Operating Instruction

Drive Element LEWA - ecosmart® type LCA
with manual stroke adjustment (HHV), motor mounted vertically

B 1.660 en

Table of contents

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction B 0.100.1.

1.2 Application

This operating instruction applies to the

drive element LEWA - ecosmart® type LCA with manual stroke adjustment (HHV), motor mounted vertically.

The LEWA works number can be found in the technical data sheet and on the nameplate fixed to the drive element housing.

1.3 Performance and applicabilities

See technical data sheet.

Plunger rod thrust:	1330 N
Stroke length:	0 - 15 mm
Scale division longitudinal scale:	1.00 mm
Ring scale:	0.05 mm

This drive element was designed for the conditions stated in the technical data sheet. LEWA does not accept any responsibility when these conditions are changed. This could lead to conditions resulting in major problems up to the destruction of the metering pump. Danger to persons, animals and the environment cannot be excluded in this case!
LEWA also does not accept any responsibility if the fluid to be conveyed or other important operating conditions have been given partially only or not at all.

1.4 Safety

Refer to operating instruction B 0.100.1.

1.5 Supply connections

Refer to operating instruction B 0.100.1.

1.6 Emissions

Refer to operating instruction B 0.100.1.

2 Transportation and intermediate storage

Refer to operating instruction B 0.100.1.

3 Product information

3.1 General description

The drive element changes the rotary motion, induced by the drive motor, into an oscillating (reciprocating) movement. The stroke length can be set from 0 to 15 mm in steps of 0.05 mm.
The stroke frequency results from the motor speed and the reduction ratio of the integrated worm gear.

3.2 Construction and method of operation

See fig. 1: The drive element mainly consists of the worm shaft (19), the worm wheel (3), the adjustment unit (7), the connecting rod (10) and the manual stroke adjustment.
The drive element works on the linear thrust crank principle. The worm shaft (19), which is coupled to the drive motor, transmits the rotary motion via the worm wheel (3) to the adjustment unit (7).
The adjustment unit (7) actuates the plunger (502, refer to assembly “Diaphragm pump head”) via the connecting rod (10).
The plunger stroke length is adjusted by turning the hand wheel (21). The adjustment unit changes the eccentricity of the connecting rod (10) and so the plunger stroke length.
The stroke length can be altered both with the metering pump stopped or running.
The relationship between the adjustment path and change of plunger stroke length is linear.

