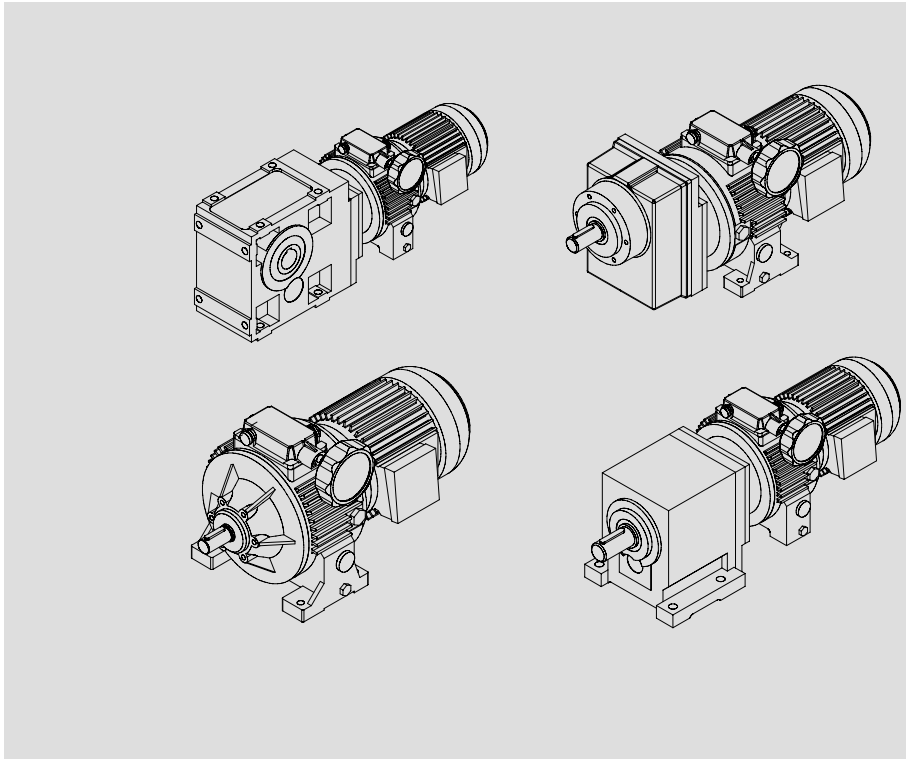
BA 11.5032-EN
13282748

Operating Instructions

Gearbox

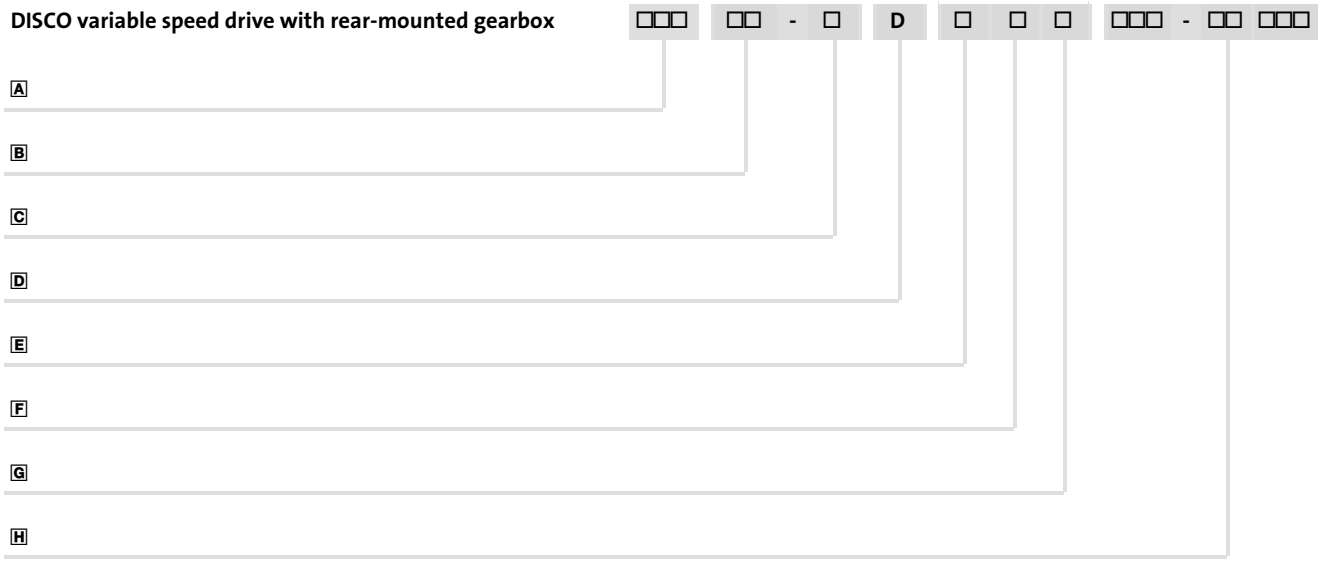


DISCO-Variable speed drive

Lenze

Product key

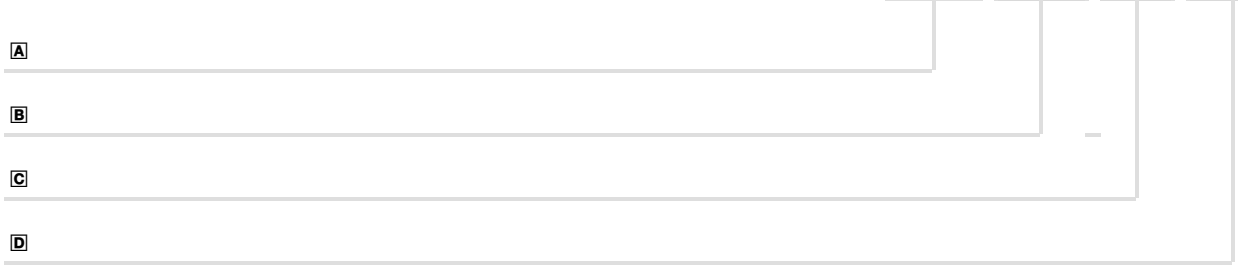
DISCO variable speed drive with rear-mounted gearbox □□□ □□ - □ D □ □ □ □□□ - □□ □□□



Lengend for the product key			
A	Gearbox type	GST GKS GSS	Helical gearbox Helical-bevel gearbox Helical-worm gearbox
B	Gearbox size		
C	Number of stages		
D	Disco variable speed drive		
E	Output design	V H S	Solid shaft Hollow shaft Hollow shaft with shrink disk
F		A B C	Foot mounting, with centring Foot mountin, without centring Without foot, with centring
G		R K I	Without flange With flange (through holes) With flange (threaded holes)
H	Drive size	Motor frame size motor design DISCO size	

DISCO variable speed drive without rear-mounted gearbox

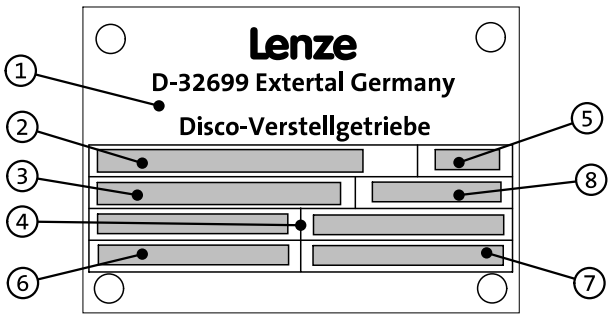
11.	7 ☐ 0	☐ ☐	0 0. ☐



Lengend for the product key			
A	Product group		
B	Product family	1 0	with motor with free drive shaft
C	DISCO size		
D	Free output shaft	1 no data	without motor Standard

Nameplate

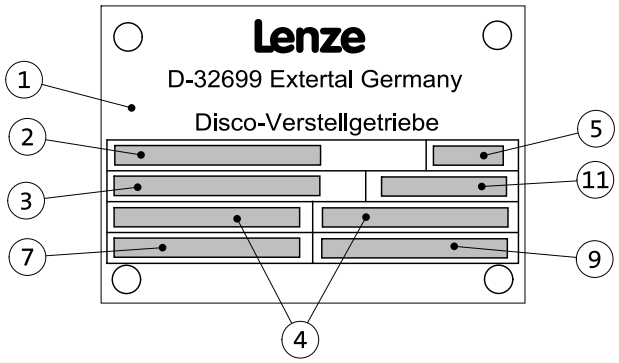
DISCO variable speed drive without rear-mounted gearbox



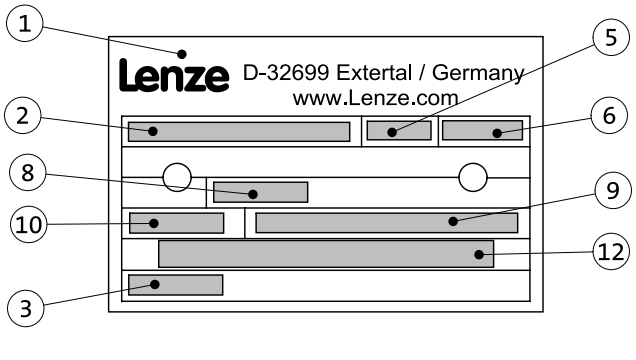
Pos.	Contents
1	Production location / Name of product
2	Gearbox type
3	Order number
4	Rated speed:drive | output
5	Year of manufacture/ week of manufacture
6	Rated torque
7	Material number
8	Power

DISCO variable speed drive with rear-mounted gearbox

DISCO nameplate



Nameplate of rear-mounted gearbox



Pos.	Contents
1	Production location / Name of product
2	Gearbox type
3	Order number
4	Rated speed:drive | output
5	Year of manufacture/ week of manufacture
6	Mounting position / position of the system modules
7	Rated torque
8	Lubricant
9	Material number / serial number
10	Ratio
11	Power
12	Bar code

Document history

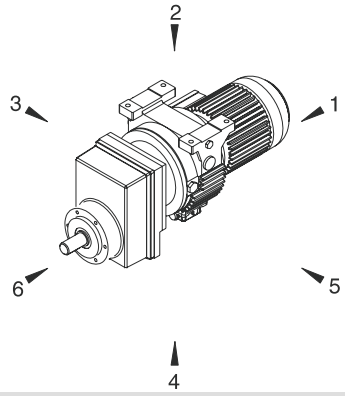
Material number	Version			Description
410700	1.0	09/1999	TD09	Completely revised
483298	1.1	12/2003	TD09	Revised description of the mounting position and position of the system blocks
13251318	2.0	10/2007	TD09	New nameplate: Compact unit and DISCO version Table of oil grades and new representation of the positions of ventilation, oil filler plug and oil drain plug
13282748	3.0	12/2008	TD09	New edition due to reorganisation of the company

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

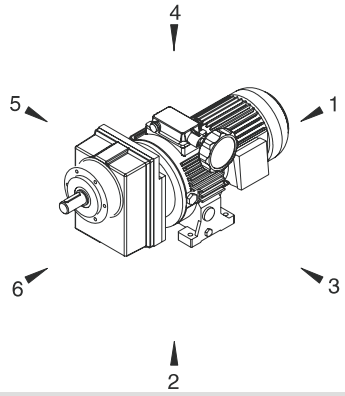
DISCO variable speed drive with helical gearbox

GST□□ - 1D VDR (foot on variable speed drive)

Terminal box: 2, 3, 4, 5 Spindle housing: 2, 3, 4, 5 Handwheel/adjusting device: 2, 3, 4, 5



