THE TECHNOLOGY ADVANTAGE

LEWA pumps + systems

Operating Manual

Betriebshandbuch

Order no.: 333159

Item no.: 10

Operating Manual

Manuel de service

Manual de servicio

Manuale di esercizio

Εγχειρίδιο λειτουργίας

Instructiehandboek

Betjeningsvejledning

Driftsanvisning

Käyttöohjekirja

Manual de serviço

Руководство по эксплуатации

取扱説明書

操作使用説明

A-90 · 090100.1272

Technical Data Sheet

LEWA

Customer	Customer-Reference No.
Prochrom S.A. 5 rue Jacques Monod 54250 Champigneulles FR-54250 Champigneulles	N° 9X7334COM3212

LEWA-Quotation-No.	LEWA-Commission-No.	LEWA-Position
- -000	E12 -333159	010

1	Element	a+b	Page 1 of 1

Enquiry Data (If operating data are incomplete LEWA takes no responsibility for the pump selection!)

			min	max		min	max
2	Fluid		Solvents				
3			min	max		min	max
4	Concentration	(%)	---	---	Vapour pressure (bar abs)	# 0	
5	Fluid temperature	(°C)	25	25	Solidifying point (°C)		
6	Density	(g/cm3)	0.8	1.5	Solids Concentration (%)	none	
7	Viscosity	(mPa s)	<5		Density (g/cm3)	none	
8	Required flow	(l/h)	6.40	37.00	Solids sizes (mm)		
9	Operating press. discharge	(bar)		150.00	Hardness (Mohs)		
10	Operating press. suction	(bar)	0.1		Setting rate (m/s)		
11	Ambient conditions (temperature, climate,..)						
12	Area classification						

Design data

13	No.	3	LEWA-Serial-No.	333159 -010 . 001...003	
14	Type	EK-2	Custom.-Item-No.	H07000005	

15	Crankcase	Type	EK	Driver	Make	Siemens
17	Rod thrust	(N)	2000	Type		1LA7083-4AA12
18	Stroke adjustment		manual	Power	(kW)	0.75
19	Eccentricity	(°)	0 / 180	Rpm	(min-1)	1400
20	Gear reduction		8.33	Ex-protection		---
21	Strokes per minute	(min-1)	33-220	Protection / Insulation		IP55 / F
22	Intermed. element	Type	---	Voltage	(V)	230/400
23		Width (mm)	---	Phases / Frequency	(Hz)	3 / 10-70
24	Pumphead	Type	M210	Size / Mounting		80 / B14
25	Plunger-Ø	(mm)	12	Flange-Ø	(mm)	120
26	Flow @ max. operating press.	(l/h)	18.8 per pump head	Shaft	(Ømm) x (mm)	19x40
27	Max. perm. operating press.	(bar)	150	Thermistors		3 KLF
28	Diaphragm condition monitor		---	VIK-design		
29	Vent screw		---	Additional remarks :		
30	Type of plunger sealing		glandless			
31	Plunger linkage		m	Variable frequency drive		
32	Valve Suction / DN		K2D / 5	Range	(Hz)	10-70
33	Spring load	(bar)	---	Start-up against load		
34	Valve Discharge / DN		K2D / 5	Rated torque at max. press.	(Nm)	
35	Spring load	(bar)	---	Start-up torque at max. press.	(Nm)	
36	Setting PRV pumphead internal		170	Aditional remarks :		
37	Setting PRV external		---			
38	Inlet pressure loss	(bar)	0.1	General		
39	Min. required suction press.	(bar abs)	0.3	Paint		RAL 5012
40	Connection Suction		G 3/8"	Name plate		Fr
41	Discharge		G 3/8"	Weight	(kg)	
42	Connection Flushing		---	Sound pressure	(dB(A))	
43	Heating / Cooling		---	Ex-protection		
44	Materials LEWA material-Code		3	Accessories / Documentation / Remarks :		
45	Pumphead / Valve body		1.4571 / 1.4571	Max. flowrate by 70 Hz.		
46	Plunger · diaphragm		1.4401K			
47	Valve Seat / Insert ring		1.4571 /	Pos. 020 Manual Instuction		
48	Guide / Ball · Cone · Plate		1.4571 / 2.4610			
49	Spring / Sealing ring		/ Gylon			
50	Type of plunger sealing		---			
51	Hydraulic fluid (diaphragm head)		J-26			
52	Intermed. fluid (sandwich diaphr.)					

	issued 04.03.99	Name VA / Jun	Rev.(1)	Name	Rev.(4)	Name
	checked	Name	Rev.(2)	Name	Rev.(5)	Name
	checked	Name	Rev.(3)	Name	Rev.(6)	Name

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1 General information / safety

1.1 Important preliminary information

In addition to the safety and caution instructions in this operating instruction also observe all general occupational safety and health regulations!
The LEWA metering pumps and process pumps must only be used in proper technical condition and for the application intended, special attention must be paid to any safety risk observing the operating instruction! Specially problems impairing the safety must be corrected immediately.
Proper use includes observation of the operating instruction and maintaining of all inspection and maintenance requirements.
The metering pumps and process pumps are only intended for the conditions and fluid stated in the technical data sheet. Any deviating use or a use exceeding these conditions is considered to be improper use. The risk rests with the user exclusively.

The operator must assure that all commissioning, service, preventive maintenance and installation work is carried out by authorized and qualified expert personnel only which has gained sufficient information by studying the operating instruction in detail.

In addition to the safety  and caution instructions  in this operating instruction also observe all general occupational safety and health regulations!
Please observe comments with the  sign for hazardous areas acc. to guideline 94/9 EC (ATEX).
The operator must assure that at least one copy of the operating instruction always is available near the pump!

- **Has the pump drive element been filled with suitable lubricant?**
- **Have all parts supplied loose been installed (e.g. plungers of plunger pump heads)?**
- **Is the power supply of the drive resp. the control correct?**
- **Has the electric hook-up of the metering pump/process pump been carried out properly and meeting local requirements?**
- **Are all connections hooked-up correctly (no tension and tight)?**
- **Is the discharge side protected by e.g. a safety valve?**

1.2 Application

This operating instruction applies to **metering** and **process pumps** manufactured by LEWA. The LEWA commission number and LEWA serial number is stated in the “Technical Data Sheet” and on the pump name plate.

1.3 Performance and applicabilities

- **The metering pump/process pump was designed for the conditions listed in the "Technical Data Sheet".**

- **The metering pump / process pump is approved for use in hazardous areas only when the technical data sheet and the factory name plate displays a degree of explosion protection corresponding to the area.**

- **LEWA cannot accept any responsibility if these conditions are changed. Under certain conditions this could lead to major problems resulting even in the destruction of the metering pump / process pump. LEWA also cannot accept any responsibility if the fluid conveyed or important operating conditions were not specified or specified incompletely only.**

Please consult LEWA if the metering pump / process pump is suited for the changed application conditions.

1.4 Safety

LEWA products meet the regulations for safety at work and prevention of accidents.

- **Depending on the place of installation and the operating mode, as well as fluid and heating agent temperature the metering pumps/process pumps can reach a high surface temperature (>80 °C) (danger of burns). Should this be the case protective measures (e.g. protection against physical contact) must be taken.**

- **When used in hazardous areas the metering pumps / process pumps are designed for temperature classes T1 to T4. For an exact classification therefore take special notice of the temperature of the metering- and heating fluid. The temperatures stated in the technical data sheet must not be exceeded. Please consult LEWA in case of deviations.**

- **If the fluid conveyed can form an explosive mixture together with the atmosphere, diaphragm pump heads with single diaphragm must not be used in hazardous areas! Exception: diaphragm pumps with a stroke volume < 1 cm^3. In case of diaphragm rupture the leaking fluid will be dangerous (e.g. hot/toxic/high pressure).**

- **Endangering the operating personnel by the fluids used must be prevented by corresponding accident prevention measures of the user. This means all seals, screwed connections and venting screws must be checked for tightness periodically!**

- **Venting screws must be opened very careful only! The leaking fluid is posing an acute danger (e.g. hot/toxic/high pressure/combustible).**

In hazardous areas, where the fluid conveyed can form an explosive mixture when in contact with the atmosphere, a safe drainage of the leaking fluid must be assured.

- **Assure safe draining of the leakage at the plunger seal of plunger pump heads.**

- **When plunger pump heads are used to convey combustible fluids the leakage at the plunger seal must be minimised (regular maintenance, flushing by a suitable fluid and safe drainage of the leakage).**

- **Wetted parts must be thoroughly flushed and cleaned before disassembly!**

- **The hydraulic fluid and the diaphragm intermediate fluid were matched to the fluid conveyed based on the operating data available to us. Fluids causing an exothermal reaction when in contact with mineral oil must be protected by using a suitable diaphragm intermediate fluid. Please consult LEWA in case of doubt.**

- **Assure that the cover of the holder (24) is always closed! The oscillating plunger rod is a possible source for accidents by squashing!**

Metering pumps / process pumps with an electric drive are machines for use in industrial high tension plants. During operation this equipment has dangerous, live parts and possibly moving resp. rotating parts. Therefore they can cause high health hazards or material damage in case

of non-authorized removal of the required covers, in case of improper use, mis-operation and insufficient maintenance.
The persons in charge of plant safety therefore must assure that

- **only qualified personnel is ordered to work on the machines resp. instruments**
- **the personnel, among other things, always have the operating instructions and all other documents of the product documentation readily available for all work concerned.**
- **The persons must be placed under the obligation to strictly adhere to these documents.**

Qualified personnel are persons which, due to their education, experience and training as well as their knowledge of the relevant standards, regulations, rules for the preventation of accidents and operating conditions, have been authorized by the persons in charge of plant safety to carry out the corresponding work required and can recognize and prevent possible dangers when performing the work.

1.5 Supply connections

Metering pumps / process pumps with an electric drive and possibly an attached electric stroke actuator need an adequate connection. The power connected is stated in the "Technical Data Sheet".

For pump heads / pipe lines with heating or cooling jackets or for drives, gears or pump drive elements with cooling the connection and supply of a suitable heating or cooling fluid must be provided.
For plunger pump heads a safe collection and draining of any leakages and the supply and draining of flushing fluid for the plunger seals must be provided.
Pneumatic stroke actuators must be supplied with operating and control air pressure.
When the pump head is equipped with a venting screw a hose connection compatible with the fluid must be installed to a collecting tank or the supply tank.

1.6 Emissions

The exact sound pressure level can be taken from the technical data sheet. Leakages can occur at the plunger seal of plunger pump heads.

Therefore make sure to observe all handling and safety instructions for the fluid conveyed ! (Safety data sheet)

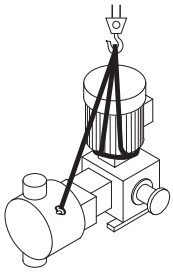
2 Transportation and erection

2.1 Condition as supplied

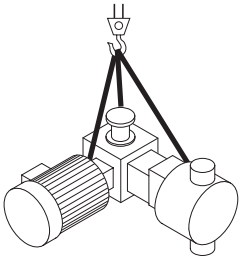
If not specified otherwise by the purchaser, LEWA metering pumps / process pumps are preferably tested with water at the performance data stated in the technical data sheet.
Except for small pumps such as e.g. LEWA ecodos the drive elements are delivered without lubricant charge. The airfilter is supplied separately and the bore in the drive element is closed by a plug.
Enclosed holders (refer to fig. 2) of hydraulically actuated diaphragm pump heads are filled with hydraulic fluid. The filling bore is closed by a plug, **the airfilter is supplied separately**.
Gears usually are supplied filled with lubricant (refer to operating instruction of the drive).
Corrodible components of the pump head (e.g. plungers) are stripped, protected and supplied loose. Installation of plunger acc. to operating instruction B 2.1100, section 4.5. Pump head connections are protected by plastic caps against damage and ingress of dirt.
If metering pumps / process pumps are shipped without motor please read and observe the enclosed operating instruction of the coupling.

2.2 Inspection of the packing at the destination

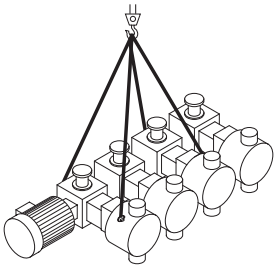
Please check packing for damages upon receipt. External damages must be reported to the corresponding forwarder immediately and a recording of damages must be requested. The packing must be in a condition which assures protection during the storage period following. The shipment must be opened if packing damage is noticed.
For drives and accessories please observe the instructions of the corresponding manufacturer.



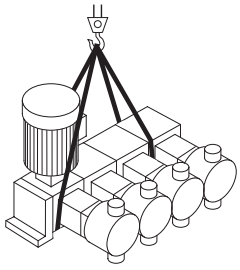
Simplex pump vertical design,
all pump heads ,
Types EK, EL, EH, EAL, EEL, ELE,
GL, GH, EAC, EAK, EEC,
EEK, FC, FCE,
LDB, LDC, LDD, LDE,



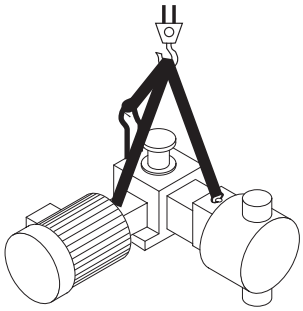
Simplex pump horizontal design
all pump heads,
Types EK, EL, EH, GL, GH, EAL,
EEL, ELE,
LDB, LDC, LDD, LDE,



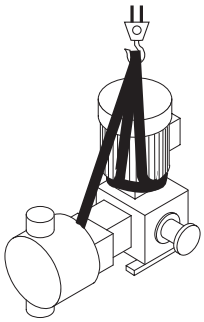
Multiplex pumps 2 - 6,
all pump heads,
Typ EK, EL, EH, GL, GH,
EAL, EEL,
LDB, LDC, LDD, LDE,



Multiplex pumps 2 - 6,
all pump heads,
Typ FC, EAC, EEC, FCE,
EAK, EEK, FKE,
LDB, LDC, LDD, LDE,



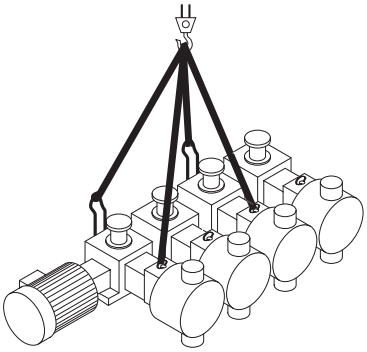
Simplex pump horizontal design
with diaphragm pump heads,
Types ES, GS, EG, GG,
LDH



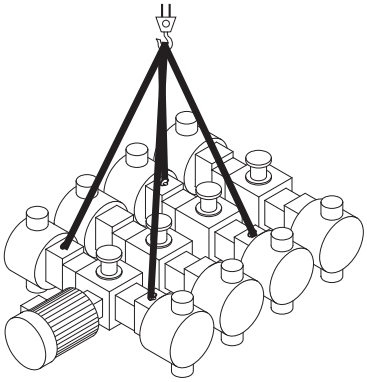
Simplex pump vertical design
all pump heads
Types ES, GS

Refer to general
arrangement drawing
concerning the
attachment of the
lifting gear resp. slings

All combinations of metering pumps (e.g.
EH1/EK1) up to and including types EH, GH

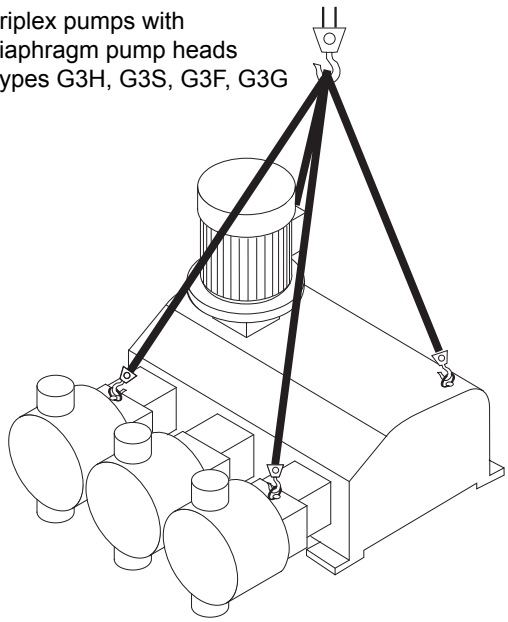


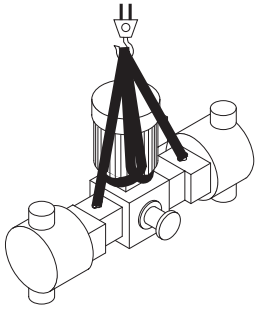
Multiplex pumps 2 - 6,
with diaphragm pump heads
Types ES, GS,
LDH,



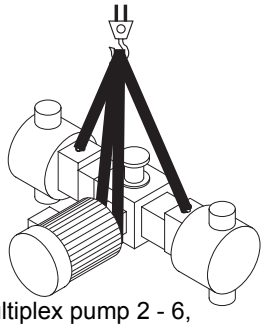
Multiplex 2 - 6,
in opposed plunger (boxer) design
with diaphragm pump heads
Types ESB, GSB,
LDHB,

Triplex pumps with
diaphragm pump heads
Types G3H, G3S, G3F, G3G





Simplex pump, opposed plunger
(boxer) design, vertical with
diaphragm pump heads
Types ESB, GSB



Multiplex pump 2 - 6,
in opposed plunger (boxer) design
with diaphragm pump heads
Types ESB, GSB, EGB, GGB,
LDHB,

The lifting gear must be attached to the corresponding lifting lugs only, install the lifting slings as shown in the pictures/ g.a. drawing.

Slacken the tension of the lifting gear only after the pump was safely installed on the foundation.

2.3 Transportation, lifting devices

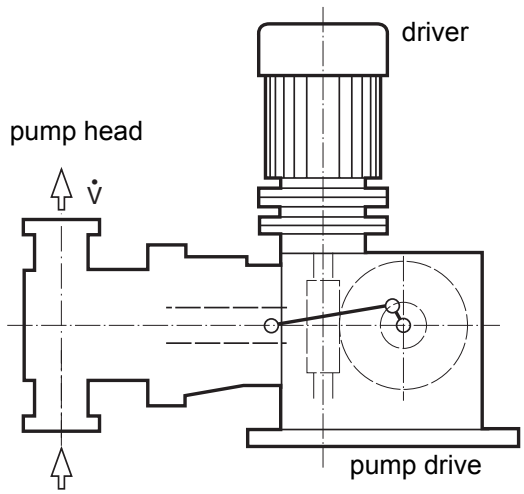
The figures and instructions concerning attachement to lifting equipment given on page 5 must be observed.
Remove lifting gear only after the pump has been safely mounted to the foundation. The pump could tip over otherwise.

3 Product information

3.1 General description

LEWA metering pumps/process pumps are reciprocating positive displacement pumps. The volume flow is produced by periodically repeating a preset stroke volume given by the plunger area and the stroke length. The volume flow can be changed by altering the stroke length and/or the stroke frequency or both.

Fig. 1



3.2 Construction and method of operation

LEWA metering pumps/process pumps are made up of the sub-assemblies driver, pump drive element and pump head and possibly further attachments (see fig. 1).

3.2.1 Driver

The driver (usually an electric motor) supplies the power required to raise the fluid conveyed from suction to discharge pressure.
For this make sure to read paragraph 1.4.

3.2.2 Pump drive

The pump drive converts the rotation of the driver into an oscillating (reciprocating) motion of the plunger as described in the operating instruction “Pump Drive Element”.

3.2.3 Pump heads (see fig. 2)

The pump heads, being the actual conveying element, can be designed as plunger or diaphragm pump head.