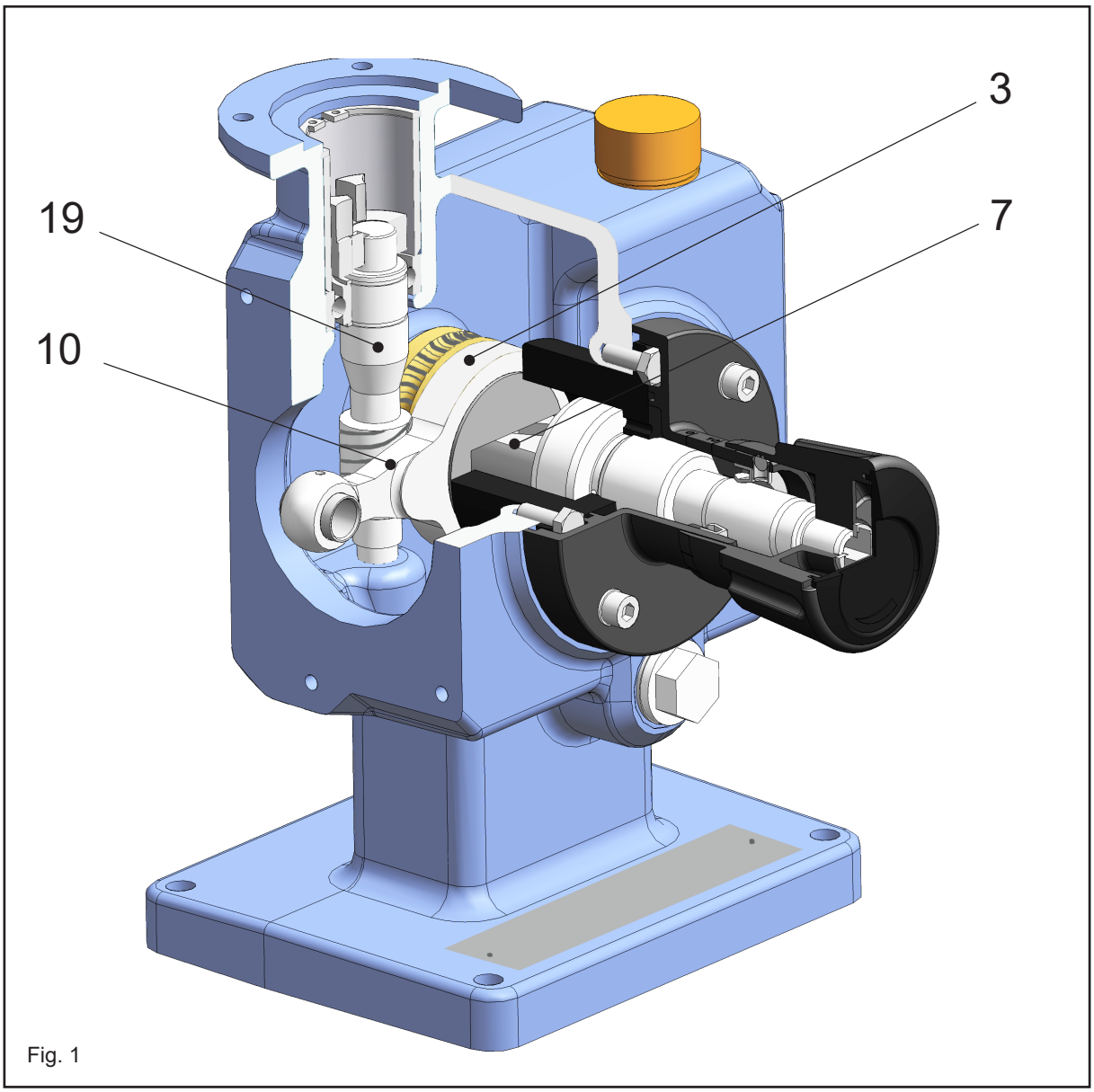

Fig. 1

3.3 Dimensions / weights / centres of gravity

Refer to operating instruction B 0.100.1.

4 Erection and assembly

Refer to operating instruction B 0.100.1.

5 Commissioning / operation / shut down

5.1 Operation

The stroke length can be adjusted via the hand wheel (21) and read off on the scale housing (24) with the metering pump running or stopped.
Clockwise rotation reduces the stroke length.
The metered flow at 15 mm stroke is shown in the technical data sheet. If you want to know the metered flow at any other stroke length, refer to section 5.4 in operating instruction B 0.100.1.

5.2 Operating and ancillary means

The drive unit must be charged with mineral oil.
Start-up temperature of drive element: > 0 °C
Maximum drive element temperature: +80 °C
Ambient temperature: - 15 °C to +40 °C
For deviating conditions, please consult LEWA.

Classification:

Ambient temperature range	Designation to DIN 51502	ISO viscosity class to DIN ISO 3448	Minimum requirements
+5 °C ... +40 °C	CLP 100 ISO-L-CKC 100	ISO VG 100	Lubricating oils CLP: Specifications according to DIN 51517-3
-15 °C ... +20 °C	CLP 32 ISO-L-CKC 32	ISO VG 32	
-30 °C ... +15 °C	HVLP 15 ISO-L-HV 15	ISO VG 15	Hydraulic oils HVLP: Specifications according to DIN 51524-3

Recommended lubricants: see operating instruction B 1.001.1 enclosed.

Lubricant volume: Drive element and diaphragm pump head have a common oil bath. The filling volume therefore also depends on the size of the diaphragm pump head and varies between 0.95 l and 1.1 l (see table).