A



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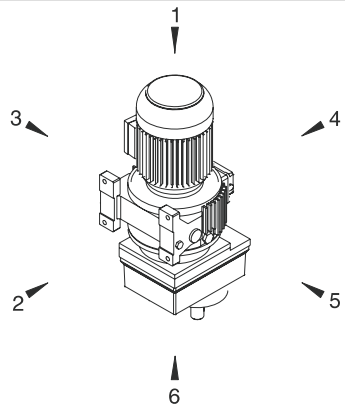

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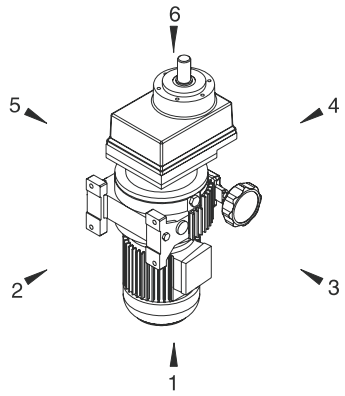
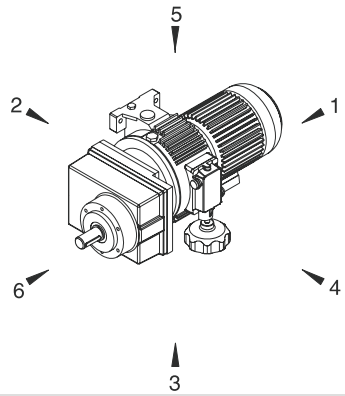
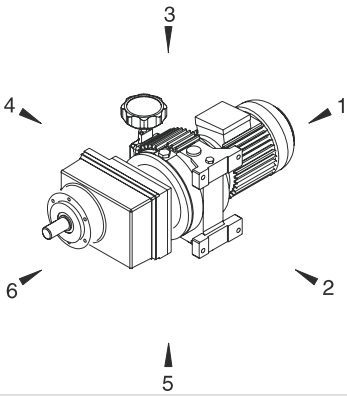


D



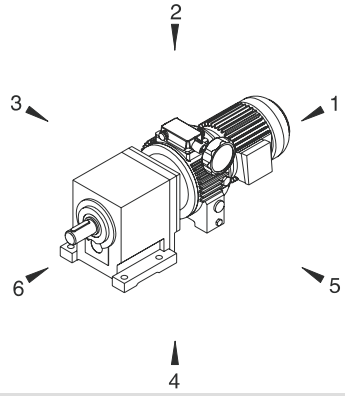
E



F

GST□□ - □D

Terminal box: 2, 3, 4, 5 Spindle housing: 2, 3, 4, 5 Handwheel/adjusting device: 2, 3, 4, 5



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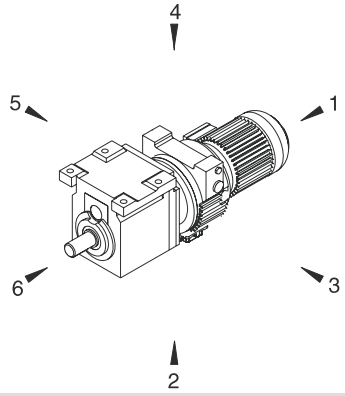

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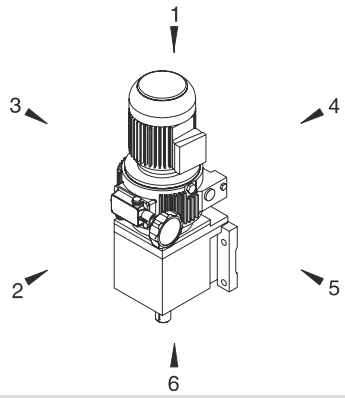

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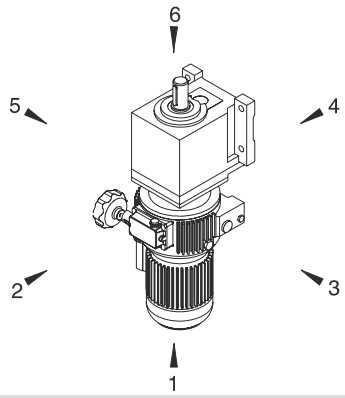

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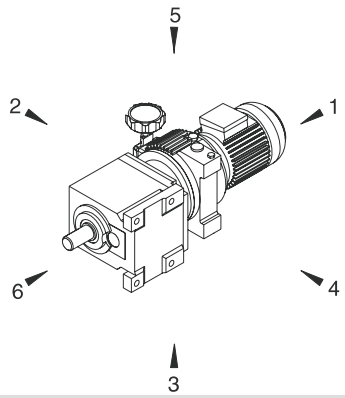

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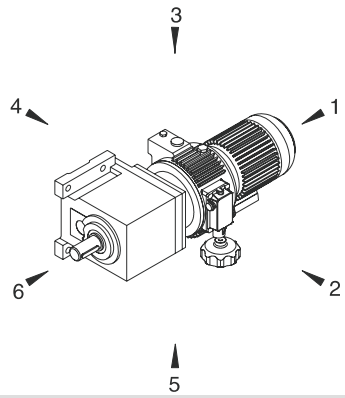
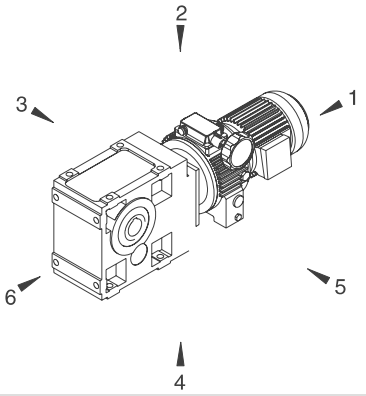


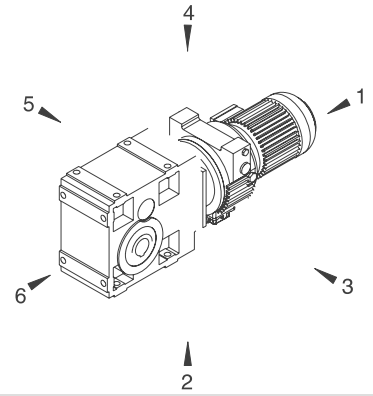
F

DISCO variable speed drive with helical-bevel gearbox and helical-worm gearbox

GKS□□ - □D / GSS□□ - □D		
Solid shaft: 2, 3, 8 (3+5)	**Hollow shaft: 0**	**Hollow shaft with shrink disc: 3, 5**
Flange: 2, 3, 8 (3+5)	**Without flange: 0**	
Terminal box: 2, 3, 4, 5	**Spindle housing: 2, 3, 4, 5**	**Handwheel/adjusting device: 2, 3, 4, 5**



A



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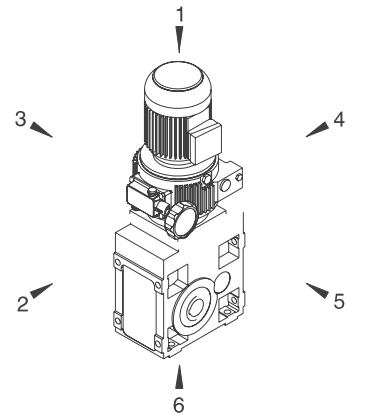

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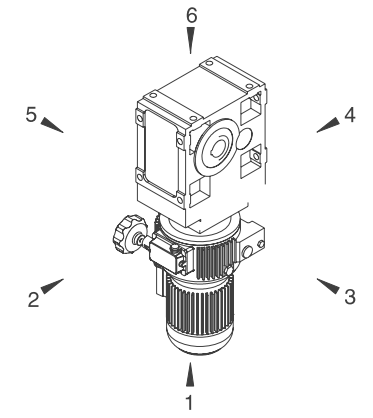

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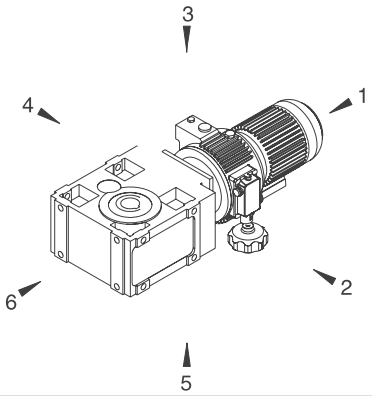

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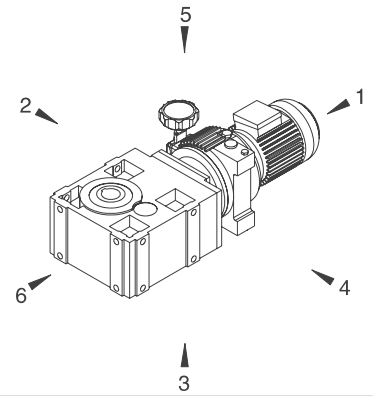

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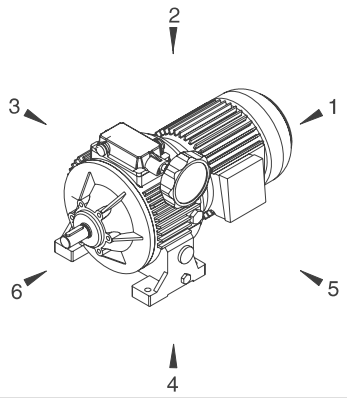
DISCO variable speed drive without rear-mounted gearbox

11.7□0

Terminal box: 2, 3, 4, 5 Handwheel/adjusting device: 2, 3, 4, 5



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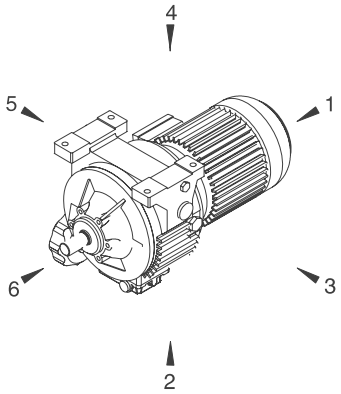

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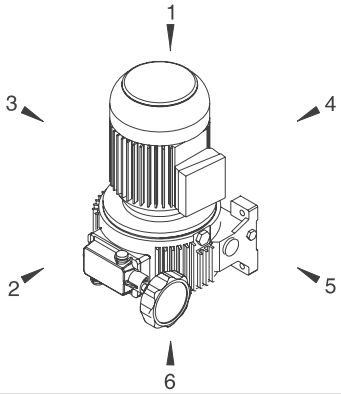

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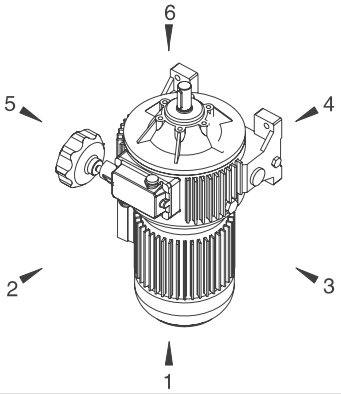

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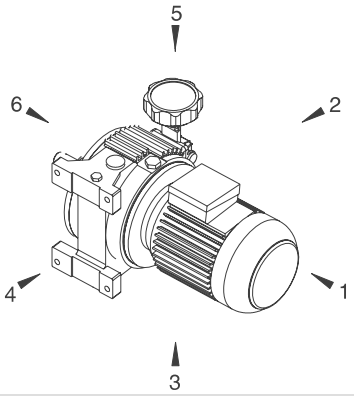
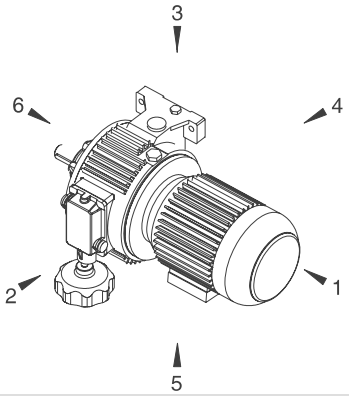


E



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1 Preface and general information

1.1 About these Operating Instructions

- These Operating Instructions provide information about safety-relevant work on and with DISCO variable speed drives. They contain safety instructions which must be observed.
- All personnel working on and with DISCO variable speed drives must have these Operating Instructions available and observe the information and notes relevant for them.
- The Operating Instructions must always be in a complete and perfectly readable state.