Plunger pump head Diaphragm pump head

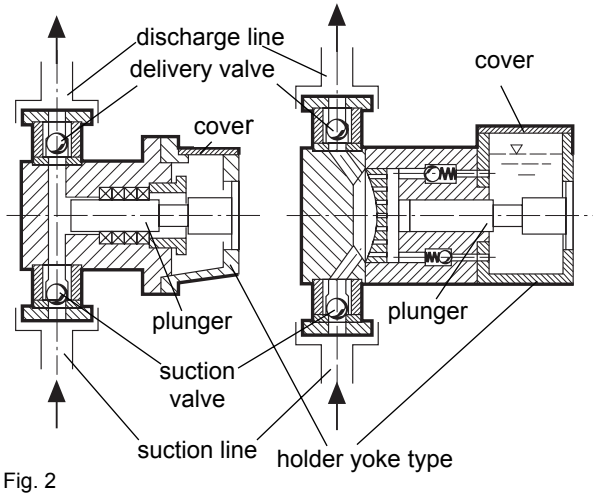


Fig. 2

3.3 Dimensions / weights / centres of gravity

Please refer to the attached general arrangement drawing for this information.

4 Requirements for the erection site

4.1 Permissible ambient conditions

The standard metering pumps/process pumps design is intended for installation in dry rooms with a non-aggressive atmosphere.
Other environmental conditions (e.g. installation outdoors, on drilling platforms, in dairies, etc.) are only permissible if they are stated in the “Technical Data Sheet” and if the pump was designed for such a particular purpose (e.g. with an appropriately protected drive or special corrosion protection).

4.2 Space requirements

The space requirement of the pump or package and the position of the foundation holes can be taken from the general arrangement drawing.

4.3 Foundation

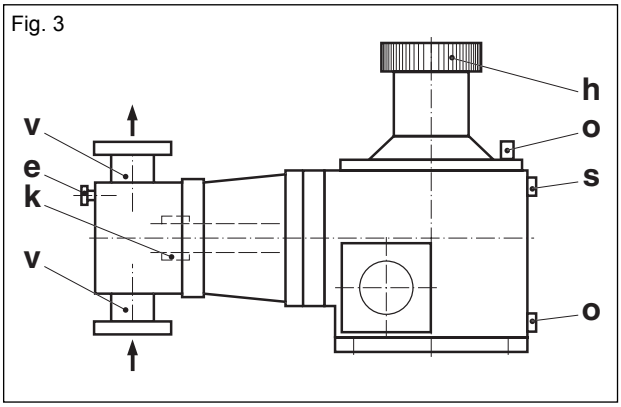
Reciprocating displacement pumps have pulsating forces and moments which act on the foundation.
For big pumps the foundation must be designed to take up these forces and moments.

The forces to be considered will be given by LEWA on request.
The user is responsible for supplying a proper foundation.
The layout of the foundation should allow ready access to the oil drain plug, oil sightglass and to the bottom cover.

4.4 Erection (s. fig. 3)

The pump must be set up so that the centre line of the piston rod is horizontal and the centre line of the valves is vertical.

Fig. 3



The following parts should be readily accessible (see fig. 3):
Handwheel for stroke adjustment and indicating scale (h),
oil filling and draining plugs (o),
oil level indication (s),
valves (v),
venting valve (e) (if fitted),
plunger packing (k) for plunger pump heads.
Please also note the assembly distances given in the general arrangement drawing.

4.5 Installation

4.5.1 Electrical (For this specially observe section 1.4)

The electric motor must be connected acc. to local regulations, with overload protection.

When connecting the motor the direction of rotation marked by an arrow at the drive element housing or the drive flange must be observed.

The complete installation must be equipped with an "emergency off" switch by the user which is accessible easily and fast from the place of work.

The earthing connection of metering pumps / process pumps in hazardous areas must be connected.

4.5.2 Hydraulical

The oscillating operation of LEWA metering pump / process pump must be taken into consideration when designing the pipeline. For this refer to information sheets D10-010 resp. D10-012!

Before mounting the pipelines the protective covers at the suction and discharge connection must be removed. The connections and pipelines must be thoroughly cleaned. The suction and discharge line must be attached to the pump head without tension or stress.

The pipelines must be installed so that the valves (v) are easily accessible and allow simple replacement of the plunger packing (k) of the plunger heads or the diaphragm of diaphragm pump heads (refer to fig. 4). The assembly space required can be taken from the general arrangement drawing.

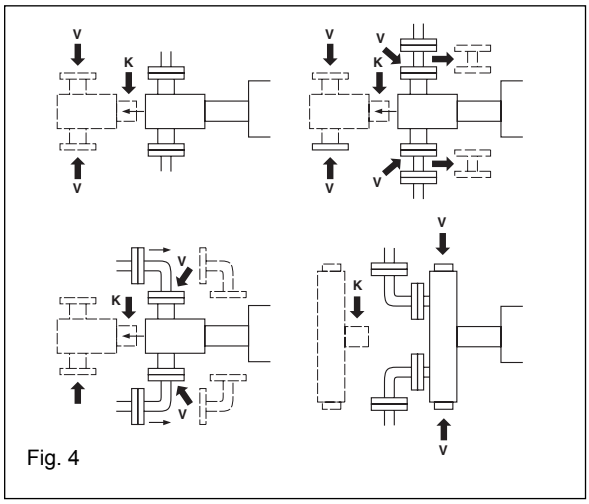


Fig. 4

4.5.3 Safeguarding against overpressure

Reciprocating positive displacement metering pumps/process pumps have a positive displacement characteristic. Therefore the pump and system must be equipped with a safety valve in the discharge line as a protection against possible overpressure (e.g. closed shut-off valve etc).
Diaphragm pump heads are equipped with an integral pressure limiting valve which protects the metering pumps/process pumps **but not the system.**

4.5.4 Dirt traps

Contamination of the fluid conveyed can lead to inaccurate metering results and to increased wear.

If contamination of the fluid conveyed cannot be prevented a dirt trap must be installed. The mesh size of the strainer sieve can be taken from table 1. We recommend to use dirt traps with a sufficient surface area with inserts which can be removed for cleaning. LEWA can offer suitable dirt traps.

Tabel 1

Valve DN	max. mesh size (mm)	
	micro metering	dirt trap
≤ 5	0,04	0,1
10		0,15
15		0,2
25		0,3
≥ 32		0,5

4.5.5 Pressure retaining valves

Pressure retaining valves are recommended if the differential pressure between suction and discharge valve is not sufficient. This prevents an uncontrolled flow through the pump head. **Pressure retaining valves are not suitable for use as a shut-off device!**

4.5.6 Metering of slurries

Trouble-free metering requires even mixing of the fluid conveved up to the metering pump. Sedimendation must be prevented. The suction and discharge side installation must be properly designed for this. We would be pleased to assist you when planning the installation. Depending on the properties of the slurry suitable slurry valves are installed in the pump.

5 Commissioning / operation / shut down

5.1 Operating equipment

See operating instruction.

5.2 Operating and ancillary means

5.2.1 Lubricant for metering pumps / process pumps drive elements

Note danger of burns by hot lubricant when draining the pump drive element.

See operating instruction of drive elements and separate operating instruction B 1.001.

5.2.2 Others

Hydraulic fluids, heating-, cooling- and flushing fluids, supply lines of stroke actuators see “Technical Data Sheet”, product list and operating instruction “Pump Head/Stroke Actuator”. For hydraulic fluids (selection table) refer to separate operating instruction B 1.002.

5.3 Commissioning, start-up, venting

Before commissioning please check if the metering pump/process pump is installed and hooked-up as required.

Provide guards for coupling, plunger rod, motor fan etc. to prevent possible injury.

- Install single parts (e. g. plungers) supplied loose.
- Fill in lubricant specified (see operating instruction „drive unit, pump head and stroke actuator“).
- Replace oil filling screwed plug and screw-in air filter supplied loose instead on dairy and cannery designs.
  Remove screwed plug from the holder of diaphragm pump heads and replace by air filter supplied loose.
- Check if all drain holes are free resp. chocked-up (e.g. leakage bores at the plunger rod guide)
- Set variable stroke metering pumps / process pumps to zero stroke.
- Turn on flushing and/or heating/cooling if provided. Open shut-off valves in suction and discharge line.
- Switch on metering pump/process pump, on low r.p.m. for variable speed drives.
- Slowly increase stroke length and, where applicable, speed.
  Let pump deliver at zero pressure in order to ensure good venting of pipe lines and pump.
- If pump does not prime itself (because of high suction lift, spring loaded discharge valve, high discharge pressure, or small plunger diameter) the suction line and pump head must be vented by one of the following methods:
  - Plunger pump heads **with venting screw:**
    connect the venting screw to the suction vessel or a collecting vessel using a hose.
    Loosen the venting screw by **1/6 of a turn (ccw).**
    The hexagon head of the venting screw serves as reference point for this!
    During each discharge stroke watch the backflow to the collecting vessel until no further air bubbles are carried along.
    Then tighten venting screw slightly.
  - Pump heads **without venting screw:**
    produce pressure on the suction side forcing a filling of the suction line and the pump head. If you require more information on the subject of start-up/venting please request leaflet D10-012 „Properties and Installation of Metering Pumps“ from LEWA and refer to section 3.5 „Start-up and venting“. For diaphragm pump heads refer to the operating instruction „Diaphragm pump head“. Please ask LEWA for assistance if none of the above procedures is succesful or possible.
  - Slowly increase pressure.

5.4 Adjustment and control

The metered flow can be adjusted by a change in stroke length or by changing the stroke frequency of variable speed drives.
The effective metered flow depends on the discharge pressure.
If you need the exact relation of metered flow to stroke length it is best to calibrate the metering pump / process pump under operating conditions. For this you need to measure the metered flow at different stroke length settings.
Figure 5 shows four methods with determination of volume or weight, namely.

- **A** Volume measurement on suction side with supply burette
- **B** Volume measurement on discharge side with measuring cylinder
- **C** Measurement of weight loss in suction vessel
- **D** Measurement of weight gain in discharge vessel.

Please choose the method which is the most appropriate one for you. In order to achieve adequate accuracy you should measure at least 100 stroke volumes.
You can also calibrate the pump by means of flow meters.

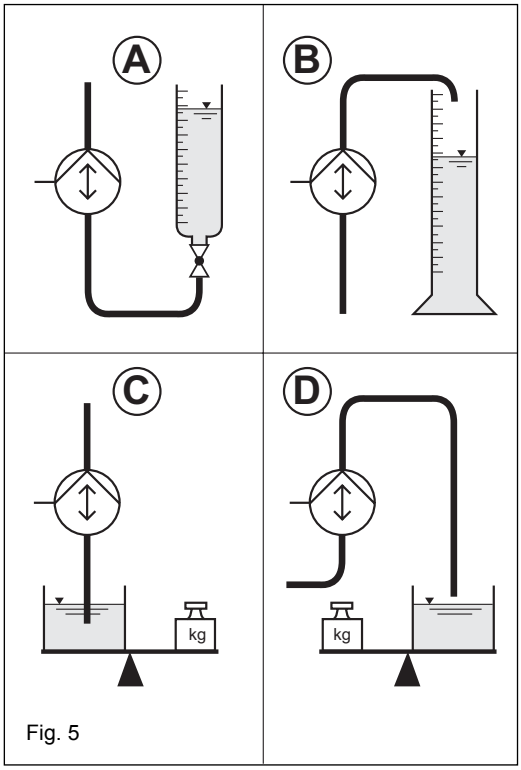


Fig. 5

5.5 Shut-down

If the metering pump/process pump is shut-down for a longer period of time you must remove all residual fluid from the pump head by flushing; disassemble and clean if required. Remove metallic plungers from plunger pump heads because of risk of pitting corrosion. Exception: hard metal plungers in high pressure pump heads.

5.6 Dismantling and return transportation

If you are stripping and returning pumps, e.g. for repair (s. par. 2.3 „Transportation, lifting devices“), the following steps must be taken before dispatch:

- All traces of the fluid must be removed from the pump head and, if required, the pipe line, clean thoroughly, neutralize or decontaminate.
- In case of return to LEWA the filled-in fluid safety data sheet must be included.
- Drain lubricant from drive unit.
- Replace air filter by a screwed plug.
- If the hydraulic fluid is not drained from pump heads with enclosed holders, replace the air filter by a screwed plug. Also make sure that all connections to outside are sealed off.
- For pneumatic stroke actuators tighten screws in the lines between oil chamber and position controller (see operating instruction “Pneumatic Stroke Actuator”).

Damage to pump or other goods resulting from leakage of lubricant or residual fluid is the responsibility of the sender.

6 Maintenance and repairs

6.1 Maintenance

Observe section 1.4 "Safety" of this operating instruction before doing any maintenance work!

Weekly: Check lubricant level in pump drive unit.
For this also refer to operating instructions of the subassemblies pump heads, stroke actuators and accessories.
Check all sealing joints for possible leaks.

Please refer to operating instruction “Pump Drive Unit” or “Stroke Actuator” for volume of lubricant.
For lubricant qualities please refer to operating instruction B 1.001 and B 1.002.
Also observe the maintenance instructions of sub-supplied assemblies such as e.g. couplings, external gears.
Depending on the ambient operating conditions (load, temperature, humidity of air, contamination of the surrounding air with pollutants) the lubricants age rather differently. Therefore lubricants should be analysed every 3-6 months, depending on the load, and replaced if they are no longer suitable.

Lubricants which are contaminated by chemicals will cause excessive wear, corrosion and leakages at seals.

For operation in the hazardous area (except category 3 (ATEX)) the maintenance intervals stated in the operating instruction of the corresponding sub-assembly must be maintained precisely.

6.2 Repairs

If you are carrying out repairs yourself, please follow the assembly instructions (par. 1.4) in the operating instructions for the sub-assemblies. Otherwise please call in our customer service.
The address of your nearest customer service department is stated at the end of your operating instruction.

7 Faults; symptoms, remedial action

The table following contains hints on how to solve faults which can affect the whole pump. Further information can be found in the operating instruction for the pump heads, stroke actuators and accessories.
If you are unable determine the cause of the fault, or if you cannot solve it, please refer to our customer service department.

Fault	Possible cause ⟶ Symptoms		Remedial action
Pump does not deliver drive motor does not run check	interruption in supply current	no power at motor	find reason for failure and repair
	motor or gear defective	drive motor does not run even when separated from pump	dismantle motor and repair if necessary
	pump is blocked by closed shut-off valve in discharge line	pump can be turned via motor fan wheel at zero stroke, but locks at increased stroke	open valve
	pump drive element has seized due to running dry		repair pump drive unit (see operating instruction "Drive unit")
Pump does not deliver, pump does not stroke although motor is running	broken components in pump drive element, built-in worm gear defective	disconnected drive motor runs normal	check pump drive unit (see operating instruction “Drive unit”)
	broken components in gear, coupling defective		check gear and coupling and repair
increased running noise	cavitation or overmetering taking place.	noise only occurs at increased stroke lengths or speeds	check pipe line (see 4.5.2) and alter accordingly
	gear is defective	flowrate unsufficent, mostly accompanied by unregular operating noise	remove gear and repair
	axial play of worm shaft has increased		reset (see operating instruction “Drive unit”)
	shaft connections or coupling components worn out due to overloading		replace keys and possibly shafts and couplings. Remove cause of overloading
	pump drive components damaged due to overload		dismantle pump drive unit and replace damaged parts. Remove cause of overload
	bearing damage		replace damaged bearings

Issue June 2003

Betriebsanleitung / Operating Instruction / Notice de service

Schmierstofftabelle / Lubrication chart / Tableau de Graissage

B 1.001 de/en/fr

(de) **Schmierstoffe für LEWA - Triebwerke:**

In der LEWA - Betriebsanleitung „Triebwerk“ finden Sie die freigegebenen Schmiermitteltypen, Füllmenge und Schmiermittelwechselintervalle für Ihr Triebwerk.
In der folgenden Schmierstofftabelle finden Sie die Herstellerbezeichnungen.
Aufgrund von Hersteller-Änderungen können wir für die Bezeichnungen keine Gewähr übernehmen.

Für bestimmte Triebwerke sind nur synthetische Schmiermittel auf Polyglykolbasis zugelassen. In diesen Fällen ist Mineralöl NICHT zugelassen, denn es kann zu Triebwerksschäden führen!
LEWA - Triebwerke werden (ausser ecodos-Pumpen) im Normalfall OHNE Schmiermittel ausgeliefert!

(en) **Lubricants for LEWA drive elements:**

In LEWA operating instruction ” Drive Element “ you will find the approved types of lubricants, their volumes and service intervals for your drive element.
The lubricant tables following list the designations / trade names of the manufacturers.
LEWA will not accept any responsibility for the designations as these are subject to possible revisions of the manufacturers.

For certain drive elements polyglycol- based lubricants are permissible only.
Do NOT use mineral oil in these cases as this could cause damage to the drive element(s)!
LEWA drive elements (except for ecodos pumps) normally are supplied without lubricant

(fr) **Lubrifiants pour parties mécaniques LEWA:**

Dans la notice de service pour « partie mécanique LEWA » sont indiqués les types de lubrifiants autorisés, le volume du remplissage et la fréquence des vidanges de la partie mécanique de votre installation.
Dans le tableau suivant vous trouverez les marques et types des lubrifiants conseillés.
Vu les modifications que les fabricants peuvent apporter à leurs produits, nous ne pouvons garantir ces dénominations.

Pour certains types de parties mécaniques, seuls sont autorisés les lubrifiants synthétiques à base de polyglycol. Dans ce cas, les huiles minérales ne sont PAS autorisées, leur utilisation pouvant endommager la partie mécanique !
Les parties mécaniques LEWA sont normalement livrées SANS lubrifiant, (à l’exception des pompes Ecodos).

Bezeichnung nach DIN 51502 ISO 6743	ISO-Viskositäts-klasse nach DIN 51519	Einsatz-bereich °C	ARAL	BP	FUCHS	TOTAL	elf	Esso	FINA	KLÜBER LUBRICATION	Mobil	Shell	TEXACO	WINTERSHALL	LEWA Ident-Nummer
CLP PG 220 ISO-L-CKS 220 (Polyglycole-Oil)	ISO VG 220	-35 - +100	Degol GS 220	Enersyn SG-XP 220	RENOLIN UNISYN 220	Carter SY 220		Glycolube 220	FINA-Giran S ISO-VG 220	SYNTHESO D 220 EP	Glygoyle 30 Glygoyle HE 220	Shell Tivela S 220	SYNLUBE-CLP 220		**076000.0254**
CLP PG 150 ISO-L-CKS 150 (Polyglycole-Oil)	ISO VG 150	-35 - +100	Degol GS 150	———	RENOLIN UNISYN CLP 150	Carter SY 150		———	FINA-Giran S ISO-VG 150	SYNTHESO D 150 EP	Glygoyle 22	Shell Tivela S 150	SYNLUBE-CLP 150		**076000.0031**
CLP 220 ISO-L-CKC 220 (Mineral-Oil)	ISO VG 220	-20 - + 50	Degol BG 220 DIN 51517 T3	Energol GR-XP 220 DIN 51517 T3	RENOLIN CLP 220 DIN 51517 T3	Carter EP 220	Reducelf SP 220	SPARTAN EP 220 DIN 51517 T3	FINA-Giran L ISO-VG 220 DIN 51517 T3	Klüberoil GEM 1-220 DIN 51517 T3	Mobil-Gear 630 DIN 51517 T3	Omala Oil 220 DIN 51517 T3	MEROPA 220 DIN 51517 T3	Ersolan 220 GF DIN 51517 T3	**076000.0412**

Ausgabe April 2005

(1) ... (9) Triebwerkselement
drive element
élément partie mécanique

(10) ... (13) Verbindungsteile
connecting parts
pièces de liaison

(14) ... (18) Zwischenelement
intermediate element
élément intermédiaire

(19) ... (24) Lackierung
painting
peinture

(25) ... (30) Beschilderung-Pumpe
name plate pump
plaque pompe

(31) ... (39) Montageteile Kolben
assembly parts plunger
pièces p. montag. piston

(40) ... (44) Fuß/Fundamenteisen
foot/foundation bars
pattes/profile fixation

(45) Antriebsflansch
flange drive side
bride d' entrainement

(50) Drehstrommotor
3-phase motor
moteur triphase

(51) ... (52) Abschlußdeckel/Kontaktgeber
end cover/contactor
couvercle/emetteur impl.

