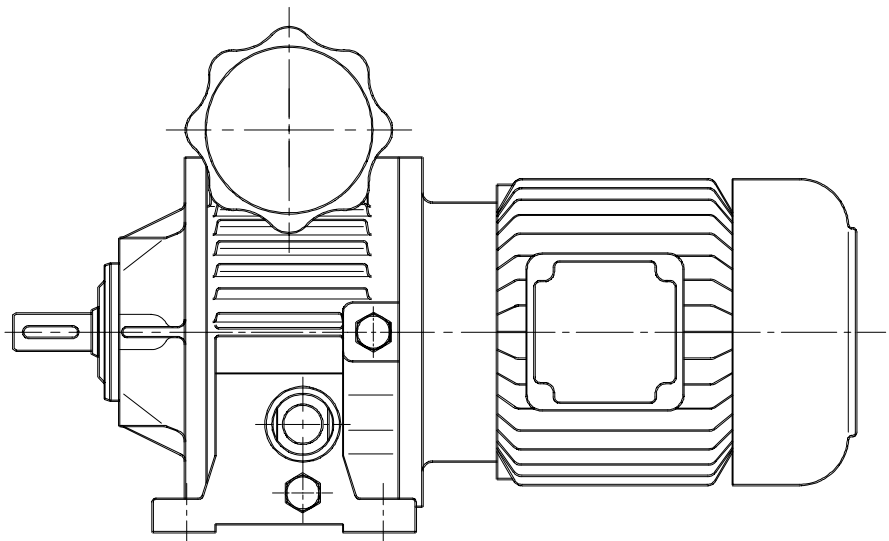


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Lenze

Antriebstechnik

Operating Instructions



Disco
Variable speed drives
type 11.700 size 02 - 03



MB11.5024

1. edition 11/92

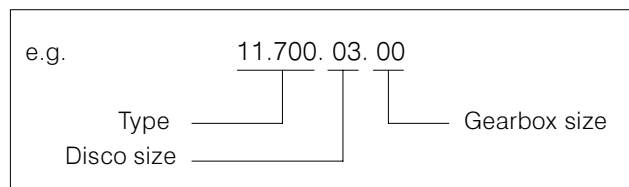
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1. Technical description

The Disco variable speed drive is a planetary drive, where all functioning parts run in an oil bath. The planets and the planet carrier rotate around the driving inner sun. From the input shaft, the speed and the torque are transmitted to the inner sun. The double conical discs (planets) are driven by the inner sun and roll along the outer rings which are fixed at the housing. Therefore, the planets do not only rotate about their own axis, but also move around the inner sun, where they drive the planet carrier, which is connected to the output shaft.

The speed is adjusted by moving one of the outer rings laterally in the housing, via a cam profile, thus changing the air gap between the rings when rotating the adjustment spindle. The planets move on variable radii - which is controlled by the size of the air gap between the outer rings, thereby adjusting the output speeds infinitely within a 6:1 range. By combining single- or multi-stage helical, worm, or spur gear planetary systems, the output speed range can be adapted to suit individual requirements.

2. Type code



3. Assembly

Disco planetary variable speed drives must be assembled stressfree on a flat surface. They are built onto and up from their output cover. Care must be taken during assembly not to pressure or distort this cover. Otherwise strains may occur in the housing, which will have negative effects on the alignment of shafts and therefore on the bearing and gear teeth. The output shaft of the Disco planetary speed drive must be carefully aligned to the driving machine shaft. Minor misalignments can be compensated by fitting a flexible coupling.

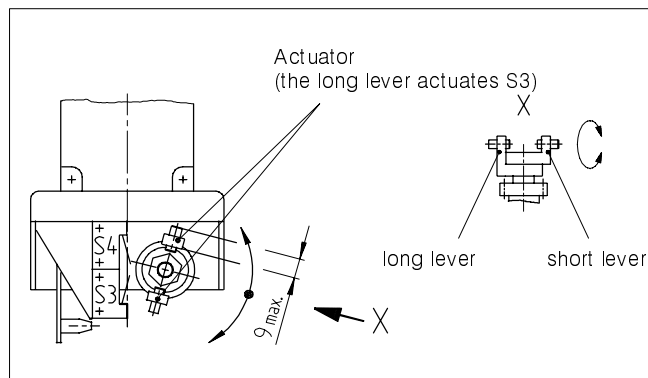
Couplings, gearwheels, sprockets, etc. may only be mounted on the shaft ends by means of a screw as hammering may damage the bearings. Fill Disco drives with oil prior to start-up (see item 4.0).

3.1 Electrical supply

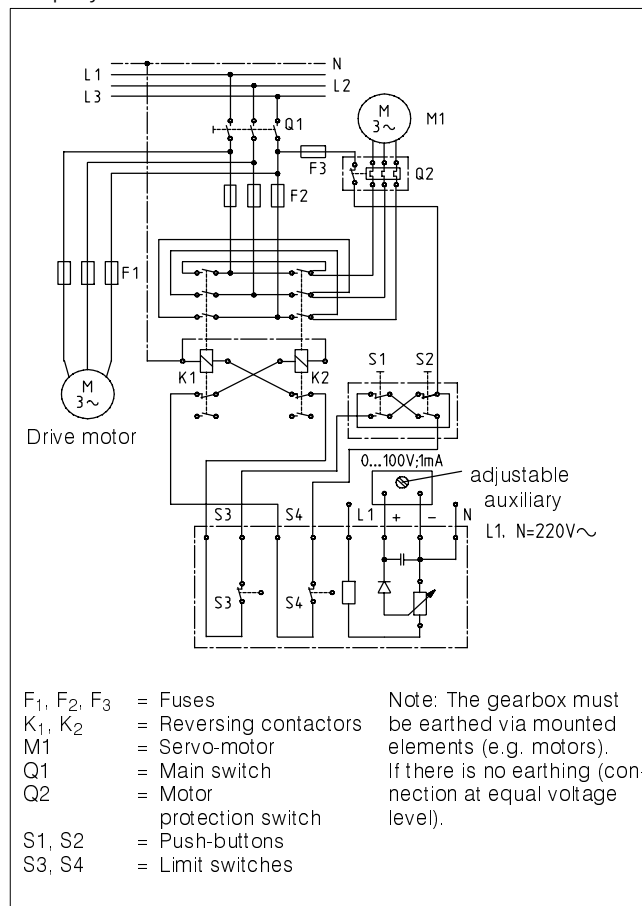
A potentiometer which is connected to the adjustment spindle via a worm pinion, transmits the position values of the spindle as partial voltage to a moving coil instrument ($100V = 1000W/V$). Normally, the scale is not calibrated, but can be calibrated to output speeds. Special calibration on request. Power supply 220 V.

Caution:

Observe polarity when connecting the servo motor.