1.2 Terminology used

Term	In the following text used for
DISCO	Disco variable speed drive
Drive system	Drive systems with DISCO variable speed drives and other drive components

1.3 Scope of supply

- The drive systems are combined individually according to a modular design. The scope of supply can be obtained from the pertinent papers.
- After receipt of the supply, check immediately whether it corresponds with the accompanying papers. Lenze does not grant any warranty for subsequent claims. Claim for
  - visible transport damages immediately to the forwarder.
  - visible deficiencies / incompleteness immediately to the responsible Lenze subsidiary / agency.

1.4 Lenze drive systems

1.4.1 Labelling

Lenze drive systems are uniquely designated by the content of their nameplates.

Manufacturer
Lenze Drives GmbH
Postfach 10 13 52
D-31763 Hameln

Application as directed

- Lenze drive systems
  - are intended for use in machinery and plant,
  - must only be used for the purposes ordered and confirmed,
  - must only be operated under the ambient conditions prescribed in these Operating Instructions,
  - must not be operated beyond their corresponding power limits.

Any other use shall be deemed inappropriate!

1.5 Legal regulations

Liability

- The information, data, and notes in the Operating Instructions were state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations, and descriptions.
- We do not accept any liability for damage and operating interference caused by:
  - inappropriate use,
  - unauthorised modifications to the drive system,
  - improper working on and with the drive system,
  - operating faults,
  - disregarding the Operating Instructions.

Warranty

- Conditions of warranty: see terms of sale and delivery of Lenze Drive Systems GmbH.
- Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.
- The warranty is void where liability claims cannot be made.

2 Safety instructions

2.1 Personnel responsible for safety

Operator

- An operator is any natural or legal person who uses the drive system or on behalf of whom the drive system is used.
- The operator or his safety officer must ensure
  - that all relevant regulations, instructions and legislation are observed.
  - that only qualified personnel work with and on the drive system.
  - that the personnel have the Operating Instructions available for all corresponding operations.
  - that non-qualified personnel are prohibited from working with and on the drive system.

Skilled personnel

Skilled personnel are persons who - because of their education, experience, instructions, and knowledge about corresponding standards and regulations, rules for the prevention of accidents, and operating conditions - are authorised by the person responsible for the safety of the plant to perform the required actions and who are able to recognise potential hazards.
(See IEC 364, definition of skilled personnel)

2.2 General safety information

- This safety information does not claimed to be complete. In case of questions and problems, please contact your Lenze representative.
- At the time of delivery the drive system meets the state of the art and ensures safe basic operation.
- The drive system is a source of danger for persons, for the drive system itself, and for other material assets of the operator, if
  - unqualified personnel works with and on the drive system,
  - the drive system is used inappropriately.
- The drive systems must be designed such that they perform their functions after proper installation and with application as directed in fault-free operation and that they do not cause hazards for persons. This also applies for their interaction with the complete plant.
- Be sure to take appropriate measures in the case of drive system failure so that no material damage occurs.
- Operate the drive system only when it is in a proper state.
- Retrofittings, modifications, or redesigns of the drive system are basically prohibited. Lenze must be contacted in all cases.

2.3 Definition of notes used

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

Safety instructions

Structure of 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 troublefree operation
 **Tip!**	Useful tip for simple handling
	Reference to another documentation

3 Technical data

- The most important technical data are provided on the nameplate (layout and contents 📖 page 4).
- The product catalogues contain further technical data.

3.1 Product features

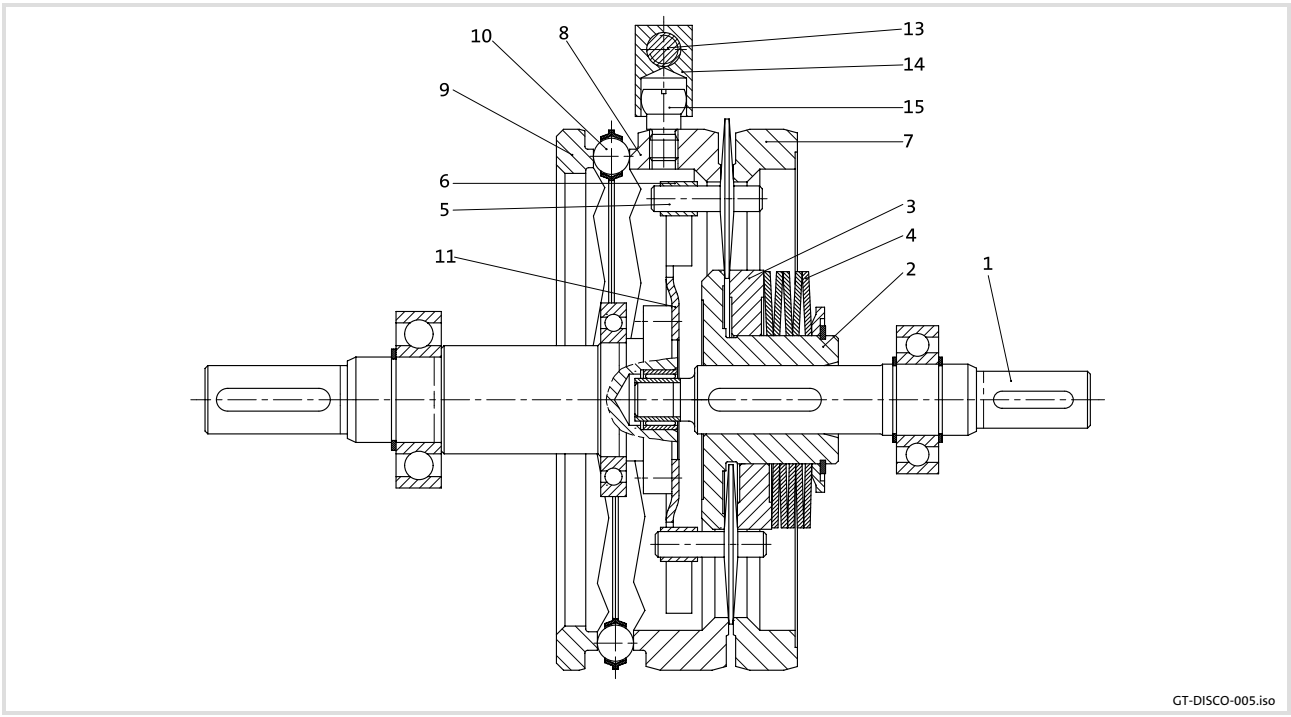


Fig. 1 Layout of the DISCO variable speed drive

1	Pinion shaft	8	Clutch thrust collar
2	Left inner sun	9	Clutch collar
3	Right inner sun	10	Ball retainer ring
4	Disk spring	11	Pinion cage
5	Planet	13	Spindle
6	Slide block	14	Guide part
7	Thrust collar	15	Ball headed pin

The DISCO variable speed drive is a planetary gearbox, where all the functional parts run in an oil bath. The planets, located in the pinion cage, rotate around the driving inner sun. The speed and the force flow are transmitted from the drive shaft to the inner sun. The flat, double-coned planets are driven by the inner sun, simultaneously rolling along the outer rings which are fixed in the housing. So the planets don't only rotate about their own axes but also about the inner sun. They thus move the pinion cage with them, which has a fixed connection with the output shaft.

The speed setting is altered by means of an adjustment spindle through rotating one of the three outer rings on the housing. This moves the planets to a different radius of rotation, depending on the size of the air gap between the outer rings. In this way, steplessly adjustable output speeds are achieved. Supplementary gearboxes, in the form of single or

multi-stage helical, conical or worm gearboxes, can be used to adjust output speed to the requirements of the application.

Stop!

The DISCO must only be changed to a **faster**speed while it is **running**!
Otherwise, the DISCO could be damaged!
Changing to a **slower**speed is allowed while the DISCO is **standing still**.

3.2 Transport weights

DISCO with GST helical gearbox

Gearbox size	Drive size							
	071-1☐ 02	071-3☐ 03	080-3☐ 04	090-3☐ 05	100-32 06	112-22 07	132-12 18	132-22 08
GST 04	< 18							
GST 05	< 25	< 32	< 43					
GST 06	< 36	< 40	< 51	< 67				
GST 07	< 56	< 64	< 75	< 83	< 120	< 130		
GST 09		< 99	< 110	< 127	< 150	< 161	< 223	< 230
GST 11			< 168	< 185	< 221	< 232	< 272	< 279
GST 14				< 296	< 333	< 343	< 406	< 413

DISCO with GKS helical-bevel gearbox

Gearbox size	Drive size							
	071-1☐ 02	071-3☐ 03	080-3☐ 04	090-3☐ 05	100-32 06	112-22 07	132-12 18	132-22 08
GKS 04	< 28							
GKS 05	< 41	< 49	< 59					
GKS 06	< 64	< 69	< 79	< 96				
GKS 07	< 104	< 113	< 123	< 131	< 168	< 178		
GKS 09		< 191	< 202	< 218	< 242	< 252	< 315	< 322
GKS 11			< 329	< 346	< 382	< 392	< 433	< 440
GKS 14				< 574	< 607	< 621	< 684	< 709

DISCO with GSS helical-worm gearbox

Gearbox size	Drive size					
	071-1☐ 02	071-3☐ 03	080-3☐ 04	090-3☐ 05	100-32 06	112-22 07
GSS 04	< 28					
GSS 05	< 41	< 48	< 59			
GSS 06	< 62	< 56	< 77	< 94		
GSS 07	< 101	< 109	< 120	< 128	< 165	< 175

DISCO type 11.700 / 11.710

DISCO size	Type 11.700 with motor size											Type 11.700
	071-1☐	071-3☐	080-1☐	080-3☐	090-1☐	090-3☐	100-1☐	100-3☐	112-22	132-12	132-22	
02	< 10											< 5
03		< 19										< 13
04			< 27	< 28								< 21
05					< 42	< 45						< 35
06							< 74	< 78				< 58
07									< 89			< 58
09										< 151		< 88
11											< 158	< 85

Weight in [kg] with oil filling, for mounting position A, all values are aproximate

3.3 Operating conditions

3.3.1 Temperatures

- DISCO: permissible ambient temperature -15 bis +40°C
- Rear-mounted gearbox (see Operating Instructions for the gearbox)
- Motor (see temperature class for the motor)

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

3.3.2 Ambient conditions

- DISCO variable speed drives are dust and hose-proof.
- Motors corresponding to their degree of protection (s. nameplate and/or operating instructions of the motor).
- Ambient media - especially chemically aggressive - can damage shaft sealing rings and lacquers (plastics in general). Abrasive media may damage the shaft sealing rings.

4 Mechanical installation

Danger!

Only transport the drive with transport equipment or hoists which are suitable for this load (see transport weights, chapter 3.2). 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!

4.1 Storage

If you do not install the DISCO at once, please ensure proper storage conditions.

- Up to one year:
  - Without special measures in dry, dust-free enclosed rooms without direct sunlight.
  - Store DISCO with ventilation in a manner that the breather screw is at the top.
  - Shafts and bright surfaces are delivered with protection against corrosion.
- Over one year:
  - Please consult the factory.

4.2 Installation

Mount the drive systems on an even surface, free from distortion. If they are mounted on a baseplate, then the baseplate must also be mounted without distortion. If this is not done, then stresses appear in the gearbox housing and have a bad effect on the parallel alignment of the shafts and thus on the bearing and tooth alignment.

