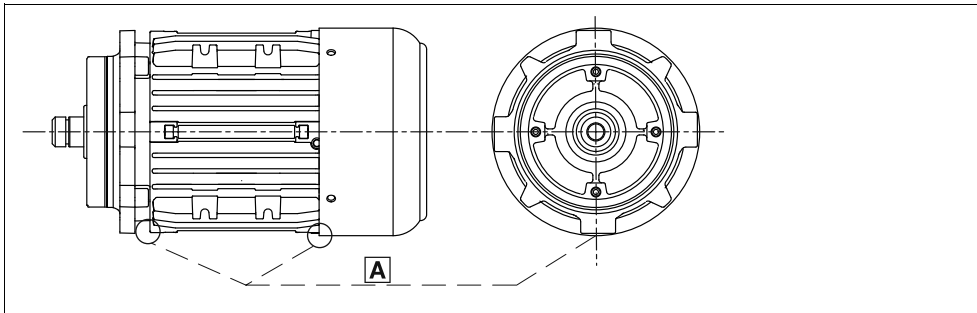


Fig. 14 Motor with condensation drain holes

A Condensation drain holes

8 Maintenance

Maintenance operations Lubricate roller bearings

8.2.2 Lubricate roller bearings

The roller bearings on motors and gearboxes from Lenze are filled with the greases listed below:

	Ambient temperature	Manufacturer	Type
Gearbox roller bearing GST, GFL, GKS, GKR, GKL	-30 °C ... +50 °C -30 °C ... +80 °C -40 °C ... +60 °C	Fuchs Klüber Klüber	Renolit H 443 Petamo 133 N Microlube GHY 72
Gearbox roller bearing GSS	-30 °C ... +80 °C -15 °C ... +60 °C	Klüber Klüber	Petamo GHY 133 N Klüberplex BE 11-462
Motor roller bearing	-30 °C ... +70 °C -40 °C ... +80 °C	Lubcon Klüber	Thermoplex 2TML Asonic GHY 72
Special grease for gearbox roller bearings			
Low-temperature oils, observe critical starting performance at low temperatures	-40 °C ... +80 °C	Klüber	Asonic GHY 72
Biopetroleum (lubricant for forestry, agriculture and water supply and distribution)	-40 °C ... +50 °C	Fuchs	Plantogel 01205

The following lubricant quantities are required:

- For fast-running bearings (motor and drive end of gearbox): fill approx. one-third of the hollow space between rolling bodies with grease.
- For slow-running bearings (in gearbox and driven side of gearbox): fill approx. two-thirds of the hollow space between roller bearings with grease.

8.2.3 Table of lubricants

**Note!**

Please note that the recommendation of a lubricant/grease or its listing in a Lenze lubricant table does not mean that Lenze is liable for these lubricants or damages resulting from incompatibilities of materials used.

For Lenze drives, the lubricants listed in the lubricant table on the following page are permitted. Special lubricants must be used, for instance for longtime storage or special operating conditions. These corresponding lubricants are available at a surcharge.

For the lubricant selection observe the following legend relating to the lubricant table!

CLP	⇒	Mineral oil
CLP PG	⇒	Polyglycol oil
CLP PAO	⇒	Synthetic hydrocarbons or poly-alpha-olefin oil
CLP E	⇒	Diester oil (water pollution class 1)
1)	⇒	Currently no test results are provided yet for the efficiency of the specified lubricants for worm gearbox lubrication. If these oils are used, the permissible torque must be reduced to 80% of the catalogue values.
2)	⇒	Polyglycol oils cannot be mixed with other types of oil
3)	⇒	For ambient temperatures above 40°C please consult us and specify the exact operating conditions!
4)	⇒	Observe critical starting performance at low temperatures! Temperatures below -25°C require special measures for the motor bearing and NBR shaft sealing rings!
5)	⇒	Ambient temperature range
	⇒	Food-grade lubricant
	⇒	Biopetroleum (lubricant for forestry, agriculture and water supply and distribution)
	⇒	Low-temperature oils, observe critical starting performance at low temperatures!

	Ambient temperature [°C]			DIN 51517-3: CLP ISO 12925-1: CKC/CKD			Gearbox type GKL, GST, GFL, GKS, GKR, GKK04 ... 06	Gearbox type GSS GKK07
	-50	0	+50					
 Shell		0				CLP	VG 460	Omala 460 From 2011 Omala S2 G 460
		-25				CLP HC	VG 320	Omala HD 320 From 2011 Omala S4 GX 320
		-20				CLP PG	VG 220	Tivela S 220 From 2011 Omala S4 WE 220
		-20				CLP PG	VG 460	Tivela S 460 From 2011 Omala S4 WE 460
		-20				CLP E	VG 320	Naturelle Gear Fluid EP 320 Naturelle Gear Fluid EP 320 1)
 KLÜBER LUBRICATION		0				CLP	VG 460	Klüberoil GEM 1-460 N
		-25				CLP HC	VG 320	Klübersynth GEM 4-320 N
		-20				CLP PG	VG 460	Klübersynth GH 6-460 2)
		-20				CLP PG	VG 220	Klübersynth GH 6-220 2)
		-30		0 4)		CLP PG	VG 32	Klübersynth GH 6-32 1) 2)
		-40		0 4)		CLP HC	VG 46	Klüber Summit HySyn FG-46 Klübersynth GEM 4-46 N
		-20				CLP HC	VG 220	Klüberoil 4 UH1-220N
		-20				CLP E	VG 320	Klübersynth GEM 2-320 Klübersynth GEM 2-320 1)
 FUCHS		0				CLP	VG 460	Renolin CLP 460
		-25				CLP HC	VG 320	Renolin Unisyn CLP 320
		-20				CLP PG	VG 460	Renolin PG 460 1) 2)
		-20				CLP E	VG 320	Plantogear 320 S Plantogear 320 1)
 Eni		0				CLP	VG 460	AGIP BLASIA 460
		-25				CLP HC	VG 320	AGIP BLASIA SX 320
		-20				CLP PG	VG 460	AGIP BLASIA S 460 1) 2)
 bp		0				CLP	VG 460	Energol GR-XP 460
		-25				CLP HC	VG 320	Enersyn EP-XF 320
		-20				CLP PG	VG 220	Enersyn SG-XP 220 1) 2)
		-20				CLP PG	VG 460	Enersyn SG-XP 460 1) 2)
 Mobil®		0				CLP	VG 460	Mobilgear 600 XP 460
		-25				CLP HC	VG 320	Mobilgear SHC Gear 320
		-10				CLP HC	VG 460	Mobil SHC Cibus 460
		-10				CLP HC	VG 220	Mobil SHC Cibus 220
		-20				CLP PG	VG 220	Mobil Glygoyle 220 1) 2)
		-20				CLP PG	VG 460	Mobil Glygoyle 460 1) 2)
 TOTAL		0				CLP	VG 460	Carter EP 460
		-25				CLP HC	VG 320	Carter SH 320
 FUCHS LUBRITECH		-10				CLP HC	VG 460	Cassida Fluid GL 460
		-20				CLP PG	VG 220	Cassida Fluid GL 220
		-40		0 4)		CLP HC	VG 46	Cassida HF 46

	Ambient temperature [°C]				DIN 51517-3: CLP ISO 12925-1: CKC/CKD			Gearbox type GKL, GST, GFL, GKS, GKR, GKK04 ... 06	Gearbox type GSS GKK07
	-50	0	+50						
		0		+40		CLP	VG 460	Alpha SP 460	
		0		+40		CLP	VG 460	Optigear BM 460	
		0		+40		CLP	VG 460	Tribol 1100/460	
		-25		+50 ³⁾		CLP HC	VG 320	Alphasyn EP 320	
		-25		+50 ³⁾		CLP HC	VG 320	Optigear Synthetic A 320	
		-25		+50 ³⁾		CLP HC	VG 320	Tribol 1510/320	
		-20		+40		CLP E	VG 320	Tribol Bio Top 1418/320	
	-40		0 ⁴⁾			CLP HC	VG 46	Optileb HY 46	
		-25		+50 ³⁾		CLP HC	VG 320	Optileb GT 220	
		-20		+40		CLP	VG 220	Food Proof 1810/220	
		-20		+40		CLP PG	VG 220		Tribol 800/220 ^{1) 2)}
		-20		+40		CLP PG	VG 460		Tribol 800/460 ^{1) 2)}
		-20		+40		CLP PG	VG 220		Alphasyn PG 220 ^{1) 2)}
		-20		+40		CLP PG	VG 460		Alphasyn PG 460 ^{1) 2)}

8.2.4 Replacing the lubricant



Stop!

- Gearbox should be warm.
- Secure drive system and machine from inadvertent movement and mains connection.



Stop!

With gearbox types GST□□-3, GFL□□-3, GSS□□-3 and GKS□□-4, the pre-stage is separately lubricated—all gearbox components have to be completely drained!



Tip!

When changing the lubricant, also change the grease packing of the bearings and replace the rotary shaft seals!

1. Place receptacle under oil drain plug.
2. Remove breathing / oil filler plug.
3. Completely drain lubricant by removing the oil drain plug.
4. Reinsert drain plug (if necessary, replace seal).
5. Fill in lubricant through filler hole (quantities see nameplate).
6. Screw in breathing / oil filler plug.
7. Dispose of waste oil according to the applicable regulations.

8 Maintenance

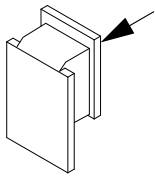
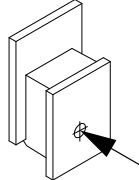
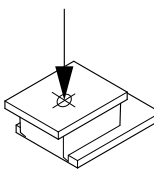
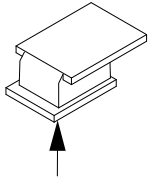
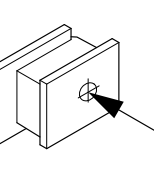
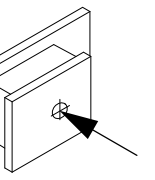
Maintenance operations
Lubricant quantity

8.2.5 Lubricant quantity



Stop!

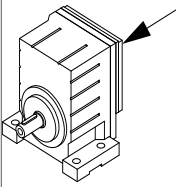
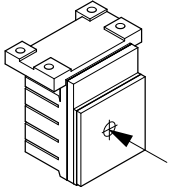
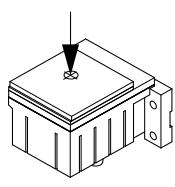
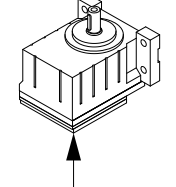
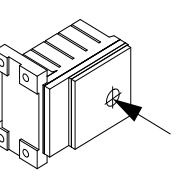
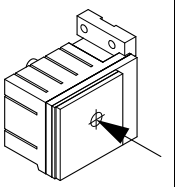
At drive speeds below 200 rpm the amount of lubricant may need to be increased. Consultation with Lenze is required.

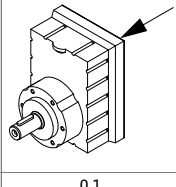
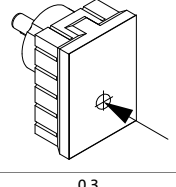
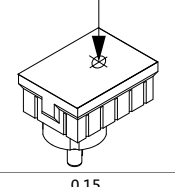
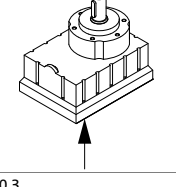
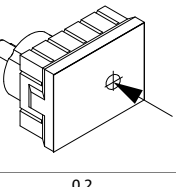
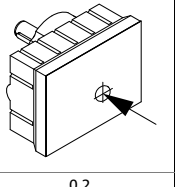
Mounting position	Pre-stage GST□□-3; GKS□□-4; GSS□□-3					
	A	B	C	D	E	F
						
	GT-GNG-GST/GL-010.iso/dms					
GST05	0.12 0.15 W ≥ 1C	0.3 0.35 W ≥ 1C	0.15	0.3 0.35 N ≥ 1B 0.4 W ≥ 1C	0.2	0.2
GST06	0.15	0.4	0.35	0.3 0.4 W ≥ 1C	0.3	0.3
GST07	0.3	0.7	0.5	0.55 0.65 M ≥ 90 A ≥ 80 N ≥ 1D	0.4	0.4
GST09	0.6	1.4	1.1	1.2	0.8	0.8
GST11	1.5 2.0 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.5 2.9 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.1	1.7 2.4 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.7	1.7
GST14	2.7 4.0 M ≥ 132 A ≥ 112 N ≥ 1G	4.6 5.2 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	4.3	3.2 4.1 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	3	3

Pre-stage shaft-mounted helical gearbox GFL□□-3□						
GFL05	0.2	0.2	0.15	0.3 0.35 N ≥ 1B 0.4 W ≥ 1C	0.12 0.15 W ≥ 1C	0.3 0.35 W ≥ 1C
GFL06	0.3	0.3	0.35	0.3 0.4 W ≥ 1C	0.15	0.4
GFL07	0.4	0.4	0.5	0.55 0.65 M ≥ 90 A ≥ 80 N ≥ 1D	0.3	0.7
GFL09	0.8	0.8	1.1	1.2	0.6	1.4
GFL11	1.7	1.7	2.1	1.7 2.4 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.5 2.0 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.5 2.9 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G
GFL14	3.0	3.0	4.3	3.2 4.1 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.7 4.0 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	4.6 5.2 M ≥ 132 A ≥ 112 N ≥ 1G