Circuit diagram of servo adjuster with potentiometer display.



a) Servo motor position I (Standard design)

The servo motor is located on the left hand side when viewed from the motor end (spindle housing on top). When switching to the fast mode (counter-clockwise rotation of the actuators in the limit switch casing) the limit switch S₄ (see figure) is actuated using an insulated screwdriver. When the polarity is correct, the servo motor and the actuator stop. If not, the direction of rotation must be changed by changing the polarity.

b) Servo motor position II

The servo motor is located at the right hand side when viewed from the motor end (spindle housing on top). When switching to the fast mode (clockwise rotation of the actuators in the limit switch casing),

the limit switch S3 is actuated using an insulated screwdriver. When the polarity is correct, the servo motor and the actuator stop. If not, the direction of rotation must be changed by changing the polarity.

Caution: Live wires!

Caution:

The servo motor can be switched on to the slow mode, when the drive is at standstill, but switching to the fast mode with the drive at standstill is not permissible.

4. Maintenance

Disco drives are normally supplied without oil and must therefore be filled prior to start-up. We recommend oil types with a viscosity of approx. 32 mm²/sec + 10% at 40°C (see Disco lubrication instructions).

Lubrication instructions for connected gearboxes can be ordered separately. The following quantities (in liters) are approximate values.

Disco planetary variable speed drive

Disco size	Mounting positions				
	horizontal			vertical	
	spindle housing			output shaft	
	top	side	bottom	bottom	top
02	0,4	0,3	0,4	0,4	0,4
03	0,4	0,5	0,8	0,6	0,6

Disco differential drive

Disco size	Mounting positions				
	horizontal			vertical	
	spindle housing			output shaft	
	top	side	bottom	bottom	top
02	0,5	0,4	0,5	0,4	0,4
03	0,5	0,6	1,0	1,0	1,0

We recommend to check the oil level regularly!

5. Repair

5.1 Dismantling

Adjust the drive to a medium speed. Drain oil. Instructions such as "left"/"right" refer to the spare parts drawings.

5.1.1 Housing and flange cover

1. Remove flange-mounted electric motor (2.08), if any, from the drive.
2. Remove allen screws (4.45) and take out of spindle housing (4.01). Remove ball head stud (4.06).
3. Mark position of cover (3.01) or flange (3.02) relative to the housing (1.01).
4. Remove screws (0.30) and position drive vertically (input side up).
5. Pull off complete housing (1.01).
6. Mark position of cam ring (3.14) and movable outer ring (3.16) relative to the cover or flange (3.01 or 3.02) or, for differential drives, relative to the housing (3.04).

5.1.2 Inner sun

1. Remove stationary outer ring (1.02) and inner sun assembly (6.01 to 6.06).
2. Secure planets to prevent displacement! Press cup springs (6.05) over spring retaining plate (6.04) using a special tool, or a parallel vice.
3. Remove circlip (6.06) and release cup springs (6.05).

5.1.3 Output shaft (for drives without gearboxes)

1. Remove movable outer ring (3.16), ball cage (3.15), cam ring (3.14) and compression springs (3.27).
2. Remove screw (3.59) and press planet carrier (3.09) off the output shaft (3.05) using two levers.
3. For size 02, remove shaft seal (3.36) and scrap, remove circlips (3.39) and (3.14) and press output shaft out of the cover (3.01) to the right.

5.1.4 Flange (for drives with gearbox)

5.1.4.1 Worm gearbox

1. Remove circlip (3.51) pull off planet carrier (3.09) from the hub (3.08).
2. Remove setscrew (3.73) and pull off hub (3.08) from the input shaft of the worm gearbox.

5.1.4.2 Helical gearbox and helical worm gearbox

1. Punch out pin (3.61) and remove pinion (3.18) (not for pinion shaft 3.06)
2. Remove circlip (3.44) and press shaft (3.06 or 3.07) out of the flange to the right.

5.1.4.3 Spur gear planetary drive in the differential drive

1. Remove movable outer ring (3.16), ball cage (3.15), cam ring (3.14) and compression springs (3.27).
2. Remove circlip (3.51) and pull planet carrier (3.09) out of the planet gear carrier (3.25).
3. Remove screws (0.34) and pull cover (3.01) completely out of the housing (3.04).
4. For size 02, remove shaft seal (3.36) and scrap.
5. Remove circlips (3.38, 3.39 or 3.41) and press complete shaft (3.05) out of the bearing to the right.
6. Pull cylindrical pins (3.70) out of the planet gear carrier (3.25) via inside thread and remove pinion (3.24) with washers (3.69).
7. Remove circlip (3.46) and press planet gear carrier (3.25) with pinion shaft (3.23) out of the bearing.

5.1.5 Input shaft

1. Remove hex head bolt (0.28) and take out complete cover (2.01 to 2.23) from the housing (1.01).
2. For size 02, remove shaft seal (2.18) and scrap, remove circlips (2.20) and press shaft (2.02) out of the cover to the right.
3. For size 03, remove circlip (2.19) and press complete shaft (2.02) out of the cover to the left.

5.1.6 Hand wheel adjuster

1. Punch out pin (4.34) and pull off hand wheel (4.12).
2. Remove setscrew (4.39) and take out position indicator (4.14).
3. Remove normal torque plate (7.29) using two narrow screwdrivers.
4. Turn spindle (7.03) out of the guide-piece (7.04) and pull off the housing (7.01). Remove shim (7.31).

5.1.7 Servo adjuster

1. Before disassembly always disconnect from power supply!
2. Loosen setscrew (4.41) and pull off small geared motor (4.10).
3. Punch out pin (4.33) and pull off bush (4.08).
4. Loosen screws (5.13) from the housing (5.01, 5.02) and open housing.
5. Loosen allen screws (4.47) and remove housing (5.02).
6. Punch out pin (4.35) and pull off intermediate part (4.09).
7. Remove shaft seal (4.23) and scrap, and remove circlip (4.28).
8. Pull spindle (4.03) out of the housing (4.01), so that the ball bearing (4.20) is free.
9. Rotate spindle out of the guide piece (4.04).
10. Press bush (4.21) and shaft seal (4.24) out of the spindle housing (4.01).

5.1.8 Bevel gear adjuster

1. Loosen setscrew (4.40) and pull off housing (4.02).
2. Punch out pin (4.34) and pull off hand wheel (4.12).
3. Pull off circlip (4.32) and press end cap (4.27) out of the housing (4.02).
4. Pull shaft (4.05) out of the bushes (4.22).
5. Punch out pins (4.37, 4.38) and pull off bevel gears wheels (4.16, 4.15).

For further disassembly see section 5.1.7, items 7-10!

5.2 Assembly

Disco planetary speed drives are put together as modules and then assembled.

5.2.1 Housing or flange cover

(for drives without gearboxes)

Size 02:

1. Press in ball bearing (3.28) and fix using two circlips (3.38).
2. Press in shaft (3.05) with bush (3.11) and press ball bearing (3.29) in cover (3.01).
3. Assemble circlip (3.39) and shaft seal (3.36). Go on as explained under item 4, size 3!