The output shaft of the drive system must be well aligned with the machine shaft that is to be driven. Small inaccuracies can be compensated by using a flexible coupling.

Couplings, gear wheels, sprockets etc. must only be fixed by screwing to the shaft ends of the drive system. Driving them on can damage the ball bearings.

5 Electrical installation

Danger!
Electrical connections must only be carried out by skilled personnel!

Danger!
Always earth the drive!
If it is not possible to earth it via attached items (e.g. the motor) then the gearbox must be earthed!

5.1 Connection of main motor

To connect the motor correctly, you must follow:

- 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.

5.2 Electrical adjusting device

Stop!
The DISCO must only be changed to a **faster**speed while it is **running**!
Otherwise, the DISCO could be damaged!
Changing to a **slower**speed is allowed while the DISCO is **standing still**.

1. Connect the electrical adjustment device as shown in the circuit diagram (Fig. 2). Ensure the right polarity of the adjustment motor!
2. It is vital to carry out a functional check in order to avoid damages to the DISCO.
   – Check the positions of the adjustment motor and the limit-switch box, see page 6 “Position of system blocks”.

5.2.1 Operational check

Adjustment motor in position 5 / limit-switch box in position 3

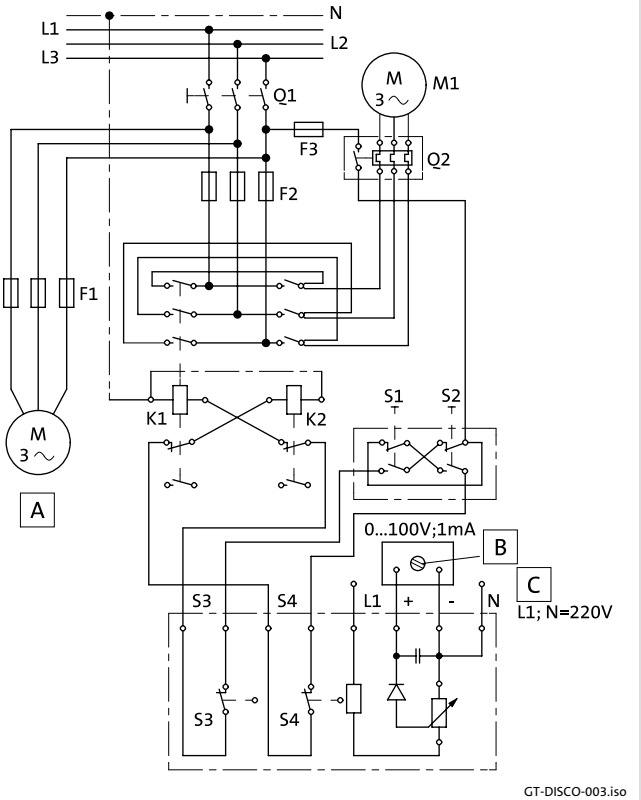
1. Switch on the DISCO.
2. Increase the speed: **counter-clockwise rotation** of the actuator in the limit-switch housing.
3. While the speed is increased activate the limit-switch **S4** with an insulated screwdriver.

4. The adjustment motor and actuator must stop.
5. If the actuator and adjustment motor do not stop, reverse the polarity of the adjustment motor.

Adjustment motor in position 3 / limit-switch box in position 5

1. Switch on the DISCO.
2. Increase the speed: **clockwise rotation** of the actuator in the limit-switch housing.
3. While the speed is increased, activate the limit-switch **S3** with an insulated screwdriver.
4. The adjustment motor and actuator must stop.
5. If the actuator and adjustment motor do not stop, reverse the polarity of the adjustment motor.

Adjustment motor in position 5 / limit-switch in position 3



Adjustment motor in position 3 / limit-switch in position 5

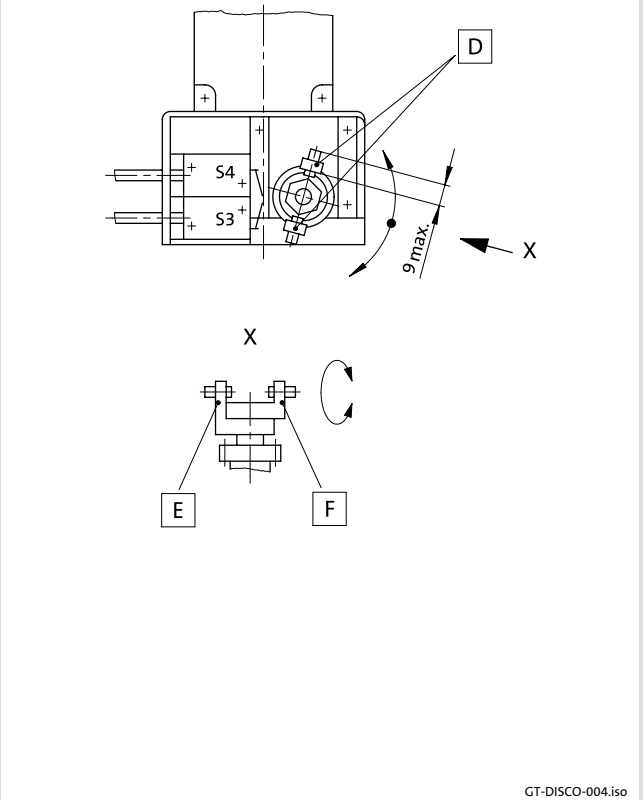


Fig. 2 Circuit plan of the servo adjustment mechanism with potentiometer indicator

- A Driving motor
- B Adjustable
- C Auxiliary supply L1, N=230 V~
- D Actuator (the long lever activates S3)
- E Long lever
- F Short lever

A1	Indicator 0...100V =/ 1000 Ω/V (option)	Q1	Main switch*
F1, F2, F3	Fuses*	Q2	Motor protection switch*
K1, K2	Reversing contactors*	S1, S2	Pushbutton switches*
M1	Adjustment motor	S3, S4	Limit switches

* not included in the scope of supply

6 Commissioning and operation

Stop!
Commissioning of the drive only by qualified staff!

6.1 Before switching on

Check:

- Is the mechanical fixing o.k.?
- Are the electrical connections o.k.?
- Are all rotating parts and surfaces that may become hot protected against contact?
- For gearboxes with breathing:
  – Is the plug removed from the breather screw?

Note!
Rear-mounted gearboxes must have separate ventilation, 🕮 Operating Instruction of the gearbox!

6.2 During operation

Stop!
During running-in, raised temperatures may occur over a period of 2 - 8 hours.

- During operation, check the drive periodically and take special care of:
  – unusual noises or temperatures,
  – leakages,
  – loose fixing elements,
  – the condition of the electrical cables.
- If any interference should occur, proceed according to the troubleshooting list in chapter 8. If the interference cannot be eliminated, please contact the Lenze Service.

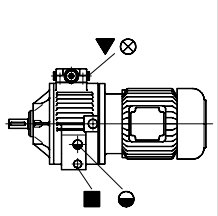
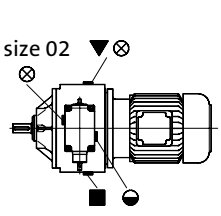
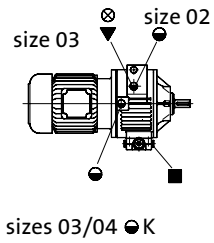
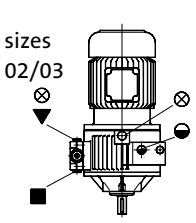
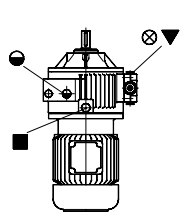
7 Maintenance

The DISCO drives are supplied with oil filling.

Note!

- ► Lubricating instructions for rear-mounted gearboxes, see Operating Instructions of the gearbox.
- ► We recommend to check the oil level regularly!
- ► If you use an oil not listed in Tab. 2, we recommend lubricants with the following technical values:
  - – Viscosity: 32mm²/s ±10% at 40°C
  - – Flash point: ~ 210°C
  - – Pourpoint: ~ -30°C
  - – FZG test A8.3/90: damage force stage ≥10
  - – Air release property: 5min. at 50°C
  - – Foam volume after air inlet at 25/95/25°C: 230/10/290 ml

7.1 Oil filling quantities for DISCO gearboxes

DISCO size	Mounting positions				
	horizontal			vertical	
	Spindle housing			Output shaft	
	above	side	below	below	above
					
			sizes 03/04 ◒K		
					GT-DISCO-008.iso
02	0,4	0,3	0,4	0,4	0,4
03	0,4	0,5	0,8	0,6	0,6
04	0,5	0,5	1,0	1,0	1,0
05	0,7	1,0	2,0	2,0	1,5
06/07	1,5	2,0	3,0	3,5	2,5
08	2,5	4,0	3,5	6,0	5,0
09	3,0	6,0	4,5	9,5	7,0
10/11	6,0	10,0	4,5	14,0	11,0

Tab. 1 Oil quantities - guide values

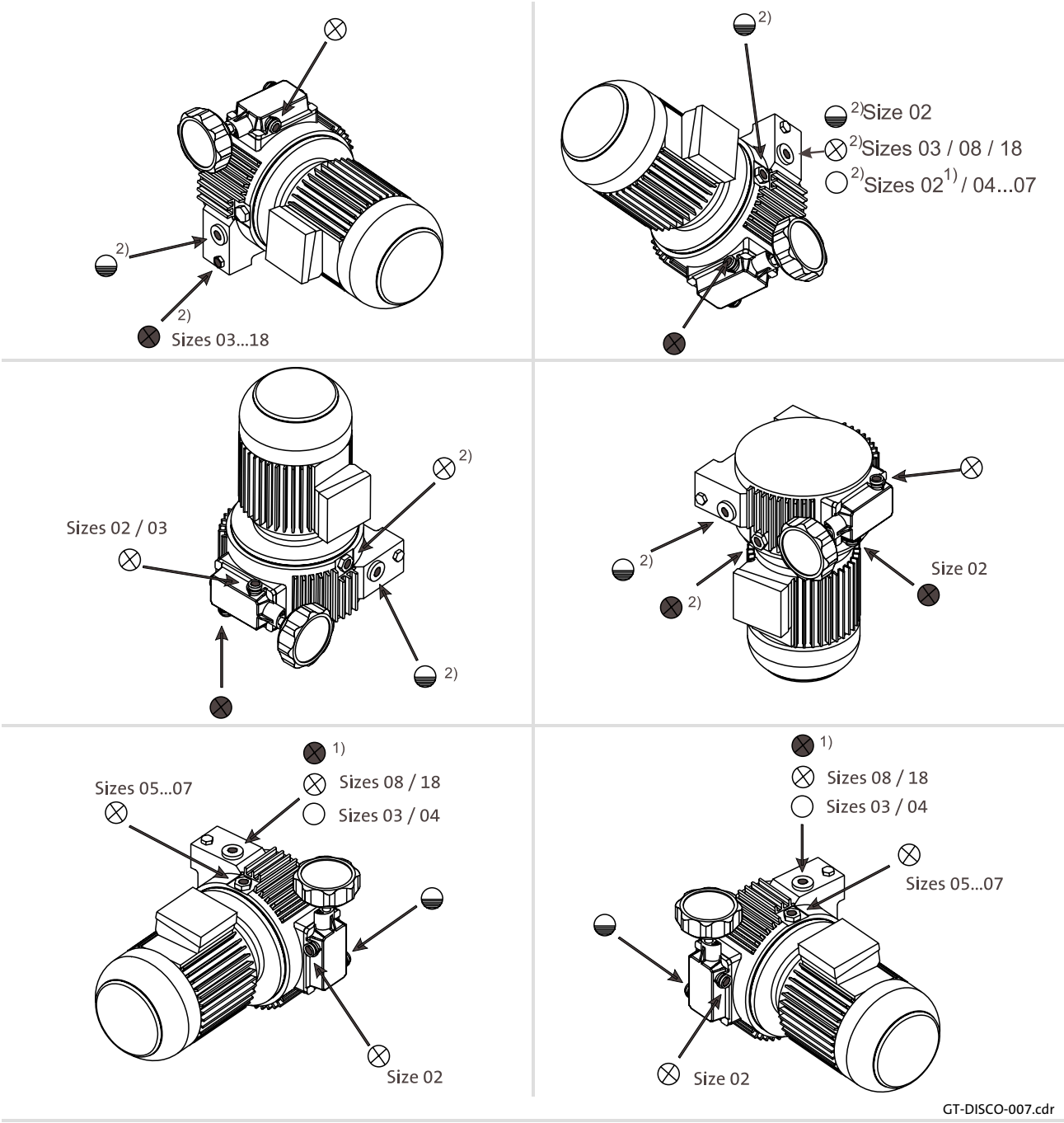
◒ Oil sight glass
◒K Oil control plug
▼ Oil filler plug
■ Oil drain plug
⊗ Ventilation