(53) ... (56) elekt /pneum. Hubstellantrieb
elec./pneum. strokeactuat
servo-moteur elec./pneum.

(57) ... (59) gemein. Hubstellantrieb
common stroke adjustment
cde simult. course

(60) ... (69) Halterung geschlossen
holder enclosed
étrier fermé

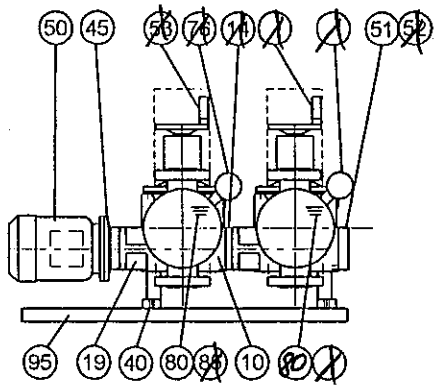
(70) ... (75) Membran-Pumpenkopf
diaphragm pump head
tête de pompe à membrane

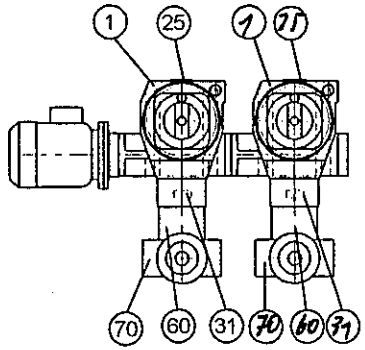
(76) ... (78) Membran-Bruchanzeige
diaphragm rupture indidcator
signalisation de rupture de membrane

(80) ... (84) Hydraulikfluid
hydraulik fluid
fluide hydraulic

(85) ... (89) Hydraulikfluid (Sandwichmembran)
hydraulik fluid (sandwich-diaphragm)
fluid hydraulic (membrane sandwich)

(95) Grundplatte
base plate
socle





				CAD	Maßstab/Scale
			Datum/Date	Name/Name	Pumpe Typ / pump type / type de pompe: EK - M -210- 2
			25.8.97	K.Lb	Fabrik-Nr. / serial-no. / no. de fabrication: 12-333159-010
					Zeichnungs-Nr./Drawing No: 1800051032 / 2D / 00

LEWA Herbert Ott GmbH & Co
D - 71229 Leonberg

11.03.99/AM-WAL 00

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-item C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	2	STK	TRIEBWERKSELEMENT DRIVE ELEMENT	EK HHV I8,33 GH STD H 170X140X240	0158/0198	P	1	1200000004 S.GR.-L.	B 1.311---
2	010	1	STK	VERBINDUNGSTEILE CONNECTING PARTS	EK/EKH 50DX37	0122/0165	P		0444020003 S.GR.-L.	
3	019	1	STK	LACKIERUNG PAINTING	MODULAR,TRIPLEX BLAU	0363/1693	P V	4	1202000014	
4	025	1	STK	BESCHILDERUNG-PUMPE NAME PLATE PUMP	EK	1210870000 S.GR.-L.	P			
5	031	2	STK	MONTAGETEILE KOLBEN ASSY.PTS. PLUNGER	EK BEW.O.BALG GH BG	0014/0161	P	3	1200330005 S.GR.-L.	
6	040	2	STK	FUSS FOOT	EK/EKH HORIZ. 170X44X35	0198/0482	P		0444040002 S.GR.-L.	
7	045	1	STK	ANTRIEBSFLANSCH FLANGE DRIVE SIDE	EK/EKH BGR.80 120DX55	EN-JL1040	P	3	0444010005 S.GR.-L.	
8	050	1	STK	DREHSTROMMOTOR 3-PHASE MOTOR	1400/400V/0,75KW/IP55/B14		G		1035011140	1000000414
9	051	1	STK	ABSCHLUSSDECKEL END COVER	EK/EKH 70X70X15	0101/0408	P		0451490002 S.GR.-L.	
10	060	2	STK	HALTERUNG GESCHLOSSEN HOLDER ENCLOSED	GR.3-12 EK 116X205X137	0198/0482	P	2	1015010003 S.GR.-L.	
11	070	2	STK	MEMBRAN-PUMPENKOPF DIAPHR.PUMP HEAD	GR.12 EK16 W3 M210 BG	1200630000 S.GR.-L.	P	1		B 2.2200--
12	080	1.800	KG	HYDRAULIKOEL HYDRAULIC FLUID	UNIVIS J26 26mm²/s-40°C FA.ESSO	J-26	W		0760001636	
13										
14										
15										
16		1	STK	DOSIERPUMPE METERING PUMP	EK/2H M210	EK-M-210-2		2		

LEWA	DOSIERPUMPE METERING PUMP	B 0.100--- B 1.001---	1800051032/2D/00	EK-M-210-2	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart
2) Bei Bestellung Ident-Nr., Teilelisten-Nr. u. Auftr.-Nr. angeben
when ordering ident-no., group-parts-list and order-no.
3) Zeichnungs-Format
draw.size DIN A0-A4
4) Aenderungs-Index
revision
5) Variante
variation
Formular entspr. DIN 24420
form conforms DIN 24420

Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

Table of contents

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction B 0.100.

1.2 Application

This operating instruction applies to the LEWA pump drive units

type EK with manual stroke adjustment.

The LEWA serial number can be found in the technical data sheet and on the factory plate fixed to the drive unit casing.

1.3 Performance and applicabilities

See technical data sheet.

Plunger rod thrust:	2000 N
Stroke length:	0-15 mm
Scale divisions axial scale:	1.00 mm
Circumferential scale:	0.01 mm
Attachable pump heads:	plunger-, diaphragm-, bellows pump heads

This drive unit was designed for the conditions given in the technical data sheet. LEWA will not accept any responsibility if these conditions are changed. This could lead to serious problems which can result in the destruction of the metering pump. In this case danger to persons, animals or the environment cannot be prevented!
LEWA accepts no responsibility when the fluid handled or important operating conditions were not given or given incompletely only.

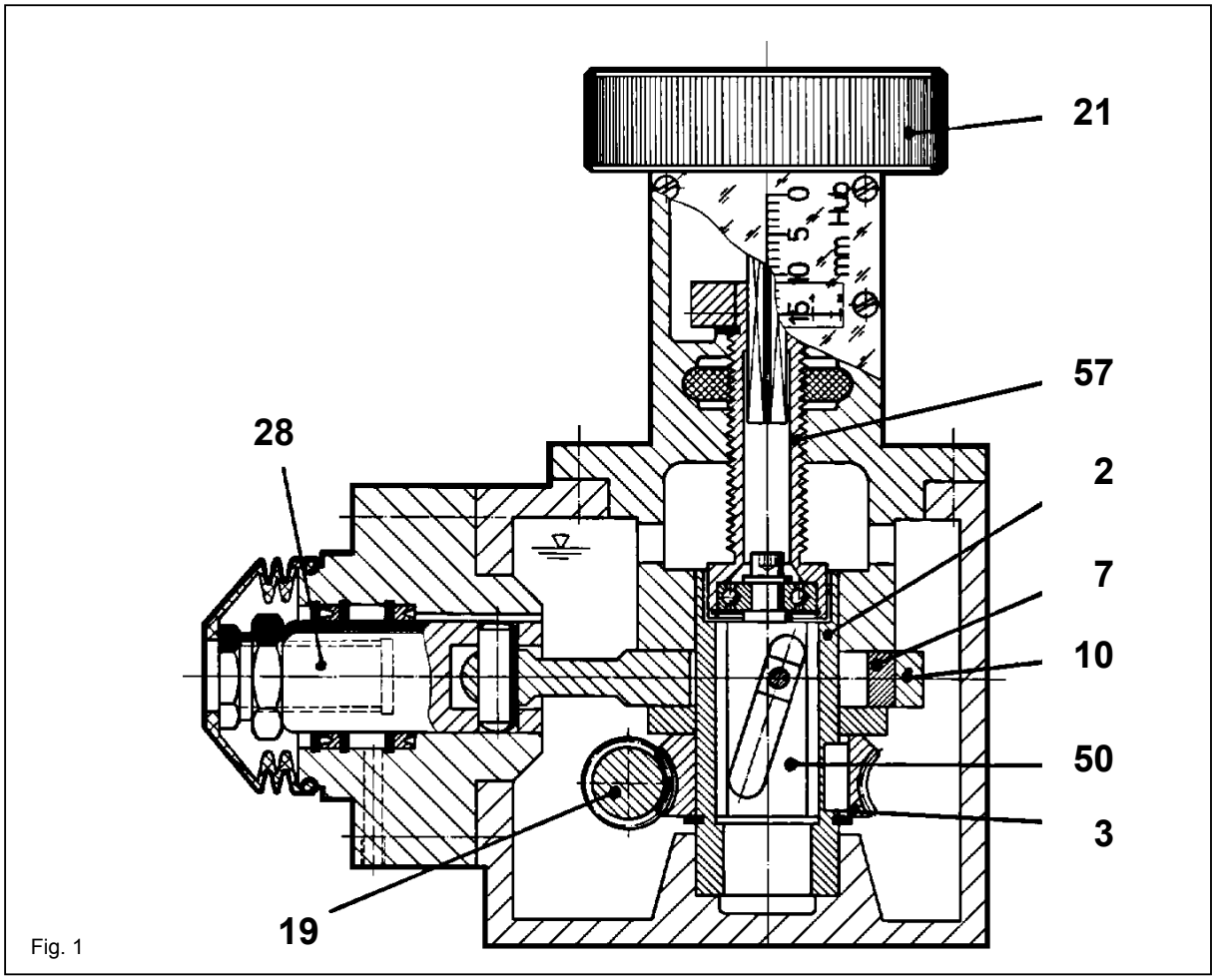


Fig. 1

1.4 Safety
Refer to operating instruction B 0.100.

1.5 Supply connections
Refer to operating instruction B 0.100.

1.6 Emissions
Refer to operating instruction B 0.100.

2 Transportation and intermediate storage

Refer to operating instruction B 0.100.

3 Product information (refer to fig. 1)

3.1 General description
The drive unit changes the rotary motion, induced by the drive motor, into an oscillating (reciprocating) movement. The stroke length can be changed steplessly from zero to 15 mm.
The stroke frequency results from the motor speed and the reduction ratio of the integral worm gear.

3.2 Construction and method of operation
The drive unit mainly consists of the worm shaft (19), the worm wheel (3), hollow shaft (2), eccenter (7), connecting rod (10), plunger rod (28) and the manual stroke adjustment.
The drive unit works on the linear thrust crank principle. The worm shaft (19), which is coupled to the drive motor, transmits the rotary motion via worm wheel (3) and hollow shaft (2) directly to the eccenter (7). The latter actuates the plunger rod (28) via connecting rod (10).
The plunger stroke length is adjusted by turning the handwheel (21). The adjusting spindle (57) and the sliding shaft (50) are thus displaced axially.
This movement is converted via the oblique slot in the sliding shaft (50) into a radial displacement of the eccenter (7), i.e. into a change in the extent of its eccentricity.
The stroke can be altered both with the pump stopped or running.
The relationship between the amount of adjustment and plunger stroke length is linear.
Multiplex pumps can be made up by linking a number of single drive units in line horizontally.
The worm shafts of the individual drive units are then connected by interlocking, splined couplings.
The drive units will run at different stroke frequencies if different worm gear reduction ratios are selected.

3.3 Dimensions / weights / centres of gravity
Refer to operating instruction B0.100

4 Erection and assembly

Refer to operating instruction B 0.100.

5 Commissioning / operation / shut down

5.1 Operation
Drive units with manual adjustment: the stroke length can be adjusted with the pump running or stopped, via the handwheel and read off on the scale disc (23). Clockwise rotation increases 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 setting please refer to section 5.4 in operating instruction B 0.100.

Drive units with stroke actuator: see operating instructions “Actuators”.

5.2 Operating and ancillary means

Normally the drive unit is charged with synthetic lubricant. Mineral oil can also be used if the plunger rod thrust during the suction stroke is less than in 500 N
Please note that synthetic lubricants and mineral oils are **not miscible**.

Synthetic lubricants:
start-up temperature of drive unit: > 0 °C
maximum drive unit temperature: +60 °C
ambient temperature: - 20 ° bis +40 °C

For different conditions please consult LEWA.
Classification:

Designation to	DIN 51502 ISO 6743	CLP PG 220 ISO - L - CKS 220
ISO viscosity class to	DIN 51519	ISO VG 220
Symbol to	DIN 51502	**CLP PG 220**

Mineral oil:
start-up temperature of drive unit: > +5 °C
maximum drive unit temperature: +60 °C
ambient temperature: -20 ° bis +40 °C

For different conditions please consult LEWA.
Classification:

Designation to	DIN 51502 ISO 6743	CLP 220 ISO - L - CKC 220
ISO viscosity class to	DIN 51519	ISO VG 220
Symbol to	DIN 51502	**CLP 220**

Use recommended lubricants only (refer to attached operating instruction B1.001).
For start-up temperature down to –20°C synthetic lubricant CLP PG 150 is recommended.

Lubricant volume per drive unit: **0.65 l**

5.3 Commissioning, start-up, venting

Refer to operating instruction B 0.100.
The specified direction of rotation of the worm shaft is marked with an arrow cast into the drive unit casing!

5.4 Adjustment and Control

Refer to operating instruction B 0.100.

5.5 Shut-down

Refer to operating instruction B 0.100.

5.6 Dismantling and return transportation

Refer to operating instruction B 0.100.

6 Maintenance and repairs

Refer to operating instruction B 0.100.

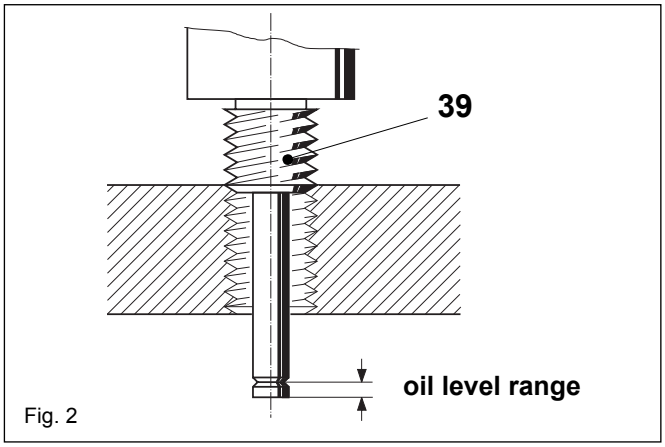


Fig. 2

6.1 Maintenance

6.1.1 Lubricant inspection intervals

In order to prevent problems check lubricant level weekly.

- Stop pump and wait for approx. 5 minutes.
- Unscrew air filter (39) and clean dipstick
- Put back air filter (39) into tapped hole, but do not screw it in (see fig. 2)
- The indicated oil level must be within the recommended range (fig. 2)
- Top up lubricant if necessary. For grade of lubricant refer to section 5.2.
- Screw in air filter (39) again.

6.1.2 Lubricant change intervals

Mineral oil:

Change oil after 4400 operating hours of continuous operation or after 1 year at the latest.

Synthetic lubricant:

Change lubricant after 8800 operating hours of continuous operation or after two years at the latest.

Danger of burns when draining hot lubricant!1
Assure environmentally safe draining and disposal of spent lubricant.

- Shut pump down.
- Open plug (40) and drain lubricant (at operating temperature).
- Screw plug (40) back in and remove air filter (39).
- Charge drive unit with ~ 0.65 litres of lubricant. Refer to section 5.2 for oil/lubricant grade.
- Reinstall air filter (39) or dip stick.

6.1.3 Inspection of coupling clearance

Read and observe enclosed separate operating instruction ”Torsionally flexible claw coupling in the drive flange B1.950”.
For multiplex pumps read and observe enclosed separate operating instructions ”Curved-teeth coupling B1.955”.

Break-down of a bearing can lead to unscheduled interruptions and very high local heat build-up.
Therefore it is recommended to check drive units 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.

6.1.4 Inspection of bearings

All roller bearings are theoretically designed for a service life of at least 30000 h. 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 local heat build-up.
Therefore it is recommended to check drive units 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.

6.2 Repairs

6.2.1 Standard tools

allen keys: size 2/3/5/6 mm
open ended spanner: size 22, 24, 27 mm
hammer, screw drivers (various sizes), circlip pliers, soft metal drifts.

6.2.2 Special tools (available from LEWA)

Mandrill for installation of radial seal ring (12): order ref. no. 103525.0317
Mandrill for installation of radial seal ring (31): order ref. no. 103525.0318
Mandrill for installation of tapper ball bearing (16): order ref. no. 103525.0319

6.2.3 Dismantling- /assembly-information, preparation

6.2.3.1 Additional reference documents required: sectional drawing “Drive Unit” and relevant parts list as well as possibly dimensional drawing of the complete metering pump.

6.2.3.2 Spare parts

Please **check** whether parts marked **“V”** in parts list are available.
For machines having an operating time of > 5 years we recommend to also assure the availability of the parts designated “**E**”. For safety reasons parts designated “**E**” or “**V**” in the parts list should be re-used in special cases and after thorough examination only.
Before installation check all parts for proper condition, in case of doubt the LEWA service department would be pleased to assist you.

6.2.3.3 Preparation

Reserve suitable clean area for depositing the individual parts.

Safeguard drive unit against unintentional operation (disconnect power supply, also refer to section 1.4 for this).

Take drive unit to a dry, enclosed, but well ventilated and essentially dustfree room.

6.2.3.4 Sealing aids

Specially for fixing flat gaskets a liquid, non-hardening sealant is required (e.g. Curil K2).

6.2.3.5 Clean all parts to be used again thoroughly using afore mentioned agents, however if possible, do so only just before re-assembly. Use a could cleaner to remove lubricant residues.

Observe any safety and disposal instructions!

6.2.3.6 Slip agents, lubricants

a) Radial seal rings and O-rings must be thinly coated with silicone grease or with any other lubricant specified before assembly.
b) Screws and threaded shafts must be coated with MoS2 greases or any other lubricant specified before assembly.

6.3 Dismantling/assembly (refer to sectional drawing / parts list of drive unit)

In the following sections (6.3.1 – 6.3.3) the replacement of the wear parts (V) is explained only. For total dismantling and replacement of spare parts (E) go to section 6.3.4.

6.3.1 Radial seal ring (12)

1. Secure motor against unintentional start and drain lubricant from drive unit.

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

Unscrew the screwed plug (40) with seal ring (41) at the lowest end of the drive element and drain off lubricant. Unscrew air filter (39) with seal ring (41).

2. Remove drive motor.
3. Pull coupling half from worm shaft (19).
4. Remove support (intermediate element in case of multiplex pumps).
5. Remove old radial seal ring (it is destroyed in the process).

Do not damage any sealing faces!

6. Install new seal ring using the mounting mandrill (refer to LEWA-special tools):
Place new radial seal ring on mandrill (expanding it slightly).
Cover radial sealing lip with the lubricant used for operation and install. Push coupling half onto worm shaft (19) and secure.
7. Install plug (40) with seal ring (41) and fill-in lubricant. Refer to section 5.2 for volume and grade of lubricant.
8. Reinstall air filter (39) with seal ring (41).
9. Mount support again (intermediate element in case of multiplex pumps).

6.3.2 Radial seal ring (31)

1. Remove pump head (refer to operating instruction pump head).
2. Drain lubricant

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

Unscrew the screwed plug (40) with seal ring (41) at the lowest end of the drive element and drain off lubricant. Unscrew air filter (39) with seal ring (41).
3. Remove bellows (42) if installed
4. Remove nut (37) and screw (36) of the plunger mounting and screw plunger from plunger rod (28). Otherwise the plunger does not need to be removed.
5. Unscrew allen head screws (30) and pull plunger rod guide (26) off towards the front. Remove flat gasket (27).
6. Remove front radial seal ring (31) and circlip (87) when installed. Remove radial seal ring (31).

Do not damage any sealing faces!