Diaphragm pump head (plunger diameter in mm)	Required filling volume (approx.) in litres
6 up to and including 17	0.95
22 up to and including 42	1.10

For detailed information, refer to the technical data sheet (line 50/51), for volume see parts list “Metering pump” (item 110).

The drive element temperature is influenced by several factors (e.g. stroke frequency, load, ambient temperature). The value given is a typical value at full load and ambient temperatures up to +40 °C.
During the start-up period the max. temperature can be exceeded by 5 - 10 °C.
Observe start-up temperature and max. drive element temperature.

5.3 Commissioning, start-up, venting

Replace transportation screwed plug (80) by air filter (39) supplied loose.
Filling in lubricating oil: see section 6.1.2.2.
Start-up: Refer to operating instruction B 0.100.1.

5.4 Adjustment and control

Refer to operating instruction B 0.100.1.

5.5 Shut-down

Refer to operating instruction B 0.100.1.

5.6 Dismantling and return transportation

Refer to operating instruction B 0.100.1.

6 Maintenance and repairs

The item numbers in the following sections (in brackets) correspond to the item numbers in the sectional drawings and the corresponding parts lists.

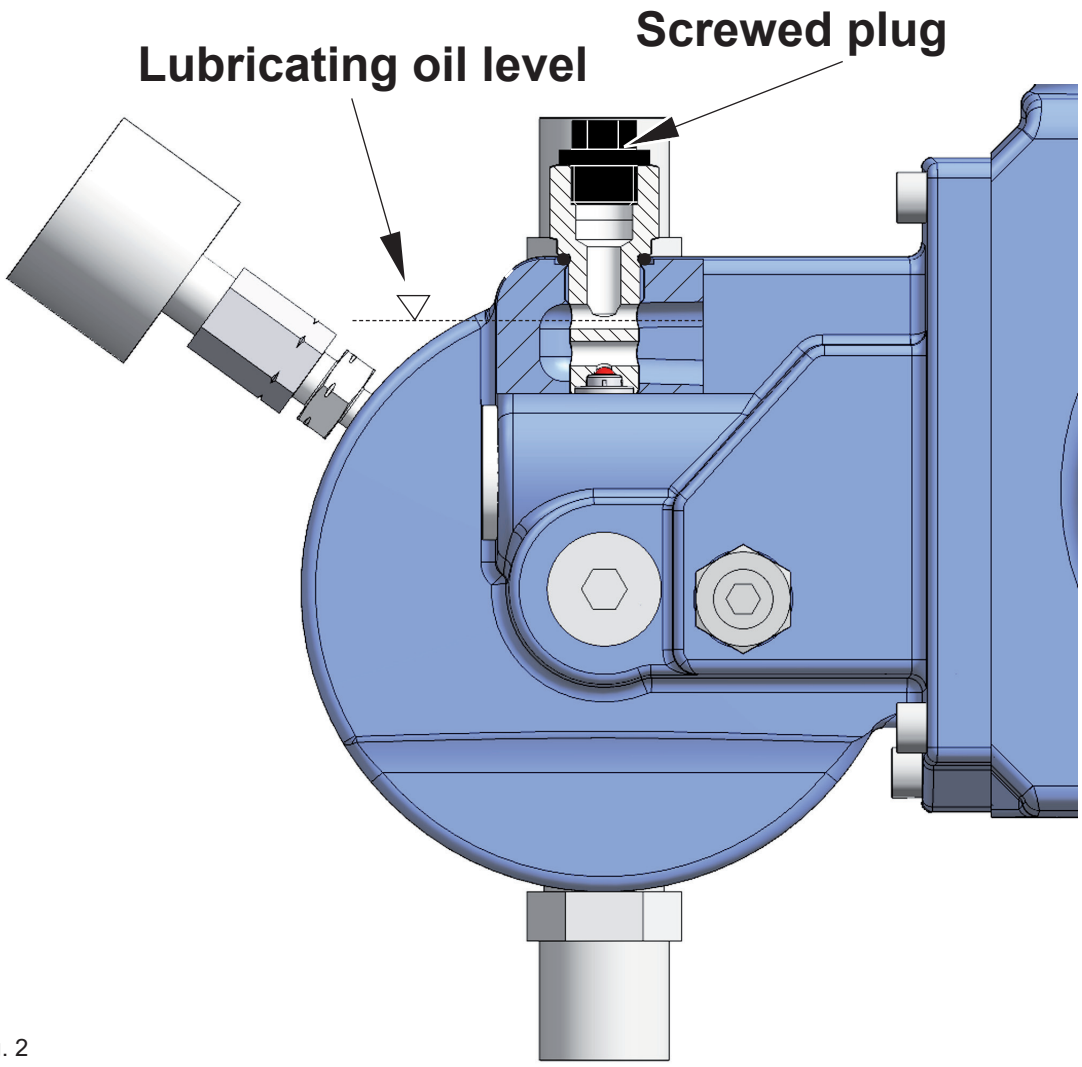

Fig. 2

6.1 Maintenance

6.1.1 Inspection intervals: lubricant

In order to prevent problems, check the lubricant level weekly.

1. Stop the metering pump and wait for approximately 5 minutes.
2. Remove the screwed plug of the hydraulic snifting valve (529) (see fig. 2).
3. The lubricant level must be within the range of the cross bore visible from above (see fig. 2).
4. If required, top up lubricant. For this, remove the air filter (39).
   For grade of lubricant, refer to section 5.2.
5. Reinstall the air filter (39) and the screwed plug of the hydraulic snifting valve (529).

6.1.2 Change of lubricant

Change the lubricating oil after 8800 hours of continuous operation or after two years at the latest.

6.1.2.1 Draining of lubricant

Danger of burns when draining hot lubricant!
Assure environmentally safe draining and disposal of spent lubricant.

1. Switch off the metering pump.
2. Open the screwed plug (40) and drain the lubricant (at operating temperature).
3. Unscrew the hydraulic snifting valve (529).