7.1.1 Oil grades for DISCO variable speed drives

Manufacturer	Oil types
Lenze	DISCO lifetime oil
Shell	Shell Tegula V 32 Astron HLP 32 / Pentran 32
KLÜBER LUBRICATION	LAMORA HLP 32
FUCHS	RENOLIN MR 10 VG 32 / RENOFLUID TF 1500
ARAL	Degol GB 32
Eni GROUP	OSO 32 / BLASIA 32
bp	Energol HL-XP 32 / Energol HLP-HM 32
Castrol	Hyspin AWS 32 / Hyspin SP 32
Esso	TORQUE FLUID N 45
SRS	Wiolan HF 32
TEXACO	Rando Oil HD A-32

Tab. 2 Recommended oil grades for DISCO variable speed drives

7.1.2 Breather position, oil filling screw and drain plug



○	Oil filling for gearboxes without ventilation	⊗	Ventilation / oil filler plug
●	Oil drain plug	◒	Oil control plug

1) Facing the housing

2) In case of a position of the handle different from the shown one, the positions are facing the housing respectively

7.2 Maintenance intervals

- The mechanical power transmission system is maintenance-free.
- No oil change when DISCO lifetime oil is used.
  If other oils are used, an oil change is necessary after every 2000 hours of operation.
- Shaft seal rings:
  – The operating life depends on the conditions of use.
  – Replace leaking shaft seals to prevent further damage.

Stop!

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

7.3 Maintenance operations

7.3.1 Replacing the lubricant

- DISCO should be warm.
- Secure the drive system and machinery against unintended movement or mains power-up.

Stop!

Rear-mounted gearboxes have separate lubrication; see the Operating Instructions for gearboxes!

1. Drain lubricant through the outlet (📖 Abb. in Tab. 1).
2. Insert oil drain plug with new seal.
3. Fill in lubricant through the inlet.
4. Fit the oil filler plug.
5. Dispose of the used oil according to current regulations.

7.3.2 Spare parts list

You find the spare parts list in the10appendix

7.4 Repair

Lenze recommends that repairs are carried out by the Lenze Service.

8 Troubleshooting and fault elimination

Fault	Possible cause	Remedy
Drive does not start	Voltage supply interrupted	Check connection
	Faulty electrical connection	Check that supply voltage matches nameplate data
	Excessive load	Reduce load Check drive-machine assignment
Motor runs, gearbox does not	Coupling components are missing or defective	Check mounting
	Gearbox is defective	Inform Lenze Service
Unusual running noise	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

9 Disposal

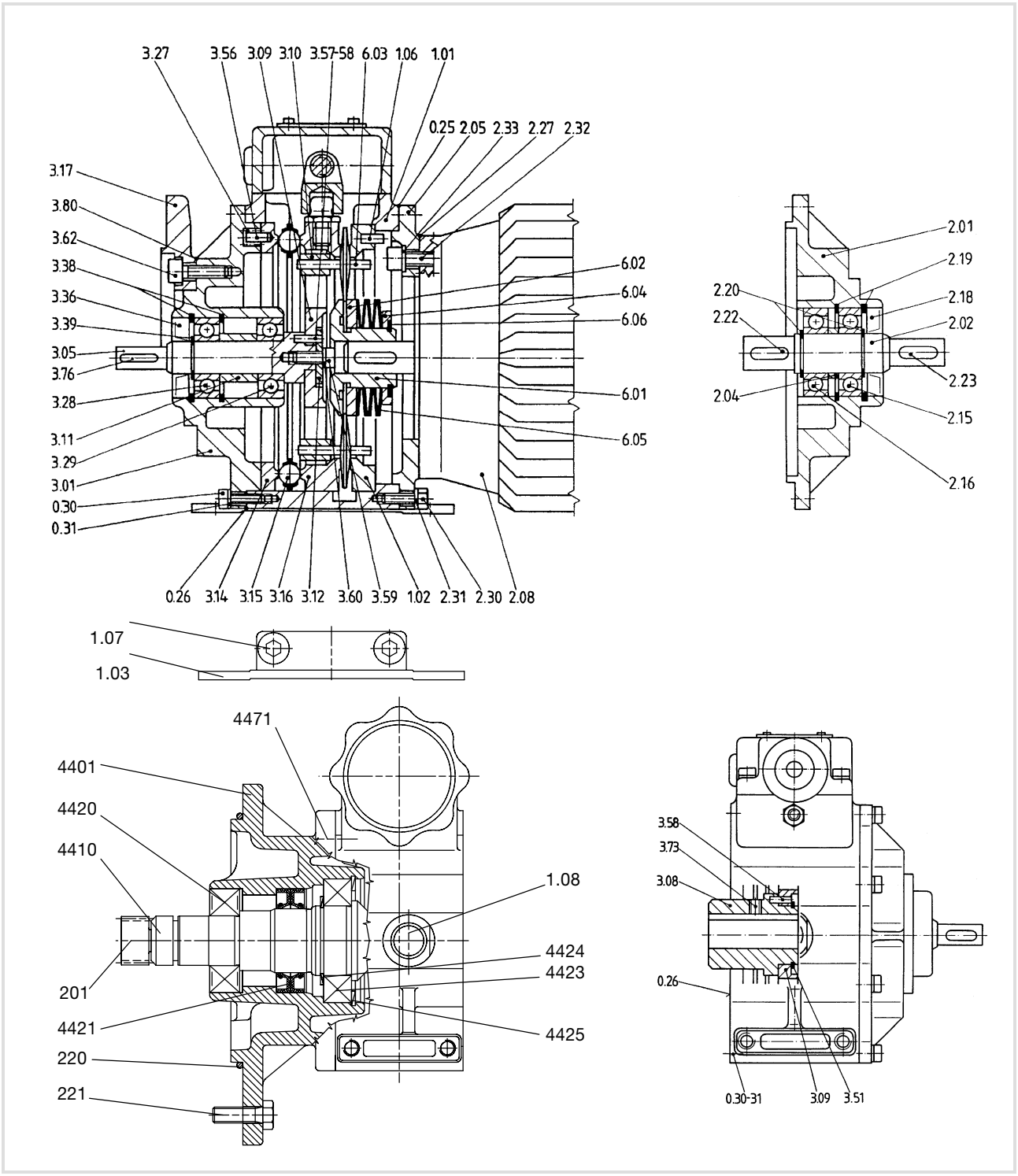
Protect the environment! Valuable materials can be recycled.

What?			Where?
Transport material	Pallets		Return to the manufacturer or forwarder
	Packaging material		Cardboard box to waste paper Plastics to plastics recycling or residual waste Reuse or dispose of wood wool
Lubricants	Oil, grease		Dispose according to current regulations
Components	Housing: Bearings, shafts, gear wheels: Seals:	Cast iron Steel Hazardous waste	Separate different types of material and dispose

10 Appendix

10.1 Spare-parts list

10.1.1 DISCO variable speed drive size 02

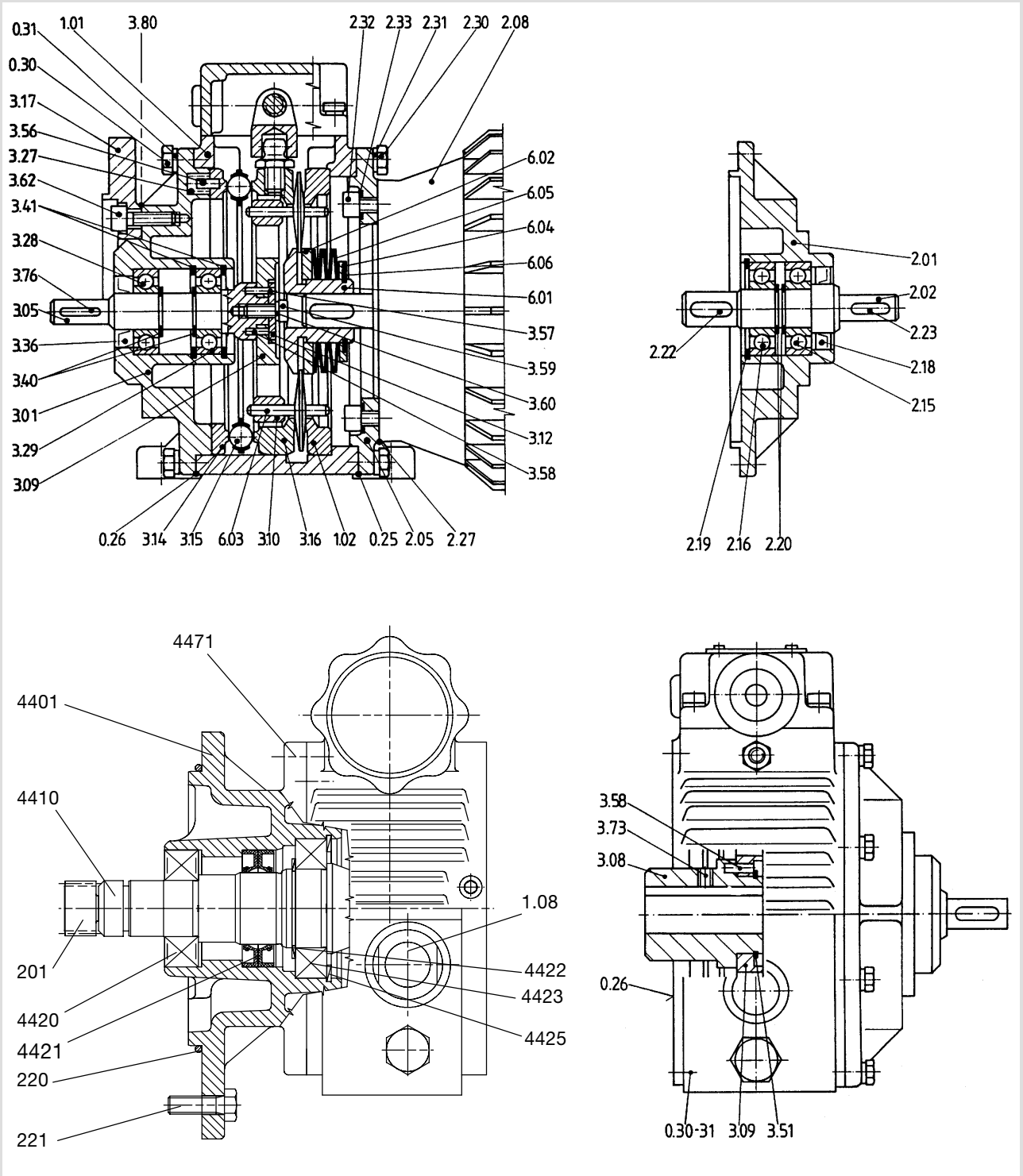


Pos.	Name
0.25	Seal
0.26	Seal
0.28	Hexagon head cap screw
0.29	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
0.30	Cheese head screw
0.31	Spring washer
0.40	Oil sight glass
0.41	Locking screw
0.42	Angled breather tube
2.01	Cover
2.02	Shaft
2.04	Housing
2.05	Flange
2.06	Fan cover
2.07	Socket
2.08	Three-phase AC motor
2.09	Fan
2.10	Starting coupling
2.11	Flexible coupling
2.15	Deep-groove ball bearing
2.16	Deep-groove ball bearing
2.17	Inner ring
2.18	Shaft sealing ring
2.19	Circlip
2.20	Circlip
2.21	Circlip
2.22	Featherkey
2.23	Featherkey
2.24	Featherkey
2.25	Shim ring
2.27	Seal
2.28	Set screw
2.29	Set screw
2.30	Hexagon head cap screw
2.31	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
2.32	Cheese head screw
2.33	Seal
2.34	Cheese head screw
2.35	Spring washer
2.36	Hexagon head cap screw
2.37	Hexagon nut
2.38	Spring washer
3.01	Cover
3.03	Flange
3.05	Shaft
3.08	Hub
3.09	Pinion cage
3.10	Slide block
3.11	Socket
3.12	Washer
3.14	Clutch collar
3.15	Ball retainer ring
3.16	Clutch thrust collar
3.17	Flange