Size 03:

1. Press in ball bearing (3.28) and assemble left circlip (3.41).
2. Press in shaft (3.05) with circlips (3.40) and ball bearing (3.29) in flange or cover (3.01).

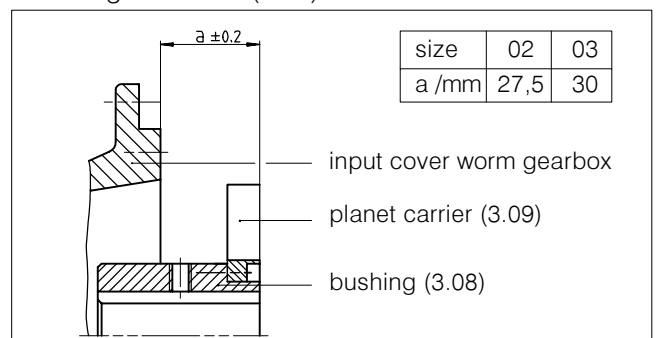
3. Assemble right circlip (3.41) and shaft seal (3.36).
4. Fix planet carrier (3.09) using pins (3.57), washer (3.12) and screw (3.59) on the shaft (3.05).
5. Insert compression springs (3.27) and cam ring (3.14). Observe the mark on the cam ring relative to the housing.
6. Assemble ball cage (3.15) and movable outer ring (3.16).

5.2.2 Flange

(for variable speed drives with gearbox)

5.2.2.1 Worm gearbox

1. Assemble planet carrier (3.09) on bush (3.08), secure using circlip (3.51).
2. Push bush (3.08) on the input shaft of the worm gearbox, until dimension "a" is reached and fix using setscrew (3.73).



For further assembly see section 5.2.1, item 5

5.2.2.2 Helical gearbox and helical worm gearbox

1. For size 02, assemble circlip (3.43) when designed with pinion shaft (3.06).
2. Press shaft (3.07) or pinion shaft (3.06) with ball bearing (3.31) from the right in the flange (3.02), assemble circlip (3.50), if necessary.
3. Assemble shaft seal (3.37), circlip (3.42) and ball bearing (3.30). Assemble circlip (3.44).
4. Assemble pinion (3.18) (not for pinion shaft 3.06).

For further assembly see section 5.2.1, item 4.

5.2.2.3 Spur gear planetary drive in the differential drive

1. For size 02, assemble ball bearing (3.28) and circlip (3.38) in cover (3.01).
For size 03, assemble ball bearing (3.28) and left circlip (3.41) in cover (3.01).
2. Press shaft (3.05) with ball bearing (3.29), circlips (3.40) or bush (3.11) in cover and secure using circlip (3.39) or (3.41) right. Assemble shaft seal (3.36).
3. Press planet gear carrier (3.25) with pre-assembled pinion shaft (3.23) in bearing and secure using circlip (3.46).
4. Insert pinion (3.24) with washers (3.69) in planet gear carrier (3.25) and press in pins (3.70).
5. Mount pre-assembled cover (3.01) on housing (3.04) by using seal (0.26) and screws (0.34).

6. Assemble planet carrier (3.09) on planet gear carrier (3.25), secure using shim (3.71) und circlip (3.51).

For further assembly see section 5.2.1, item 5.

5.2.3 Inner sun

1. Left inner sun must be easily displaceable on the input shaft or motor shaft. Lay left inner sun (6.01) with the hub at the top on the assembly device.
2. Push right inner sun (6.02) with chamfer (approx. 1mm) at the bottom on the hub.
3. Push planets (6.03) with long journal at the bottom to the middle of the seating surface between the inner sun assembly and secure against displacement.
4. Push cup springs (6.05) on the hub in the correct sequence, lay spring retaining plate (6.04) with recess at the top and circlip (6.06) on cup springs (6.05).
5. Press together cup springs (6.05) over spring retaining plate (6.04) using an assembly device, assemble circlip (6.06).

Caution:

Check if the circlip fully rests in the keyway and is located in the recess of the spring retaining plate. After this, release the cup springs!

5.2.4 Input shaft

1. For size 02, assemble ball bearing (2.15) using circlips (2.19) in cover (2.01). Press in pre-assembled shaft (2.02), assemble circlip (2.20) and insert seal (2.18).
2. For size 03, assemble shaft (2.02) with ball bearing (2.15) and circlips (2.20) in cover (2.01). Assemble ball bearing (2.16), secure using circlip (2.19) and insert seal (2.18).

5.2.5 Hand wheel adjuster

1. Push spindle (7.03) with greased O-rings (7.23) into the housing (7.01).
2. Turn guide-piece (7.04) on the spindle (7.03).
3. Set shim (7.31) on spindle (7.03). Push spindle in flange sleeve (7.75) and press normal torque plate (7.29) on the spindle (7.03).
4. Assemble handwheel (4.12) using pin (4.34). Assemble position indicator (4.14), secure using setscrew (4.39).

5.2.6 Servo adjuster

1. Press bush (4.21) in spindle housing (4.01).
2. Push spindle (4.03) with ball bearing (4.20) in spindle housing (4.01).
3. Rotate guide-piece (4.04) on spindle and press spindle completely in.
4. Assemble circlip (4.28) and shaft seal (4.23).
5. Assemble shaft seal (4.24) and secure intermediate part (4.09) using pin (4.35).
6. Secure bush (4.08) using pin (4.33).
7. Do not yet assemble small geared motor (4.10) and limit switch housing (5.02 and 5.01)! (see

section 5.3.2)

5.2.7 Bevel gear adjuster

1. Assembly as explained under section 5.2.6, item 1-5.
2. Secure bevel gears (4.16, 4.15) using pins (4.37, 4.38).
3. Push shaft (4.05) in bushes (4.22).
4. Assemble circlip (4.32).
5. Assemble handwheel (4.12) and hammer in pin (4.34).
6. Assemble housing (4.02) only after setting of the dead stops at the spindle housing (4.01) (see section 5.3.2).
7. Bevel gears have a soft running. The permissible axial tolerance in X-direction is maximum 0.2 mm.

5.2.8 Assembly of the modules

1. Lay seal (0.26) on cover (3.01) or flange (3.02) or housing (3.04).
2. Push stationary outer ring (1.02) in housing (1.01) and slightly misalign or support in the spindle housing recess by using a bolt.
3. Lay complete inner sun (6.01 to 6.06) on movable outer ring (3.16) thereby inserting the journals of the planets (6.03) in the planet bearings (3.10).
4. Lay housing (1.01) vertically on the pre-assembled flange (3.02), cover (3.01) or housing (3.04). Observe mark at the flange or housing.
5. Secure using hex head bolts (0.30).
6. Screw in ball head studs (4.06).

5.2.9 Motor assembly

1. Lay seal (0.25) on housing (1.01).
2. Cover motor shaft end with lubricant and vertically insert into the inner sun (6.01).
3. Secure motor (2.08) and housing (1.01) using hex head bolts (2.30).