Tab. 9 Amount of lubricant in litres

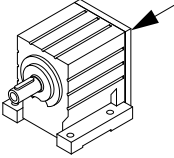
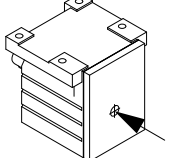
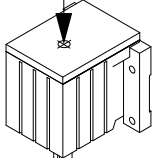
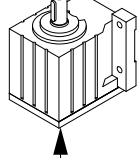
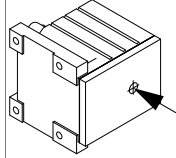
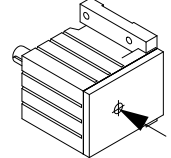
→ Drive 90...132 Motor size
A, M, N, W Drive-end version 1A ...2K Drive size

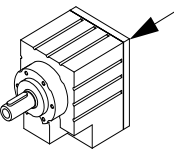
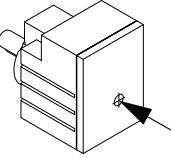
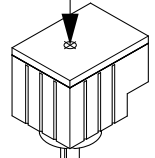
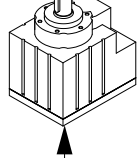
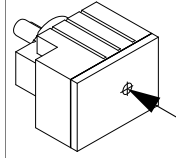
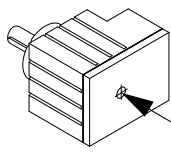
Helical gearbox GST□□-1□VA□ / VB□ (foot housing)						
Mounting position	A	B	C	D	E	F
						
GST04	0.1	0.37	0.2	0.3 0.35 W ≥ 1C	0.25	0.25
GST05	0.2	0.6	0.35	0.5 0.6 M ≥ 90 A ≥ 80 N ≥ 1D	0.35	0.35
GST06	0.4	1.2	0.65	0.85 1 W ≥ 1E	0.7	0.7
GST07	0.7 1.3 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.3 2.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.3	1.5 2.2 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.5	1.5
GST09	1.2 2.5 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	4.1 4.8 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.8	2.7 3.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.5	2.5

Helical gearbox GST□□-1□VC□ (flange housing)						
Mounting position	A	B	C	D	E	F
						
GST04	0.1	0.3	0.15	0.3 0.35 W ≥ 1C	0.2	0.2
GST05	0.2	0.5	0.2	0.45 0.55 M ≥ 90 A ≥ 80 N ≥ 1D	0.3	0.3
GST06	0.4	1	0.45	0.85 1 W ≥ 1E	0.6	0.6
GST07	0.8 1.5 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.6 2.0 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	0.85	1.6 2.3 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.3	1.3
GST09	1.6 2.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	3.0 3.5 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.7	2.7 3.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.3	2.3

Tab. 10 Amount of lubricant in litres

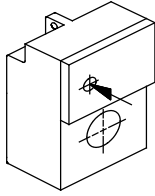
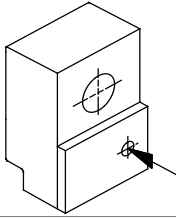
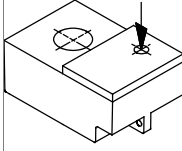
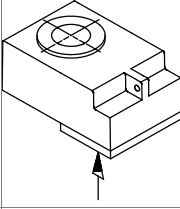
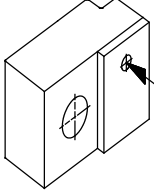
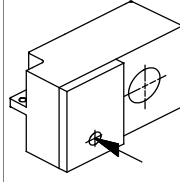
→ Drive 90...132 Motor size
A, M, N, W Drive-end version 1A ...2K Drive size

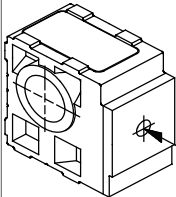
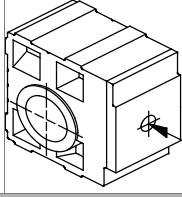
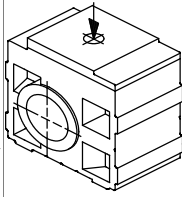
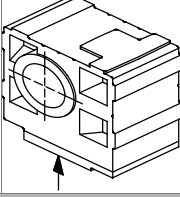
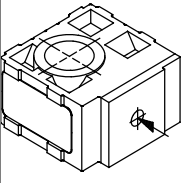
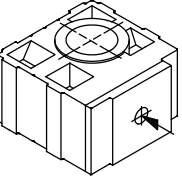
Helical gearbox GST□□-2□; -3□ VA□ / VB□ (foot housing)						
Mounting position	A	B	C	D	E	F
						
GST03	0.2	0.2	0.2	0.2	0.2	0.2
GST04	0.35	0.5	0.45	0.55	0.3	0.3
GST05	0.5	0.80	0.75	1	0.55	0.55
GST06	0.6 0.7 M ≥ 132	1.1 1.2 M ≥ 132	1.2	1.7 1.8 M ≥ 132	1.0 1.1 M ≥ 132	1.0 1.1 M ≥ 132
GST07	2.2 2.6 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.5 2.9 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.6	3 3.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.7 2.1 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.7 2.1 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G
GST09	4.2 4.8 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	5.3 5.9 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	5.4	6.1 7.3 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	3.1 3.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	3.1 3.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G
GST11	8.5	9.5	10	11.5	7	7
GST14	15	18	18	20	11	11

Helical gearbox GST□□-2□; -3□ VC□ (flange housing)						
Mounting position	A	B	C	D	E	F
						
GST03	0.17	0.17	0.17	0.17	0.17	0.17
GST04	0.35	0.45	0.3	0.6	0.3	0.3
GST05	0.45	0.7	0.6	0.95	0.45	0.45
GST06	0.5 0.6 M ≥ 132	0.9 1.0 M ≥ 132	1.1	1.6 1.7 M ≥ 132	0.9 1.0 M ≥ 132	0.9 1.0 M ≥ 132
GST07	1.8 2.2 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.4 2.8 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.2	2.7 3.4 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.5 1.9 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	1.5 1.9 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G
GST09	3.5 4.1 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	4.5 5.0 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	4.4	5.5 6.7 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.8 3.4 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G	2.8 3.4 M ≥ 132 A ≥ 112 N ≥ 1G W ≥ 1G
GST11	7.5	8.5	8.0	10.5	6	6
GST14	13	16	14	18	9.5	9.5

Tab. 11 Amount of lubricant in litres

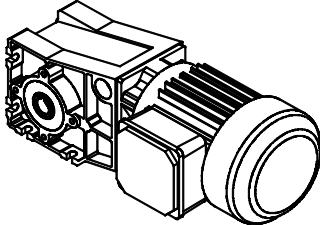
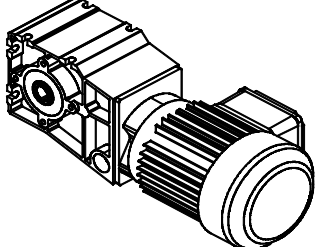
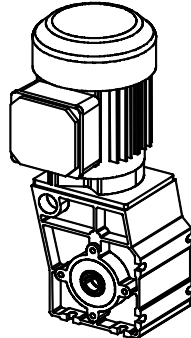
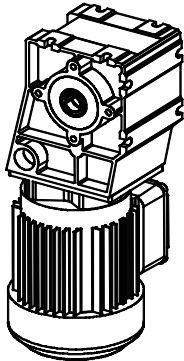
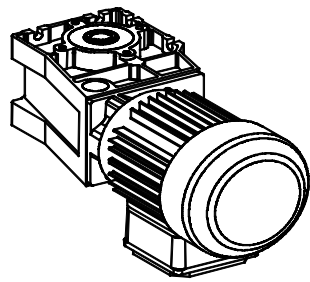
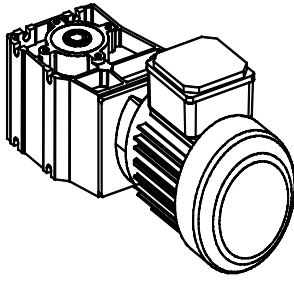
→ Drive 90...132 Motor size
A, M, N, W Drive-end version 1A ...2K Drive size

Mounting position	Shaft-mounted helical gearbox GFL□□-2; -3					
	A	B	C	D	E	F
						
GFL04	0.65	0.6	1.05	0.8	0.75	0.35
GFL05	1.3	1.4	1.7	1.7	1.3	0.7
GFL06	2.0	2.1	3.0	2.8	2.1	1.2
GFL07	4.3	3.8	6.3	5.8	4.6	2.5
GFL09	8.9	7.6	13	11.3	9.5	5.2
GFL11	16	15	25	21	20	9.0
GFL14	32	36	47	42	27	28

Mounting position	Right-angle gearbox					
	A	B	C	D	E	F
						
Helical-bevel gearbox GKS□□-3; -4						
GKS04	0.8	1.4	1.5	1.1	1.3	1.3
GKS05	1.4	2	2.1	1.7	1.9	1.9
GKS06	2.4	3.6	4	3	3.6	3.6
GKS07	4.5	6.7	7.7	5.6	6.5	6.5
GKS09	6	14	16	10	14	14
GKS11	11.5	27	29	21	25	25
GKS14	21	50	56	38	47	47
Helical-worm gearbox GSS□□-2; -3						
GSS04	0.5	1.0	1.0	1.0	0.8	0.8
GSS05	1.2	1.7	1.7	1.7	1.4	1.4
GSS06	1.8	3.0	3.0	3.0	2.6	2.6
GSS07	3.6	5.6	5.9	5.6	4.8	4.8
Helical-bevel gearbox GKL□□						
GKL07	2.6	5.0	6.8	4.8	4.8	4.8
GKL09	4.6	8.4	10.4	7.7	8.8	8.4

Tab. 12 Amount of lubricant in litres

→ Drive

Bevel gearbox GKR			
Mounting position	A	B	C
			
GKR03	0.35	0.35	0.35 / 0.4 *
GKR04	0.4	0.5	0.7 / 0.8 *
GKR05	0.8	1.3	1.5 / 1.6 *
GKR06	1.5	2.3	3.0 / 3.2 *
Mounting position	D	E	F
			
GKR03	0.35	0.35	0.35
GKR04	0.7	0.6	0.4
GKR05	1.4	1.5	1.0
GKR06	2.6	3.0	1.8

Tab. 13 Amount of lubricant in litres

* with version V□K at the output end

8 Maintenance

Maintenance operations

Lubricant amounts for combinable mounting positions

8.2.6 Lubricant amounts for combinable mounting positions

For the gearbox sizes 03 ...05 a combination of different mounting positions with amounts of lubricant to suit are permissible as per the following tables.

Advantage:

Easier logistics for users who use gearboxes in different mounting positions.

Disadvantage:

On some gearboxes more lubricant is necessary in the gearbox than is necessary technically. As a result a higher internal pressure is produced.