7. Before installing the new radial seal ring (31) coat sealing lip with the lubricant used for operation. Replace flat gasket (27).
9. Install plug (40) with seal ring (41) and fill-in lubricant.
Refer to section 5.2 for volume and grade of lubricant
10. Reinstall air filter (39) with seal ring (41).

6.3.3 Seal ring (41)

1. Drain lubricant

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

Unscrew the screwed plug (40) with seal ring (41) at the lowest end of the drive element and drain off lubricant. Unscrew air filter (39) with seal ring (41).
2. Clean sealing faces
3. Place new seal ring (41) over the thread of plug (40) and screw plug in again.
4. Fill in lubricant. Refer to section 5.2 for volume and grade of lubricant.
5. Reinstall air filter (39) with seal ring (41).

6.3.4 Total dismantling

1. Remove pump head (refer to operating instruction pump head). Remove bellows (42) if installed. Loosen nut and screw and screw plunger from plunger rod (28). Unscrew allen head screws (30) and pull plunger rod guide (26) off towards the front. Remove radial seal rings (31) if required.
2. If required disconnect and remove motor.
Take off drive flange and end flange.
3. Unscrew grub screw (27) somewhat until you can lift-off the hand wheel (21). Now you can loosen cheese head screw (25) and take off scale disc (23) with flat gasket (24). Turn out grub screw (71) so that you can slide the scale ring (70) upwards.
Lift circlip (69) from adjusting spindle (57).
Replace hand wheel (21) again and tighten grub screw (22).
4. Now remove allen head screws (29).
5. Hold scale housing (65) to prevent it from turning and rotate hand wheel (21) in “stroke increase” direction until the complete stroke adjustment can be removed (see figure 3).
6. For further dismantling of the stroke adjustment loosen grub screw (22) again and lift off hand wheel (21). Remove locking disc (71) and lift plate spring (74) off. A slight push from above is sufficient to force shaft (66) through downwards.
Now you can remove scale ring (70), circlip (69), shim disc (68) and clamp (67). Note the sequence of the parts installed on the shaft (66) (refer to figure 4)!

7. Now pull adjusting spindle (57) upwards (see figure 5). Push plunger rod (28) into the drive unit when doing so.
8. Slide connecting rod (10) over the eccenter (7) (refer to figure 6).
9. Now press adjusting spindle (57) down again and pull connecting rod (10) with plunger rod (28) out diagonally upwards (see figure 7).
10. Remove cylindrical pin (32) to separate plunger rod (28) from connecting rod (10) if required.
11. Force the half coupling from worm shaft (19) using a pulling device. Take off key (20) at the same time.
12. Remove radial seal rings 12) on both sides of the worm shaft (19). They are destroyed in the process and must be replaced therefore (refer to figure 8).
13. Remove circlips (13) and shim discs (14 / 15).

Note the number of shim discs (14 / 15). If the same worm shaft and worm wheel is used again for re-assembly the same number of shim discs (14 / 15) must be installed again.

Fig. 3

14. Force worm shaft (19) (the tapper ball bearings (16) are pressed onto the worm shaft) to the drive side so that the tapper ball bearing (16) is accessible on the motor side in the drive unit housing (refer to figure 9). Turn the worm shaft (19) as much as possible and pull out the complete adjusting unit.
15. Loosen grub screw (8), force out cylindrical spin (6) and take off eccenter (7). Remove adjusting spindle (57) with sliding shaft (50) form hollow shaft (2). If required remove circlip (58) and pull sliding shaft (50) with grooved ball bearing (53) out. After you have dismantled allen head screw (56) and disc (5) you can pull-off grooved ball bearing (53).
16. Note number of shim discs (5) between worm wheel (3) and disc (17) resp. worm wheel (3) and circlip (439 when removing circlip (43).

Fig. 4

Note the number of shim discs (5). If the same worm shaft and worm wheel is used again for re-assembly the same number of shim discs (5) must be installed again.

6.3.5 Assembly

Assembly takes place in the reverse order to dismantling in general. Observe the following points:

Fig. 5

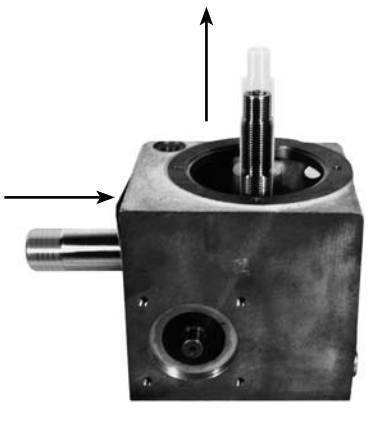


Fig. 6

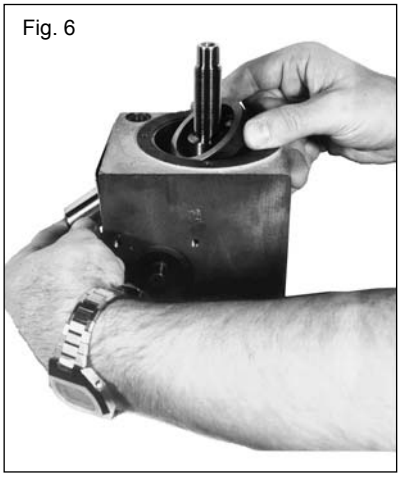


Fig. 7

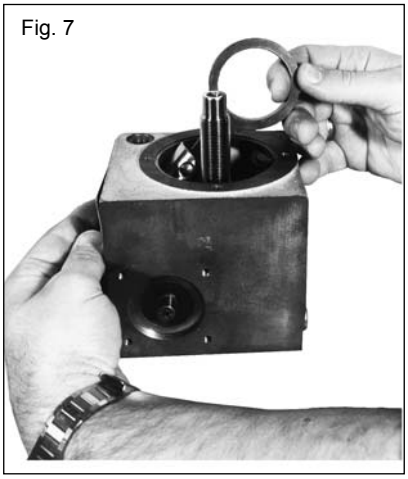
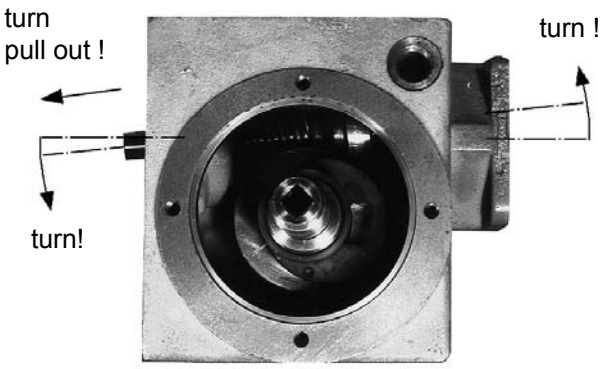


Fig. 8

Fig. 9



1. If worm shaft (19) and worm wheel (3) has been removed and replaced the position of the worm wheel (3) to the worm shaft (19) must be adjusted again (refer to section 6.4.4). In the other case install the same number of shim discs (5) again in the same order as removed during dismantling. This assures that the position of worm wheel (3) towards worm shaft (119) remains unchanged.
2. Make sure that the leakage bore in the plunger rod guide (26) points **downwards**.
3. The mounting position of the eccenter (7) and the sliding shaft (50) must follow the sectional drawing resp. figure 10.
4. Observe the following when installing allen head screws (56):

Secure allen head screw (56) safety lacquer (LEWA no. 327).

5. Fill installation space with roller bearing grease before mounting grooved ball bearing (53).
6. Observe direction of rotation of motor shaft when connecting motor again. The direction of rotation is designated by an arrow in the casting of the drive unit housing.

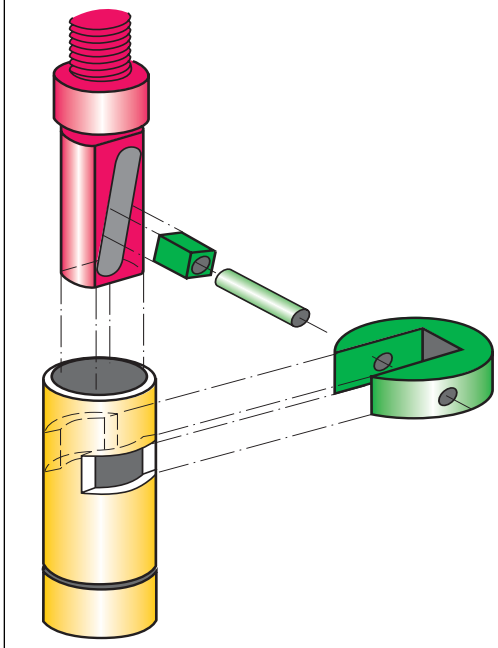
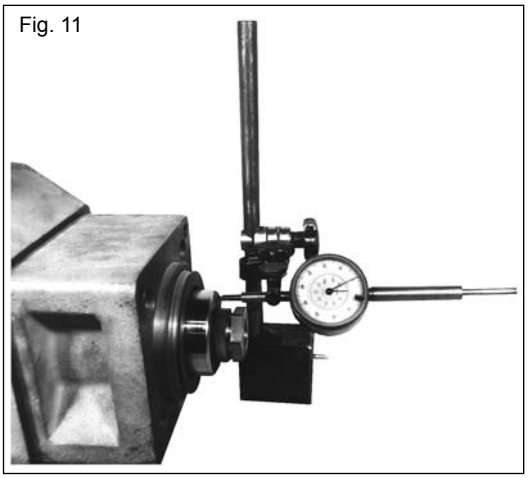


Fig. 10

Fig. 11



6.4 Filling, venting, setting

6.4.1 Filling

- Metering pump is switched off.
- Unscrew air filter (39)
- Fill 0,65 l lubricant into the drive unit
  Refer to section 5.2 for oil / lubricant grade.
- Install air filter (39) again. Checking of lubricant level as per section 6.1.1.

6.4.2 Setting of stroke scale

Set to 5 mm stroke length by turning the handwheel (21) in the appropriate direction. Checking is done by means of a dial gauge (see figure 11).
Measure the movement of the plunger rod (28).
In order to move the latter you must either rotate the motor shaft (unscrew motor fan cover) or the worm shaft.
Now fit scale disc (23) and note the position of the stroke length mark (for 5 mm stroke).
Take off scale disc and place scale ring (70) in noted position.
Fix scale ring (70) by means of grub screw (71).
The stroke length measured on the dial gauge must be exactly the same as the scale reading.

After the setting has been completed the scale disc (23) and gasket (24) is fastened by the cylindrical screws (25).

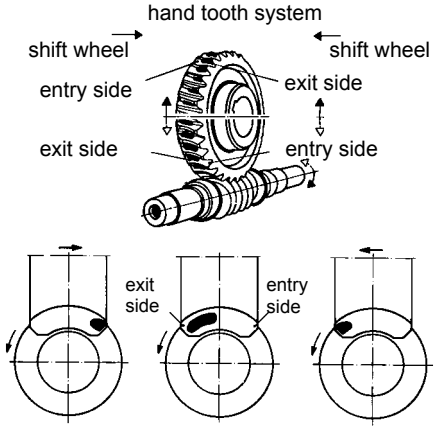


Fig. 12

6.4.3 Setting of worm wheel (3) and worm shaft (19)

First clean worm wheel (3) and worm shaft (19) thoroughly using a cold cleaner or similar

This procedure can be made easier when you assemble without connecting rod (10) and shaft (66) for setting the play first.

Apply a thin coat of marking ink to worm shat (19) and install together with the worm wheel (3). (The tapper ball bearings (16) are slightly positioned only to facilitate removal of the worm shaft (19) after the inking procedure).
Turn the worm shaft a few turns and inspect the contact trace on the worm wheel. The shifting direction of the wheel by adding or removing the lower shim discs (5) can be taken from figure 12.

6.4.3.1 You now can set the control dimension of 46,15 – 0,1 mm given on the sectional drawing by adding or removing the upper shim discs (5). Make sure that surfaces are absolutely clean.

6.4.3.2 After installation and tightening the scale housing (65) check the play, 0,05 – 0,15 mm, between the eccenter (7) and the scale housing (65).

No of ele-ments 1)	ecc. stag	ele-ment	No. of turns of worm shaft 2) (rotate in same direction)			
			i = 8,33	i = 10	i = 12,5	i = 17
2	180°	b	4u + 3Z	5u	6u + 5Z	8u + 10Z
3	120°	b	2u + 16Z	3u + 7Z	4u + 3Z	5u + 13Z
	240°	c	5u + 11Z	6u +13Z	8u + 7Z	11u + 7Z
4	90°	b	2u + 2Z	2u +10Z	3u + 3Z	4u + 5Z
	180°	c	4u + 3Z	5u	6u + 5Z	8u + 10Z
	270°	d	6u + 5Z	7u +10Z	9u + 8Z	12u + 15Z
5	72°	b	1u + 13Z	2u	2u + 10Z	3u + 8Z
	144°	c	3u + 7Z	4u	5u	6u + 16Z
	216°	d	5u	6u	7u + 10Z	10u + 4Z
	288°	e	6u + 13Z	8u	10u	13u + 12Z
6	60°	b	1u + 8Z	1u +13Z	2u + 2Z	2u + 17Z
	120°	c	2u + 16Z	3u + 7Z	4u + 3Z	5u + 13Z
	180°	d	4u + 3Z	5u	6u + 5Z	8u + 10Z
	240°	e	5u + 11Z	6u +13Z	8u + 7Z	11u + 7Z
	300°	f	6u + 19Z	8u + 7Z	10u +8Z	14u + 3Z

1) number of drive units with same worm reduction ratio.
2) continue to turn shaft in the same direction by “Z” number of coupling teeth.

6.4.4 Setting of the staggering of eccenters for multiplex pumps

Only required when, on multiplex pumps, all or at least 2 or the drive units have the same gear ratio.
First move the plunger rods of the individual drive units to the front dead centre position. The plunger rod (28) now will project the most from the drive unit. Check this using a dial gauge. Measure the movement of the plunger rod (28) by rotating the worm shaft (19) (refer to figure 11).

Eccentric staggering ∢°	60 300	72 288	90 270	120 240	144 216	180
⊿ h mm	3,4 bis 3,5	4,8 bis 4,9	7,0 bis 7,2	10,9 bis 11,1	13,4 bis 13,5	15,0

If a uniform staggering of the eccenters is selected turn the worm shafts or the individual drive units as shown in the table.

Engage drivers at the coupling and tighten up.
To check the eccentric staggering turn the worm shaft until the plunger rod or the first drive unit is in its rear dead centre position (0°). Check this location using a dial gauge (figure 11).From table “eccentric shifting” you can take the ⊿ h dimensions by which the plunger rods of the other drive units must project more from the plunger rod guide.

6.4.5 Adjustment of the plunger

The screwed parts of the plunger mounting must be tightened with the maximum torque of 50 Nm, otherwise the connecting rod can break (see information on the sectional drawing “mounting parts plunger”)

6.4.5.1 Design with rigid(s) plunger mounting

(see sectional drawing drive unit)
First turn the nut (37) right back on the thread of the screw (36).
Push the screw (36) on the plunger together with the bellows (42).
Now screw domed nut (35) to the plunger thread.
Tighten domed nut (35).
Place the washer (34) in the plunger rod bore.
Then screw the plunger with screw (36) into the plunger rod and tighten firmly. Additionally lock with nut (37).

6.4.5.2 Design for plunger mounting with transverse alignment (q) (see sectional drawing drive unit)
First turn the nut (37) right back on the thread of the screw (36).
Push the screw (36) on the plunger together with the bellows (42).
Now screw domed nut (35) to the plunger thread.
Tighten domed nut (35).
Place the washer (34) in the plunger rod bore.
Then screw the plunger with screw (36) into the plunger rod and tighten up.
By slightly slackening off screw (36) you can now set up a 0.05 – 0.1 mm clearance gap.

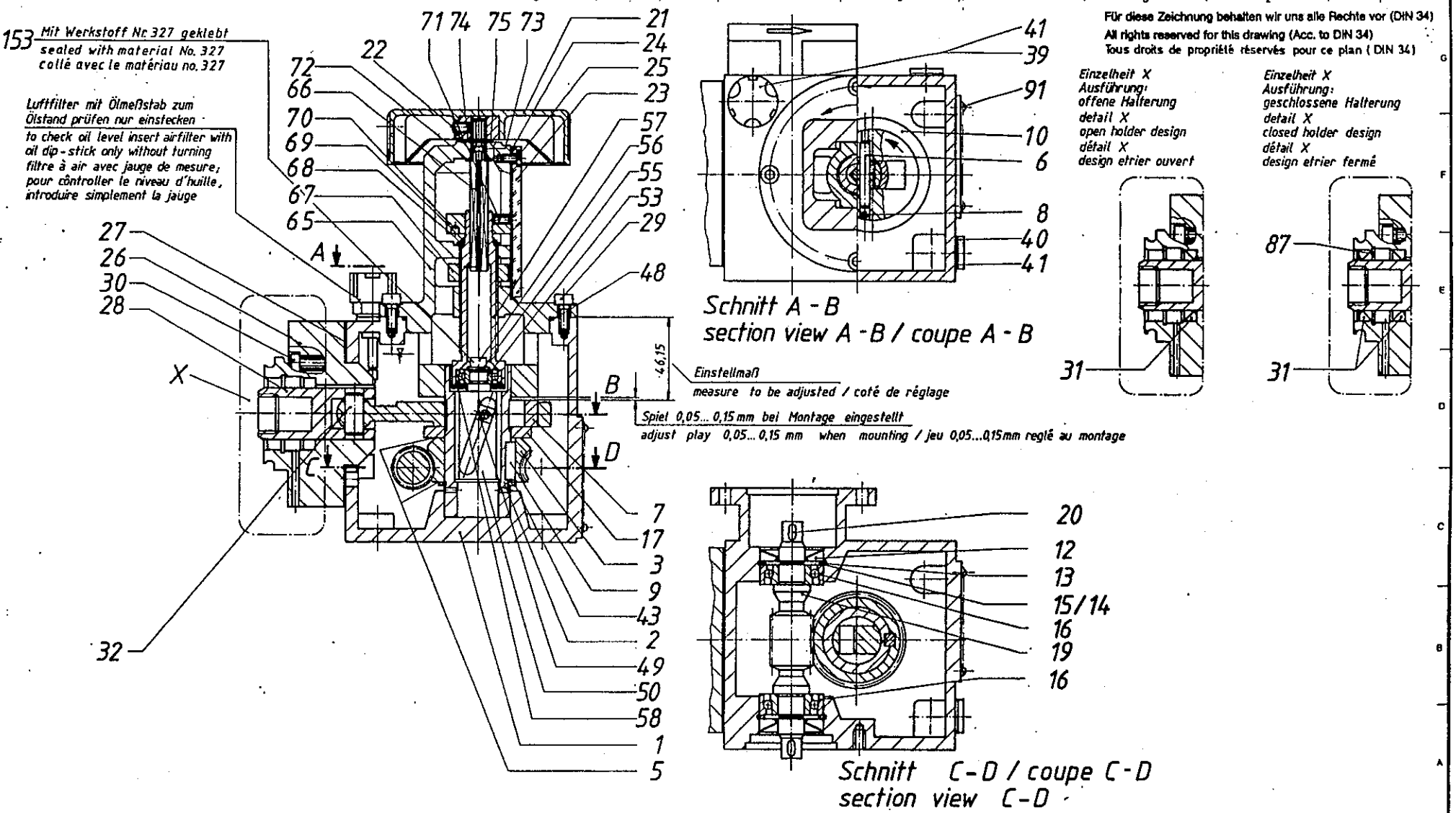
Check: the plunger must be free to turn, but must not have any axial movement.

After this adjustment lock screw (36) by nut (37).

6.4.5.3 Design with direct (d) plunger mounting (see sectional drawing drive unit)
Turn nut (37) completely onto the thread of the plunger (2).
Screw plunger (2) with nut (37) into the plunger rod (28) and tighten. Lock with nut (37).

7 Fault; symptoms, remedial action

Refer to operating instruction B 0.100.