Pos.	Name
3.19	Socket
3.26	Socket
3.27	Pressure spring
3.28	Deep-groove ball bearing
3.29	Deep-groove ball bearing
3.32	Deep-groove ball bearing
3.36	Shaft sealing ring
3.38	Circlip
3.39	Circlip
3.40	Circlip
3.41	Circlip
3.51	Circlip
3.52	Dowel pin
3.53	Hexagon head cap screw
3.56	Dowel pin
3.57	Dowel pin
3.58	Dowel pin
3.59	Cheese head screw
3.60	Spring washer
3.62	Cheese head screw
3.73	Set screw
3.76	Featherkey
3.78	Circlip
3.80	Seal
4.00	Spindle housing assembly
4.01	Spindle housing
4.02	Housing
4.03	Spindle
4.04	Guide part
4.05	Shaft
4.06	Ball headed pin
4.08	Socket
4.09	Adapter
4.10	Small worm-geared motor
4.12	Handwheel
4.13	Rotation-direction indicator
4.14	Setting indicator
4.15	Bevel
4.16	Bevel
4.17	Worm
4.20	Deep-groove ball bearing
4.21	Socket
4.22	Flange sleeve
4.23	Shaft sealing ring
4.24	Shaft sealing ring
4.25	Seal
4.26	Seal
4.27	Sealing ring
4.28	Circlip
4.29	Locking ring
4.31	Shim ring
4.32	Seeger ring
4.33	Dowel pin
4.34	Dowel pin
4.35	Dowel pin
4.36	Dowel pin

Pos.	Name
4.37	Dowel pin
4.38	Dowel pin
4.39	Set screw
4.40	Set screw
4.41	Set screw
4.42	Conical plug
4.43	Protection cover
4.44	Hexagon head cap screw
	Cheese head screw
4.45	Hexagon head cap screw
	Cheese head screw
4.46	Spring washer
4.47	Cheese head screw
4.48	Circlip
4.51	Cover
4.52	Cheese head screw
4.53	Spring washer
4.55	Hub
4.56	Bell housing
4.57	Handle
4.58	Hexagon head cap screw
6.00	Inner sun assembly
6.01	Left inner sun
6.02	Right inner sun
6.03	Planet
6.04	Pressure disc
6.05	Disk spring
6.06	Circlip
201	Pinion
220	O-ring
221	Hexagon head cap screw
4401	Flange
4410	Shaft
4420	Deep-groove ball bearing
4421	Shaft sealing ring
4422	Circlip
4423	Deep-groove ball bearing
4424	Adapter disc
4425	Circlip
4471	Hexagon head cap screw

10.1.2 DISCO variable speed drive size 03

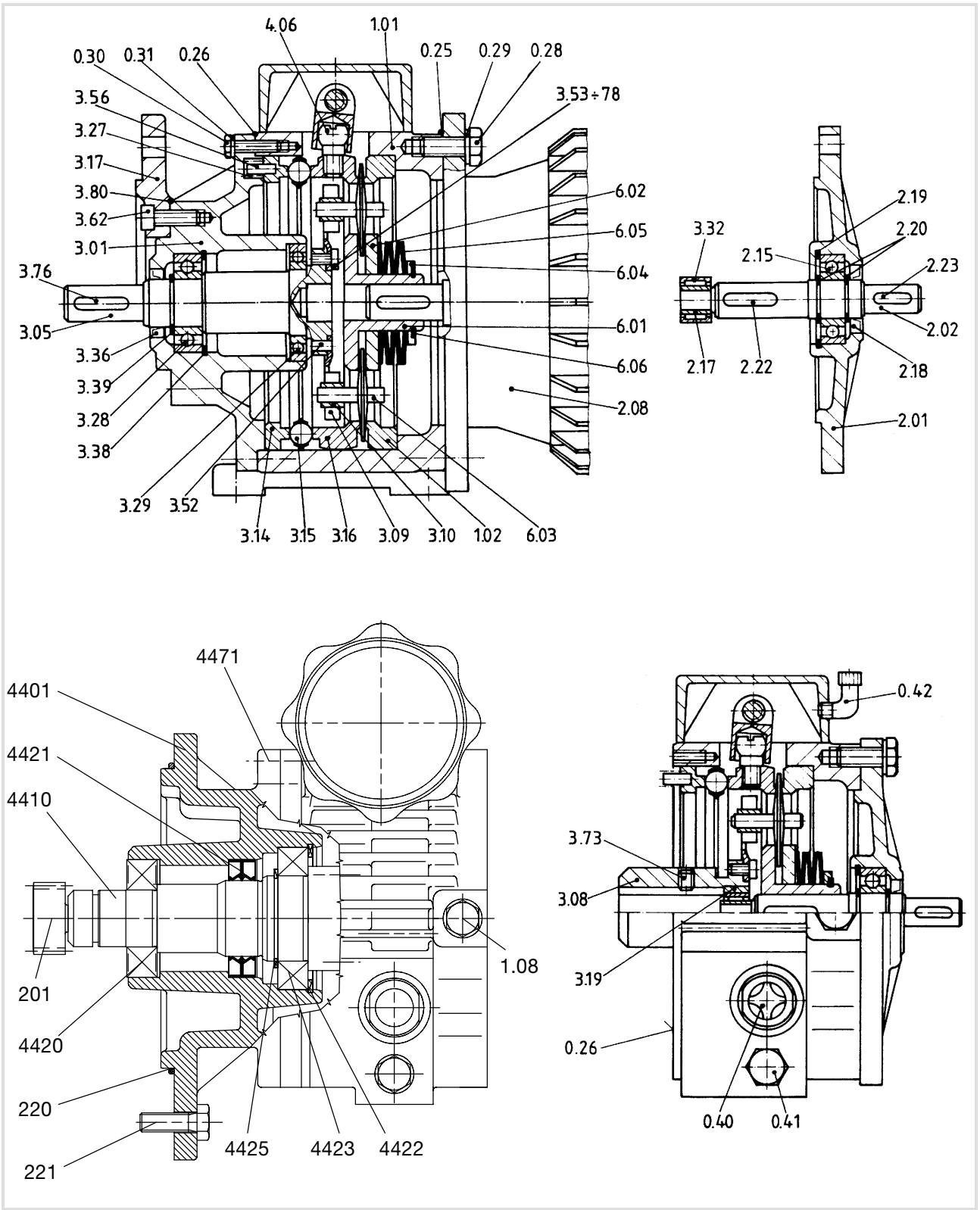


Pos.	Name
0.25	Seal
0.26	Seal
0.28	Hexagon head cap screw
0.29	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
0.30	Cheese head screw
0.31	Spring washer
0.40	Oil sight glass
0.41	Locking screw
0.42	Angled breather tube
1.01	Housing
1.02	Thrust collar
1.03	Foot
1.04	Set screw
1.05	Seal-Lock hexagon nut
1.06	Dowel pin
1.07	Cheese head screw
1.08	Oil sight glass
2.01	Cover
2.02	Shaft
2.04	Housing
2.05	Flange
2.06	Fan cover
2.07	Socket
2.08	Three-phase AC motor
2.09	Fan
2.10	Starting coupling
2.11	Flexible coupling
2.15	Deep-groove ball bearing
2.16	Deep-groove ball bearing
2.17	Inner ring
2.18	Shaft sealing ring
2.19	Circlip
2.20	Circlip
2.21	Circlip
2.22	Featherkey
2.23	Featherkey
2.24	Featherkey
2.25	Shim ring
2.27	Seal
2.28	Set screw
2.29	Set screw
2.30	Hexagon head cap screw
2.31	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
2.32	Cheese head screw
2.33	Seal
2.34	Cheese head screw
2.35	Spring washer
2.36	Hexagon head cap screw
2.37	Hexagon nut
2.38	Spring washer
3.01	Cover
3.03	Flange
3.05	Shaft
3.08	Hub

Pos.	Name
3.09	Pinion cage
3.10	Slide block
3.11	Socket
3.12	Washer
3.14	Clutch collar
3.15	Ball retainer ring
3.16	Clutch thrust collar
3.17	Flange
3.19	Socket
3.26	Socket
3.27	Pressure spring
3.28	Deep-groove ball bearing
3.29	Deep-groove ball bearing
3.32	Deep-groove ball bearing
3.36	Shaft sealing ring
3.38	Circlip
3.39	Circlip
3.40	Circlip
3.41	Circlip
3.51	Circlip
3.52	Dowel pin
3.53	Hexagon head cap screw
3.56	Dowel pin
3.57	Dowel pin
3.58	Dowel pin
3.59	Cheese head screw
3.60	Spring washer
3.62	Cheese head screw
3.73	Set screw
3.76	Featherkey
3.78	Circlip
3.80	Seal
4.00	Spindle housing assembly
4.01	Spindle housing
4.02	Housing
4.03	Spindle
4.04	Guide part
4.05	Shaft
4.06	Ball headed pin
4.08	Socket
4.09	Adapter
4.10	Small worm-geared motor
4.12	Handwheel
4.13	Rotation-direction indicator
4.14	Setting indicator
4.15	Bevel
4.16	Bevel
4.17	Worm
4.20	Deep-groove ball bearing
4.21	Socket
4.22	Flange sleeve
4.23	Shaft sealing ring
4.24	Shaft sealing ring
4.25	Seal
4.26	Seal
4.27	Sealing ring

Pos.	Name
4.28	Circlip
4.29	Locking ring
4.31	Shim ring
4.32	Seeger ring
4.33	Dowel pin
4.34	Dowel pin
4.35	Dowel pin
4.36	Dowel pin
4.37	Dowel pin
4.38	Dowel pin
4.39	Set screw
4.40	Set screw
4.41	Set screw
4.42	Conical plug
4.43	Protection cover
4.44	Hexagon head cap screw
	Cheese head screw
4.45	Hexagon head cap screw
	Cheese head screw
4.46	Spring washer
4.47	Cheese head screw
4.48	Circlip
4.51	Cover
4.52	Cheese head screw
4.53	Spring washer
4.55	Hub
4.56	Bell housing
4.57	Handle
4.58	Hexagon head cap screw
201	Pinion
220	O-ring
221	Hexagon head cap screw
4401	Flange
4410	Shaft
4420	Deep-groove ball bearing
4421	Shaft sealing ring
4422	Circlip
4423	Deep-groove ball bearing
4424	Adapter disc
4425	Circlip
4471	Hexagon head cap screw