Helical gearbox GST04 ... 05-1; V□□

Mounting position	All types V□□ except for V□□	
	GST04	GST05
A	0.10	0.20
B D	0.35	0.60
C E F	0.25	0.35
Type V□□		
A C	0.15	0.20
B D	0.35	0.50
E F	0.20	0.30

Helical gearbox GST03 ... 05-2; V□□

All types except for VC□			
Mounting position	GST03	GST04	GST05
A B C D E F	0.20	---	---
A E F	---	0.35	0.55
B C		0.50	0.85
D		0.55	1.0
Type VC□			
A B C D E F	0.17	---	---
A E F	---	0.35	0.45
B C		0.45	0.70
D		0.60	0.95

Shaft-mounted helical gearbox GFL04 ... 05-2; V□□

Mounting position	Types V□R; V□L	
	GFL04	GFL05
A B E	0.7	1.4
C D	1.0	1.7
F	0.3	0.7
Type V□K		
A B E	0.8	1.4
C D	1.1	1.7
F	0.35	0.7

Helical-bevel gearbox GKS04 ... 05-3; V□□

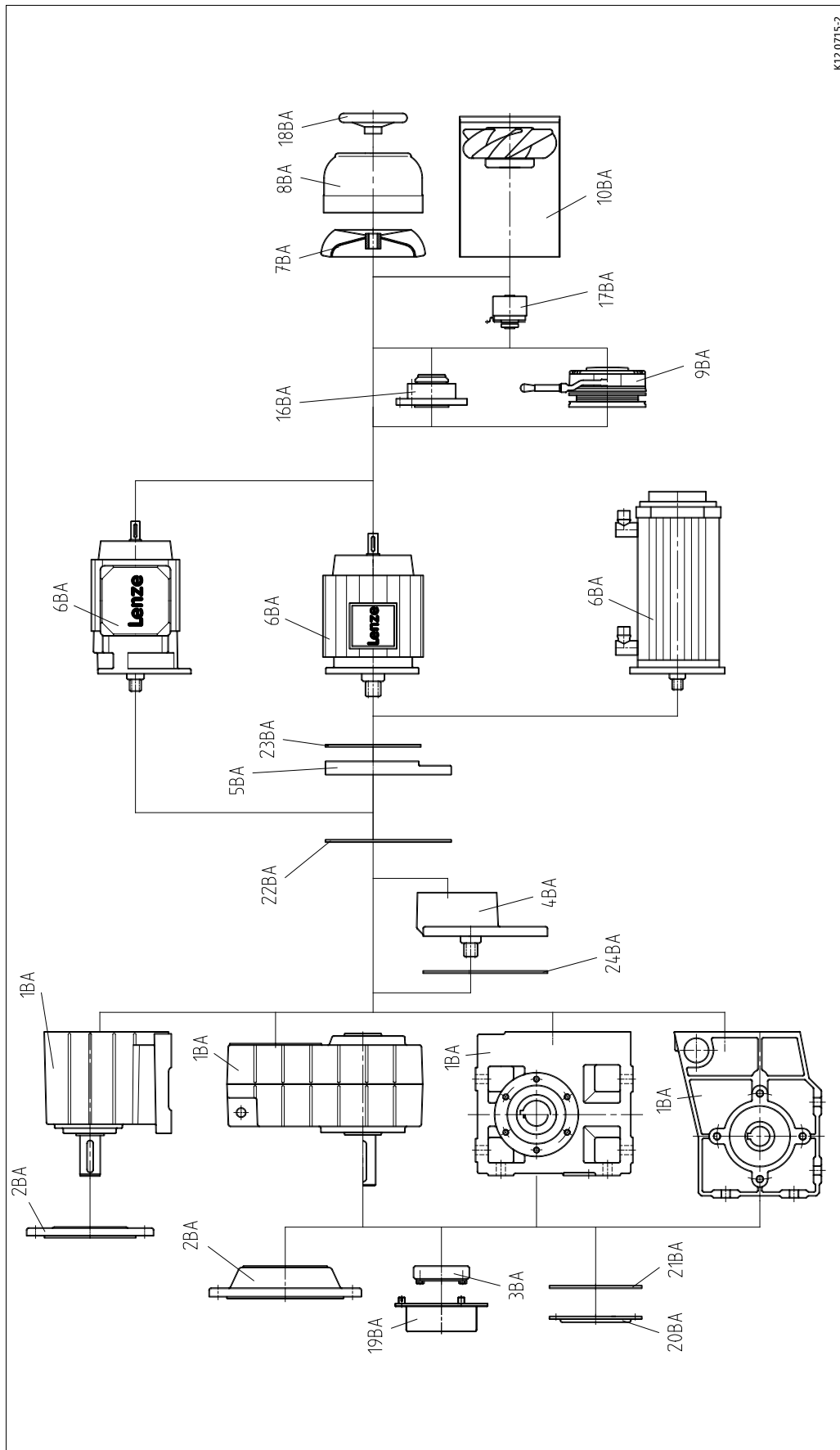
Mounting position	Type V□R; V□L	
	GKS04	GKS05
A	0.8	1.3
B C E F	1.3	2.0
D	1.0	1.6
Type V□K		
A	0.8	1.4
B C E F	1.5	2.1
D	1.1	1.7

Bevel gearbox GKR03 ... 05-2; V□□

Type V□R; V□L			
Mounting position	GKR03	GKR04	GKR05
A	0.35	0.4	0.8
B C D E		0.7	1.5
F		0.4	1.0
Type V□K			
A	0.35	0.4	0.8
B D E		0.7	1.5
C	0.4	0.8	1.6
F	0.35	0.4	1.0

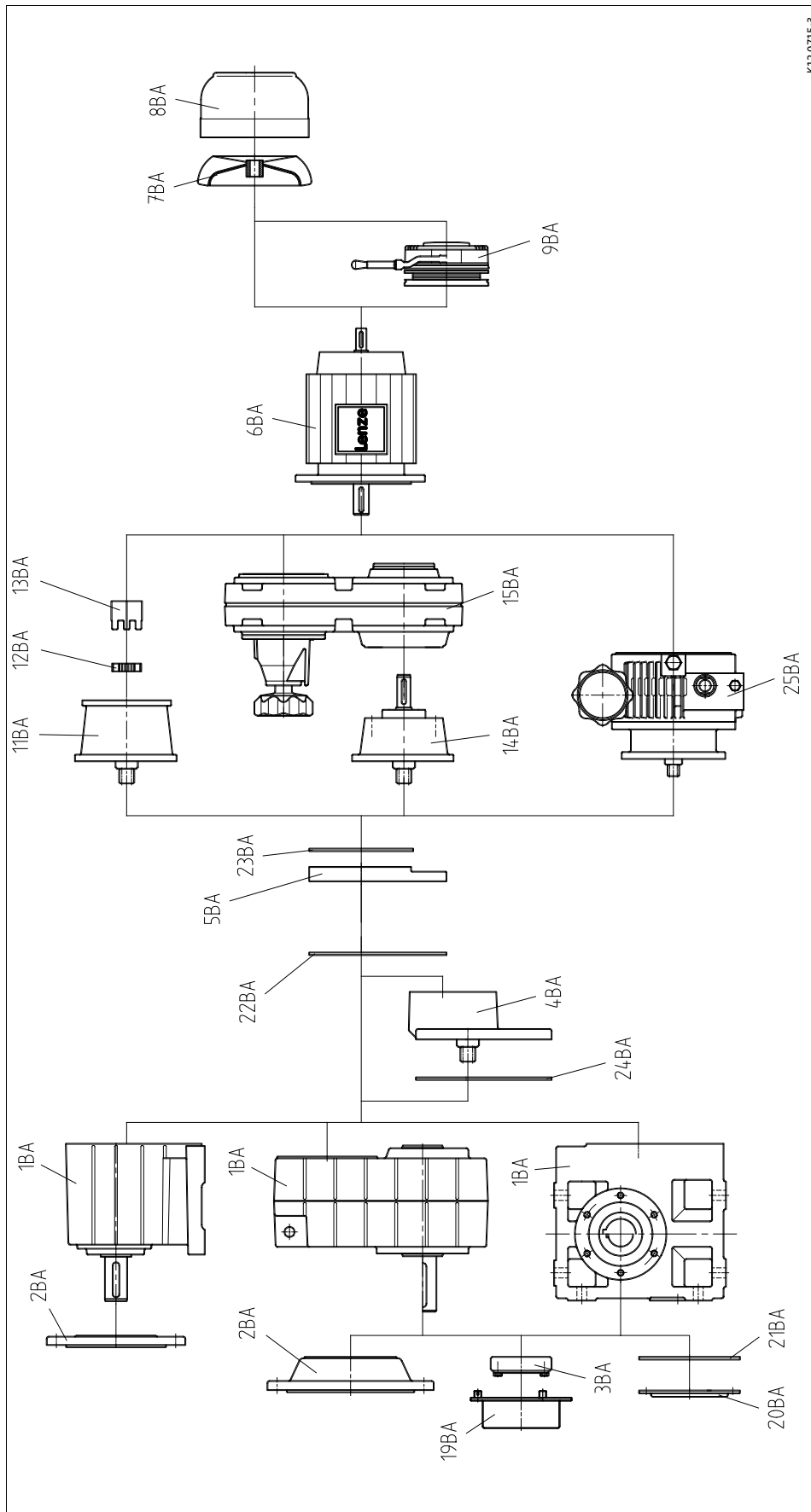
8.3 Repair

- We recommend having all repairs carried out by the Lenze customer service.



K12.0715-2

8.5 Spare parts list for gearboxes and gearboxes with variable speed drives



8 Maintenance

Order form

8.6 Order form

		Recipient: Lenze	
		Postcode / town, city: _____	
		Telefax No.: _____	
Sender _____		Customer no. _____	
Address / P.O. box _____		Order No. _____	
Postcode / town, city _____		Originator _____	
Delivery address _____		Telephone _____	
		Fax _____	
Invoice recipient * _____		Delivery date _____	
Date _____		Signature _____	
* Please state if different to sender			

Position	Name	Pce. number	Position	Name	Pce. number
1BA	Basic gearbox GST □□		12BA	Spider	
	Basic gearbox GFL □□		13BA	Coupling hub	
	Basic gearbox GKS □□		14BA	Free drive shaft	
	Basic gearbox GKR □□		15BA	Variable speed belt drive	
	Basic gearbox GSS □□		16BA	Backstop	
2BA	Output flange		17BA	Speed sensor / position encoder	
3BA	Shrink disc		18BA	Handwheel	
4BA	Pre-stage		19BA	Shrink disc cover	
5BA	Intermediate cover		20BA	Hollow shaft cover	
6BA	Motor		21BA	Seal	
7BA	Fan		22BA	Seal	
8BA	Fan cover		23BA	Seal	
9BA	Spring-applied brake		24BA	Seal	
10BA	Blower		25BA	Planetary variable speed drive	
11BA	Mounting flange				

If any malfunctions should occur during operation of the drive system, please check the possible causes using the following table. If the fault cannot be eliminated by one of the listed measures, please contact the Lenze Service.

Fault	Possible cause	Remedy
Drive is not running	Voltage supply interrupted	Check connection
	Faulty electrical connection	Check that supply voltage matches nameplate data
	Excessive load	Reduce load Check drive-machine assignment
Motor is running, but gearbox is not running	Coupling components are missing or defective	Check mounting
	Gearbox is defective	Inform Lenze Service
	Clutch disengaged	Engage the clutch
Unusual running noises	Overload	Reduce load Check drive-machine assignment
	Damage to the gearbox or motor	Inform Lenze Service
Excessive temperature	Overload	Reduce load Check drive-machine assignment
	Inadequate heat dissipation	Improve cooling air flow Clean gearbox / motor
	Lack of lubricant	Top up lubricant according to regulations
Loose fixing elements	Vibrations	Avoid vibrations
Shrink disc connection is spinning	- Correct screw tightening torque has not been reached - Insufficient number of passes, not all screws are tightened correctly. - Machine shaft and hollow shaft bore not sufficiently degreased - Wrong component part dimensions - Fits, roughnesses - Yield point of machine shaft material is too low $R_e > 300 \text{ N/mm}^2$ required - Friction factors are too low - Coefficients of friction $\mu \geq 0.15$ required - The shrink disc itself has been degreased so that the screws and the bevels are dry. Due to incorrect friction factors, the shrink disc cannot be tightened correctly.	Specifications for assembly, dimensions and material not observed



Notes





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🌐 www.lenze.com



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Germany

☎ 0080002446877 (24 h helpline)

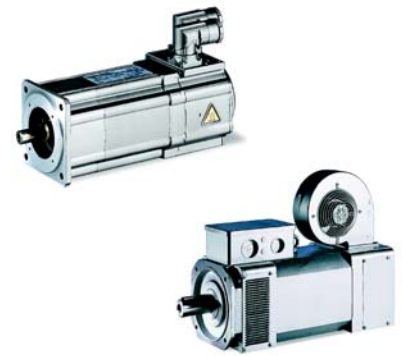
📠 +49 5154 82-1112

@ service@lenze.com

10 9 8 7 6 5 4 3 2 1

M...

Asynchronous servo motors / synchronous servo motors



MCA, MCS, MCM, MQA, MD□KS
0.5 Nm ... 1100 Nm

Operating Instructions

EN



Lenze



Please read these instructions before you start working!
Follow the enclosed safety instructions.

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Contents

- The present documentation serves to safely work on and with the drives. It includes safety instructions which must be observed.
- All persons working on and with the drives must have the documentation available and must observe the information and notes relevant for their work.
- The documentation must always be in a complete and perfectly readable state.

If the information provided in this documentation is not sufficient in your case, please refer to the controller or gearbox documentation.



Tip!

Information and tools concerning the Lenze products can be found in the download area at www.lenze.com

Validity

This documentation applies to servo motors:

Type	Name
MCS	Synchronous servo motors
MCM	
MCA	Asynchronous servo motors
MQA	
MD□KS	Synchronous servo motors

Target group

This documentation is directed at qualified skilled personnel according to IEC 60364.

Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

1.1 Document history

Material number	Version			Description
13302706	1.0	07/2009	TD09	First edition of the operating instructions, separate from three-phase AC motors
13340243	2.0	06/2010	TD09	Complete revision
13459473	3.0	01/2014	TD09	Revision of several chapters Implementation of new layout
---	4.0	---	TD09	Cancelled
13491314	5.0	04/2015	TD09	Complete revision with supplement of the MCM motor
13491314	5.1	07/2015	TD09	Changes of the nameplates MCA, MCM, MCS and MQA

1 About this documentation

Conventions used

1.2 Conventions used

This documentation uses the following conventions to distinguish different types of information:

Type of information	Writing	Example/notes
Spelling of numbers		
Decimal	Normal spelling	Example: 1234
Decimal separator	Point	The decimal point is always used. For example: 1234.56
Icons		
Page reference		Reference to another page with additional information For instance:  16 = see page 16
Documentation reference		Reference to another documentation with additional information Example:  EDKxxx = see EDKxxx documentation
Wildcard		Wildcard for options, selection data

1.3 Terminology used

Term	Describes the following
Motor	Servo motor in the designs according to motor code,  12 to  16
Inverter	Any servo inverter Any frequency inverter
Drive system	Drive systems with servo motors and other Lenze drive components

1.4 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Layout of the safety instructions:



Danger!