Änderung	Datum	Änderungstext	Mitteilungs-Nr.
4	13.03.97	Pos. 44 entfallen	14027
3	24.07.95	Baugruppen aufgelöst Sub assemblys canceled	13554
2	24.08.94	Pos. 14 neu / new	13298
1	12.3.92	Pos. 65 -75 entfällt	12 822

Text s. Blatt
Instructions
see sheet
Texte voir feuille
B 1.311

Triebwerkselement Typ EK
mit Handhubverstellung
drive element type EK
with manual stroke adjustment
élément partie mécanique type EK
réglage de course manuel

LEWA
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Schnittbild-Nr. / Section drawing-no. / Plan coupe-no.	intern	A-Index
120000 0000	1	G04

11.03.99/AM-WAL 00

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no.	Menge quantity	Mengen-einheit unit of quantity	1)	Benennung designation	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2)	Gr. LEWA-Intern	F 3)	Ident-Nr. ident-no. 2)	Bemerkungen remarks
1	2	3	A	4	5	B	C	D	6	7
1	001	1	STK		TRIEBWERKSGEHAEUSE DRIVE ELEMENT HOUSING	EK 140X129X122	EN-JL1040	T	1	1031150198
2	002	1	STK		HOHLWELLE HOLLOW SHAFT	EK 36DX82	1.0421	T	3	0423070230
3	003	1	STK	E	SCHNECKENRAD WORM WHEEL	EK Z=25 I=8,33 56DX24	2.1052	T	4	0423080157
4	005	4	STK		PASSSCHEIBE SHIM DISC	36X45X0,1 DIN 988	ST	T		0811110122
5	006	1	STK		ZYLINDERSTIFT CYLINDRICAL PIN	A- 6 X 36 ISO 8734	ST-H	T		0733610133
6	007	1	STK		EXZENTERSCHEIBE ECCENTER	EK 50DX14	1.0503-2.2	T	4	0423150158
7	008	1	STK		GEWINDESTIFT GRUB SCREW	M 4X10 DIN 914	45H-A2B	T		0804170484
8	009	1	STK	E	PASSFEDER KEY	A8X7X22 DIN 6885	1.0503 K	T		0725480126
9	010	1	STK	E	PLEUEL CONNECTING ROD	EK 116X63X13	EN-JL1040	T	4	0390480198
10	012	2	STK	V	RADIALDICHTRING RADIAL SEAL RING	CB 15X35X7 35DX7	ST/HNBR-70	T		0804181689
11	013	2	STK	E	SICHERUNGSRING CIRCLIP	35X1,5 DIN 472	FST	T		0714160130
12	014	1	STK		PASSSCHEIBE SHIM DISC	25X35X0,3 DIN 988	ST	T		0720280122
13	015	3	STK		PASSSCHEIBE SHIM DISC	25X35X0,1 DIN 988	ST	T		0720270122
14	016	2	STK	E	SCHRAEGKUGELLAGER TAPER BALL BEARING	15/35DX11 DIN 628		T		0804200000
15	017	1	STK		SCHEIBE WASHER	EK 60DX5,97	1.0401	T	4	0423760127
16		1	STK		TRIEBWERKSELEMENT DRIVE ELEMENT	EK HHV I8,33 GH STD H 170X140X240	0158/0198		1	1200000004

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Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart
Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

2) Bei Bestellung Ident-Nr., Teilelisten-Nr. u. Auftr.-Nr. angeben when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format draw.size DIN A0-A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420
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Pos.Nr. item.no.	Menge quantity	Mengen-einheit unit of quantity	1)	Benennung designation	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2)	Gr. LEWA-intern 4)	F 3)	Ident-Nr. ident-no. 2)	Bemerkungen remarks
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1 019	1	STK	E	SCHNECKENWELLE WORM SHAFT	EK 3-GG. I=8,33 24DX129	1.7131-2.2	T	3	0423280178	
2 020	1	STK	E	PASSFEDER KEY	A4X4X10 DIN 6885	1.0503 K	T		0725090126	
3 021	1	STK		HANDRAD HANDWHEEL	EK 100DX30	PA/GLF	U V	3	0499150002	
4 022	1	STK		GEWINDESTIFT GRUB SCREW	M6X10 DIN 913	A2-70	T		0704370481	
5 023	1	STK		SKALENSCHEIBE SCALE DISK	EK 60X83X4,5	PA-T	T	4	0559880459	
6 024	1	STK	V	FLACHDICHTUNG GASKET	EK 60X83X1	KO/NBR	T	4	0517500093	
7 025	6	STK		LINSENSCHRAUBE CHEESE HEAD SCREW	M4X10-H ISO 7045	A2-50	T		0764481502	
8 026	1	STK	E	KOLBENSTANGENFUEHRUNG PLUNGER ROD GUIDE	EK 100X100X61	EN-JL1040	T	3	1031170198	
9 027	1	STK	V	FLACHDICHTUNG GASKET	TYP EKH/EK 100X100X0,5	AFM 33/2	T	3	1069410092	
10 028	1	STK	E	KOLBENSTANGE PLUNGER ROD	EK 28DX63	0158/0264	U V	3	0463090002	
11 029	4	STK		ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X16 ISO 4762	A4-70	T		0700210482	
12 030	4	STK		ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X30 ISO 4762	8.8-A2B	T		0700260101	
13 031	2	STK	V	RADIALDICHTRING RADIAL SEAL RING	A28X40X7 LEWA-DESIGN	ST/FPM-80	T		0849950297	
14 032	1	STK		ZYLINDERSTIFT CYLINDRICAL PIN	A10X24 AEHN.ISO 2338 SON	ST-H	T		0743220133	
15 039	1	STK		LUFTFILTER AIR FILTER	M14X1,5 M=30 28DX64	1.4104	G		0900130027	
16	1	STK		TRIEBWERKSELEMENT DRIVE ELEMENT	EK HHV I8,33 GH STD H 170X140X240	0158/0198		1	1200000004	

LEWA	DOSIERPUMPE METERING PUMP	B 1.311---	1200000000/1G/04	1200000004	A	333159 00100000	2 von of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

Formular entspr. DIN 24420
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Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teillisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	040	2	STK		VERSCHLUSSSCHRAUBE SCREWED PLUG	M14X1,5 DIN 908	5.8-A2B	T		0752040099	
2	041	3	STK	V	DICHTRING SEAL RING	A14X18X1,5 DIN 7603	POM	T		0701650135	
3	043	1	STK	E	SICHERUNGSRING CIRCLIP	36X1,75 DIN 471	FST	T		0804210130	
4	048	1	STK	V	O-RING O-RING	72,75X1,78 T.NR.040	NBR-70	T		0731270062	
5	049	1	STK	E	GLEITSTEIN SLIPPER	EK 15.5X10X9	1.0503-2.2	T	4	0423140158	
6	050	1	STK		SCHIEBEWELLE SLIDING SHAFT	EK 26DX60	1.0503-2.2	T	3	0428010158	
7	053	1	STK	E	RILLENKUGELLAGER GRVE.BALL BEARING	NR.6000 DIN 625 kli 10/26DX8		T		0712140000	
8	055	1	STK		SCHEIBE WASHER	A6.4 DIN 125	A4-70	T		0734560482	
9	056	1	STK		ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X10 ISO 4762	8.8-A2B	T		0700190101	
10	057	1	STK		VERSTELLSPINDEL ADJUSTING SPINDLE	EK 29,5DX97,2	1.4122	T	4	0517480010	
11	058	1	STK	E	SICHERUNGSRING CIRCLIP	26X1,2 DIN 472	FST	T		0714110130	
12	065	1	STK		SKALENGEHAEUSE SCALE HOUSING	EK 108DX142	EN-JL1040	T	2	0517470198	
13	066	1	STK		WELLE SHAFT	EK 10DX93	1.4301	T	4	0423210011	
14	067	1	STK		KLEMMSTUECK CLAMP	EK EL 38X34X10	AU-90	T	3	0423230096	
15	068	1	STK		PASSSCHEIBE SHIM DISC	17X24X1 DIN 988	ST	T		0741940122	
16		1	STK		TRIEBWERKSELEMENT DRIVE ELEMENT	EK HHV I8,33 GH STD H 170X140X240	0158/0198		1	1200000004	

LEWA Hersteller manufacturer	DOSIERPUMPE METERING PUMP Benennung des Erzeugnis denomination of product	B 1.311--- Betriebsanleitung operating instruction	1200000000/1G/04 Zeichnungs-Nr. drawing-no.	1200000004 Gruppen-Teillisten-Nr. group parts list no. 2)	A 5) G	333159 00100000 Auftrags-Nr. order-no. 2)	3 von of Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart
Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

2) Bei Bestellung Ident-Nr., Teillisten-Nr. u. Auftr.-Nr. angeben when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format draw.size DIN A0–A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420 form conforms DIN 24420

11.03.99/AM-WAL 05

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Item C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	069	1	STK E	SICHERUNGSRING CIRCLIP	17X1 DIN 471	FST	T		0715120130	
2	070	1	STK	SKALENRING SCALE RING	EK-EL 35,5DX11	3.3535 DEK	T	4	0423200556	
3	071	1	STK	GEWINDESTIFT GRUB SCREW	M4X8 DIN 916	45H-A2B	T		0736250484	
4	072	1	STK	STUETZSCHEIBE SUPPORT.DISC	S 9X15X1,2 DIN 988	FST	T		0804230130	
5	073	1	STK V	O-RING O-RING	4,47X1,78 T.NR.008	NBR-70	T		0731200062	
6	074	1	STK	TELLERFEDER PLATE SPRING	CB 18,8X9,2X0,3x0,65	FST	T		0804260130	
7	075	1	STK E	SICHERUNGSSCHEIBE LOCKING DISK	7 DIN 6799	FST	T		0728560130	
8	087	1	STK E	SICHERUNGSRING CIRCLIP	40X1,75 DIN 472	FST	T		0714190130	
9	153	0.001	STK	SICHERUNGSLACK SAFETY LACQUER	DELO-ML5249(113)MITTFEST	FK 4	W		0750000327	
10										
11										
12										
13										
14										
15										
16		1	STK	TRIEBWERKSELEMENT DRIVE ELEMENT	EK HHV I8,33 GH STD H 170X140X240	0158/0198		1	1200000004	

LEWA	DOSIERPUMPE METERING PUMP	B 1.311---	1200000000/1G/04	1200000004	A	333159 00100000	4 von 4 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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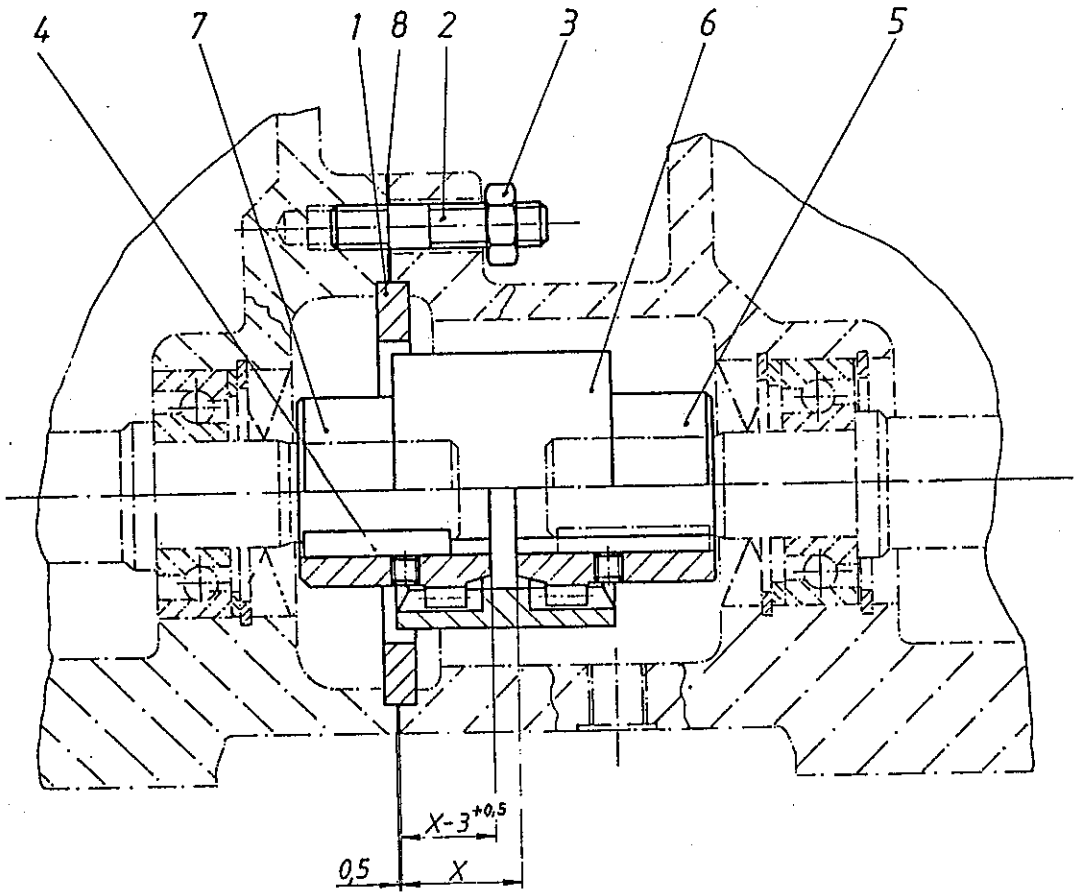
when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

Formular entspr. DIN 24420
form conforms DIN 24420



Änderung	Datum	Änderungstext	Mitteilungs-Nr.
4	05.04.93	Pos.9 u. 10 entfällt/be inapplicable	13021
3	10.7.91	Pos. 9,10 u. Maß 0,5 neu/new	12740
2	11.12.90	Pos. 8 neu/new	12550
1	22.4.85	Maße x und x-3 neu.	9969

Text s. Blatt
Instructions
see sheet

Verbindungsteile
Typ EK/EL/EH
assembling parts
type EK/EL/EH

LEWA
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Schnittbild-Nr. / Section drawing-no. / Plan coupe-no.	LEWA Intern
048 237 0000 3 G 04	

11.03.99/AM-WAL 05

erstellt/gepr. Issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teillisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	1	STK		ZENTRIERRING CENTERING RING	ZU EK,EKH 50DX6	1.0254	T	4	0390490165	✓
2	002	4	STK		STIFTSCHRAUBE STUD	M6X18 DIN 939	A4-70	T		0750020482	
3	003	4	STK		SECHSKANTMUTTER HEXAGON NUT	M6 ISO 4032	A4-70	T		0742240482	✓
4	004	1	STK	E	PASSFEDER KEY	A4X4X10 DIN 6885	1.0503 K	T		0725090126	✓
5	005	1	STK		NABE HUB	M-14 12D M.ABZIEHGEW 33DX15,5	ST	T		0815260122	✓
6	006	1	STK	V	KUPPLUNGSBUCHSE COUPLING BUSH	M14 ZU BOWEX 40DX37	PA	T		0733960066	✓
7	007	1	STK		NABE HUB	M-14 12D M.ABZIEHGEW 33DX15,5	ST	T		0815260122	✓
8	008	1	STK	V	FLACHDICHTUNG GASKET	EK 70X70X0,5	AFM 33/2	T	4	1026600092	✓
9											
10											
11											
12											
13											
14											
15											
16		1	STK		VERBINDUNGSTEILE CONNECTING PARTS	EK/EKH 50DX37	0122/0165		3	0444020003	

LEWA	DOSIERPUMPE METERING PUMP		0482370003/3G/04	0444020003	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teillisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

Formular entspr. DIN 24420
form conforms DIN 24420

11.03.99/AM-WAL 06

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	000	1	STK		BESCHILDERUNG-PUMPE NAME PLATE PUMP	EK LL -FR	121090 0000 S.GR.-L.	P			
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16		1	STK		BESCHILDERUNG-PUMPE NAME PLATE PUMP	EK	121087 0000				

LEWA

Hersteller manufacturer

DOSIERPUMPE
METERING PUMP

Benennung des Erzeugnis denomination of product

Betriebsanleitung operating instruction

Zeichnungs-Nr. drawing-no.

121087 0000 — Gruppen-Teilelisten-Nr. group parts list no. 2)

A — 5) G

333159 00100000 — Auftrags-Nr. order-no. 2)

1 von of 1 — Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart

2) Bei Bestellung ident-Nr., Teilelisten-Nr. u. Auftr.-Nr. angeben
when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format draw.size DIN A0-A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420
form conforms DIN 24420

Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

11.03.99/AM-WAL 00

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	2	STK	FABRIKSCHILD FACTORY PLATE	FC-ES/EEL/ALT-PR. LL -FR 60X60X0,5	V2A	G	4	1048120002	
2	003	1	STK	DREHRICHTUNGSSCHILD DIRECTIONAL PLATE	PFEIL GERADE, ROT 50MM	PVC-FOLIE	G		0901000104	
3	004	2	STK	HINWEISSCHILD INSTRUCTION PLATE	OEL EINFUELLEN BIS EH 40X20X0,1	FAS-FOLIE	G	4	1048140004	
4	005	2	STK	HINWEISSCHILD INSTRUCTION PLATE	QUETSCHGEFAHR BIS EH 40X30X0,1	FAS-FOLIE	G	4	1048140007	
5	006	1	STK	HINWEISSCHILD INSTRUCTION PLATE	VERSCHL.-SCHR.->LUFTFILT. 148X90X0,5	PAPIER KAS	G	4	1048140025	
6	008	12	STK	HALBRUNDKERBNAGEL ROUNDH.NOTCHED PIN	2,6X4 ISO 8746	A2-70	T		0715450481	
7	009	1	STK	PRUEFPLAKETTE INSPECTION STICKER	CE-ZEICHEN BIS EH 25DX0,1	FAS-FOLIE	G	4	1048180001	
8										
9										
10										
11										
12										
13										
14										
15										
16		1	STK	BESCHILDERUNG-PUMPE NAME PLATE PUMP	EK LL -FR	1210900000 S.GR.-L.				

LEWA

Hersteller manufacturer

DOSIERPUMPE
METERING PUMP

Benennung des Erzeugnis denomination of product

Betriebsanleitung operating instruction

Zeichnungs-Nr. drawing-no.

1210900000 — Gruppen-Teilelisten-Nr. group parts list no. 2)

A — 5) G

333159 00100000 — Auftrags-Nr. order-no. 2)

Blatt page 1 von of 1 Blättern pages

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when ordering ident-no., group-parts-list and order-no.

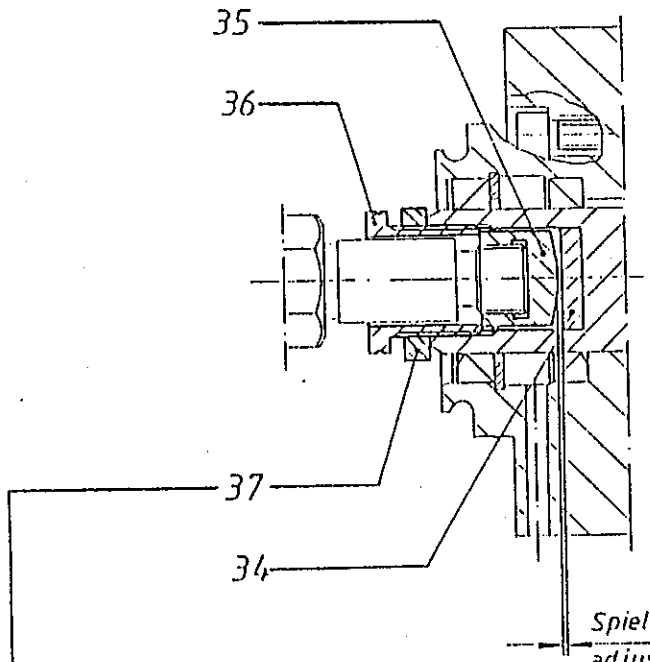
3) Zeichnungs-Format draw.size DIN A0–A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420
form conforms DIN 24420

Querbewegliche Kolbenbefestigung
movable plunger mounting
fixation flottante du piston



Spiel 0,05... 0,1 mm bei Montage eingestellt
adjust play 0,05... 0,1 mm when mounting
jeu 0,05... 0,1 reglé au montage

Anziehdrehmoment 40 - 50 Nm
torque 30 - 37 ft x lb
couple de serrage 40 - 50 Nm

	Datum date	Kürzel mark
gezeichnet drawn signature	02.12.94	gn
geprüft checked contrôlé		We
Norm-geprüft checked I. standards conformité aux normes		

Text siehe Blatt
Instructions see sheet
Texte voir feuille

Montageteile Kolben
assembly parts plunger
pièces de montage pour le piston

LEWA®
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Vor - Nr.	Schnittbild - Nr.	
Pre - no.	Section drawing - no.	
Pré - no.	Plan coupe - no.	
530	120033	0005

Aenderung	Datum	Aenderungstext	Mitteilungs-Nr.