   Open the screwed plug (560) and drain residual lubricant from the diaphragm pump head.
4. Screw in the screwed plugs (40 and 560) with seal rings (41, 561) and the hydraulic snifting valve (529). Observe the torque specified in the parts list “Diaphragm pump head”.

6.1.2.2 Filling in lubricant

1. Switch off the metering pump.
2. Remove the screwed plug from the hydraulic snifting valve (529).
3. Unscrew the air filter (39).
4. Fill lubricating oil into the drive element.
   Oil quantity and grade: see section 5.2.
5. Wait until the pressure chamber (B) of the diaphragm pump head has also filled with lubricating oil via the installation space of the hydraulic snifting valve (529).
   Check of lubricant level: see section 6.1.1.
6. Reinstall the hydraulic snifting valve (529).
7. Reinstall the air filter (39).

6.1.3 Inspection of coupling clearance, change of coupling - toothed rim

Read and observe enclosed separate operating instruction “Torsionally flexible jaw coupling” B 1.950.

In order to replace the toothed rim (76, drawing / parts list "Flange drive side") proceed as follows (also refer to the attached, separate operating instruction B 1.950):

1. Switch off the metering pump.

Safeguard the drive element against unintentional operation (disconnect power supply).

2. Remove the 4 hexagon head screws at the motor flange and lift off the motor.
3. Remove the toothed rim (76, drawing / parts list “Flange drive side”) and replace by a new toothed rim.
4. Mount the motor again and tighten using the 4 hexagon head screws.

6.1.4 Grooved ball bearing (16) and grooved ball bearing from adjustment unit (7)

All roller bearings are theoretically designed for a service life of at least 30 000 hours. The effective service life strongly depends on the operating conditions (e.g. load, quality of lubricant, temperature) and can be considerably longer or also shorter depending on the individual case.

Break-down of a bearing can lead to unscheduled interruptions and very high heat build-up locally.
Therefore, it is recommended to check drive elements regularly with regard to the roller bearings. One indication for damaged roller bearings is the development of noise.
Damage at the bearings can be detected at an early stage with suitable diagnosis systems.