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure trouble-free operation
 Tip!	Useful tip for easy handling
	Reference to another document

2 Safety instructions

General safety instructions for drive components

2.1 General safety instructions for drive components



Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!



Note!

Safety-related parameters of safety encoders used can be obtained from the SISTEMA database, the Lenze AKB (Application Knowledge Base) or the data sheet of the encoder manufacturer.

- Transport and storage in a dry, low-vibration environment without aggressive atmosphere; preferably in the packaging provided by the manufacturer.
 - Protect against dust and impacts.
 - Observe climatic conditions according to the technical data.
- Use load carrying equipment for transport! (21)
- Lenze drive and automation components ...
 - ... must only be used as intended.
 - ... must never be commissioned despite noticeable damage.
 - ... must never be technically changed.
 - ... must never be commissioned in an incompletely mounted state.
 - ... must never be operated without the required covers.
 - ... may have live, moving or rotary parts during and after operation - corresponding to their type of protection. Surfaces may be hot.
 - ... must not be operated with large vibrations.
 - ... must not be operated in the frequency range of a plant or the drive system.
- All specifications of the corresponding enclosed documentation must be observed.

This is vital for safe and trouble-free operation and for achieving the specified product features.
- Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.

According to IEC 60364 or CENELEC HD 384, these are persons ...

 - ... who are familiar with the installation, assembly, commissioning and operation of the product,
 - ... possess the appropriate qualifications for their work,
 - ... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.

2.2 Application as directed

Low-voltage machines are not household appliances, but are intended as components that are only applied for re-use for industrial or professional purposes in terms of IEC/EN 61000-3-2.

They meet the requirements of the 2014/35/EU Low-Voltage Directive and the harmonised standards of the IEC/EN 60034 series.

Low-voltage machines with IP23 protection or less are only intended for outdoor use when applying special protective features.

The integrated brakes must not be used as safety brakes. It cannot be ruled out that interference factors which cannot be influenced cause a brake torque reduction.

- Drives
 - ... must only be operated under the operating conditions and power limits specified in this documentation.
 - ... comply with the protection requirements of the EU Low-Voltage Directive.

Any other use shall be deemed inappropriate!

2.3 Foreseeable misuse

- Do not operate the motors
 - ... in explosion-protected areas
 - ... in aggressive environments (acid, gas, vapour, dust, oil)
 - ... in water
 - ... in radiation environments



Note!

Increased surface and corrosion protection can be achieved by using adapted coating systems.

2.4 Residual hazards

Protection of persons

- The motor surfaces can become very hot. Danger of burns when touching!
 - Provide protection against accidental contact, if necessary.
- Highfrequency voltages can be capacitively transferred to the motor housing through the inverter supply.
 - Earth motor housing carefully.
- Danger of unintentional starting or electrical shocks
 - Connections must only be made when the equipment is deenergised and the motor is at standstill.
 - Installed brakes are no fail-safe brakes.

2 Safety instructions

Residual hazards

Motor protection

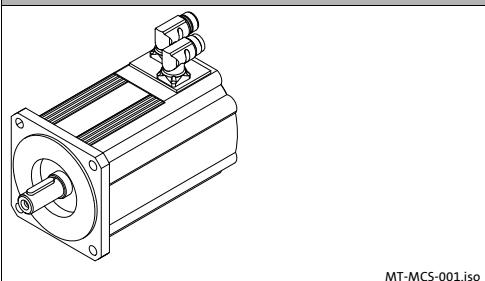
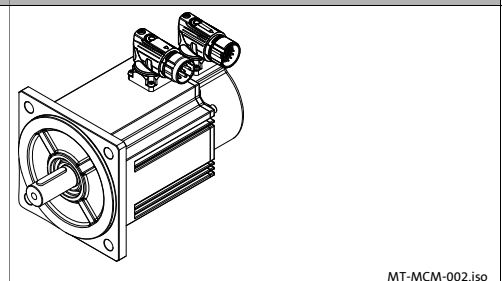
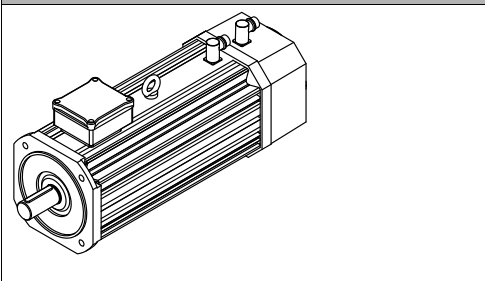
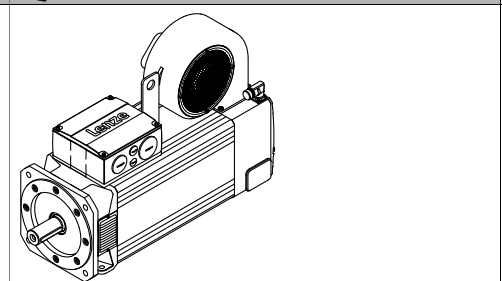
- Installed thermal detectors are **no full protection** for the machine.
 - If required, limit the maximum current, parameterise the controller such that it will be switched off after some seconds of operation with $I > I_N$, especially if there is the danger of blocking.
 - Installed overload protection does not prevent an overload under any conditions.
- Installed brakes are **no fail-safe brakes**.
 - The torque may be reduced by disruptive factors that cannot be influenced such as ingressing oil.
- Fuses are no motor protection.
 - Use current-dependent motor protection switches at average operating frequency.
 - Use installed thermal detectors at high operating frequency.
- Too high torques cause a fraction of the motor shaft.
 - The maximum torques according to catalogue must not be exceeded.
- Lateral forces from the motor shaft may occur.
 - Align shafts of motor and driving machine exactly to each other.
- If deviations from normal operation occur, e.g. increased temperature, noise, vibration, determine the cause and, if necessary, contact the manufacturer. If in doubt, switch off the motor.

Fire protection

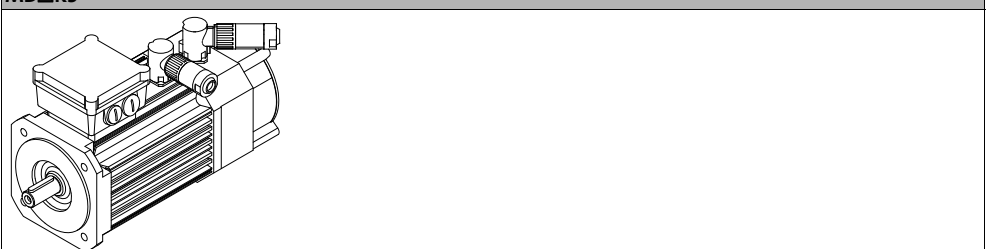
- Fire hazard
 - Prevent contact with flammable substances.

3.1 Identification

MC, MQA type

Synchronous servo motors	
MCS	MCM
 MT-MCS-001.iso	 MT-MCM-002.iso
Asynchronous servo motors	
MCA	MQA
 MT-MCA-001.iso	 MT-MQA-001.iso

MD... type

Synchronous servo motors	
MD□KS	
 MT-MDFKS-001.iso	

3 Product description

Identification
Motor code

3.1.1 Motor code

MCA; MCS; MQA

servo motors

Example		M	C	A	21X25	-	RS0	B0	-	A38R	-	ST5 S00N	-	R0SU
Meaning	Type	Motor code												
Product line		M												
Type	Compact servo motors (if required, with axial ventilation)		C											
	Radially ventilated motor		Q											
Design	Asynchronous			A										
	Synchronous			S										
Motor frame size, motor length, speed	Square dimension 62 mm				06									
	Square dimension 89 mm				09									
	Square dimension 102 mm				10									
	Square dimension 116 mm				12									
	Square dimension 130 mm				13									
	Square dimension 142 mm				14									
	Square dimension 165 mm				17									
	Square dimension 192 mm				19									
	Square dimension 200 mm				20									
	Square dimension 214 mm				21									
	Square dimension 220 mm				22									
	Square dimension 260 mm				26									
	Overall length				C...X									
	Speed in 100 rpm				XX									
Speed, angle encoder	Resolver p=1						RS0							
	Multiturn absolute value encoder with sin/cos signals, Hiperface						SKM							
	Singleturn absolute value encoder with sin/cos signals, Hiperface						SR5							
	Multiturn absolute value encoder with sin/cos signals, Hiperface						SRM							
	Singleturn absolute value encoder with sin/cos signals, EnDat						ECN							
	Multiturn absolute value encoder with sin/cos signals, EnDat						EQN							
	Multiturn absolute value encoder with sin/cos signals, EnDat						EQI							
	TTL incremental encoder with commutation signals UVW (IK4096-5V-T, Renco R35i)						C40							
	Incremental encoder TTL						TXX							
	Incremental HTL encoder						HXX							
	Resolver p=1 for safety function						RV0							
	Singleturn absolute value encoder with sin/cos signals, Hiperface for safety function						SVS							
	Multiturn absolute value encoder with sin/cos signals, Hiperface for safety function						SVM							
	Incremental encoder for safety function						S1S							
	Sin-Cos IG2048-5V-S incremental encoder						S20							
	No encoder						NN0							
Brake	Without brake							B0						
	Spring-applied brake 24V DC							F1						
	Spring-applied brake 24V DC, reinforced							F2						
	Spring-applied brake 205V DC							F5						
	Spring-applied brake 205V DC, reinforced							F6						
	Spring-applied brake 230V AC							FG						
	Spring-applied brake 230V AC, reinforced							FH						
	PM brake 24V DC							P1						
	PM brake 24V DC, reinforced							P2						
	PM brake 205V DC							P5						
	PM brake 205V-DC, reinforced							P6						

Example		M	C	A	21X25	-	RS0	B0	-	A38R	-	ST5 S00N	-	R0SU
Meaning	Type	Motor code												
Design	Standard flange form A/FF with through hole, cyl. shaft without keyway									A				
	Standard flange form A/FF with through hole, cyl. shaft with keyway									B				
	Standard flange form C/FT with threaded holes, cyl. shaft without keyway									C				
	Standard flange form C/FT with threaded holes, cyl. shaft with keyway (standard attachment)									N				
	Same as version A except that flange is large									F				
	Same as version B except that flange is large									G				
	Same as version C except that flange is large									U				
	Same as version N except that flange is large									V				
	Foot mounting B3 without keyway									O				
	Foot mounting B3 with keyway									P				
										11				
Shaft	Shaft 11x23 (MCS06)									14				
	Shaft 14x30 (MCS09; MCA 10)									19				
	Shaft 19x40 (MCS12; MCA13)									24				
	Shaft 24x50 (MCS14; MCA14, 17)									28				
	Shaft 28x60 (MCS19; MCA19)									38				
	Shaft 38x80 (MCA22, 22)									55				
	Shaft 55x110 (MCA26)									N, R or V				
										Z0X				
Concentricity/vibrational severity/direct gearbox attachment	Concentricity/vibrational severity									Y0X				
	Direct gearbox attachment: Motor without pinion for mounting on open gearbox with pinion; flange for direct gearbox attachment without intermediate cover, with tapered hollow shaft													
	Direct gearbox attachment: Motor without pinion for mounting on open gearbox with pinion; flange for direct gearbox attachment with intermediate cover, with tapered hollow shaft													
Electrical connection	Separate circular connectors for power/brake, encoder/thermal detector, fan											ST		
	Shared rectangular connector for power, encoder...											SQ		
	Separate terminal boxes for power/brake, encoder/thermal detector/fan											KK		
	Separate terminal boxes for power/brake, blower circular connectors for encoder, thermal detector											KG		
	Terminal box for power+brake; circular connector for encoder and thermal detector; circular connector for blower											KS		
	Circular connector for power+brake; circular connector for encoder+thermal detector; terminal box for fan											SK		
Enclosure	IP23													
	IP54 without shaft sealing ring (except for direct gearbox attachment)											2		
	IP65 with shaft sealing ring											5		
	IP64 (A-flange, without shaft sealing ring) / IP65											6		
	IP54 with shaft sealing ring (A-end bearing, oil-tight)											A		
	IP54 with shaft sealing ring, double lip (A-end bearing dust-tight)											B		
Cooling	Natural ventilation / without fan											C		
	Natural ventilation / without fan													
	Blower 230V; AC; 1N; filter											D		
	Blower 400V; AC; 3N; filter											S00		
	Blower 480V; AC; 3N											F1F		
	Blower 230V; AC; 1N											F3F		
Load flywheel	Without additional load flywheel											FWO		
	With additional mass inertia											F10		
												F30		
												F50		
												FWF		
												N		
Motor protection, temperature protection	NC thermal contact											J		
	KTY + PTC (MCS09...19)													B
	KTY sensor; electronic nameplate													D
	KTY sensor													E
Electronic nameplate	KTY - TCO NC contact (standard MQA)													R
	Standard nameplate													T
	Standard nameplate + electronic nameplate													0
	Second nameplate supplied loose													1
Colour/specification	Second nameplate supplied loose + electronic nameplate													2
	Colour: black													3
	Specification - UL design and CSA design, approval													S
	Specification - UL design, approval													U
														R