11.03.99/AM-WAL 00

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	034	1	STK	SCHEIBE WASHER	HU-H,EL,EH 21DX4	NITRIERST.	T	4	0322680166	✓
2	035	1	STK	HUTMUTTER DOMED NUT	M14 EK16 19DX15	1.4528	T	4	0463080161	✓
3	036	1	STK	SCHRAUBE SCREW	M22X1,5 EK16 BEW. 24X27,7X22	1.4104	T	4	0463070014	✓
4	037	1	STK	SECHSKANTMUTTER HEXAGON NUT	M22X1,5 AE.ISO 8675 27X31,2X5	1.4104	T	4	0463050014	✓
5	155	0.001	STK	KLEBER ADHESIVE	DELO-ML 5349 (138)	FK 2	W		0750000293	✓
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16		1	STK	MONTAGETEILE KOLBEN ASSY.PTS. PLUNGER	EK BEW.O.BALG GH BG	0014/0161		3	1200330005	

LEWA Hersteller manufacturer	DOSIERPUMPE METERING PUMP Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	1200330005/3G/01 Zeichnungs-Nr. drawing-no.	1200330005 Gruppen-Teilelisten-Nr. group parts list no. 2)	A 5) G	333159 00100000 Auftrags-Nr. order-no. 2)	1 von 1 of Blatt page / Blättern pages

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3) Zeichnungs-Format draw.size DIN A0-A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420
form conforms DIN 24420

11.03.99/AM-WAL 01

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-item C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	1	STK	FUSS FOOT	EK 170X44X35	EN-JL1040	T	3	0390310198	✓
2	002	2	STK	ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X20 ISO 4762	A4-70	T		0700230482	✓
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16		1	STK	FUSS FOOT	EK/EKH HORIZ. 170X44X35	0198/0482			0444040002	

LEWA	DOSIERPUMPE METERING PUMP			0444040002	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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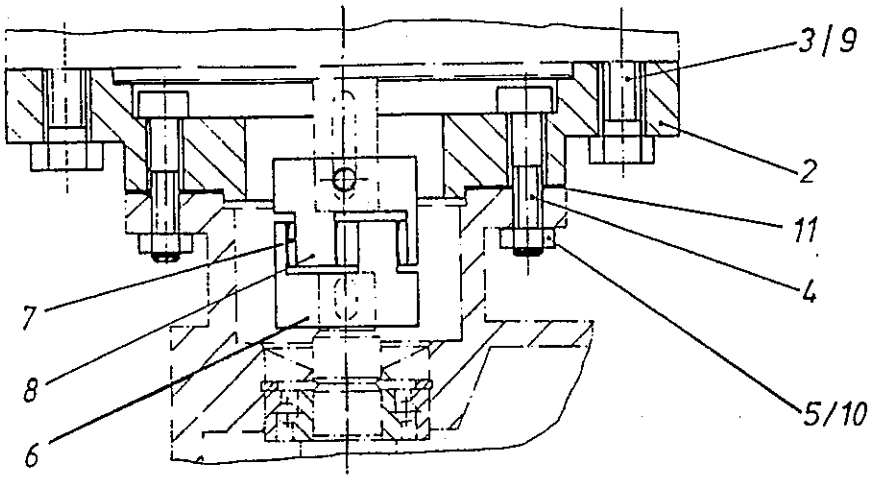
3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

Formular entspr. DIN 24420
form conforms DIN 24420



Änd.-Nr.	Datum	Name	Änderungstext	Mitteilung-Nr.

	Datum date data дата	Name nom nome имя
gezeichnet drawn dessiné segnato чертил	10.7.91	Ac
geprueft checked contrôlé approvato КОНТРОЛИРОВА	11.7.91	
Normgeprueft checked f. stand contrôlé sel. normes approv. p. norma СГЛАСО		

Text siehe Blatt
Instructions s. sheet
Texte voir feuille
Testo vedi foglio
Текст см. лист

Antriebsflansch
flange drive side
bride coté entraînement
flangia di attacco
del motore
Фланец привода
Typ EK

LEWA
LEWA Herbert Ott GmbH + Co.
Ulmer Str. 10, D-7250 Leonberg

Vor-Nr. Pre-no Pré-no Prefisso Пред №	Schnittbild-Nr. Section drawing-no. Plan coupe-no N° designo Разрез №	
033	044401	0000

11.03.99/AM-WAL 01

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) 8	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	002	1	STK	ANTRIEBSFLANSCH FLANGE DRIVE SIDE	EK/EKH BGR.80 120DX55	EN-JL1040	T	3	0446220198	✓
2	003	4	STK	SECHSKANTSCHRAUBE HEXAGON HEAD SCREW	M6X25 ISO 4017	A4-70	T		0727160482	✓
3	004	4	STK	ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X55 ISO 4762	A4-70	T		0700290482	✓
4	005	4	STK	SECHSKANTMUTTER HEXAGON NUT	M6 ISO 4032	A4-70	T		0742240482	✓
5	006	1	STK	NABE HUB	GR.19/24 12D M.ABZG. 40DX39	ST	T		0810280122	
6	007	1	STK	V ZAHNKRANZ TOOTHED-RIM	ZU ROTEX GR.19 40DX12	AU-90	T		0733800096	
7	008	1	STK	NABE HUB	GR.19/24 19D M.STEL. 40DX39	ST	T		0810890122	✓
8										
9										
10										
11										
12										
13										
14										
15										
16		1	STK	ANTRIEBSFLANSCH FLANGE DRIVE SIDE	EK/EKH BGR.80 120DX55	EN-JL1040		3	0444010005	

LEWA
Hersteller manufacturer

DOSIERPUMPE
METERING PUMP
Benennung des Erzeugnis denomination of product

Betriebsanleitung operating instruction

0444010000/3G/03
Zeichnungs-Nr. drawing-no.

044401 0005
Gruppen-Teilelisten-Nr. group parts list no. 2)

A
5) G

333159 00100000
Auftrags-Nr. order-no. 2)

Blatt page 1 von of 1
Blättern pages

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3) Zeichnungs-Format draw.size DIN A0-A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420
form conforms DIN 24420

11.03.99/AM-WAL 02

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	1	STK		DECKEL F.PUMPSTAENDER PUMP SUPP.COVER	EK 70X70X15	PA/GLF	T	4	042330 0408	✓
2	002	4	STK		ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X16 ISO 4762	A4-70	T		070021 0482	✓
3	003	1	STK	V	FLACHDICHTUNG GASKET	EK 70X70X1,6	DK-153	T	4	103129 0070	✓
4											
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12											
13											
14											
15											
16		1	STK		ABSCHLUSSDECKEL END COVER	EK/EKH 70X70X15	0101/0408			045149 0002	

LEWA

Hersteller manufacturer

DOSIERPUMPE
METERING PUMP

Benennung des Erzeugnis denomination of product

Betriebsanleitung operating instruction

Zeichnungs-Nr. drawing-no.

045149 0002 — Gruppen-Teilelisten-Nr. group parts list no. 2)

A — 5) G

333159 00100000 — Auftrags-Nr. order-no. 2)

1 von of 1 — Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart
Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

2) Bei Bestellung Ident-Nr., Teilelisten-Nr. u. Auftr.-Nr. angeben
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3) Zeichnungs-Format draw.size DIN A0-A4

4) Aenderungs-Index revision

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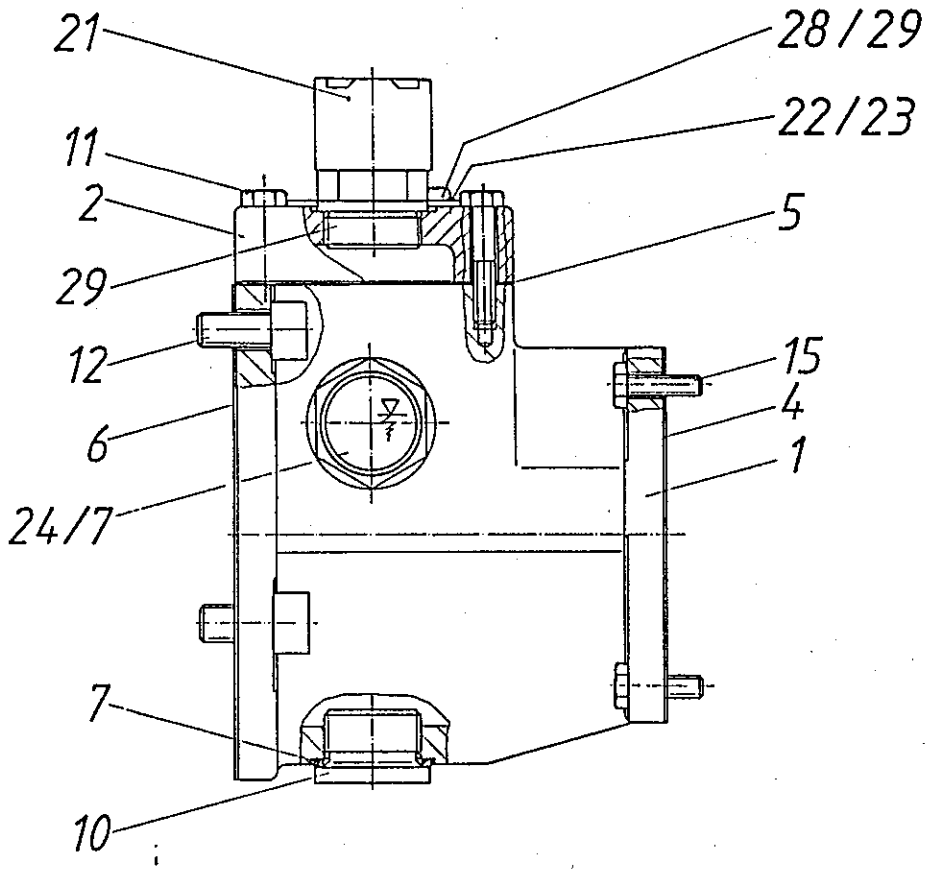

Text siehe Blatt
Instructions
see sheet
Texte voir feuille

Halterung geschl. Typ EK
holder enclosed type EK
étrier ferme type EK

LEWA
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Vor-Nr. / Pre-no. / Pré-no.	Schnittbild-Nr. / Section drawing-no. / Plan coupe-no.
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Änderung	Datum	Änderungstext	Mitteilungs-Nr.

11.03.99/AM-WAL 03

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	1	STK	HALTERUNG GESCHLOSSEN HOLDER ENCLOSED	GR.3-12EK M510 154,2X137X115	EN-JL1040	T	0	055651 0198	✓
2	002	1	STK	DECKEL F.HALTERUNG COVER F.HOLDER	EK 92X75X13	EN-JL1040	T	3	101532 0198	✓
3	004	1	STK V	FLACHDICHTUNG GASKET	TYP EKH/EK 100X100X0,5	AFM 33/2	T	3	106941 0092	✓
4	005	1	STK V	FLACHDICHTUNG GASKET	AL 92X75X0,5	AFM 33/2	T	4	051447 0092	✓
5	006	1	STK V	FLACHDICHTUNG GASKET	AL 143X137X0,5	AFM 33/2	T	4	055752 0092	✓
6	007	2	STK V	DICHTRING SEAL RING	A27X32X2 DIN 7603	POM	T		070912 0135	✓
7	010	1	STK	VERSCHLUSSSCHRAUBE SCREWED PLUG	M27X2 DIN 908	5.8-A2B	T		075213 0099	✓
8	011	4	STK	ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M6X20 ISO 4762	A4-70	T		070023 0482	✓
9	012	4	STK	ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M8X20 ISO 4762	A4-70	T		070035 0482	✓
10	015	4	STK	SECHSKANTSCHRAUBE HEXAGON HEAD SCREW	M6X20 ISO 4017	A4-70	T		072715 0482	✓
11	021	1	STK	LUFTFILTER AIR FILTER	L1.0406-87 M22X1,5 36DX50	PAGLF/NBR	G		090150 0015	
12	024	1	STK	SCHAUGLAS SIGHT GLASS	M27X2 1311-25-00 32DX17	A1-50	T		081200 0580	✓
13	027	1	STK	VERSCHLUSSSCHRAUBE SCREWED PLUG	M22X1,5 DIN 908	5.8-A2B	T		075207 0099	
14	029	1	STK V	DICHTRING SEAL RING	A22X27X1,5 DIN 7603	POM	T		072298 0135	
15										
16		1	STK	HALTERUNG GESCHLOSSEN HOLDER ENCLOSED	GR.3-12 EK 116X205X137	0198/0482		2	101501 0003	

LEWA	DOSIERPUMPE METERING PUMP		1015010000/2G/00	101501 0003	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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form conforms DIN 24420

Table of contents

1 General information / safety

1.1 Important preliminary information

Refer to operating instruction B 0.100.

1.2 Application

This operating instruction applies to diaphragm pump heads

type M 2 .. in metal and **plastic design.**

The LEWA commission number is stated in the technical data sheet and on the face of the diaphragm pump head.

1.3 Performance and applicabilities

See „Technical Data Sheet“.

1.4 Safety

Refer to operating instruction B 0.100.

1.5 Supply connections

Refer to operating instruction B 0.100.

1.6 Emissions

Refer to operating instruction B 0.100.

2 Transportation and intermediate storage

Refer to operating instruction B 0.100.

3 Product information

3.1 General description

Refer to operating instruction B 0.100.

3.2 Construction and method of operation (Fig. 1)

The diaphragm pump head is divided into three functional chambers:
the operating chamber (A), in contact with the metering fluid, the hydraulic pressure chamber (B), and the hydraulic reservoir (C).
Operating (A) and hydraulic pressure chamber (B) are separated by the diaphragm (27). This means that the operating chamber (A) is also sealed off to atmosphere.
The barrier between hydraulic pressure chamber (B) and hydraulic reservoir (C) is provided by the piston (2) and also by the hydraulic combination valve (50, consisting of pressure relief and venting valve) or separate pressure relief valve (50), the hydraulic snifting valve (29) and possibly the separate venting valve (41). The design applying to you can be taken from the sectional drawing attached resp. the corresponding parts list.
The purpose of these various valves is to precisely control the displacement of the diaphragm and to protect the metering pump against overload and faulty operation. The reciprocating piston transmits the displacer movement to the diaphragm (27) via the hydraulic fluid contained in the hydraulic pressure chamber (B). It is this diaphragm which acts directly on the fluid metered and produces the pumping process, as described in operating instruction B 0.100, sect. 3. The diaphragm (27) always displaces a somewhat smaller volume than the piston (2) because, with each stroke, a small amount of hydraulic fluid escapes via the piston seal (20) and possibly the venting valve (41) from the hydraulic pressure chamber (B) into the hydraulic reservoir (C). This leakage has to be replenished via the snifting valve (29).
This is achieved as follows:
shortly before completion of the suction stroke the diaphragm (27) bottoms against the rear support

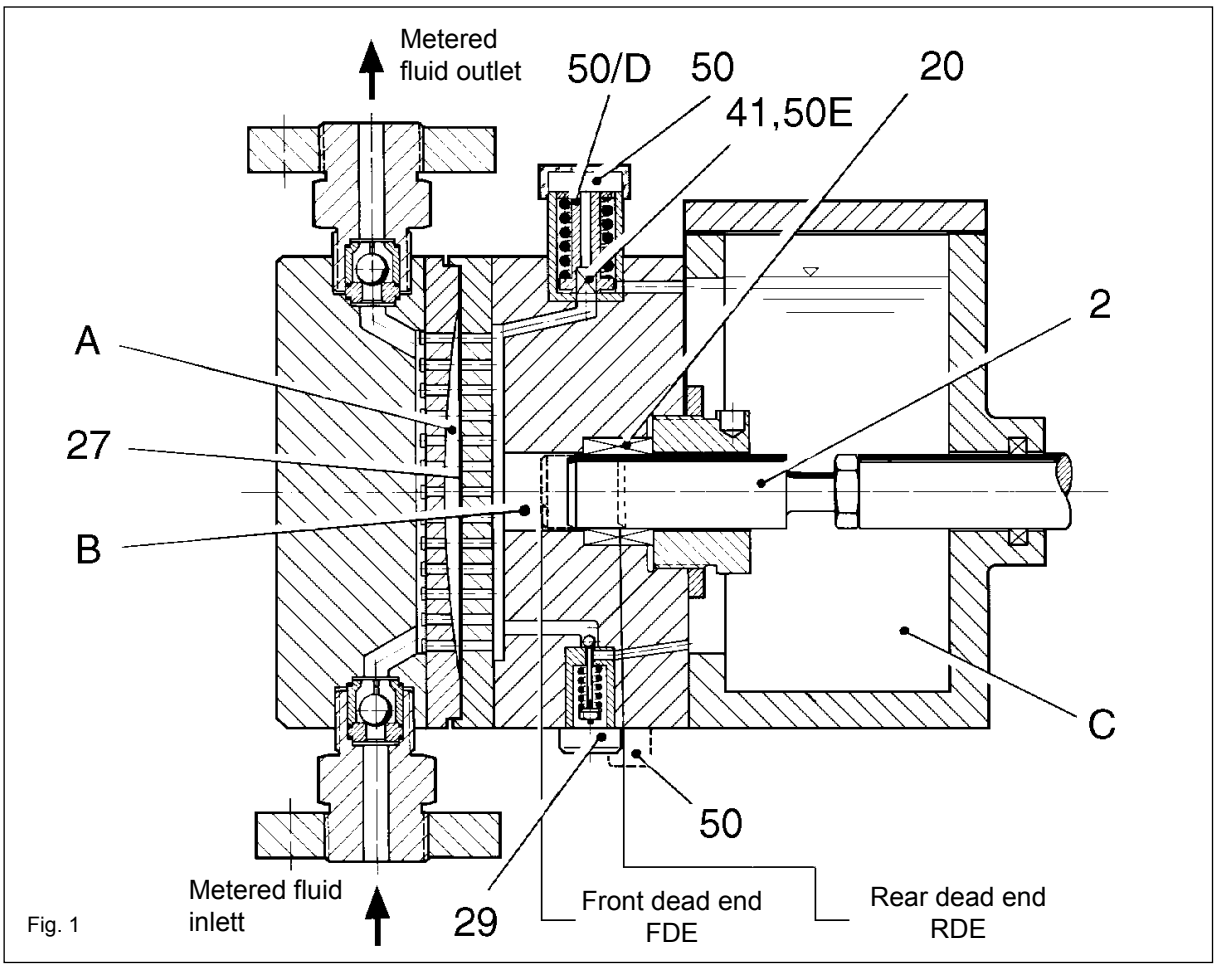


Fig. 1

face in piston direction. As the plunger retracts farther in direction of the rear dead end (RDE) a vacuum is created in the hydraulic pressure chamber (B). The snifting valve (29) therefore opens, and the missing volume of hydraulic fluid is replenished from the hydraulic reservoir (C) into the hydraulic pressure chamber (B).