Replacement of grooved ball bearing (16): see sections 6.3.1 - 6.3.3.

Grooved ball bearing (part of adjustment unit (7)): The grooved ball bearing in the adjustment unit (7) can be replaced as complete spare part unit together with the adjustment unit only.

6.2 Repairs

6.2.1 Standard tools

- allen keys: size 4/5 mm,
- open ended spanner: size 10/ 13/ 19 mm,
- plastic hammer
- screwdrivers (different sizes)
- circlip pliers (inside and outside)
- soft metal drifts
- claw pulling device
- pulling device with sliding hammer (insert for M8).

6.2.2 Required documents

Additional documents required: sectional drawing “Metering pump LCA” and corresponding parts list.

6.2.3 Wear parts, spare parts

Check whether the parts marked with “V” as wear parts in parts list are available.
For machines which have been in operation for 5 years or more, we recommend that the parts marked with “E” as spare parts are available also.
For safety reasons, parts designated with “E” or “V” in the parts list should be re-used as an exception and after thorough inspection only.

6.3 Dismantling / Assembly

6.3.1 Preparation Dismantling/ Assembly

Reserve suitable clean area for depositing the individual parts.

Safeguard drive element against unintentional operation (disconnect power supply).

Take the drive element to a dry, enclosed, but well ventilated and essentially dust-free room for dismantling / assembly if possible.

- **Clean** all parts to be used again thoroughly, however, if possible, do so only just before re-assembly.
  Use a cold cleaner to remove lubricant residues.

Observe any safety and disposal instructions!

- **Check** all parts for proper condition before installation.
- **Slip agents, lubricants**
  a) Radial seal rings and O-rings must be thinly coated with the lubricating agent specified for operation before assembly.
  b) Screws and threaded shafts must be coated with the lubricating agent specified for operation before assembly.

6.3.2 Total dismantling

Safeguard drive element against unintentional operation (disconnect power supply).

1. Drain lubricant (refer to section 6.1.2.1).
2. Remove the pump head (according to operating instruction “pump head”).
3. Remove the motor.
   Take the drive flange off.
   If installed (see parts list), remove the O-Ring (111).
4. Force the protecting cover (72) from the hand wheel (21) using a small screwdriver. Remove the hexagon head screw (22) and the disk (75).
   Pull the hand wheel (21) from the adjustment unit (7) using the claw pulling device (see fig. 3).
5. Loosen the screws (33). Make sure not to lose the seal rings (34)! Pull the scale housing (24) off via the adjustment unit (7).
6. Remove the O-ring (48) and the hexagon head screws (29). Using the plunger (502), hold the connecting rod (10) tight and pull the adjustment unit (7) out of the drive element housing (1).