3 Product description

Identification

Motor code

MCM

servo motors

Example		M	C	M	06 B 30	-	RS0	B0	A11	ST S00	RU
Meaning	Type	Motor code									
Product line		M									
Type	Compact servo motors (if required, with axial ventilation)		C								
Design	Synchronous			M							
Motor frame size	Square dimension 62 mm				06						
	Square dimension 89 mm				09						
	Square dimension 116 mm				12						
Motor length	20				B						
	30				C						
	40				D						
	50				E						
	60				F						
	70				G						
	80				H						
	90				I						
	100				J						
Speed 100 rpm	3000				30						
Mains voltage	400 V					-					
Speed sensor, angle sensor	Resolver p=2						RS0				
	Multiturn absolute value encoder with sin/cos signals, Hiperface						SKM				
Brake	Without brake							B0			
	Spring-applied brake 24V DC							F1			
Design	Standard flange form A/FF with through hole, cyl. shaft without keyway								A		
	Standard flange form A/FF with through hole, cyl. shaft with keyway								B		
Shaft	Shaft 11x23 (MCM06)								11		
	Shaft 14x30 (MCM09)								14		
	Shaft 19x40 (MCM12)								19		
Electrical connection	Separate circular connectors for power/brake, encoder/KTY									ST	
Cooling	Natural ventilation / without fan									S00	
Motor protection, temperature	KTY sensor										R
Specification	Specification - UL design and CSA design, approval										U

MD□KS

servo motors

Example		M	D	S	K	S	AG	056	-	1	3
Meaning	Type	Motor code									
Product line		M									
Type	Three-phase AC current		D								
Cooling	Forced ventilated			F							
	Natural ventilation			S							
Design, housing	Compact servo motor with square housing and cooling ribs				K						
Machine type	Synchronous machine					S					
Built-on accessories	Absolute value encoder						AG				
	Brake and sin-cos absolute value encoder or SSI absolute value encoder						BA				
	Brake and resolver						BS				
	Resolver						RS				
	Resolver for safety function						RV				
Size								056			
								071			
Overall length										0	
										1	
										2	
										3	
Number of pole pairs											3

3 Product description

Identification
Motor code

Encoder code

Example		SFC	1024	-	8V	-	K	2
Meaning	Type	Encoder code						
Product line	Resolver	RS						
	Resolver for safety function	RV						
	Incremental encoder	IG						
	Incremental encoder with commutation signal	IK						
	Singleturn absolute value encoder	SFC						
	Multiturn absolute value encoder	AM						
Number	2-pole resolver for servo motors		0					
	2-pole resolver for three-phase AC motors		1					
	Number of pole pairs for resolvers		2, 3, 4, ...					
	Number of steps / increments per revolution		32, 128, 512, 1024, 2048, ...					
Voltage	Medium supply voltage			-	5V, 8V, 15V, 24V, ...			
Interface or signal level	Standard							
	TTL						T	
	HTL (for incremental encoders)						H	
	Hiperface (for absolute value encoders)						H	
	EnDat						E	
	sin/cos 1 V _{SS}						S	
	For safety function							
	TTL						U	
	HTL (for incremental encoders)						K	
	Hiperface (for absolute value encoders)						K	
	EnDat						F	
	sin/cos 1 V _{SS}						V	
	Safety integration level (SIL)							1
								2
								3
								4



Note!

If feedback systems for safety functions are used, the manufacturer's documentation must be observed!

3.1.2

Nameplate

Asynchronous and synchronous servo motors

Lenze		1		15	
2		4			
5.5	5.8	5.2	5.4	5.3	
5.6	5.9	5.10	16.6	22	
5.7	14.2	14.1	27	14.3	
9			12		
8					
10.2/10.3		18	11		

MT-SYN-001.des

MCM synchronous servo motors

Lenze		1		15		43	
2		4					
5.5	5.8	5.2	5.4	5.3			
5.6	5.9	5.10	16.6	22			
5.7	14.2	14.1	27	14.3			
9			12				
8							
10.2/10.3		18	11				

MT-MCM-00X.des

3 Product description

Nameplate

Pos.	Contents
1	Manufacturer / production location
2	Type of motor / standard
3	Gearbox type
4	Motor type
5	Technical data
5.1	Ratio
5.2	Rated torque
5.3	Rated speed
5.4	Rated frequency
5.5	Rated voltage
5.6	Rated current
5.7	Maximum current
5.8	Rated power [kW]
5.9	Rated power [HP]
5.10	Continuous standstill torque
6	Mounting position / position of the system blocks
7	Lubricant details
7.1	Lubricant amount
7.2	Lubricant type
8	Brake data
8.1	Type
8.2	AC/DC brake voltage
8.3	Braking torque, electrical power input
9	For feedback / pulse encoder or resolver data see encoder code 16
10	Production data
10.1	Order number
10.2	Material number
10.3	Serial number
11	Bar code
12	Motor number
13	Information with regard to the operating mode
14	Additional motor specifications
14.1	Temperature class
14.2	Enclosure
14.3	Motor protection
15	Applicable conformities, approvals and certificates
16	Rated data for various frequencies
16.1	Hz = frequency
16.2	kW = motor power
16.3	rpm = motor speed
16.4	V = motor voltage
16.5	A = motor current
16.6	$\cos \varphi$ = motor power factor for MCA
	U_{in} [V] = induced voltage for MC□
16.7	η = motor efficiency: at a rated power of 100%
17	Application factor (specified if <1.0) / load capacity
18	Year of manufacture / week of manufacture
19	UL file number
20	Additional customer data
21	UL category (e.g. inverter duty motor)
22	C86 = motor code for controller parameterisation (code 0086)
23	Efficiency class
24	Partial load efficiencies for 50Hz operation at a rated power of 50% and 75%
25	Range A Voltage tolerance range according to range A as specified by IEC/EN 60034-1
27	Permissible ambient temperature (e.g. $T_a \leq 40^\circ\text{C}$)
29	Standstill current (ampere locked rotor ALR)
30	Weight
31	Plug design (number of poles)
43	Internal key: QR code

4.1 General data and operating conditions

General data

Conformity			
CE	2006/95/EC	Low-Voltage Directive	
Approvals			
UL	ANSI/UL 1004-1 ANSI/UL 1004-6	Rotating Electrical Machines Servo and Stepper Motors	
CSA	CSA-C22.2 No. 100	Motors and Generators	
EAC	TP TC 020/2011 (TR CU 020/2011)	Electromagnetic compatibility of technical means	Eurasian Conformity TR CU: Technical Regulation of Customs Union
	TP TC 004/2011 (TR CU 004/2011)	On safety of low voltage equipment	Eurasian Conformity TR CU: Technical Regulation of Customs Union

Protection of persons and devices		
Enclosure	IEC/EN 60034-5	See nameplate
		Degrees of protection only apply to horizontal installation
		All unused connectors must be closed with protection covers or blanking plugs.
Temperature class	F (155 °C) IEC/EN 60034-1	Exceedance of the temperature limit weakens or destroys the insulation
Permissible voltage		As specified by limiting curve A of the pulse voltage from IEC / TS 60034-25:2007 (corresponds to IVIC C/B/B@500V)
EMC		
Noise emission	IEC/EN 61800-3	Depending on the controller, see documentation for the controller.
Noise immunity		

Operating conditions

Ambient conditions			
Climatic			
Transport	IEC/EN 60721-3-2	2K3 (-20 °C ... +70 °C)	
Storage	IEC/EN 60721-3-1	1K3 (-20 °C ... +60 °C)	< 3 months
		1K3 (-20 °C ... +40 °C)	> 3 months
Operation	IEC/EN 60721-3-3	3K3 (-20 °C ... +40 °C) MC A, MCS, MD□KS	Without brake
		3K3 (-15 °C ... +40 °C) MC M, MQA	
		3K3 (-10 °C ... +40 °C)	With brake
		3K3 (-15 °C ... +40 °C)	With blower
		> +40 °C	With power reduction, see catalogue
Site altitude		< 1000 m amsl - without power reduction > 1000 m amsl < 4000m amsl with power reduction, see catalogue	
Humidity		Relative humidity ≤ 85 %, without condensation	
Electrical			
The motor connection type depends on the controller			
Length of the motor cable		See inverter instructions	
Length of cable for speed feedback			
Mechanical			
	IEC/EN60721-3-3	3M6	

4 Technical data

General data and operating conditions

Setting the switching frequency to the rated motor data

4.1.1 Setting the switching frequency to the rated motor data

The rated data are valid for operation on an inverter with a switching frequency of at least 8 kHz. If operated at a switching frequency of $f_{ch}=4$ kHz, the following consequences must be observed.

Motor type	Consequences
MQA 20, 22, 26 MCA 20, 22, 26	At $f_{ch} = 4$ kHz, the motor continuously reaches only approx. 95 % of its rated torque. Increased noise emission
MCM, MCS MCA 10, 13, 14, 17, 19, 21 MD□KS	All published rated data remain valid if $f_{ch} = 4$ kHz.

5.1 Important notes



Danger!

Some of the motors mounted to the gearboxes are equipped with transport aids. They are **only** intended for the mounting/dismounting of the motor to the gearbox and must **not** be used for the entire geared motor!

- Only move the drive with means of transport or hoists that have sufficient load-bearing capacity.
- Ensure safe fixing.
- Avoid shocks!

5.2 Preparation

Remove the corrosion protection from the shaft ends and flanges. If necessary, remove dirt using standard cleaning solvents.



Stop!

Bearings or seals must not come into contact with the solvent - material damages.

After a long storage period (> 1 year) you have to check whether moisture has entered the motor. For this purpose, measure the insulation resistance (measuring voltage 500 V_{DC}). In case of values $\leq 1\text{k}\Omega$ per volt of rated voltage, dry the winding.

5.3 Assembly of built-on accessories

Follow these instructions carefully. Please note that the warranty and product liability will become void in the event of impermissible alterations or modifications to the motors.

- Mount the transmission elements:
 - Shocks and impacts must be avoided! They could destroy the motor.
 - For mounting always use the centre bore in the motor shaft as specified by DIN 332-DR-M...
 - Tolerances of the shaft ends:
 $\leq \varnothing 50\text{ mm}$: ISO k6, $> \varnothing 50\text{ mm}$: ISO m6.
- Only use an extractor for the disassembly.
- When using belts for torque/power transmission:
 - Tension the belts in a controlled manner.
 - Provide protection against accidental contact! During operation, surface temperatures of up to 140°C are possible.

5 Mechanical installation

Assembly of built-on accessories
Installation

5.3.1 Installation

Important notes

- The mounting surface must be dimensioned for the design, weight and torque of the motor.
- The foot and flange faces must rest flat on the mounting surface.
 - Incorrect motor alignment reduces the service life of the roller bearings and transmission elements.

Impacts on shafts can cause bearing damage.

- Do not exceed the permissible range of ambient operating temperature (📖 19).
- Fasten the motor securely.
- Ensure that the ventilation is not impeded. The exhaust air, also the exhaust air of other machines next to the drive system, must not be taken in immediately.
- During operation, surfaces are hot, up to 140 °C! Ensure that guard preventing accidental contact is in place!



Note!

From the air inlet to other component parts, a minimum distance of 10% of the outer diameter of the fan cover must be complied with!

Ensure an even surface, solid foot or flange mounting and exact alignment if a direct clutch is connected. Avoid resonances with the rotational frequency and double mains frequency which may be caused during assembly. With an additional support on the N-end side in the case of flange-mounted motors (in particular for MQA and great MCA), vibrations that may occur can be reduced. Bracing of the motor by the additional support must be reliably avoided.

Only mount or remove transmission elements using appropriate means. In order to facilitate handling, heat them beforehand. Cover belt pulleys and clutches with a touch guard.



Stop!

Ensure a correct belt tension!

The machines are halfkey balanced. The clutch must be halfkey balanced, too. The visible jutting out part of the key must be removed.

Designs with shaft end at the bottom must be protected with a cover at the N-end, preventing the ingress of foreign particles into the fan.

5.4 Holding brake (option)

Important notes

As an option, the motors can be fitted with a brake. The installation of brakes (in or on the motor) increases the length of the motor.



Note!

The brakes used are not fail-safe because interference factors which cannot be influenced (e.g. oil ingress) may lead to a reduction in torque.

The brakes are used as holding brakes and serve to hold the axes at standstill or in the deenergised state.

Emergency stops at higher speeds are possible but high switching energy increases wear on the friction surfaces and the hub, (26).