Assisted by the rear diaphragm support face the hydraulic snifting valve (29) therefore replenishes the leakage losses in the hydraulic pressure chamber (B).
However, the hydraulic snifting valve can also open unintentionally, namely when the pressure in the diaphragm pump head falls below the setting pressure of the snifting valve, e.g. because of a fault condition causing a drop in the suction line pressure or because the suction line is shut off (the required suction pressure is stated in the „Technical Data Sheet“!)
The metering pump will then not draw fluid from the suction line, but take hydraulic fluid from the hydraulic reservoir (C). The diaphragm remains stationary. Consequently there will be too much hydraulic fluid in the hydraulic pressure chamber (B).
During the next discharge stroke the diaphragm will be displaced towards the forward (left hand) support face. If the diaphragm presses against this face before the piston (2) has reached the front dead end (FDE) the pressure in the hydraulic pressure chamber (B) will rise rapidly until the pressure relief valve (50, 50/D) lifts. The fluid which is displaced by the piston (2) will then flow through the pressure relief valve (50, 50/D) back into the hydraulic reservoir (C). The metering pump is „circulating“.

The venting valve (41, 50/E) eliminates metering errors due to gas accumulation in the hydraulic pressure chamber (B).
It is located at the highest point of the hydraulic pressure chamber (B). Its purpose is to move gas bubbles forming and accumulating there due to the continuous change in pressure into the hydraulic reservoir (C) with the aid of a defined leakage.
The leakage rate is fixed by the design and cannot be set by the user.
The rate is selected based on the operating conditions of the metering pump. Depending on the selection it can vary between 0.1 % and 1.5 % of the maximum output of the pump.

The pressure limiting valve (50, 50/D) protects the pump.

If the metering pump delivers into a separately pressurized process circuit then the installation must be protected by a separate safety valve.

The pressure relief valve is set to the pressure stated in the „Technical Data Sheet“. When this pressure is exceeded (e.g. because a shut off valve is shut in the discharge line) the pressure relief valve will lift and the hydraulic fluid, displaced by the piston (2), will flow from the hydraulic pressure chamber (B) into the hydraulic reservoir (C).
During the subsequent suction stroke the diaphragm will bottom against the rear support face soon after the piston has begun to move back. The piston, which continues to retract in direction of the rear dead end (RDE), will then take in hydraulic fluid from the hydraulic reservoir (C) via the snifting valve (29).
The cross-sections of the flow passages are dimensioned so that, during this process, the hydraulic fluid will foam up due to the high pressure drop (release of dissolved gas). Because of this only a fraction of the stroke volume is by-passed through the pressure relief valve (50, 50/D) into the hydraulic reservoir (C) during the next discharge stroke. The heating-up of the hydraulic fluid is limited therefore.

This „circulating“, as a rule, is harmless as long as it only goes on for a short time (a few minutes).

Installations, where operating conditions make „circulating“ likely in the future, should be protected by a contact thermometer in the hydraulic reservoir (C). The pump will then be switched off automatically when the temperature limit set at the contact thermometer is reached.

With the exception of designs for small metered flows and high pressure which have a separate venting valve (41) installed the diaphragm pump heads also are equipped with a venting valve (50/E) integrated in the hydraulic combination valve (50).
Also the metering pump will not be damaged if the suction line is blocked for a short period of time (e.g. by sedimentation or a closed suction shut-off valve). In this condition vaporization and cavitation will occur either in the operating chamber (A) or in the hydraulic pressure chamber (B) during each suction stroke.
After the suction fault has been corrected the gas which has formed in the hydraulic pressure chamber (B) is moved into the hydraulic reservoir (C) via the venting valve (41, 50/E). After a short time the metering pump will start to function properly again.

Special design with double diaphragm:
In the double diaphragm design there is an intermediate diaphragm element (35) with an additional diaphragm (see sectional drawing) between diaphragm (27) and diaphragm pump body (26). The intermediate element between the two diaphragms is filled with a suitable fluid (see „Technical Data Sheet“). The front „fluid-diaphragm“ is thus coupled hydraulically to the rear „hydraulic-diaphragm“ and moves in synchronism.
The hydraulic-diaphragm moves between 2 support faces and protects the metering pump against faults as described above.
The fluid-diaphragm, on the other hand, oscillates freely in the operating chamber. The double diaphragm design is therefore used for suspensions or highly viscous fluids where forward bottoming of a single diaphragm would lead to malfunctioning.

Sandwich diaphragm - see separate operating instruction B 2.2900.

3.3 Dimensions / weights / centres of gravity

Refer to operating instruction B 0.100.

4 Erection and assembly

Refer to operating instruction B 0.100.

5 Commissioning / operation / shut down

5.1 Operation
Refer to operating instruction B 0.100.

5.2 Operating and ancillary means
5.2.1 Hydraulic fluid
See technical data sheet, line 51, for volume refer to parts list for diaphragm pump head (item 55) or "product list metering pump" (pos. 80 - 84).
Only recommended lubricants shall be used (refer to attached operating instruction B 1.002).

5.3 Initial commissioning
Please check if temperature and pressure conditions in suction and discharge line correspond to the values given in the „Technical Data Sheet".

Replace transportation plug on enclosed holder by air filter also supplied. Check level of hydraulic fluid in holder at zero stroke (center line oil sight glass resp. within the marks on the oil dipstick). If an oil dipstick is supplied it is inserted only to measure the level (not screwed in!).
When diaphragm pumpheads are supplied without drive unit the enclosed holder must be charged with the hydraulic fluid specified in the „Technical Data Sheet" (line 36) (refer to sect. 5.2.1).

5.4 Adjustment and control
Refer to operating instruction B 0.100.

5.5 Shut down
Refer to operating instruction B 0.100.

5.6 Dismantling and return transportation
Refer to operating instruction B 0.100.

6 Maintenance and repairs

Please observe precautionary measures as per section 1.4 (operating instruction B 0.100).

6.1 Maintenance
Monthly: Check oil level in hydraulic reservoir (center line oil sight glass resp. within the marks on the oil dipstick). If an oil dipstick is supplied it is inserted only to measure the level (not screwed in!).

Change hydraulic oil depending on the degree of soiling; minimum however once yearly (refer to sect. 6.3.3 and 6.4.1). For safety reasons we recommend to replace the diaphragms at the same time (refer to sect. 6.3.2).

If a glycerin/water mixture is used as hydraulic fluid the pH value of the hydraulic fluid must be checked weekly using e.g. indicator paper. The pH value must be set to pH 8-9 using a suitable inhibitor.

6.2 Repairs
Even after the metering pump has been shut down the operating chamber (A) contains the fluid metered. Assure that all safety and handling instructions for the fluid metered are observed.

Assure utmost cleanliness during disassembly. This is specially valid for all parts in contact with hydraulic fluid.

6.3 Dismantling / assembly
6.3.1 Suction and discharge valves (9 and 13)
In case of aggressive fluids it is advisable to flush out the pipe line first. Close shut-off valves and remove pipe lines.

If system is not flushed the fluid metered will run out.

Unscrew valve bodies (3 and 4). If valves are flange tensioned unscrew cylindrical screws (30) and lift off valve retaining flanges (5 and 6) with valves.
If you remove the suction valve (9) with the pumphead still installed make sure that the valve does not fall out after the valve body or valve retaining flange has been loosened.

When dismantling the valves make sure that no sealing faces are damaged.

6.3.2 Diaphragm (27)

Even after thorough flushing specially after diaphragm rupture the fluid metered can be contained in the sandwich diaphragm, in the intermediate diaphragm element, in the hydraulic pressure chamber (B) and the hydraulic reservoir (C).

Take the appropriate safety measures if required (also see section 6.2.).
Remove pipe lines.
Undo screwed plug (10) at the holder (60-63, see parts list "Metering pump") bottom and drain hydraulic fluid. For this, (if possible) press hydraulik snifting valve (29) to drain fluid from the pressurised hydraulic chamber (B).

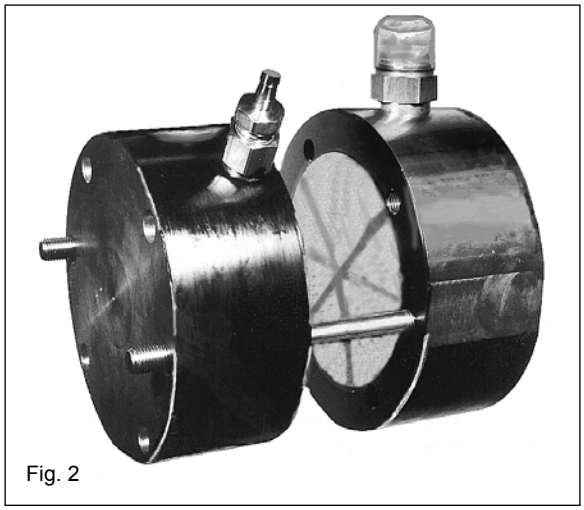


Fig. 2

In event of diaphragm rupture the hydraulic fluid may contain the fluid metered.

Heavy diaphragm pump bodies should be suspended from lifting gear, or replace 2 screws by two longer screwed bolts (see fig. 2). Take off diaphragm pump body (26) by removing screws and, if necessary, pull off perforated disc (33) or diaphragm intermediate element (35) in forward direction.

Residues of metered fluid in pump head will escape.

Lift out diaphragm (diaphragms). After diaphragm rupture drain off hydraulic fluid. Strip hydraulic valves and clean everything thoroughly.

6.3.3 Drain off hydraulic fluid

In case of single diaphragm designs the fluid metered may be entrained in the hydraulic fluid after diaphragm rupture.

Remove cover of enclosed holder (60-63, see parts list "Metering punp"). Undo screwed plug underneath the enclosed holder (24) and drain off hydraulic fluid from reservoir.

Make sure that the hydraulic fluid is disposed of environmentally safe.

If possible press hydraulic snifting valve (29) to drain fluid from hydraulic pressure chamber (B).

6.3.4 Design with hydraulic combination valve (50)

The valve can be unscrewed as a complete unit. The lifting pressure setting will remain unchanged. Please use sectional drawing of the hydraulic combination valve to check the venting valve. Remove seal and protective cover (12) or hood (10).
Loosen hexagon lock nut (8) and turn out setting screw (7).

Spring compression!

The spring guide (11) can now be removed from the valve housing (1) together with the stock of springs (the spherical washer 13) and the valve stem (2), make sure that the ball (24) does not get lost. The piston (20) must move easily inside the valve stem. After removal of circlip (26) the piston (20) and the compression spring (23) can be removed for cleaning.
In case of faults which you cannot correct please return the complete valve to LEWA for repair. For adjustment of the hydraulic combination valve refer to section 6.4.3.1.

6.3.5 Design with pressure relief valve (50)

Unscrew housing of pressure relief valve. Make sure that the setting of the lifting pressure is not

disturbed. In some models the hood with the lead seal does not need to be removed.
In case of faults please return complete valve to LEWA for repair. For adjustment of the pressure relief valve refer to section 6.4.3.1.

6.3.6 Design with separate venting valve (41)
In case of faults please return complete valve to LEWA for repair.

6.3.7 Hydraulic snifting valve (29)
Undo screwed plug underneath the enclosed holder (60-63, see parts list "Metering pump") and drain off hydraulic fluid from reservoir.

After diaphragm rupture metered fluid can also leak out (refer to section 6.2). Unscrew hydraulic snifting valve (29) from diaphragm drive housing.

Residues of the hydraulic fluid will escape. Make sure that the hydraulic fluid is disposed off environmentally safe!

In case of faults which you cannot correct, please return the complete valve to LEWA for repair. For adjustment of the hydraulic snifting valve refer to section 6.4.3.2.

6.3.8 Removal of pump head from the metering pump
Close shut-off valves in the pipe lines and take pipe lines off the pump head. Undo screwed plug at the bottom of the holder (60-63, see parts list "Metering pump") and drain hydraulic fluid from hydraulic reservoir (see 6.3.3).

If diaphragm was ruptured metered fluid may also escape.

Remove cover from holder.
Support heavy pump heads or suspend them from lifting gear. Undo the screws which fasten the pump head to the holder and pull the pump head off in forward direction without jamming it.
If necessary remove enclosed holder from drive unit and piston (2) from piston rod.

6.3.9 Piston seal
Remove pump head from metering pump (see 6.3.8).
There is no need to take the piston (2) from the piston rod. For designs with piston rings (40) spring them open and pull off.
Extract packing rings (42) from groove with a pointed tool.

Do not damage the groove!

If the bore in bush (20) is damaged, undo allen screws (43) and replace bush.

6.3.10 Assembly
Proceed in reverse order to dismantling.

The following points which are important for the function must be observed:

6.3.10.1 All components must be thoroughly cleaned and checked for proper condition. The grooves of the diaphragm sealing areas must be undamaged and absolutely clean.

6.3.10.2 Metallic valve seats of ball valves should be re-lapped with a ball of the same diameter using lapping paste

for valve sizes up to 10 mm nom. dia.:	grain size < 5µ e.g. Tetrabor 1200 Elektroschmelzwerk Kempten GmbH
for valve sizes up to 15 mm nom. dia.:	grain size <20µ e.g. Tetrabor 600 Elektroschmelzwerk Kempten GmbH

For valves up to 15 mm bore lapping tools are available from LEWA.
For plate valves valve seat and plate should be re-lapped on a plate of grey cast iron if the wear is minor or replace if required.

6.3.10.3 Faces for flat gaskets at diaphragm drive housings and drive element holders should be coated with a liquid, non-hardening sealant, e.g. Curil K. Check compatibility of sealant with the hydraulic fluid if Curil K is not available also if another hydraulic fluid is used which is not specified by LEWA.

6.3.10.4 Evenly handtighten hexagon head screws (36) / hexagon nuts (37).
When tightening the hexagon head screws (36) / hexagon nuts (37) keep to the torque value shown on the face of the diaphragm body.

Raise the torque across corners in steps. Required steps 5 %, 10 %, 20 %, 50 % and 100 %.

6.3.10.5 For flange tensioned valves the required torque value for the retaining screws (30) is punched in on the flange. Raise the torque across corners in steps.

Raise the torque across corners in steps. Required steps 5 %, 10 %, 20 %, 50 % and 100 %.

6.3.10.6 Watch direction of flow when fitting the valves. The direction of flow is shown on the sectional drawing and engraved on the valves as well as on the face of the diaphragm body (26).

6.3.10.7 All stainless steel threads should be lubricated against pick-up. Take care that this lubricant does not get inside the valves.

6.3.10.8 If, depending on the design, the setting of the hydraulic snifting valve (29) or the pressure relief/ hydraulic combination valve (50) was disturbed during disassembly a resetting according to section 6.4.3 is required.
Utmost cleanliness is required during assembly.

6.3.10.9 Design with hydraulic combination valve (50)
When installing hydraulic combination valve (50) make sure that the piston moves freely in venting valve (50/E). To check tap face of piston with small screw driver as shown in figure 3. The piston can be pressed in by approx. 2 mm and should then easily return to its original position due to the force of the spring.
When piston is jammed or hard to move clean venting valve (50/E).

6.3.10.10 Design with separate venting valve (41)
When installing venting valve (41) make sure that the piston moves freely in the valve. To check tap face of piston with small screw driver as shown in figure 4. The piston can be pressed in by approx. 2 mm and should then easily return to its original position due to the force of the spring.
When piston is jammed or hard to move clean or replace venting valve (41).

6.3.10.11 For the design plunger seal with piston rings these must be installed with a 180° staggering of the gaps.

6.3.10.12 For assembly and adjustment of piston (2) refer to operating instruction „Drive Unit“ section 8.3.

6.4 Filling, venting, adjusting

6.4.1 Filling with hydraulic fluid

If the hydraulic fluid drained is reused it must be assured that it is free of all dirt particles (run through microfilter).

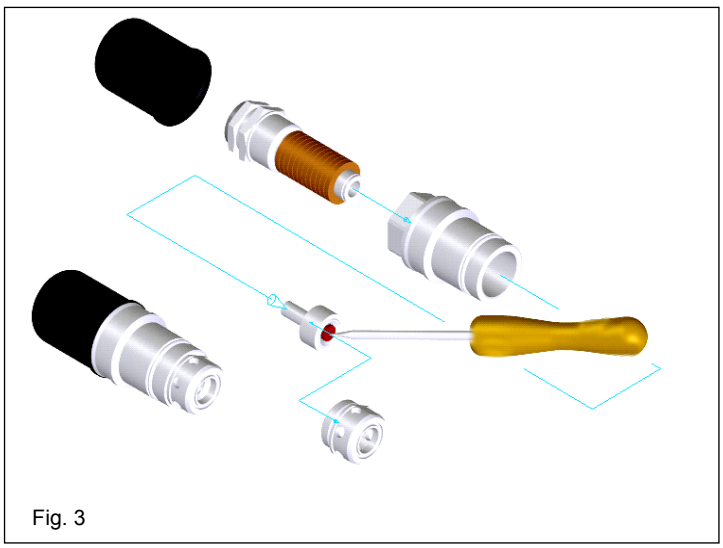


Fig. 3

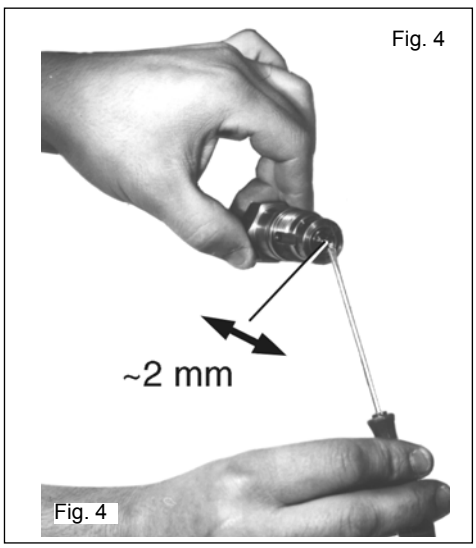


Fig. 4

1. Pour hydraulic fluid (see operating instruction B 1.002) into enclosed holder (remove air filter). The level of the hydraulic fluid must be in the center of the oil sight glass resp. within the marks of the oil dipstick.
   If an oil dipstick is supplied it is inserted only to measure the level (not screwed in!).
2. With the hydraulic combination valve (50) or the venting valve (41) out pour hydraulic fluid into the bore below until there are no or only very small air bubbles coming up.
3. Stick sealing ring to hydraulic combination valve (50) or venting valve (41) with a trace of silicone paste or grease.
4. For models with sandwich diaphragm see operating instruction B 2.2900, sect. 6.4.
5. Commissioning - as described in 5.3.
6. **Special design with double diaphragm and diaphragm intermediate element**
   Slacken venting screws (84) at the side and on top. Raise pressure in operating chamber to appr. 1 bar (fluid-diaphragm will be pushed against rear support plate).
   Introduce intermediate fluid via bore of the lower venting screw (84) using a squeeze bottle (see fig. 5). When liquid comes out at the top and has stopped bubbling, tighten upper venting screw. Raise the pressure a little by means of squeeze bottle and simultaneously depress snifting valve (29) (hydraulic diaphragm is pushed to the rear support face). Maintain squeeze bottle pressure and tighten lower venting screw.

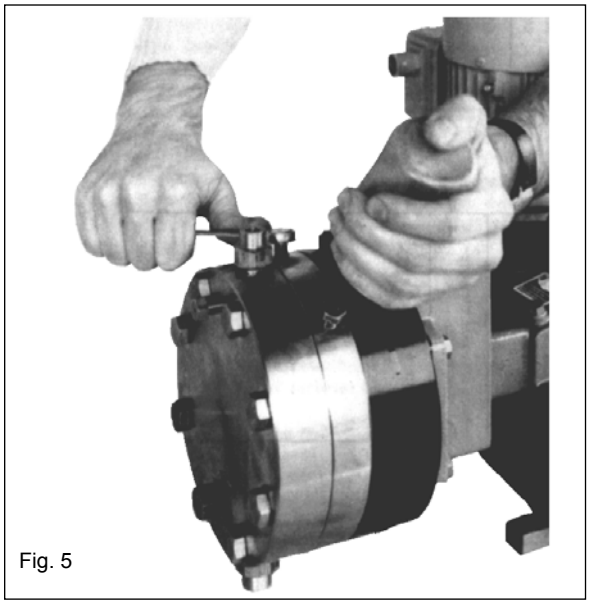


Fig. 5

6.4.2 Venting

6.4.2.1 Hydraulic pressure chamber

Let metering pump deliver at zero pressure and depress hydraulic snifting valve (29) (if possible) until there are no more air bubbles coming out.
The venting process can be shortened in the case of designs with a venting valve (41) or a hydraulic combination valve (50) located at the top by slackening the valve. As soon as the escaping hydraulic fluid is free of air bubbles tighten valve again.
Afterwards check level of hydraulic fluid in reservoir.