5.2.10 Adjusters

1. Lay handwheel or servo adjuster with seal (4.25) on housing (1.01). Ball head stud (4.06) must slide in the guide piece (4.04).
2. Fix adjuster using allen screws (4.45) at the housing. See chapter 5.3.

5.3 Speed setting

1. Fill gearbox oil up to the middle of the oil sight glass, in individual cases up to the oil check plug, according to the mounting position.

5.3.1 Handwheel adjuster

Setting is also necessary when the drive has been disassembled!

1. Bolt handwheel adjuster in the desired position with a seal and turn towards the fast mode, until a resistance is perceptible.
2. Switch on motor and set minimum idle speed using tacho tachometer according to the table.

3. Fix setscrew (1.04) against guide piece (4.04) in housing (1.01). Slightly fix using counter nut (1.05).
4. Set maximum idle speed according to the table.
5. Fix setscrew (1.04) against guide piece (4.04) in housing (1.01). Slightly fix using counter nut (1.05).
6. When the driving motor is at standstill, change the adjustment from maximum to minimum. Switch on drive motor. Check speeds and correct, if necessary. Tighten nuts (1.05), without turning setscrews (1.04).

No-load output speeds

	Type Size	11.710		11.740	
		02	03	02	03
4-pole motors	$n_{\min}(\text{min}^{-1})$	180 ⁻⁵ 1) 200 ⁺⁵	185 ⁻⁵ 1) 205 ⁺⁵	0 ^{-2,5} 1) 25 ^{+2,5}	0 ^{-2,5} 1) 25 ^{+2,5}
	$n_{\max}(\text{min}^{-1})$	1020 ⁺¹⁰ 1) 990 ⁻¹⁰	1030 ⁺¹⁰ 1) 1000 ⁻¹⁰	940 ⁺¹⁰ 1) 905 ⁻¹⁰	940 ⁺¹⁰ 1) 905 ⁻¹⁰
2-pole motors	$n_{\min}(\text{min}^{-1})$	360 ⁻¹⁰ 1) 390 ⁺¹⁰	370 ⁻¹⁰ 1) 390 ⁺¹⁰	0 ⁺⁵ 1) 30 ⁺⁵	0 ⁺⁵ 1) 30 ⁺⁵
	$n_{\max}(\text{min}^{-1})$	2040 ⁺¹⁵ 1) 2000 ⁻¹⁵	2015 ⁺¹⁵ 1) 1975 ⁻¹⁵	1880 ⁺¹⁰ 1) 1850 ⁻¹⁰	1880 ⁺¹⁰ 1) 1850 ⁻¹⁰

Dead stops as for hand wheel adjusters

1) Switching points for limits switches in case of servo adjusters.

5.3.2 Servo adjuster

5.3.2.1 Servo motor position I (Standard design)

1. Assemble spindle housing (4.01) and seal (4.25) in the corresponding position using screws (4.45) and spring lock washer (4.46) on housing (1.01). The guide piece (4.04) must slide on the ball head stud (4.06)!
2. Connect main motor (2.08) and switch on.
3. Adjust minimum idle speed n_{\min} (see table) by hand using a hand tacho. Screw in setscrew (1.04) against guide piece (4.04) in housing (1.01). Tighten nut (1.05).
4. Adjust maximum idle speed n_{\max} (see table) by hand using a hand tacho. Screw in setscrew (1.04) against guide piece (4.04) in housing (1.01). Tighten nut (1.05).
5. Set medium speed by hand!
6. Assemble small geared motor (4.10) on spindle housing (4.01). Before, cover the output shaft of the small geared motor with ant-corrosion agent, in order to avoid frictional corrosion. Cover setscrew (4.41) with screw locking glue and tighten.
7. Assemble limit switch housing (5.02) with allen screws (4.47) and shakeproof washers (4.48) at spindle housing (4.01). Observe gearing of worm shaft (4.17) and worm wheel (5.08).
8. Connect power supply for small geared motor. Check polarity of the servo motor according to section 3.1 item a) or b) and change polarity, if necessary.
9. Set speed according to the lowest switching point for the limit switch (see table) for jogging. Find out the direction of rotation of the wiper in the potentiometer. The wiper moves towards the zero position of the multiturn potentiometer. The setscrew (5.14) in the actuator may have to be released using a long lever (5.03). If, after re-

aching the lowest switching point for limit switches, the wiper should not be at the beginning of the multiturn potentiometer, the potentiometer must be adjusted. For this, remove setscrew (5.15) in the worm gear (5.08). Turn actuator (5.03) until wiper is at the beginning of the multiturn potentiometer. Retighten setscrew (5.15) in the worm gear (5.08).

10. Turn setscrew (5.11) in the actuator with long lever (5.03) against the limit switch (S3) (see section 3.1), until you hear it switching. Tighten actuator (5.03) using setscrew (5.14).
11. Slightly increase idle speed and approach to the lower switching point, make fine setting using setscrew (5.11) if necessary. Check with hand tacho.
12. In the jogging mode, select the speed according to the upper switching point for limit switches (see table) using hand tacho. Loosen setscrew (5.14) in the actuator with short lever (5.03).
13. Turn setscrew (5.11) in the actuator with short lever (5.03) against limit switch (S4) (see section 3.1) until you hear it switching. Tighten actuator (5.03) using setscrew (5.14).
14. Slightly lower idle speed and approach to the upper switching point for limit switches, make fine setting using setscrew (5.11) if necessary. Check using hand tacho.
15. Again approach both switching points and correct, if necessary.
16. Close housing (5.02) with housing (5.01), seal (5.19) and screws (5.13).

Caution:

If Disco variable speed drives are subsequently modified from servo motor position I to servo motor position II, the two plug-in contacts on the back of the board (5.04) in the limit switch housing (5.02) must be interchanged. In this case, proceed according to section 5.3.2.2 "servo motor position II", which applies for Disco variable speed drives with servo motor position II as standard.