The spring-applied brakes work on the basis of the closed-circuit principle, i.e. the brake is closed in the deenergised state. The brakes for DC supply can be fed with a bridge-rectified DC voltage (bridge rectifier) or with a smoothed DC voltage. The permissible voltage tolerance is $\pm 10\%$.

If long motor supply cables are used, pay attention to the ohmic voltage drop along the cable and compensate for it with a higher voltage at the input end of the cable.

The following applies to Lenze system cables:

$U^* = U_B + \left[\frac{0.08 \, \Omega}{m} \cdot L \cdot I_B \right]$	U^* [V]	Resulting supply voltage
	U_B [V]	Rated voltage of the brake
	l [m]	Cable length
	I_B [A]	Rated current of the brake



Stop!

If no suitable voltage (incorrect value, incorrect polarity) is applied to the brake, the brake will be applied and can be overheated and destroyed by the motor continuing to rotate.

The shortest operating times of the brakes are achieved by DC switching of the voltage and an external suppressor circuit (varistor or spark suppressor). Without suppressor circuit, the operating times may increase. A varistor/spark suppressor limits the breaking voltage peaks. It must be ensured that the power limit of the suppressor circuit is not exceeded. This limit depends on the brake current, brake voltage, disengagement time and the switching operations per time unit.

Furthermore the suppressor circuit is necessary for interference suppression and for increasing the service life of the relay contacts (external, not integrated into the motor).



Please refer to the catalogue for servo motors for detailed information about holding brakes.



Note!

The brake cannot be readjusted. When the wear limit is reached, the brake has to be replaced.

5 Mechanical installation

Holding brake (option)
Permanent magnet holding brakes

5.4.1 Permanent magnet holding brakes

These brakes are used as holding brakes and serve to hold the axes without backlash at standstill or in the deenergised state.



Stop!

- Inherent to the design, the rated torque for permanent magnet holding brakes is solely classified as holding torque at standstill. When braking from full motor speed, e.g. in the case of emergency stops, the braking torque is substantially reduced.
- This holding brake is only designed for a limited number of emergency stops. Utilisation as a working brake, e.g. to decelerate a load, is not permissible.

When activating the brake, it must be ensured that the brake is released or engaged at zero speed to avoid unnecessary and rapid wear of the brake.

When used solely as holding brakes, the brakes are virtually wear free on their friction surfaces. If the max. permissible switching energy per emergency stop (see catalogue) is not exceeded, at least 2000 emergency stop functions from a speed of 3000 rpm are possible.

$W = \frac{1}{2} \cdot J_{\text{tot}} \cdot \omega^2$	W [J]	Energy
	J_{tot} [kgm ²]	Total moment of inertia
	ω [1/s]	Angular velocity $\omega = 2\pi \cdot n / 60$, n = speed [rpm]

The holding torques specified in the catalogue only apply when the motor is at standstill. In the case of a slipping brake, the dynamic braking torque always applies which depends on the speed.



Note!

The permanent magnet holding brakes are maintenance-free and cannot be adjusted. In the event of wear, e.g. by emergency stops, the brakes must be replaced.

These brakes work on the basis of the closed-circuit principle, i.e. the brake is closed in the deenergised state.

Brakes with a rated voltage of DC 24 V are designed for smoothed DC voltages with a ripple of <1 %. It must be ensured that the connector on the motor side is supplied with the minimum voltage of DC 24 V -10 %. If necessary, the voltage drop in the cable should also be considered. If the maximum voltage DC 24 V + 5 % is exceeded, the brake can close again. Supplying the brake with bridge-rectified DC voltage (bridge rectifier without additional smoothing) or a DC voltage with a ripple of >1 % can lead to a malfunctioning of the brake or an increase in the engagement and disengagement times.

Brakes with a rated voltage of DC 205 V are designed for bridge-rectified DC voltage, i.e. for supply via a bridge rectifier from the 230 V mains (half-wave rectifiers are not permissible). Supplying the brake with smoothed DC voltage can lead to malfunctioning or an increase in the engagement and disengagement times. With regard to the minimum and maximum voltages, the same conditions apply as for brakes with 24 V, i.e. the permissible voltage tolerance is 205 V DC +5 %, -10 %.

Wear of permanent magnet brakes

If applied as directed (application as holding brakes), the permanent magnet brakes of the servo motors are wear free and intended for long operating times. The wear on the friction lining is due to e.g. emergency stops.

The table below describes the different reasons for wear and their impact on the components of the permanent magnet brakes.

Component	Effects	Influencing factors	Cause
Friction lining / friction surface at the armature plate and external pole	Wear on the friction lining	Applied friction energy	Braking during operation (impermissible, holding brakes!)
			Emergency stops
			Overlapping wear when the drive starts and stops
			Active braking by the drive motor with the help of the brake (quick stop)
Springs	Fatigue failure of the springs	Number of switching operations of the brake	Axial duty cycle of the springs
Permanent magnet	Useless brake	Temperature, overvoltage	Excessive overvoltages / temperatures

**Stop!**

In case of wear above the maximum air gap (⚠ brake operating instructions), application of the brake cannot be ensured. In this case, no braking process is carried out.

5 Mechanical installation

Holding brake (option)
Spring-applied holding brakes

5.4.2 Spring-applied holding brakes

These brakes are used as holding brakes and serve to hold the axes without backlash at standstill or in the deenergised state.

For permissible operating speeds and characteristics, please see the motor catalogue applicable in each case. Emergency stops at higher speeds are possible, but high switching energy increases wear on the friction surfaces and the hub.



Stop!

The friction surfaces must always be free from oil and grease because even small amounts of grease or oil will considerably reduce the braking torque.

The formula below provides a simplified way to calculate friction energy per switching cycle which must not exceed the limit value for emergency stops that depends on the operating frequency (motor catalogue; Lenze drive solutions: formulas, dimensioning, and tables).

$Q = \frac{1}{2} \cdot J_{\text{tot}} \cdot \Delta\omega^2 \cdot \frac{M_K}{M_K - M_L}$	Q [J]	Friction energy
	J_{tot} [kgm ²]	Total mass inertia (motor + load)
	$\Delta\omega$ [1/s]	Angular velocity $\omega = 2\pi \cdot n / 60$, n = speed [rpm]
	M_K [Nm]	Characteristic torque
	M_L [Nm]	Load torque

Depending on the operating conditions and possible heat dissipation, surface temperatures can be up to 130 °C.



More detailed information on the used brakes is provided in the corresponding catalogues.

Wear on spring-applied brakes

Spring-applied brakes are wear-resistant and designed for long maintenance intervals, (23).

However, the friction lining, the teeth between the brake rotor and the hub, and also the braking mechanism are naturally subject to function-related wear which depends on the application case (see table). In order to ensure safe and problem-free operation, the brake must therefore be checked and maintained regularly and, if necessary, replaced (see brake maintenance and inspection).

The following table describes the different causes of wear and their effect on the components of the spring-applied brake. In order to calculate the useful life of the rotor and brake and determine the maintenance intervals to be prescribed, the relevant influencing factors must be quantified. The most important factors are the applied friction energy, the starting speed of braking and the switching frequency. If several of the indicated causes of wear on the friction lining occur in an application, their effects are to be added together.

Component	Effect	Influencing factors	Cause
Friction lining	Wear on the friction lining	Applied friction energy	Braking during operation (impermissible, holding brakes!)
			Emergency stops
			Overlapping wear when the drive starts and stops
			Active braking by the drive motor with the help of the brake (quick stop)
		Number of start-stop cycles	Starting wear if motor is mounted in a position with the shaft vertical, even if the brake is open
Armature plate and flange	Running-in of armature plate and flange	Applied friction energy	Friction between the brake lining and the armature plate or flange e.g. during emergency braking or service brake operation
Teeth of the brake rotor	Teeth wear (primarily at the rotor end)	Number of start-stop cycles, Level of the braking torque, Dynamics of the application, Speed fins in operation	Relative movement and impacts between brake rotor and brake hub
Armature plate bracket	Armature plate, cap screws and bolts are deflected	Number of start-stop cycles, Level of braking torque	Load changes and impacts due to reversal error during interaction between armature plate, cap screws and guide bolts
Springs	Fatigue failure of the springs	Number of switching operations of the brake	Axial load cycle and shearing stress on the springs due to radial reversing error of the armature plate

6 Electrical installation

Important notes

6.1 Important notes



Danger!

Hazardous voltage on the power connections even when disconnected from mains: residual voltage >60 V!

Before working on the power connections, always disconnect the drive component from the mains and wait until the motor is at standstill. Verify safe isolation from supply!



Stop!

Electrical connections must be carried out in accordance with the national and regional regulations!

Observe tolerances according to IEC/EN 60034-1:

- Voltage $\pm 5\%$
- Frequency $\pm 2\%$
- Wave form, symmetry (increases heating and affects electromagnetic compatibility)

Observe notes on wiring, information on the nameplate, and the connection scheme in the terminal box.

- The connection must ensure a continuous and safe electrical supply, i.e.
 - no loose wire ends,
 - use assigned cable end fittings,
 - ensure good electrical conductivity of the contact (remove residual lacquer) if an (additional) PE connection on the motor housing is used),
 - establish a safe PE conductor connection,
 - tighten the plugin connector to the limit stop.
 - After the connection is completed, make sure that all connections on the terminal board are firmly tightened.
- The smallest air gaps between uncoated, live parts and against earth must not fall below the following values.

Minimum requirements for basic insulation according to IEC/EN 60664-1 (CE)	Higher requirements for UL design	Motor diameter
3.87 mm	6.4 mm	< 178 mm
	9.5 mm	> 178 mm

- The terminal box has to be free of foreign bodies, dirt, and humidity.
- All unused cable entries and the box itself must be sealed against dust and water.

6.2 EMC-compliant wiring

The EMC-compliant wiring of the motors is described in detail in the Operating Instructions for the Lenze controllers.

- Use of metal EMC cable glands with shield connection.
- Connect the shielding to the motor and to the device.

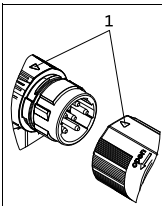
6.3 Plug connectors

The connectors comply with vibration and shock class 3M6 as specified in IEC/EN60721-3-3. This applies to all power, encoder and fan connector boxes.



Stop!

- **Cable connectors with screwed connection:**
 - Always use with the O-rings supplied.
- **Cable connectors with a SpeedTec bayonet lock:**
 - Remove O-ring and dispose of it.



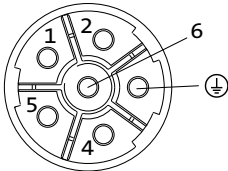
When connecting the cable connector to the motor connector, make sure that the aids to orientation (pos. 1) are facing each other. Only then trouble-free operation is ensured.

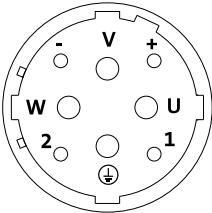
- Tighten the box nut of the cable connectors!
- Never disconnect cable connectors whilst voltage is being applied! Otherwise the connector may be destroyed! Inhibit the inverter before disconnecting the plugs!