10.1.3 DISCO variable speed drive size 04-07

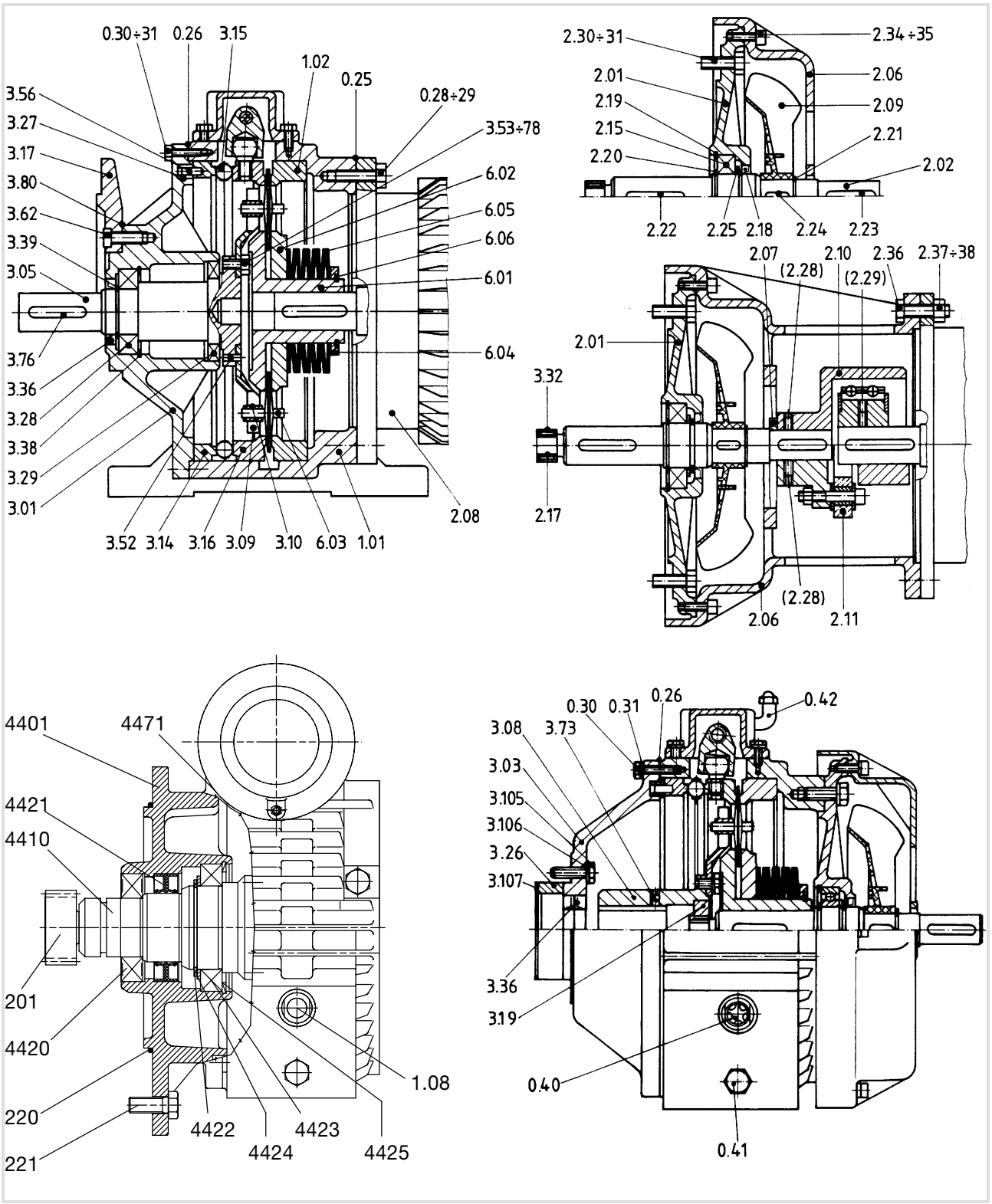


Pos.	Name
0.25	Seal
0.26	Seal
0.28	Hexagon head cap screw
0.29	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
0.30	Cheese head screw
0.31	Spring washer
0.40	Oil sight glass
0.41	Locking screw
0.42	Angled breather tube
1.01	Housing
1.02	Thrust collar
1.03	Foot
1.04	Set screw
1.05	Seal-Lock hexagon nut
1.06	Dowel pin
1.07	Cheese head screw
1.08	Oil sight glass
2.01	Cover
2.02	Shaft
2.04	Housing
2.05	Flange
2.06	Fan cover
2.07	Socket
2.08	Three-phase AC motor
2.09	Fan
2.10	Starting coupling
2.11	Flexible coupling
2.15	Deep-groove ball bearing
2.16	Deep-groove ball bearing
2.17	Inner ring
2.18	Shaft sealing ring
2.19	Circlip
2.20	Circlip
2.21	Circlip
2.22	Featherkey
2.23	Featherkey
2.24	Featherkey
2.25	Shim ring
2.27	Seal
2.28	Set screw
2.29	Set screw
2.30	Hexagon head cap screw
2.31	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
2.32	Cheese head screw
2.33	Seal
2.34	Cheese head screw
2.35	Spring washer
2.36	Hexagon head cap screw
2.37	Hexagon nut
2.38	Spring washer
3.01	Cover
3.03	Flange
3.05	Shaft
3.08	Hub

Pos.	Name
3.09	Pinion cage
3.10	Slide block
3.11	Socket
3.12	Washer
3.14	Clutch collar
3.15	Ball retainer ring
3.16	Clutch thrust collar
3.17	Flange
3.19	Socket
3.26	Socket
3.27	Pressure spring
3.28	Deep-groove ball bearing
3.29	Deep-groove ball bearing
3.32	Deep-groove ball bearing
3.36	Shaft sealing ring
3.38	Circlip
3.39	Circlip
3.40	Circlip
3.41	Circlip
3.51	Circlip
3.52	Dowel pin
3.53	Hexagon head cap screw
3.56	Dowel pin
3.57	Dowel pin
3.58	Dowel pin
3.59	Cheese head screw
3.60	Spring washer
3.62	Cheese head screw
3.73	Set screw
3.76	Featherkey
3.78	Circlip
3.80	Seal
4.00	Spindle housing assembly
4.01	Spindle housing
4.02	Housing
4.03	Spindle
4.04	Guide part
4.05	Shaft
4.06	Ball headed pin
4.08	Socket
4.09	Adapter
4.10	Small worm-geared motor
4.12	Handwheel
4.13	Rotation-direction indicator
4.14	Setting indicator
4.15	Bevel
4.16	Bevel
4.17	Worm
4.20	Deep-groove ball bearing
4.21	Socket
4.22	Flange sleeve
4.23	Shaft sealing ring
4.24	Shaft sealing ring
4.25	Seal
4.26	Seal
4.27	Sealing ring

Pos.	Name
4.28	Circlip
4.29	Locking ring
4.31	Shim ring
4.32	Seeger ring
4.33	Dowel pin
4.34	Dowel pin
4.35	Dowel pin
4.36	Dowel pin
4.37	Dowel pin
4.38	Dowel pin
4.39	Set screw
4.40	Set screw
4.41	Set screw
4.42	Conical plug
4.43	Protection cover
4.44	Hexagon head cap screw
	Cheese head screw
4.45	Hexagon head cap screw
	Cheese head screw
4.46	Spring washer
4.47	Cheese head screw
4.48	Circlip
4.51	Cover
4.52	Cheese head screw
4.53	Spring washer
4.55	Hub
4.56	Bell housing
4.57	Handle
4.58	Hexagon head cap screw
6.00	Inner sun assembly
6.01	Left inner sun
6.02	Right inner sun
6.03	Planet
6.04	Pressure disc
6.05	Disk spring
6.06	Circlip
201	Pinion
220	O-ring
221	Hexagon head cap screw
4401	Flange
4410	Shaft
4420	Deep-groove ball bearing
4421	Shaft sealing ring
4422	Circlip
4423	Deep-groove ball bearing
4424	Adapter disc
4425	Circlip
4471	Hexagon head cap screw