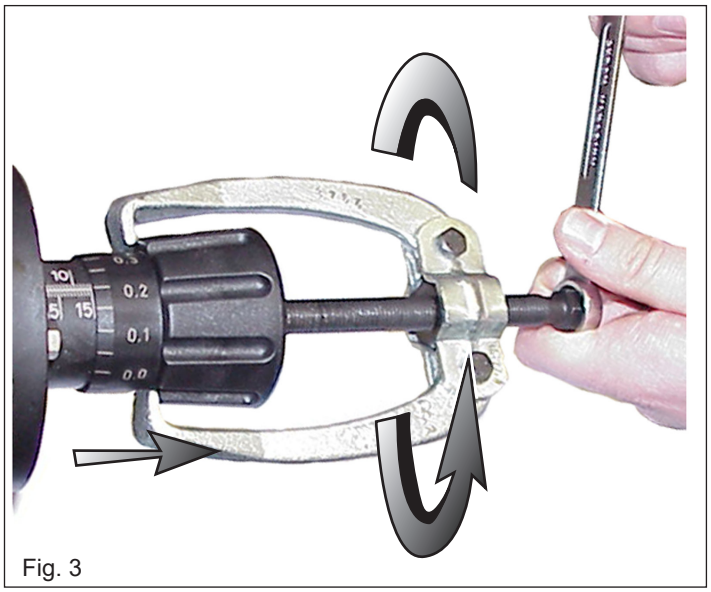

Fig. 3

7. For further dismantling, turn the adjustment unit (7) clockwise from the threaded bushing (65).
8. Remove the connecting rod (10), the plunger (502) and the cylindrical pin (32) from the drive element housing (1).
9. Remove the circlip (13) and take out the spacer pipe (23).
   If an O-ring (17) is installed below the spacer pipe (23) - see parts list:
   Lift the worm shaft (19) by approximately 20 mm. The O-ring (17) is moved upwards from its operating position by this. Drop the worm shaft (19) again. Remove the O-ring (17).
10. Pull out the worm shaft (19) while turning it.
11. If the grooved ball bearing (16) must be replaced, separate the coupling hub (75, drawing / parts list “Flange drive side”) and the worm shaft (19) using the claw pulling device.
    Remove the key (20) and then the circlip (15).
    Now you can pull the grooved ball bearing (16) from the worm shaft (19).
    If the grooved ball bearing (16) does not have to be replaced, do not dismantle the assembly.
12. If shim discs (14) were used, also remove them from the drive element housing (1) and note their number for re-assembly with the same grooved ball bearing (16).
    When installing a new grooved ball bearing (16), make sure to follow the instructions in section 6.3.3, no. 2.
13. Take the worm wheel (3) out of the drive element housing (1).
    Unscrew the air filter (39) and the screwed plug (40).

6.3.3 Assembly

Assembly is basically carried out in reverse order to dismantling.
Observe the following points when doing so:

1. Before assembly, clean the individual parts. Use a cold cleaner to remove lubricant residues.

Follow the safety and disposal regulations!

Check the parts for damage. Damaged or heavily worn parts must be replaced.

2. Mounting of shim discs (14)/ grooved ball bearing (16), item 12 of dismantling: determine the number of shim discs (14) required when installing a new grooved ball bearing (16) to assure that the grooved ball bearing (16) has no play.
   If an O-ring (17) is installed: **Remove the O-ring (17) before installation (to determine the dimension)**.
   Mount the worm shaft (19) with the grooved ball bearing (16), install the spacer pipe (23) and fit the circlip (13). Using a feeler gauge, measure the distance between the circlip (13) and the upper edge of the spacer pipe (23). Select shims according to the dimension measured and install below the grooved ball bearing (16).
3. Replacement of the spacer pipe (23), to item 9 of dismantling: If the spacer pipe (23) is replaced and there was an O-ring (17) installed under the old spacer pipe, a new O-Ring (111) must be fitted to the top of the drive element housing. The old O-ring (17) is omitted with new spacer pipes.
4. Mounting of circlip (13), to item 9 of dismantling: Place the circlip (13) and force it into its final location using a soft drift.

Afterwards, check that the circlip (13) is seated correctly!

5. Observe the torque stated in the parts list when tightening screws (33)!
6. When connecting the drive motor again, observe the direction of rotation of the motor shaft.
   The direction of rotation is marked by an arrow in the casting of the drive element housing (1).

6.4 Filling, adjustment

6.4.1 Setting of stroke scale

First, set a stroke length of 5 mm by turning the hand wheel (21) in the corresponding direction. This is checked using a dial gauge. Measure the movement of the plunger (502) with the diaphragm pump head mounted and the screwed plug (570) removed.

Before proceeding, safeguard the motor against unintentional start!

To move the plunger, either rotate the motor shaft (remove fan cover), or turn the worm shaft.
Now, install the hand wheel (21) so that the zero division on the hand wheel (21) covers the 5 mm reference line on the scale housing (24).
Tighten the hexagon head screw (22) with the disk (75) until the 5 mm division mark remains just visible.
Close the hand wheel (21) with the protecting cover (72).

6.4.2 Filling

Filling lubricating oil into the drive element: see section 6.1.2.2.
Venting the diaphragm pump head: see operating instruction “Diaphragm pump heads”.

7 Faults: symptoms, remedial action

Refer to operating instruction B 0.100.1.