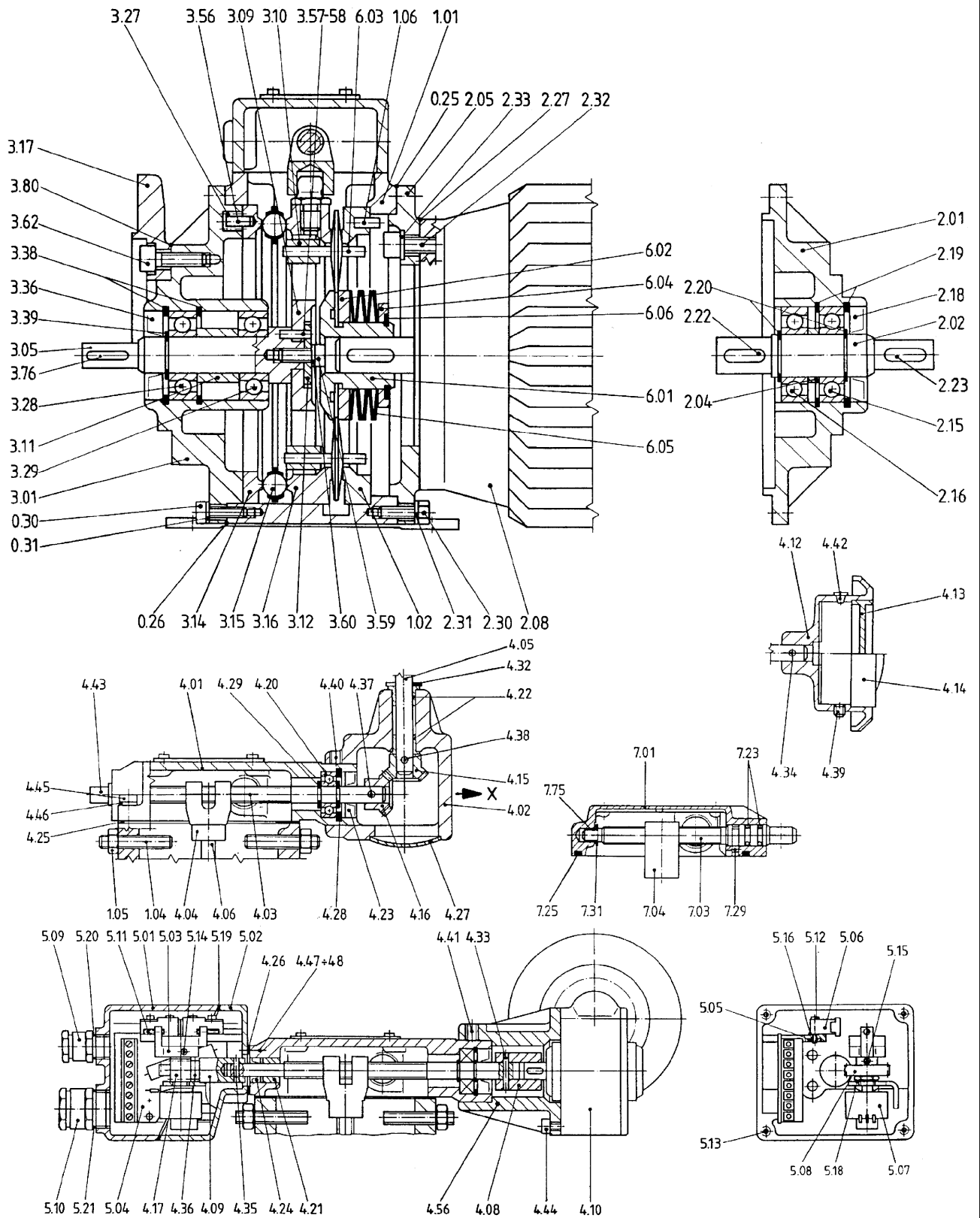
5.3.2.2 Servo motor position II

1. Assemble spindle housing (4.01) and seal (4.25) in the corresponding position using screws (4.45) and spring lock washer (4.46) on housing (1.01). The guide piece (4.04) must slide on the ball head studs (4.06)!
2. Connect main motor (2.08) and switch on.
3. Adjust minimum idle speed n_{\min} (see table) by hand using a hand tacho. Screw in setscrew (1.04) against guide piece (4.04) in housing (1.01). Tighten nut (1.05).
4. Adjust maximum idle speed n_{\max} (see table) by hand using a hand tacho. Screw in setscrew (1.04) against guide piece (4.04) in housing (1.01). Tighten nut (1.05).
5. Set medium speed by hand!
6. Assemble small geared motor (4.10) on spindle housing (4.01). Before, cover the output shaft of the small geared motor with anti-corrosion agent, in order to avoid frictional corrosion. Co-

- ver setscrew (4.41) with screw locking glue and tighten.
7. Assemble limit switch housing (5.02) with allen screws (4.47) and shakeproof washers (4.48) at spindle housing (4.01). Observe gearing of worm shaft (4.17) and worm wheel (5.08).
 8. Connect power supply for small geared motor. Check polarity of the servo motor according to section 3.1 item a) or b) and change polarity, if necessary.
 9. Set speed according to the lowest switching point for the limit switch (see table) for jogging. Find out the direction of rotation of the wiper in the potentiometer. The wiper moves towards the zero position of the multiturn potentiometer. The setscrew (5.14) in the actuator may have to be released using a long lever (5.03). If, after reaching the lowest switching point for limit switches, the wiper should not be at the beginning of the multiturn potentiometer, the potentiometer must be adjusted. For this, remove setscrew (5.15) in the worm gear (5.08). Turn actuator (5.03) until wiper is at the beginning of the multiturn potentiometer. Retighten setscrew (5.15) in the worm gear (5.08).
 10. Turn setscrew (5.11) in the actuator with short lever (5.03) against the limit switch (S4) (see section 3.1), until you hear it switching. Tighten actuator (5.03) using setscrew (5.14).
 11. Slightly increase idle speed and approach to the lower switching point, make fine setting using setscrew (5.11) if necessary. Check with hand tacho.
 12. In the jogging mode, select the speed according to the upper switching point for limit switches (see table) using hand tacho. Loosen setscrew (5.14) in the actuator with long lever (5.03).
 13. Turn setscrew (5.11) in the actuator with long lever (5.03) against limit switch (S3) (see section 3.1) until you hear it switching. Tighten actuator (5.03) using setscrew (5.14).
 14. Slightly lower idle speed and approach to the upper switching point for limit switches, make fine setting using setscrew (5.11) if necessary. Check using hand tacho.
 15. Again approach both switching points and correct, if necessary.
 16. Close housing (5.02) with housing (5.01), seal (5.19) and screws (5.13).