6 Electrical installation

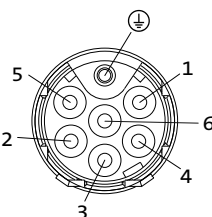
Plug connectors
Power connections / holding brake

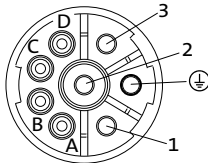
6.3.1 Power connections / holding brake

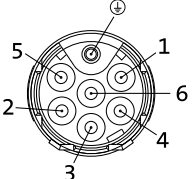
6-pole (external view of poles)			
Contact	Name	Meaning	M23
1	BD1	Holding brake +	
2	BD2	Holding brake -	
⊕	PE	PE conductor	
4	U	Power phase U	
5	V	Power phase V	
6	W	Power phase W	

MCA 19...21, MCS 14...19, MQA 20 (external view of poles)			
Contact	Name	Meaning	M40
1	Not assigned		
2			
+	BD1	Holding brake +	
-	BD2	Holding brake -	
⊕	PE	PE conductor	
U	U	Power phase U	
V	V	Power phase V	
W	W	Power phase W	

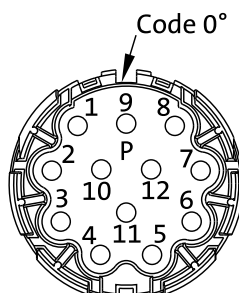
6.3.2 Fan

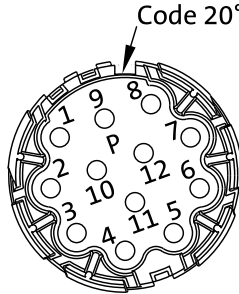
Single-phase (external view of poles)			
Contact	Name	Meaning	M17
⊕	PE	PE conductor	
1	U1	AC fan	
2	U2		
3	Not assigned		
4	U+	DC fan	
5	U-		
6	Not assigned		

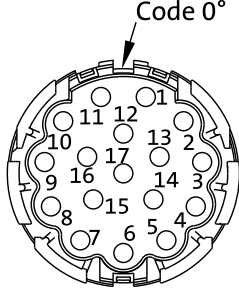
8-pole (external view of poles)			
Contact	Name	Meaning	
⊕	PE	PE conductor	
1	Not assigned		
2			
3			
A	U1	AC fan	
B	U2		
C	U+	DC fan	
D	U-		

Three-phase (external view of poles)			
Contact	Name	Meaning	M17
⊕	PE	PE conductor	
1	U	Fan	
2	Not assigned		
3	V	Fan	
4	Not assigned		
5	Not assigned		
6	W	Fan	

6.3.3 Feedback system

Resolver (external view of poles)			
Contact	Name	Meaning	
1	+ Ref	Transformer windings	
2	- Ref	(reference windings)	
3	+VCC ENP	Supply: electronic nameplate ¹⁾	
4	+COS	Stator windings cosine	
5	-COS		
6	+SIN	Stator windings	
7	-SIN	Sine	
8	Not assigned		
9			
10	Shield	Encoder housing shield	
11	+ KTY	Thermal detector KTY	
12	- KTY		

Incremental encoder / sin/cos absolute value encoder Hiperface (external view of poles)			M23	
Contact	Name	Meaning		
1	B	Track B / + SIN		
2	$\bar{A}$	Track A inverse / - COS		
3	A	Track A / + COS		
4	+ U _B	Supply +		
5	GND	Mass		
6	$\bar{Z}$	Zero track inverse / - RS485		
7	Z	Zero track / + RS485		
8	Not assigned			
9	$\bar{B}$	Track B inverse / - SIN		
10	Shield	Encoder housing shield		
11	+ KTY	Thermal detector KTY		
12	- KTY			

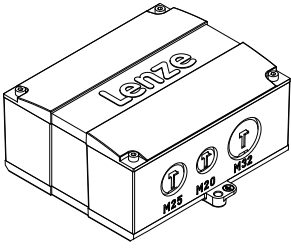
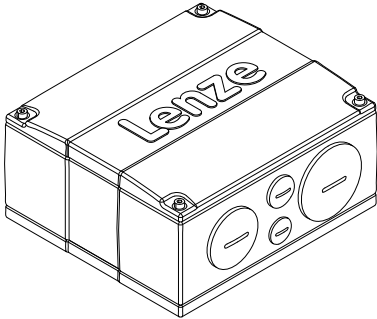
Sin/cos absolute value encoder with EnDat interface (external view of poles)			M23
Contact	Name	Meaning	
1	U _P sensor	Supply U _P sensor	
2	Not assigned		
3			
4	0 V sensor	0 V sensor supply	
5	+ KTY	Thermal detector KTY	
6	- KTY		
7	+ U _B	Supply + / +VCC ENP ¹⁾	
8	Cycle	Clock pulse EnDat interface	
9	Cycle	Clock pulse inverse EnDat interface	
10	GND	Mass	
11	Shield	Encoder housing shield	
12	B	Track B	
13	B̄	Track B inverse	
14	Data	Data EnDat interface	
15	A	Track A	
16	Ā	Track A inverse	
17	Data	Data inverse EnDat interface	

1) Only for versions with electronic nameplate ENP.

6 Electrical installation

Terminal box
Feedback system

6.4 Terminal box

Terminal box with knock out	Terminal box with screwed connections
 MT-terminal-box-001.iso The openings in the terminal box are cast closed and can be opened by the customer as required.	 MT-terminal-box-002.iso



Note!

Open the holes on the underside of the knock out terminal box when the cover is closed.

Cable glands and terminal studs for the power terminal box

Motor type / motor size		Cable glands	Power connection			Terminal board	
			Cable cross-section [mm ²]	Terminal Stripping length [mm]	Tightening torque [Nm]	Threaded bolt	Tightening torque [Nm]
MCA	10, 13, 14, 17	1 x M20 x 1.5 + 1 x M16 x 1.5	0.08 ... 2.5	10 ... 11	2)	-----	-----
	19, 21	1 x M32 x 1.5 + 1 x M25 x 1.5	0.2 ... 10	10 ... 11	2)	-----	-----
	20	2 x M20 + 2 x M 25 + 2 x M32	2.5 ... 16	18 ... 20	2)	-----	-----
	22	1 x M40x1.5 + 1 x M50x1.5 + 1 x M20x1.5 + 1 x M16x1.5	10 ... 35	18	3.2	-----	-----
	26	1 x M50 x 1.5 + 1 x M63 x 1.5 + 1 x M20 x 1.5 + 1 x M16 x 1.5	-----			M12	15.5
MQA	20	2 x M20 + 2 x M 25 + 2 x M32	2.5 ... 16	18 ... 20	2)	-----	-----
	22	1 x M40x1.5 + 1 x M50x1.5 + 1 x M20x1.5 + 1 x M16x1.5	10 ... 35	18	3.2	-----	-----
	26	1 x M50 x 1.5 + 1 x M63 x 1.5 + 1 x M20 x 1.5 + 1 x M16 x 1.5	-----			M12	15.5
MCS	09, 12, 14D, 14H, 14L15, 14P14, 19F15, 19J15	2 x M20 + 2 x M25 + 2 x M32	0.08 ... 2.5 ¹⁾	10 ... 11	2)	-----	-----
	14L32, 14P32, 19F13, 19J30, 19P		0.2 ... 10	10 ... 11	2)	-----	-----
MD□KS	056, 071	1 x M20 x 1.5 + 1 x M16 x 1.5	0.08 ... 2.5	10 ... 11	2)	-----	-----

Tab. 1 Cable glands and connecting terminals

- 1) 4 mm² without wire end ferrule
2) Spring terminal

Cable glands for the fan terminal box

Motor type/size	Screwed connection	
MCA/MQA	20	1 x M 16 x 1.5
	22	
	26	

6.4.1 Power connections

MCA; MCS, MQA 20...22, MD□KS		
Contact	Name	Meaning
⊕	PE	PE conductor
U	U	Motor winding phase U
V	V	Motor winding phase V
W	W	Motor winding phase W
TP1	TP1	PTC thermistor
TP2	TP2	
TB1	TB1	Thermostat
TB2	TB2	Thermal NC contact

MCA 26, MQA 26		
Contact	Name	Meaning
⊕	PE	PE conductor
1	U1	Start of winding phase U
2	V1	Start of winding phase V
3	W1	Start of winding phase W
4	W2	End of winding phase W
5	U2	End of winding phase U
6	V2	End of winding phase V

Star connection	Delta connection

6.4.2 Holding brake DC 205 V - connected via rectifier (optional)

Contact	Name	Meaning	AC-excited brake (rectifier)
~	BA1	Connection to L1 - mains	
~	BA2	Connection to N - mains	
+	BD1 (factory-set wiring)	Connection of holding brake +	
-	BD2 (factory-set wiring)	Connection of holding brake -	
⎓	Switching contact, DC switching		

6 Electrical installation

Terminal box
Holding brake DC 24 V (optional)

6.4.3 Holding brake DC 24 V (optional)

Contact	Name	Meaning
BD1	BD1	Holding brake +
BD2	BD2	Holding brake -

6.4.4 Fan

1-phase		
Contact	Name	Meaning
⊕	PE	PE conductor
U1	U1	Connection to L1 - mains
U2	U2	Connection to N - mains

3-phase		
Contact	Name	Meaning
⊕	PE	PE conductor
L1	U	Connection to L1 mains
L2	V	Connection to L2 mains
L3	W	Connection to L3 mains

6.4.5 Feedback system

Resolver		
Contact	Name	Meaning
B1	+ Ref	Transformer windings (reference windings)
B2	- Ref	
B3	+ VCC ENP	Supply: electronic nameplate ¹⁾
B4	+COS	Stator winding cosine
B5	-COS	
B6	+SIN	Stator winding sine
B7	-SIN	
B8	Not assigned	
R1	+ KTY	Thermal detector KTY
R2	- KTY	

1) Only for versions with electronic nameplate ENP.

Incremental encoder / sin/cos absolute value encoder with Hiperface		
Contact	Name	Meaning
B1	+ U _B	Supply + Mass
B2	GND	
B3	A	Track A / + COS
B4	$\bar{A}$	Track A inverse / - COS
B5	B	Track B / + SIN
B6	$\bar{B}$	Track B inverse / - SIN
B7	Z	Zero track / + RS485
B8	$\bar{Z}$	Zero track inverse / - RS485
B10	Shield	Encoder housing shield
R1	+ KTY	Thermal detector KTY
R2	- KTY	

Sin/cos absolute value encoder with EnDat interface		
Contact	Name	Meaning
B1	+ U _B	Supply + / + VCC ENP ¹⁾
B2	GND	Mass
B3	A	Track A
B4	$\bar{A}$	Track A inverse
B5	B	Track B
B6	$\bar{B}$	Track B inverse
B7	Data	Data EnDat interface
B8	$\overline{\text{Data}}$	Data inverse EnDat interface
B20	Cycle	Clock pulse EnDat interface
B21	$\overline{\text{Cycle}}$	Clock pulse inverse EnDat interface
B22	U _p sensor	U _p sensor
B23	0 V sensor	0 V sensor
B24	Shield	Encoder housing shield
B25	Not assigned	
R1	+ KTY	Thermal detector KTY
R2	- KTY	

1) Only for versions with electronic nameplate ENP.

Motor-encoder combinations

Drive systems with Servo Drives 9400 and safety module SM301 provide speed-dependent safety functions for safe speed monitoring and/or safe relative-position monitoring. Observe permissible motor-encoder combinations during configuration.

- Possible speed-dependent safety functions with safety module SM301:
 - Safe stop 1 (SS1)
 - Safe operational stop (SOS)
 - Safely limited speed (SLS)
 - Safe maximum speed (SMS)
 - Safe direction (SDI)
 - Safe speed monitor (SSM)
 - Safely limited increment (SLI)
- Permissible motor-encoder combinations for these functions:

Synchronous servo motors	Encoder		Safe speed monitoring with SM301	
	Type	Product key		
MCS 06 ... 19 MDXKS 56 / 71	Sin/cos absolute value, single-turn	AS1024-8V-K2	Single-encoder concept	PL d / SIL 2
	Sin/cos absolute value, multi-turn	AM1024-8V-K2		PL e / SIL 3
	Resolver	RV03	Two-encoder concept Up to PL e / SIL 3	

Asynchronous servo motors	Encoder		Safe speed monitoring with SM301	
	Type	Product key	Single-encoder concept	PL e / SIL 3
	MCA 10 ... 26 MQA 20 ... 26	Sin/cos incremental Resolver		IG1024-5V-V3 RV03
			Two-encoder concept	Up to PL e / SIL 3

A "two-encoder concept" includes e.g. a resolver as motor encoder and, at the same time, an absolute value encoder (sin/cos), an incremental encoder (TTL), or digital encoder (SSI/bus) as position encoder on the machine.

In the case of the "2-encoder concept", the achievable risk mitigation (PL/SIL) depends on the suitability of the encoders used.



Note!

If feedback systems for safety functions are used, the manufacturer's documentation must be observed!

8.1 Important notes

For trial run without output elements, lock the featherkey. Do not deactivate the protective devices, not even in a trial run.

Check the correct operation of the brake before commissioning motors with brakes.

8.2 Before switching on



Note!

Before switch-on, you must ensure that the motor starts with the intended direction of rotation.

Lenze motors rotate CW (looking at the driven shaft) if a clockwise three-phase field L1 → U1, L2 → V1, L3 → W1 is applied.

Before initial commissioning, before commissioning after an extended standstill period, or before commissioning after an overhaul of the motor, the following must be checked:

- Measure the insulation resistance, in case of values $\leq 1 \text{ k}\Omega$ per volt of rated voltage, dry the winding.
- Have all screwed connections of the mechanical and electrical parts been firmly tightened?
- Is the unrestricted supply and removal of cooling air ensured?
- Has the PE conductor been connected correctly?
- Have the protective devices against overheating (temperature sensor evaluation) been activated?
- Is the controller correctly parameterised for the motor?
(🔗 Controller operating instructions)
- Are the electrical connections o.k.?
- Does the motor connection have the correct phase sequence?
- Are rotating parts and surfaces which can become very hot protected against accidental contact?
- Is the contact of good electrical conductivity if a PE connection on the motor housing is used?

8 Commissioning and operation

Functional test

8.3 Functional test

- Check all functions of the drive after commissioning:
- Direction of rotation of the motor
 - Direction of rotation in the disengaged state (see chapter "Electrical connection").
- Torque behaviour and current consumption
- Function of the feedback system

8.4 During operation



Stop!

- Fire hazard! Do not clean or spray motors with flammable detergents or solvents.
- Avoid overheating! Deposits on the drives impede the heat dissipation required and have to be removed regularly.



Danger!

During operation, motor surfaces must not be touched. According to the operating status, the surface temperature for motors can be up to 140°C. For the protection against burn injuries, provide protection against contact, if necessary. Observe coolingoff times!