10.1.4 DISCO variable speed drive size 08-18

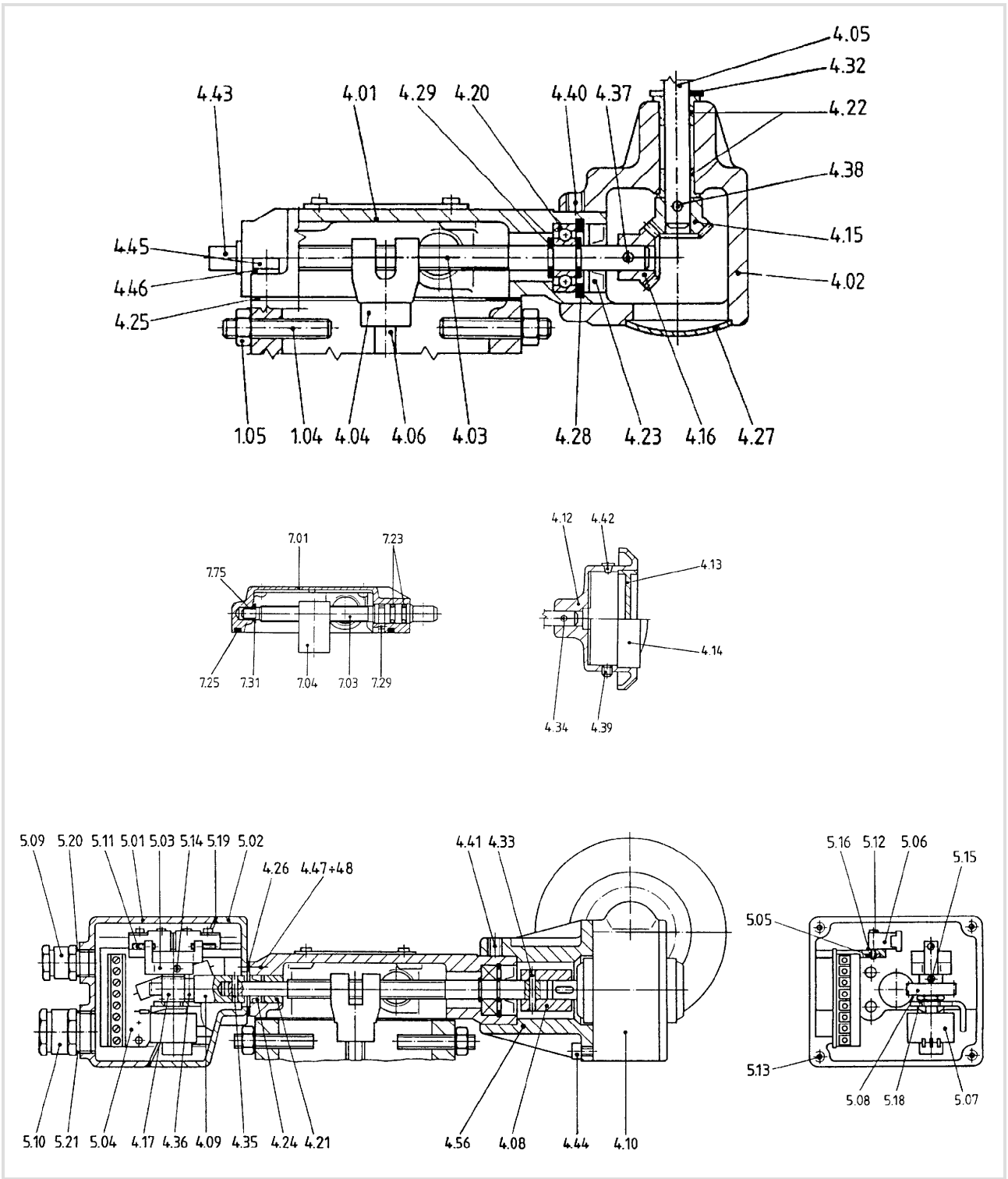


Pos.	Name
0.25	Seal
0.26	Seal
0.28	Hexagon head cap screw
0.29	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
0.30	Cheese head screw
0.31	Spring washer
0.40	Oil sight glass
0.41	Locking screw
0.42	Angled breather tube
1.01	Housing
1.02	Thrust collar
1.03	Foot
1.04	Set screw
1.05	Seal-Lock hexagon nut
1.06	Dowel pin
1.07	Cheese head screw
1.08	Oil sight glass
2.01	Cover
2.02	Shaft
2.04	Housing
2.05	Flange
2.06	Fan cover
2.07	Socket
2.08	Three-phase AC motor
2.09	Fan
2.10	Starting coupling
2.11	Flexible coupling
2.15	Deep-groove ball bearing
2.16	Deep-groove ball bearing
2.17	Inner ring
2.18	Shaft sealing ring
2.19	Circlip
2.20	Circlip
2.21	Circlip
2.22	Featherkey
2.23	Featherkey
2.24	Featherkey
2.25	Shim ring
2.27	Seal
2.28	Set screw
2.29	Set screw
2.30	Hexagon head cap screw
2.31	Locking washer for sizes 02-03
	Spring washer for sizes 04-07
2.32	Cheese head screw
2.33	Seal
2.34	Cheese head screw
2.35	Spring washer
2.36	Hexagon head cap screw
2.37	Hexagon nut
2.38	Spring washer

Pos.	Name
3.01	Cover
3.03	Flange
3.05	Shaft
3.08	Hub
3.09	Pinion cage
3.10	Slide block
3.11	Socket
3.12	Washer
3.14	Clutch collar
3.15	Ball retainer ring
3.16	Clutch thrust collar
3.17	Flange
3.19	Socket
3.26	Socket
3.27	Pressure spring
3.28	Deep-groove ball bearing
3.29	Deep-groove ball bearing
3.32	Deep-groove ball bearing
3.36	Shaft sealing ring
3.38	Circlip
3.39	Circlip
3.40	Circlip
3.41	Circlip
3.51	Circlip
3.52	Dowel pin
3.53	Hexagon head cap screw
3.56	Dowel pin
3.57	Dowel pin
3.58	Dowel pin
3.59	Cheese head screw
3.60	Spring washer
3.62	Cheese head screw
3.73	Set screw
3.76	Featherkey
3.78	Circlip
3.80	Seal
6.00	Inner sun assembly
6.01	Left inner sun
6.02	Right inner sun
6.03	Planet
6.04	Pressure disc
6.05	Disk spring
6.06	Circlip
201	Pinion
220	O-ring
221	Hexagon head cap screw

Pos.	Name
4401	Flange
4410	Shaft
4420	Deep-groove ball bearing
4421	Shaft sealing ring
4422	Circlip
4423	Deep-groove ball bearing
4424	Adapter disc
4425	Circlip
4471	Hexagon head cap screw

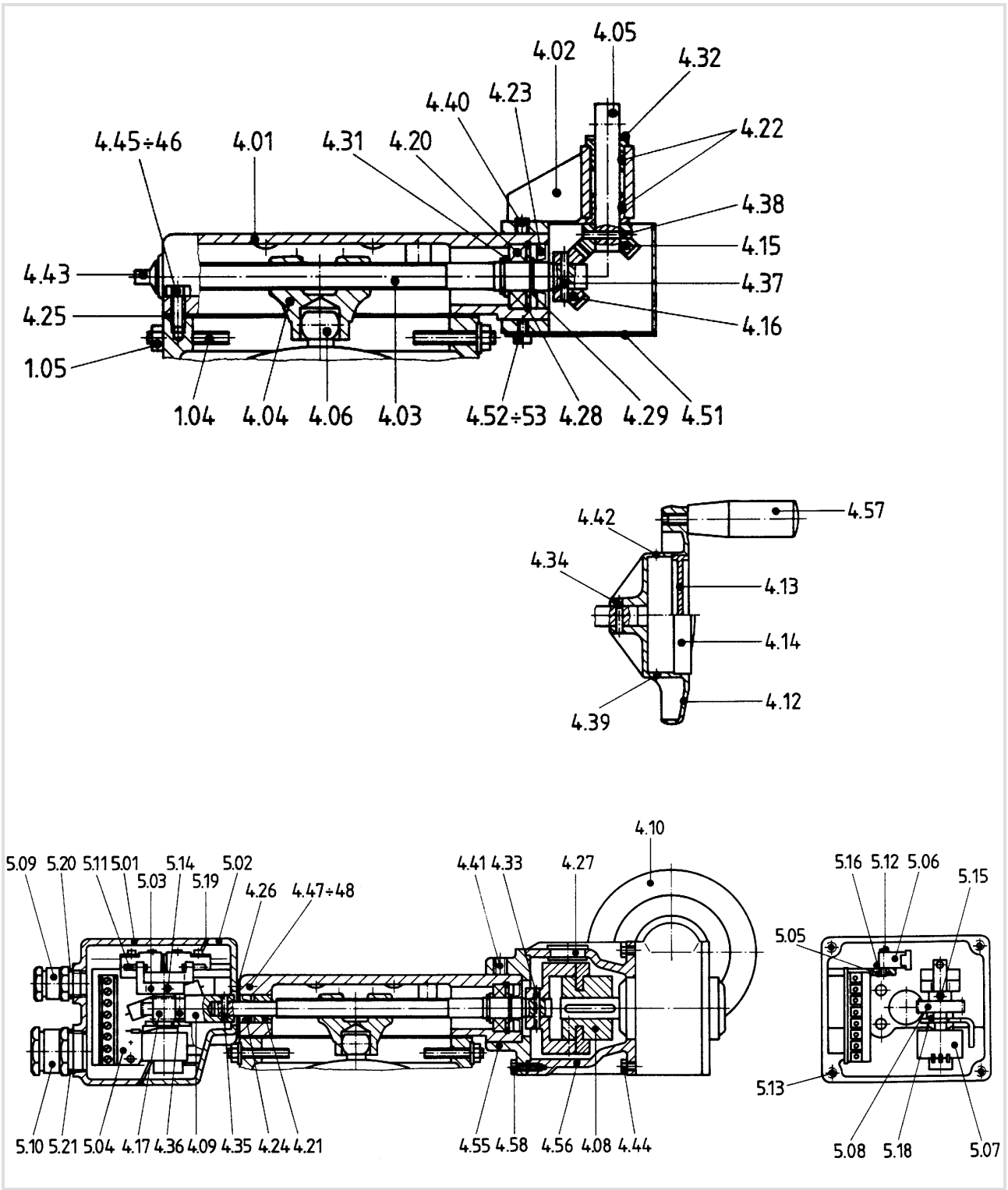
10.1.5 Speed adjustment mechanism, size 02-07



Pos.	Name
4.00	Spindle housing assembly
4.01	Spindle housing
4.02	Housing
4.03	Spindle
4.04	Guide part
4.05	Shaft
4.06	Ball headed pin
4.08	Socket
4.09	Adapter
4.10	Small worm-geared motor
4.12	Handwheel
4.13	Rotation-direction indicator
4.14	Setting indicator
4.15	Bevel
4.16	Bevel
4.17	Worm
4.20	Deep-groove ball bearing
4.21	Socket
4.22	Flange sleeve
4.23	Shaft sealing ring
4.24	Shaft sealing ring
4.25	Seal
4.26	Seal
4.27	Sealing ring
4.28	Circlip
4.29	Locking ring
4.31	Shim ring
4.32	Seeger ring
4.33	Dowel pin
4.34	Dowel pin
4.35	Dowel pin
4.36	Dowel pin
4.37	Dowel pin
4.38	Dowel pin
4.39	Set screw
4.40	Set screw
4.41	Set screw
4.42	Conical plug
4.43	Protection cover
4.44	Hexagon head cap screw
	Cheese head screw
4.45	Hexagon head cap screw
	Cheese head screw
4.46	Spring washer
4.47	Cheese head screw
4.48	Circlip
4.51	Cover
4.52	Cheese head screw
4.53	Spring washer
4.55	Hub
4.56	Bell housing
4.57	Handle
4.58	Hexagon head cap screw

Pos.	Name
5.00	Limit-switch assembly
5.01	Housing
5.02	Housing
5.03	Actuator
5.04	Board assembly
5.05	Plate
5.06	Microswitch
5.07	Potentiometer
5.08	Worm
5.09	Screw joint
5.10	Screw joint
5.11	Set screw
5.12	Cheese head screw
5.13	Screw
5.14	Set screw
5.15	Set screw
5.16	Adapter
5.18	Circlip
5.19	Seal
5.20	O-ring
5.21	O-ring
7.00	Spindle housing assembly
7.01	Spindle housing
7.03	Spindle
7.04	Guide part
7.23	O-ring
7.25	Seal
7.29	Keeper plate
7.31	Shim ring
7.75	Flange sleeve

10.1.6 Speed adjustment mechanisms, size 08-18



Pos.	Name
1.01	Housing
1.02	Thrust collar
1.03	Foot
1.04	Set screw
1.05	Seal-Lock hexagon nut
1.06	Dowel pin
1.07	Cheese head screw
1.08	Oil sight glass
4.00	Spindle housing assembly
4.01	Spindle housing
4.02	Housing
4.03	Spindle
4.04	Guide part
4.05	Shaft
4.06	Ball headed pin
4.08	Socket
4.09	Adapter
4.10	Small worm-geared motor
4.12	Handwheel
4.13	Rotation-direction indicator
4.14	Setting indicator
4.15	Bevel
4.16	Bevel
4.17	Worm
4.20	Deep-groove ball bearing
4.21	Socket
4.22	Flange sleeve
4.23	Shaft sealing ring
4.24	Shaft sealing ring
4.25	Seal
4.26	Seal
4.27	Sealing ring
4.28	Circlip
4.29	Locking ring
4.31	Shim ring
4.32	Seeger ring
4.33	Dowel pin
4.34	Dowel pin
4.35	Dowel pin
4.36	Dowel pin
4.37	Dowel pin
4.38	Dowel pin
4.39	Set screw
4.40	Set screw
4.41	Set screw
4.42	Conical plug
4.43	Protection cover
4.44	Hexagon head cap screw
	Cheese head screw
4.45	Hexagon head cap screw
	Cheese head screw
4.46	Spring washer
4.47	Cheese head screw
4.48	Circlip
4.51	Cover
4.52	Cheese head screw

Pos.	Name
4.53	Spring washer
4.55	Hub
4.56	Bell housing
4.57	Handle
4.58	Hexagon head cap screw
5.00	Limit-switch assembly
5.01	Housing
5.02	Housing
5.03	Actuator
5.04	Board assembly
5.05	Plate
5.06	Microswitch
5.07	Potentiometer
5.08	Worm
5.09	Screw joint
5.10	Screw joint
5.11	Set screw
5.12	Cheese head screw
5.13	Screw
5.14	Set screw
5.15	Set screw
5.16	Adapter
5.18	Circlip
5.19	Seal
5.20	O-ring
5.21	O-ring

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