6. Spare parts list

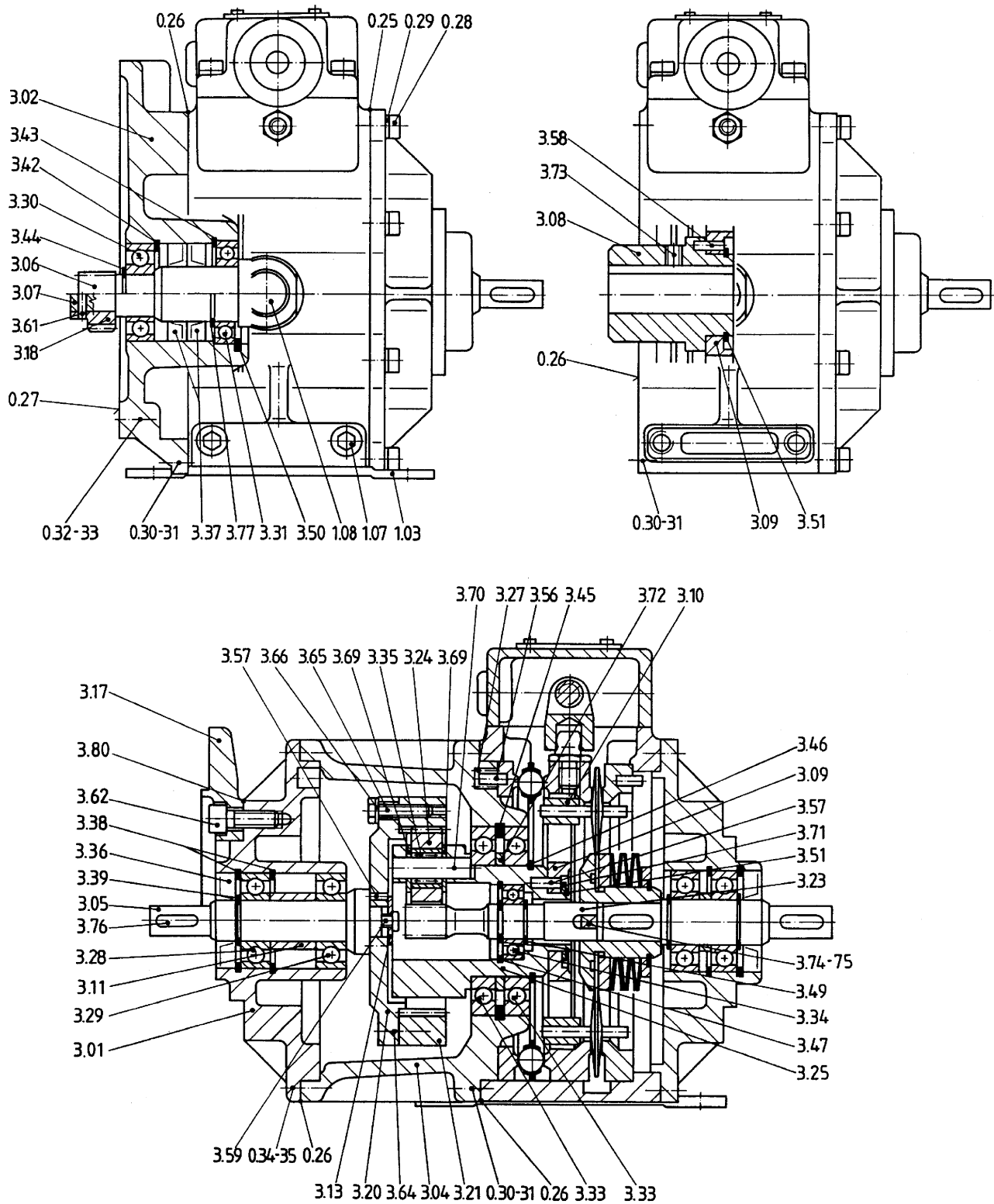
6.1 Disco variable speed drives series 11.700 size 02