During operation, carry out inspections on a regular basis. Pay special attention to:

- Unusual noises
- Oil spots on drive end or leakages
- Irregular running
- Increased vibration
- Loose fixing elements
- Condition of electrical cables
- Speed variations
- Impeded heat dissipation
 - Deposits on the drive system and in the cooling channels
 - Pollution of the air filter

In case of irregularities or faults: 45.

9.1 Important notes



Danger!

Hazardous voltage on the power connections even when disconnected from mains: residual voltage >60 V!

Before working on the power connections, always disconnect the drive component from the mains and wait until the motor is at standstill. Verify safe isolation from supply!



Stop!

Repair work or replacement of defective safety encoders must only be carried out by Lenze service personnel!

Shaft sealing rings and roller bearings have a limited service life.

Regrease bearings with relubricating devices while the lowvoltage machine is running. Only use the grease recommended by the manufacturer.

If the grease drain holes are sealed with a plug, (IP54 drive end; IP23 drive and nondrive end), remove plug before commissioning. Seal bore holes with grease.

9.2 Maintenance intervals

Inspections

- If the machine is exposed to dirt, clean the air channels regularly.

9.2.1 Motor

- Only the bearings and shaft sealing rings become worn.
 - Check bearings for noise (after approx. 15,000 h at the latest).
- In order to prevent overheating, remove dirt deposits on the drives regularly.
- We recommend carrying out an inspection after the first 50 operating hours. In this way, you can detect and correct any irregularities or faults at an early stage.

9.2.2 Safety encoder

After a service life of 10 years, an inspection of the metal elastomer torque plate is required for the AS1024-8V-K, AS1024-8V-K2; AM1024-8V-K, and AM1024-8V-K2 encoders. If no replacement is required, an inspection interval of max. 5 years has to be observed.



Stop!

Repair work or replacement of defective safety encoders must only be carried out by Lenze service personnel!

9 Maintenance/repair

Maintenance operations Holding brake

9.2.3 Holding brake

The brakes need to be checked on a regular basis to ensure safe and trouble-free operation.

The necessary maintenance intervals primarily depend on the stress to which the brake is subjected in an application. When a maintenance interval is being calculated, all causes of wear must be taken into account (see notes "Wear on spring-applied brakes"). In the case of brakes which are subjected to low levels of stress, e.g. holding brakes with emergency stop function, regular inspections at a fixed time interval are recommended. In order to reduce the amount of work involved in maintenance, perform the inspection at the same time as other maintenance work carried out cyclically on the machine if possible.

If the brakes are not properly serviced, operating faults, production outages or damage to machinery can occur. A maintenance concept adapted to the operating conditions and the stresses to which the brakes are subjected must therefore be drawn up for every application. For brakes, the maintenance intervals and servicing work listed in the following table are necessary.

Maintenance interval for holding brake with emergency stop	Maintenance work
At least every 2 years	Inspection of the brake integrated in the motor: • Check ventilation function and activation/deactivation
After 1 million cycles at the latest	
Shorter intervals in the case of frequent emergency stops!	

The brakes of the MCA, MCM, MCS, MQA, and MD□KS motors cannot be accessed from the outside! (Maintenance work on the brakes must be carried out by Lenze Service staff only!)

9.3 Maintenance operations



Stop!

- Make sure that no foreign bodies can enter the inside of the motor!
- Do not remove plugs when voltage is being applied!



Danger!

- Only work on the drive system when it is in a deenergised state!
- Hot motor surfaces of up to 150 °C. Observe cooling times!
- Remove loads acting on motors or secure loads acting on the drive!

9.3.1 Blower

If the motor is equipped with a blower, this blower must be cleaned or even replaced at regular intervals depending on the amount of dust (if necessary, daily).

9.3.2 Fan with dust protection filter

For the motors, dry filters are used.



Note!

The dust protection filter is mounted to the fan unit. Depending on the amount of dust, the filter must be cleaned completely or replaced at regular intervals!

Polluted filters substantially reduce the amount of cooling air. This brings about higher winding temperatures, reduces the filters' service life and may cause damage to the filters.

When replacing the filters it **must** be ensured that all covers as well as the filter are fit tightly, therefore preventing the occurrence of leakages for a damaging ingress of dust!

In the case of **moist** dust, new filter mats must be mounted. At the latest when the filter is replaced for the first time it should be checked that the interior of the motor is clean.

9.3.3 Motors with bearing relubricating devices

Under normal operating conditions, the bearings used have a service life of approx. 20.000 operating hours. Ex works the bearings are filled with a high-quality, heat-resistant roller bearing grease. (The permissible operating temperature range of the grease used is between -25°C and +120°C).

Relubrication period, type of grease and amount of grease are stated on an additional indicating label on the motor.

Nachschmierung / Lubrication	
Herstellbezeichnung/ Manufacturer designation	A
Bezeichnung nach DIN51502/ Standard designation	B
Nachschmierfrist/ Lubrication period	C
Fettmenge/ Quantity of grease	D

A Manufacturer designation

B Designation of grease type according to DIN51502

C Relubrication period

D Amount of grease

9 Maintenance/repair

Maintenance operations
Motor plug connection assignment

9.3.4 Motor plug connection assignment

This motor-plug assignment is a rough selection of possible mechanical combinations.



Note!

When making your selection, the motor data and permissible currents of the cables according to the system cable system manual must be observed.



Further information is provided in the system cables system manual at:

www.Lenze.de → Download → Technical documentation →
Finding technical documentation

Filter: Type of contents

System manual

Filter: Product

System cable

Connector	Connectable cross-section of the motor cable
EWS0001 / EWS1001	1.0 mm ² , 1.5 mm ² , 2.5 mm ²
EWS0012 / EWS1012	2.5 mm ² , 4.0 mm ²
EWS0013 / EWS1013	6.0 mm ² , 10.0 mm ² , 16.0 mm ²

9.3.5 Power connection cable connectors

Asynchronous servo motors

Motor type	Plug size *	Screw plug		SpeedTec	
		Spare part designation	Coding in the system cable type code	Spare part designation	Coding in the system cable type code
MCA	10I40- ... S00	EWS0001	M01	EWS1001	M04
	13I34- ... Fx0				
	13I41- ... S00				
	14L16- ... Fx0				
	14L20- ... S00				
	14L35- ... Fx0				
	14L41- ... S00				
	17N17- ... Fx0				
	17N23- ... S00				
	17N35- ... Fx0				
	17N41- ... S00				
	19S17- ... Fx0	EWS0012	M02	EWS1012	M05
	19S23- ... S00				
	19S35- ... Fx0	EWS0012	M02	EWS1012	M05
		EWS0013	M03	EWS1013	M06
	19S42- ... S00	EWS0012	M02	EWS1012	M05
	20X14- ... Fx0	EWS0013	M03	EWS1013	M06
	20X29- ... Fxx	EWS0013	M03	EWS1013	M06
	21X17- ... Fx0	EWS0012	M02	EWS1012	M05
		EWS0013	M03	EWS1013	M06
	21X25- ... S00	EWS0012	M02	EWS1012	M05
	21X35- ... Fx0	EWS0013	M03	EWS1013	M06
	21X42- ... S00	EWS0012	M02	EWS1012	M05
		EWS0013	M03	EWS1013	M06
MQA	20				

Synchronous servo motors

Motor type	Plug size *	Screw plug		SpeedTec	
		Spare part designation	Coding in the system cable type code	Spare part designation	Coding in the system cable type code
MDSKS 056 - 071	M23	EWS0001	M01	EWS1001	M04
MCM, 06					
MCS 09					
12					
14D					
14H12- ... Fx0					
14H15- ... S00					
14H28- ... Fx0	M40	EWS0012 EWS0013	M02 M03	EWS1012 EWS1013	M05 M06
14H32- ... S00	M23	EWS0001	M01	EWS1001	M04
14L14- ... Fx0					
14L15- ... S00					
14L30- ... Fx0	M40	EWS0012 EWS0013	M02 M03	EWS1012 EWS1013	M05 M06
14L32- ... S00					
14P11- ... Fx0	M23	EWS0001	M01	EWS1001	M04
S43.14	M40	EWS0012 EWS0013	M02 M03	EWS1012 EWS1013	M05 M06
14P26- ... Fx0					
14P32- ... S00					
19F12- ... Fx0	M23	EWS0001	M01	EWS1001	M04
19F14- ... S00					
19F29- ... Fx0	M40	EWS0012 EWS0013	M02 M03	EWS1012 EWS1013	M05 M06
19F30- ... S00					
19J12- ... Fx0					
19J14- ... S00	M23	EWS0001	M01	EWS1001	M04
19J29- ... Fx0	M40	EWS0013	M03	EWS1013	M06
19J30- ... S00	M40	EWS0012 EWS0013	M02 M03	EWS1012 EWS1013	M05 M06
19P12- ... Fx0					
19P14- ... S00	M23	EWS0001	M01	EWS1001	M04
19P29- ... Fx0	M40	EWS0013	M03	EWS1013	M06
19P30- ... S00					

* At times, older documents also stated plug sizes of 1.0 (M23) and 1.5 (M40).

9.3.6 Cable connectors

Feedback

Type of encoder	Plug size *	Screw plug		SpeedTec	
		Spare part designation	Coding in the system cable type code	Spare part designation	Coding in the system cable type code
Resolver	M23	EWS0006	F01	EWS1006	F05
Incremental encoder		EWS0010	F02	EWS1010	F06
Sin/cos encoder, Hiperface		EWS0010	F02	EWS1010	F06
Sin/cos encoder, EnDat		EWS0017	F03	EWS1017	F07
Incremental encoder, Renco R35		EWS0023	F04	EWS1023	F08

9 Maintenance/repair

Repair

Blower

Blower	Plug size *	Screw plug		SpeedTec	
		Spare part designation	Coding in the system cable type code	Spare part designation	Coding in the system cable type code
MDFKS	M23	EWS0003	L01	EWS1003	L03
MCS, MCA, MQA	M17	EWS0021	L02	EWS1021	L04

9.4 Repair

- We recommend having all repairs carried out by the Lenze customer service.
- In case of version with safety encoder, observe chapter 9.2.2!

If faults occur during operation of the drive system:

- First check the possible causes of malfunction according to the following table.



Note!

Also observe the corresponding chapters in the operating instructions for the other components of the drive system.

If the fault cannot be remedied using one of the listed measures, please contact the Lenze Service.



Danger!

- Only work on the drive system when it is in a deenergised state!
- Hot motor surfaces of up to 150 °C. Observe cooling times!
- Remove loads acting on motors or secure loads acting on the drive!

Fault	Cause	Remedy
Motor too hot Can only be evaluated by measuring the surface temperature: • Non-ventilated motors > 140 °C • Externally ventilated or self-ventilated motors > 110 °C	Insufficient cooling air, blocked air ducts.	Ensure unimpeded circulation of cooling air
	Preheated cooling air	Ensure a sufficient supply of fresh cooling air
	Overload, with normal mains voltage the current is too high and the speed too low	Use larger drive (determined by power measurement)
	Rated operating mode exceeded (S1 to S8 IEC/EN 60034-1)	Adjust rated operating mode to the specified operating conditions. Determination of correct drive by expert or Lenze customer service
	Loose contact in supply cable (temporary single-phase operation!)	Tighten loose contact
	Fuse has blown (single-phasing!)	Replace fuse
	Overload of the drive	Check load and, if necessary, reduce by means of longer ramp-up times Check winding temperature
Motor suddenly stops and does not restart	Heat dissipation impeded by deposits	Clean surface and cooling fins of the drives
	Overload monitoring of the inverter is activated	Check controller settings Reduce load caused by longer acceleration times
Incorrect direction of rotation of the motor, correct display on the controller	Motor cable polarity is reversed	Check the polarity and correct
	Polarity of encoder cable reversed	
Motor rotates normally but does not reach the expected torque	Motor cable interchanged cyclically Not all motor phases connected	Connect the phases at the motor cable connection correctly
Motor turns in one direction at maximum speed in an uncontrolled manner	Motor cable interchanged cyclically	Check motor connector and, if necessary, correct
	Polarity of encoder cable reversed	Check encoder connection and, if necessary, correct
Motor rotates slowly in one direction and cannot be influenced by the controller	Polarity of motor cable and encoder cable reversed	Check the polarity and correct
Irregular running	Insufficient shielding of motor or resolver cable	Checking shielding and earth connection
	Drive controller gain too large	Adjust the gains of the controllers (see Drive controller operating instructions)
Vibrations	Insufficiently balanced coupling elements or machine	Rebalance
	Inadequate alignment of drive train	Realign machine unit, check foundation if necessary
	Loose fixing screws	Check and tighten screw connections
Running noises	Foreign particles inside the motor	Repair by manufacturer if necessary
	Bearing damage	
Surface temperature > 140°C	Overload of the drive	Check load and, if necessary, reduce by means of longer ramp-up times Check winding temperature
	Heat dissipation impeded by deposits	Clean surface and cooling fins of the drives



Notes





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