Suitable for mounting of

helical and helical worm gearboxes

worm gearboxes



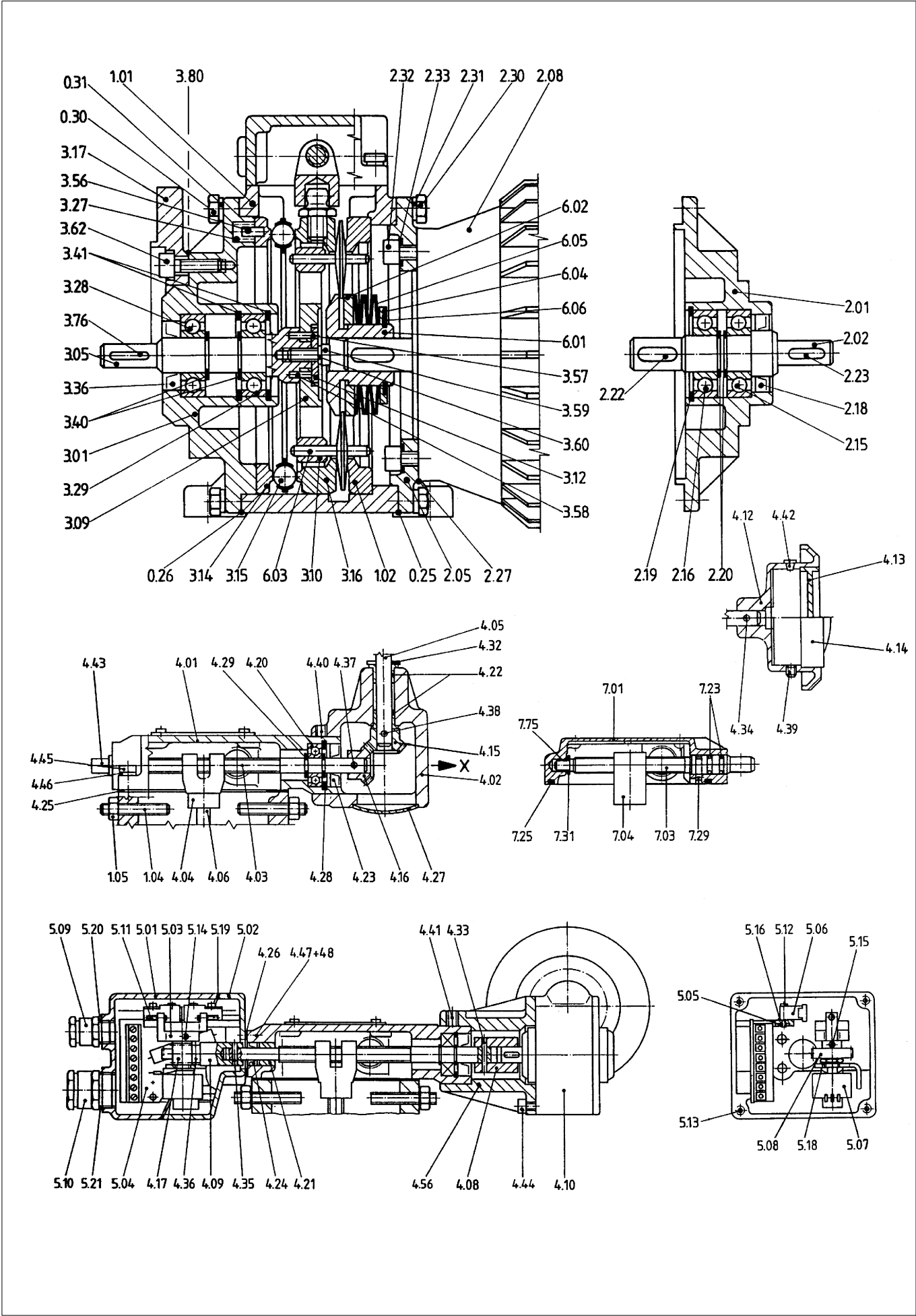
Item	Description	Item	Description	Item	Description
0.25	Gasket	3.30	Deep groove ball bearing	4.32	Seeger ring
0.26	Gasket	3.31	Deep groove ball bearing	4.33	Dowel pin
0.27	Gasket	3.33	Deep groove ball bearing	4.34	Dowel pin
0.28	Hex. head screw	3.34	Deep groove ball bearing	4.35	Dowel pin
0.29	Locking washer	3.35	Needle bush	4.36	Dowel pin
0.30	Socket head cap screw	3.36	Shaft seal	4.37	Dowel pin
0.31	Spring washer	3.37	Shaft seal	4.38	Dowel pin
0.32	Socket head cap screw	3.38	Circlip	4.39	Set screw
0.33	Spring washer	3.39	Circlip	4.40	Set screw
0.34	Screw	3.42	Circlip	4.41	Set screw
0.35	Spring washer	3.43	Circlip	4.42	Conical plug
0.35	Seal ring 1)	3.44	Circlip	4.43	Protective cap
1.01	Housing	3.45	Circlip	4.44	Socket head cap screw
1.02	Stationary outer ring	3.46	Circlip	4.45	Socket head cap screw
1.03	Foot	3.47	Circlip	4.46	Spring washer
1.04	Set screw	3.49	Circlip	4.47	Socket head cap screw
1.05	Seal-Lock hex. nut	3.50	Circlip	4.48	Locking washer
1.06	Dowel pin	3.51	Circlip	4.56	Bell housing
1.07	Socket head cap screw	3.56	Dowel pin		
1.08	Oil sight glass	3.57	Dowel pin	5.00	Microswitch housing, compl.
		3.58	Dowel pin	5.01	Housing
		3.59	Socket head cap screw	5.02	Housing
2.01	Cover	3.60	Spring washer	5.03	Actuator
2.02	Shaft	3.61	Dowel pin	5.04	Complete board
2.04	Bush	3.62	Socket head cap screw	5.05	Metal sheet
2.05	Flange	3.64	Dowel pin	5.06	Microswitch
2.08	Motor (3-phase)	3.65	Hex. head screw	5.07	Pre-set potentiometer
2.15	Deep groove ball bearing	3.66	Spring washer	5.08	Wormwheel
2.16	Deep groove ball bearing	3.69	Washer	5.09	Gland connection
2.18	Shaft seal	3.70	Cylindrical pin	5.10	Gland connection
2.19	Circlip	3.71	Shim	5.11	Set screw
2.20	Circlip	3.72	Shim	5.12	Socket head cap screw
2.22	Key	3.73	Set screw	5.13	Screw
2.23	Key	3.74	Key	5.14	Set screw
2.27	Gasket	3.75	Dowel pin	5.15	Set screw
2.30	Hex. head screw	3.76	Key	5.16	Leveling piece
2.31	Locking washer	3.77	Circlip	5.18	Locking washer
2.32	Socket head cap screw	3.80	Gasket	5.19	Gasket
2.33	Seal ring			5.20	O-ring seal
		4.00	Spindle housing, compl.	5.21	O-ring seal
3.01	Cover	4.01	Spindle housing		
3.02	Flange	4.02	Housing	6.00	Complete inner sun
3.04	Housing	4.03	Spindle	6.01	LH inner sun
3.05	Shaft	4.04	Guide-piece	6.02	RH inner sun
3.06	Pinion shaft	4.05	Shaft	6.03	Planet
3.07	Shaft	4.06	Speed control stud	6.04	Spring retaining cap
3.08	Bush	4.08	Bush	6.05	Cup spring
3.09	Planet carrier	4.09	Adapter	6.06	Circlip
3.10	Planet bearing	4.10	Small worm geared motor		
3.11	Bush	4.12	Handwheel	7.00	Spindle housing, compl.
3.12	Washer	4.13	Direction indicator	7.01	Spindle housing
3.13	Washer	4.14	Position indicator	7.03	Spindle
3.14	Cam ring	4.15	Bevel gear	7.04	Guide-piece
3.15	Ball cage	4.16	Bevel gear	7.23	O-ring seal
3.16	Movable outer ring	4.17	Worm	7.25	Gasket
3.17	Flange	4.20	Deep groove ball bearing	7.29	Fixing metal sheet
3.18	Pinion	4.21	Bush	7.31	Shim
3.20	Outer ring gear carrier	4.22	Collar bush	7.75	Collar bush
3.21	Outer ring gear	4.23	Shaft seal		
3.23	Pinion shaft	4.24	Shaft seal		
3.24	Pinion	4.25	Gasket		
3.25	Planet gear carrier	4.26	Gasket		
3.27	Pressure spring	4.27	End cover		
3.28	Deep groove ball bearing	4.28	Circlip		
3.29	Deep groove ball bearing	4.29	Circlip		

1)For the screws (0.34) inside of the oval flange of the differential drive with helical gearbox

When ordering spare parts please quote :

Type and no. as shown on type plate, position and description of the spare part as shown in the spare parts list and no. of the installation and operating instructions.

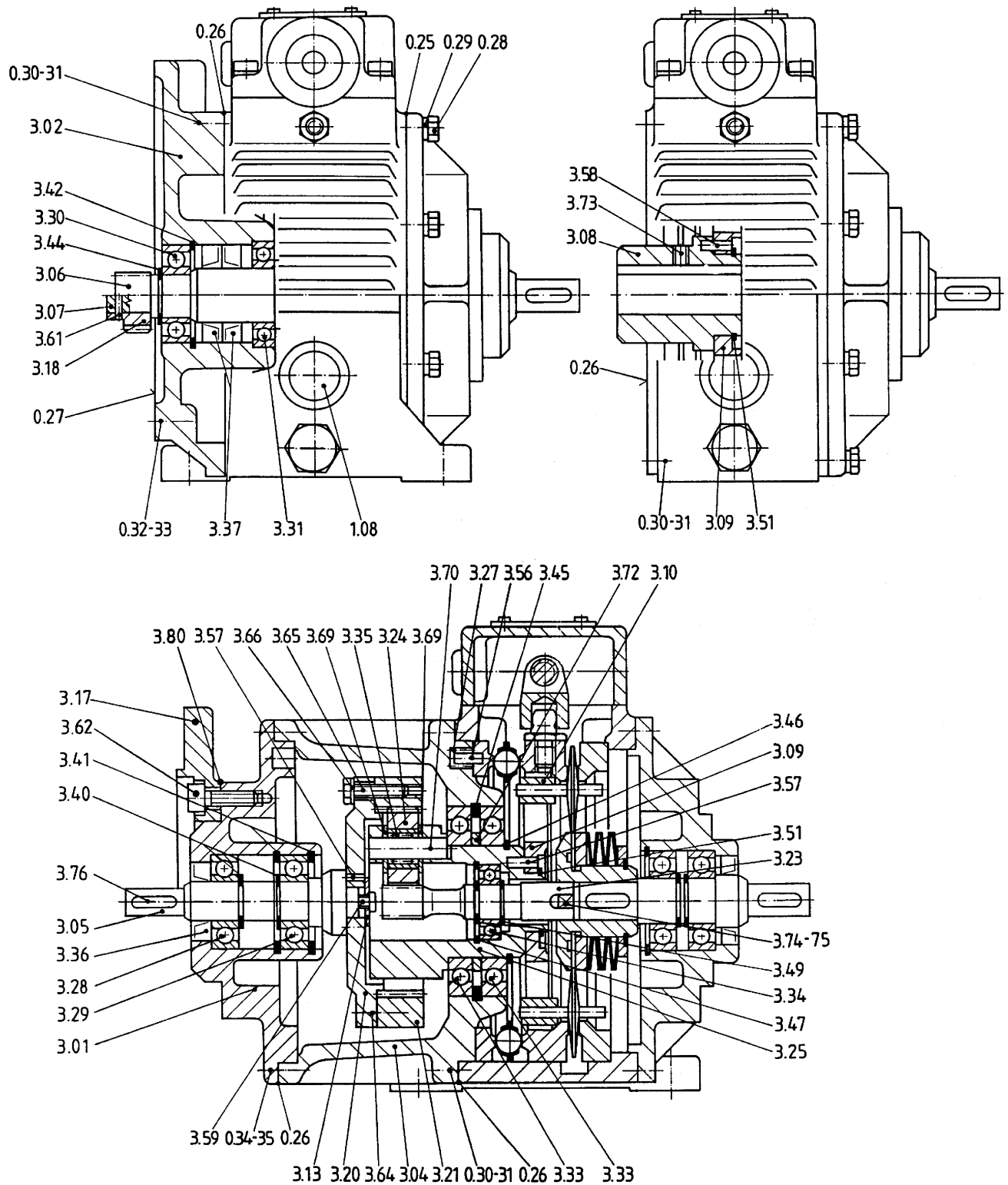
Pos. 7.00 (7.01...7.75): only complete replaceable.



Suitable for mounting of

helical and helical worm gearboxes

worm gearboxes



Item	Description	Item	Description	Item	Description
0.25	Gasket	3.40	Circlip	4.44	Socket head cap screw
0.26	Gasket	3.41	Circlip	4.45	Socket head cap screw
0.27	Gasket	3.42	Circlip	4.46	Spring washer
0.28	Hex. head screw	3.44	Circlip	4.47	Socket head cap screw
0.29	Spring washer	3.45	Circlip	4.48	Locking washer
0.30	Socket head cap screw	3.46	Circlip	4.56	Bell housing
0.31	Spring washer	3.47	Circlip	5.00	Microswitch housing, compl.
0.32	Socket head cap screw	3.49	Circlip	5.01	Housing
0.33	Spring washer	3.51	Circlip	5.02	Housing
0.34	Screw	3.56	Dowel pin	5.03	Actuator
0.35	Spring washer	3.57	Dowel pin	5.04	Complete board
0.35	Seal ring 1)	3.59	Socket head cap screw	5.05	Metal sheet
1.01	Housing	3.60	Spring washer	5.06	Microswitch
1.02	Stationary outer ring	3.61	Dowel pin	5.07	Pre-set potentiometer
1.04	Set screw	3.62	Socket head cap screw	5.08	Wormwheel
1.05	Seal-Lock hex. nut	3.64	Dowel pin	5.09	Gland connection
1.08	Oil sight glass	3.65	Hex. head screw	5.10	Gland connection
2.01	Cover	3.66	Spring washer	5.11	Set screw
2.02	Shaft	3.69	Washer	5.12	Socket head cap screw
2.05	Flange	3.70	Cylindrical pin	5.13	Screw
2.08	Motor (3-phase)	3.72	Shim	5.14	Set screw
2.15	Deep groove ball bearing	3.73	Set screw	5.15	Set screw
2.16	Deep groove ball bearing	3.74	Key	5.16	Leveling piece
2.18	Shaft seal	3.75	Dowel pin	5.18	Locking washer
2.19	Circlip	3.76	Key	5.19	Gasket
2.20	Circlip	3.80	Gasket	5.20	O-ring seal
2.22	Key	4.00	Spindle housing, compl.	5.21	O-ring seal
2.23	Key	4.01	Spindle housing	6.00	Complete inner sun
2.27	Gasket	4.02	Housing	6.01	LH inner sun
2.30	Hex. head screw	4.03	Spindle	6.02	RH inner sun
2.31	Locking washer	4.04	Guide-piece	6.03	Planet
2.32	Socket head cap screw	4.05	Shaft	6.04	Spring retaining cap
2.33	Seal ring	4.06	Speed control stud	6.05	Cup spring
3.01	Cover	4.08	Bush	6.06	Circlip
3.02	Flange	4.09	Adapter	7.00	Spindle housing, compl.
3.04	Housing	4.10	Small worm geared motor	7.01	Spindle housing
3.05	Shaft	4.12	Handwheel	7.03	Spindle
3.06	Pinion shaft	4.13	Direction indicator	7.04	Guide-piece
3.07	Shaft	4.14	Position indicator	7.23	O-ring seal
3.08	Bush	4.15	Bevel gear	7.25	Gasket
3.09	Planet carrier	4.16	Bevel gear	7.29	Fixing metal sheet
3.10	Planet bearing	4.17	Worm	7.31	Shim
3.12	Washer	4.20	Deep groove ball bearing	7.75	Collar bush
3.13	Washer	4.21	Bush		
3.14	Cam ring	4.22	Collar bush		
3.15	Ball cage	4.23	Shaft seal		
3.16	Movable outer ring	4.24	Shaft seal		
3.17	Flange	4.25	Gasket		
3.18	Pinion	4.26	Gasket		
3.20	Outer ring gear carrier	4.27	End cover		
3.21	Outer ring gear	4.28	Circlip		
3.23	Pinion shaft	4.29	Circlip		
3.24	Pinion	4.32	Seeger ring		
3.25	Planet gear carrier	4.33	Dowel pin		
3.27	Pressure spring	4.34	Dowel pin		
3.28	Deep groove ball bearing	4.35	Dowel pin		
3.29	Deep groove ball bearing	4.36	Dowel pin		
3.30	Deep groove ball bearing	4.37	Dowel pin		
3.31	Deep groove ball bearing	4.38	Dowel pin		
3.33	Deep groove ball bearing	4.39	Set screw		
3.34	Deep groove ball bearing	4.40	Set screw		
3.35	Needle bush	4.41	Set screw		
3.36	Shaft seal	4.42	Conical plug		
3.37	Shaft seal	4.43	Protective cap		

1)For the screws (0.34) inside of the oval flange of the differentia drive with helical gearbox

When ordering spare parts please quote :

Type and no. as shown on type plate, position and description of the spare part as shown in the spare parts list and no. of the installation and operating instructions.

Pos. 7.00 (7.01...7.75): only complete replaceable.