6.4.2.2 Special design with double diaphragm and diaphragm intermediate element

After filling let pump deliver at zero pressure for a few minutes. This will allow entrained air to be flushed out of the horizontal passages and to collect under the venting screws.
Then top up intermediate element as described in 6.4.1, sect. 6.

6.4.3 Setting up

6.4.3.1 Design with pressure relief/hydraulic combination valve (50)

- Relax spring of valve. Set the metering pump to zero stroke.
- Switch on metering pump and run with discharge shut-off valve closed.
- Set stroke to approx. 1/5 maximum stroke.
- Tighten spring by a small amount.
- A pressure gauge between metering pump and discharge shut-off valve will now indicate the lifting pressure. Slowly increase spring compression until the maximum permissible or required lifting pressure has been reached.
- If increased spring compression fails to raise the pressure further, increase the stroke length carefully until the pressure relief valve responds.
- The pressure relief valve has a certain range of adjustment. If adjustment to values outside this range is required, an appropriate valve will have to be ordered from LEWA.

6.4.3.2 Hydraulic snifting valve (29)

The setting pressure Δp is 0.4 bar usually. At special operating conditions another setting can be of advantage.

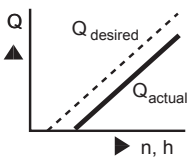
However change setting after consulting LEWA only.

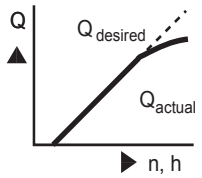
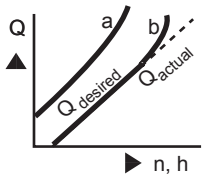
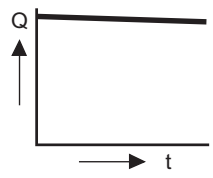
The setting pressure depends on the nominal bore and can be taken from following table.
To check the setting press valve stem against a scale until the ball or cone lifts off the seat. The weight read off corresponds to the setting pressure. The setting can be changed by turning nut (7). When checking make sure that valve seat and closing element are dry.

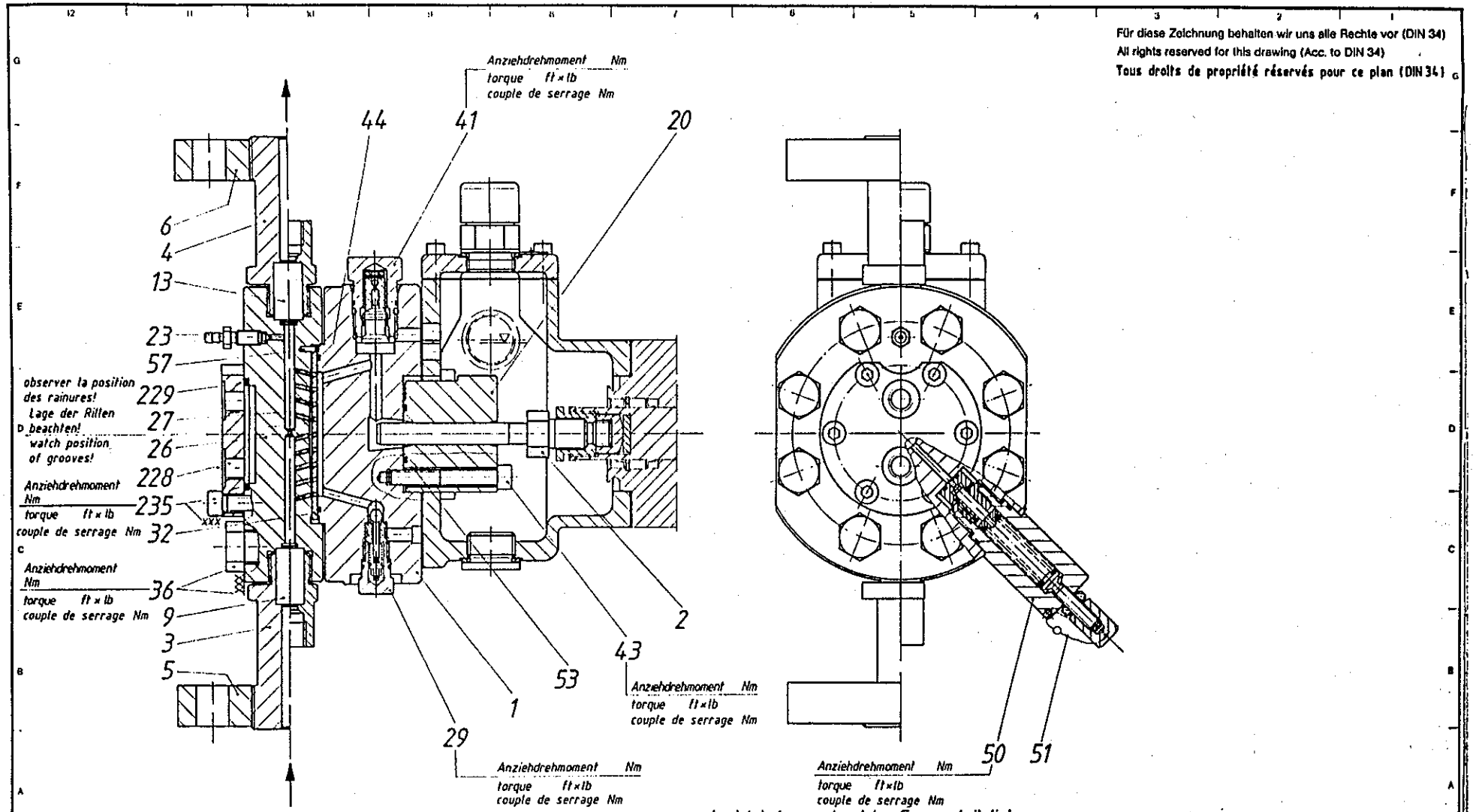
Type	DN 5	DN 10	DN 15	DN 25
Δ p = 0,4 bar	80 - 100 g	300 - 350 g	700 - 800 g	2000 - 2100 g

If a liquid film is between the parts the setting can be too inaccurate due to the sticking effect.

7 Faults; symptoms, remedial action

Fault	possible cause →	can be recognized by	Corrective action
metering pump does not deliver	- discharge shut-off valve closed - back pressure too high (see „Technical Data Sheet“ - discharge valve (13) wrongly fitted or jammed	Pressure relief valve (50, 50/D) operates. Knocking in stroke rhythm visible at sight glass. When venting screw (23) is opened, (if provided) metered fluid comes out in pulses	- open shut-off valve - reduce discharge pressure or, if permissible, raise setting of pressure relief valve (50, 50/D) (see sect. 6.4.3.1) - remove discharge valve (13), inspect and fit correctly
	- suction shut-off valve closed - dirt trap or line blocked - metered fluid solidified - suction valve (9) wrongl fitted, jammed or damaged - suction pressure too low (see „Technical Data Sheet“)	Pressure relief valve (50, 50/D) operates. Knocking noise in stroke rhythm, visible at sight glass. When venting screw (23) is opened (if provided) metered fluid comes out in pulses	- open shut-off valve - clean dirt trap or line - improve heating of pump head - remove suction valve (9) inspect and fit correctly - check suction conditions (see B 0.100 - 4.5.2)
	- air in operating chamber (A) - air in hydraulic pressure chamber (B) (or in sandwich diaphragm) - gas in metered fluid	When venting screw (23) (if provided) is opened metered fluid escapes irregularly	- vent pump (sect. 6.4.2) - replace venting valve (41), vent sandwich diaphragm (see B 2.2900-6.4) - check installation (see B 0.100, sect. 4.5)
metering pump output over whole range too low 	- suction or discharge valve (9) or (13) leaking due to dirt or wear		- clean or repair valves, check dirt trap
	- vent valve (41) dirty or defective - pressure relief valve (50) or hydraulic snifting valve (29) and control push rod not leak tight - piston seal (piston rings/ ground-in bushing) or piston (2) worn	Leak rate < 0.1 % or >> 2 % of max. stroke volume. If pump power > 1 kw the hydraulic fluid is unusually warm/hot e.g. because of non permissible leakage rates	- clean or replace valves, clean hydraulic reservoir and charge with new hydraulic fluid - replace piston seal or piston (2); clean pump; check that a suitable hydraulic fluid is being used (see sect. 5.2.1)

Fault	possible cause	can be recognized by	Corrective action
metering pump output too low at long strokes or high stroking rates 	- pressure drop in discharge line too high	pressure relief valve (50) responds from time to time	- re-calculate pipe line and modify if appropriate (see B 0.100 sect.4.5)
	- suction shut-off valve not fully open. Dirt trap fouled up. - pressure losses in suction line too high, or suction pressure is too low. Metered or hydraulic fluid gassing off or cavitating	unusual operating or piping noise possible	- open all valves completely, clean dirt trap - re-calculate pipe line, modify if appropriate (see B 0.100, sect. 4.5)
pump output excessive  metered flow fluctuates at or above $Q_{des.}$	a) static pressure at suction flange higher than at discharge flange b) inertia forces in the pipe line cause pressure in suction line momentarily to exceed pressure in discharge line	metered fluid passing through pump head with pump at rest	reduce suction pressure, elevate pump, provide positive differential pressure. LEWA would be pleased to assist you re-calculate pipe line, modify if appropriate (see B 0.100, sect. 4.5)
metered flow fluctuates, but remains smaller than Q_{de}	- metered fluid contaminated or gas entrained - valves defective		- check dirt trap and improve, de-gas metered fluid, - refurbish or replace unsuitable or defective valve components - clean filter up-stream or in the hydraulic snifting valve (29) and check if it is open
metered flow falls off 	- gas formation because venting valve (41, /50/E)	no discharge from venting does valve (41, 50/E)	- replace venting valve (41, 50/E)
	- gas formation because snifting valve (29) is set too high - gas formation because of unsuitable hydraulic fluid	venting valve discharges hydraulic fluid saturated with gas	- check setting of hydraulic snifting valve (29) (see 6.4.3.2) - ask LEWA for suitable hydraulic fluid and fill into pump head
	- gas formation in operating chamber. Generally causes difficulties at metered flows < 50 l/h	full metered flow restored after brief increase in stroke length or frequency	fit special valves. Enquire from LEWA please. Optimize piping installation. LEWA would be pleased to assist you
plunger seal gets too hot	- in case of ground-in seal plunger mounting no longer laterally movable		- check plunger mounting as described in operating instruction „Drive Unit“ section 6.4.5.



Anziehdrehmoment siehe Gruppenteileliste
torque see group parts list / couple de serrage voir nomenclature des sous-ensembles

Änderung	Datum	Änderungstext	Mitteilungs-Nr.

Text siehe Blatt
instructions see sheet
texte voir feuille

B2.2200

Membranpumpenkopf
Gr. 8/10/12 EK M 210

diaphragm pump head
size 8/10/12 EK M 210

tête de pompe à membran
taille 8/10/12 EK M 210

LEWA
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Ver.-Nr. Pro.-no. Pré.-no.	Schnittbild-Nr. Section drawing-no. Plan coupe-no.
010	120063 0000

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teillisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	001	1	STK		MEMBRANANTRIEBSGEH. DIAPHRAGM DRIVE	GR.10/12EK M210 164X138X57	1.0570	T	1	0571160350	
2	002	1	STK	V	TAUCHKOLBEN PLUNGER	GR. 12 HU 22X26X130	1.4528	T	4	0142100161	
3	003	1	STK		VENTILKOERPER VALVE BODY	DN5 G3/8 IG H,HL,FR 27X31,2X50	1.4571	T	4	0052190001	
4	004	1	STK		VENTILKOERPER VALVE BODY	DN5 G3/8 IG H,HL,FR 27X31,2X50	1.4571	T	4	0052190001	
5	009	1	STK	E	2-KUGELVENTIL 2-BALL VALVE	DN 5 HU-H 16DX32	0001/0020	G	4	0100550007 S.GR.-L.	
6	013	1	STK	E	2-KUGELVENTIL 2-BALL VALVE	DN 5 HU-H 16DX32	0001/0020	G	4	0100550007 S.GR.-L.	
7	020	1	STK	E	BUCHSE BUSHING	GR.12EK/12EL M210 62DX55,5	EN-JL1040	T		0556540198	
8	026	1	STK		MEMBRANPUMPENKOERPER DIAPHRAGM BODY	GR.10/12EK M210 158X138X43	1.4571-3B	T	0	1056360802	
9	027	1	STK	V	MEMBRANE DIAPHRAGM	GR.10/12EK M210 97,5DX0,25	1.4401K-3B	T	4	0557840209	
10	029	1	STK	E	HYDR.-SCHNUEFFELVENTIL HYDRAUL.SNIFT.VLE	DN 5 0,5BAR M2.. 18DX46	0091/0321	G	4	0434730006 S.GR.-L.	Drehmom. 17 Nm torque12,5ftxlb
11	032	1	STK		LOCHSCHEIBE PERFORATED DISK	GR.10/12EK M210 97,6DX3	1.0503-2.2	T	2	1056350158	
12	036	8	STK		SECHSKANTSCHRAUBE HEXAGON HEAD SCREW	M16X70 ISO 4014	8.8-A2B	T		0721760101	Drehmom. 84 Nm torque 62 ftxlb
13	041	1	STK		GASAUSSCHLEUSVENTIL DEGASSING VALVE	HUB 0,4/0,3BAR 27X31,2X52	0158/0178	G		0568500003 S.GR.-L.	Drehmom. 60 Nm torque 44 ftxlb
14	043	6	STK		ZYLINDERSCHRAUBE M.INN ALLEN SCREW	M8X60 ISO 4762	8.8-A2B	T		0700440101	Drehmom. 12 Nm torque 9 ftxlb
15	044	1	STK	V	O-RING O-RING	82,22X2,62 T.NR.152	FPM-70(VA)	T		0733370104	
16		1	STK		MEMBRAN-PUMPENKOPF DIAPHR.PUMP HEAD	GR.10-12 EK16 M210 BG	1200630000		1		

LEWA Hersteller manufacturer	DOSIERPUMPE METERING PUMP Benennung des Erzeugnis denomination of product	B 2.2200-- Betriebsanleitung operating instruction	1200630000/1G/00 Zeichnungs-Nr. drawing-no.	1200630000 Gruppen-Teillisten-Nr. group parts list no. 2)	A 5) G	333159 00100000 Auftrags-Nr. order-no. 2)	1 von of Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart
Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

2) Bei Bestellung Ident-Nr., Teillisten-Nr. u. Auftr.-Nr. angeben
when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format draw.size DIN A0-A4

4) Aenderungs-Index revision

5) Variante variation

Formular entspr. DIN 24420
form conforms DIN 24420

11.03.99/AM-WAL 02

erstellt/gepr. Issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1	050	1	STK E	DRUCKBEGRENZUNGSVENTIL PRESSURE LIMIT VALVE	DN3 70-250 BAR 30X34,6X122	0178/0242	P	3	0563750007 S.GR.-L.	Drehmom. 60 Nm torque 44 ftxlb
2	051	1	STK	PLOMBE LEAD SEAL	8D	0111/0143	G		0900460001	
3	053	1	STK V	O-RING O-RING	26,64X2,62 T.NR.121	FPM-70(VA)	T		0708180104	
4	057	1	STK	ZYLINDERSTIFT CYLINDRICAL PIN	B- 3 X 8 ISO 2338	A2-50	T		0738801502	
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16		1	STK	MEMBRAN-PUMPENKOPF DIAPHR.PUMP HEAD	GR.10-12 EK16 M210 BG	1200630000		1		

LEWA Hersteller manufacturer	DOSIERPUMPE METERING PUMP Benennung des Erzeugnis denomination of product	B 2.2200-- Betriebsanleitung operating instruction	1200630000/1G/00 Zeichnungs-Nr. drawing-no.	1200630000 Gruppen-Teilelisten-Nr. group parts list no. 2)	A 5) G	333159 00100000 Auftrags-Nr. order-no. 2)	2 von of 2 Blatt page / Blättern pages

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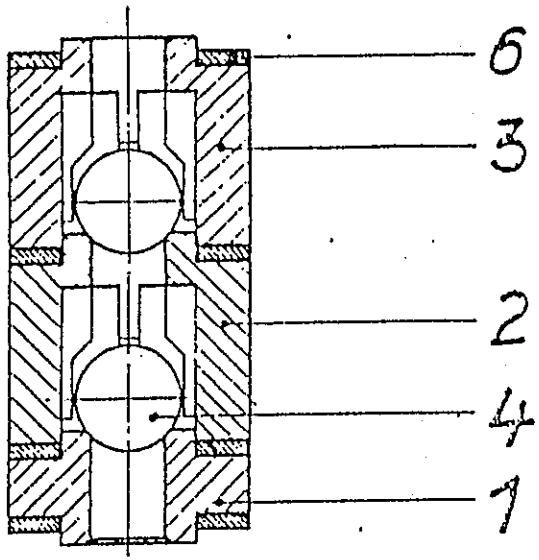

Änderung	Datum	Änderungstext	Mitteilungs-Nr.

Text s. Blatt
Instructions
see sheet

2-Kugelventil DN 3-5
mit Flachdichtungen
2-ball valve DN 3-5
with flat sealing rings

LEWA

Schnittbild-Nr.
Section drawing-No.
040 010055 0000

11.03.99/AM-WAL 02

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no.	Menge quantity	Mengen-einheit unit of quantity	1)	Benennung designation	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2)	Gr. LEWA-Intern	F 3)	Ident-Nr. ident-no. 2)	Bemerkungen remarks
1	2	3	A	4	5	B	C	D	6	7
1 001	1	STK	V	VENTILSITZ VALVE SEAT	DN 5 HU-H 16DX8	1.4571	T	4	0066070001	
2 002	1	STK	V	VENTILFUEHRUNG M.SITZ VALVE GUIDE W/SEAT	DN 5 HU-H 16DX14	1.4571	T	4	0100560001	
3 003	1	STK	V	VENTILFUEHRUNG M.SITZ VALVE GUIDE W/SEAT	DN 5 HU-H 16DX14	1.4571	T	4	0100560001	
4 004	2	STK	V	KUGEL BALL	7D DIN 5401	2.4610	T		0744010020	
5 006	4	STK	V	DICHTRING SEAL RING	A9X16X1 AEHNL.DIN 7603	GYL	T		0703090065	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16	1	STK	E	2-KUGELVENTIL 2-BALL VALVE	DN 5 HU-H 16DX32	0001/0020		4	0100550007	

LEWA	DOSIERPUMPE METERING PUMP		0100550000/4G/00	0100550007	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

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11.03.99/AM-WAL 00

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no.	Menge quantity	Mengen-einheit unit of quantity	1)	Benennung designation	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2)	Gr. LEWA-Intern	F 3)	Ident-Nr. ident-no. 2)	Bemerkungen remarks
1	2	3	A	4	5	B	C	D	6	7
1 001	1	STK	V	VENTILSITZ VALVE SEAT	DN 5 HU-H 16DX8	1.4571	T	4	0066070001	
2 002	1	STK	V	VENTILFUEHRUNG M.SITZ VALVE GUIDE W/SEAT	DN 5 HU-H 16DX14	1.4571	T	4	0100560001	
3 003	1	STK	V	VENTILFUEHRUNG M.SITZ VALVE GUIDE W/SEAT	DN 5 HU-H 16DX14	1.4571	T	4	0100560001	
4 004	2	STK	V	KUGEL BALL	7D DIN 5401	2.4610	T		0744010020	
5 006	4	STK	V	DICHTRING SEAL RING	A9X16X1 AEHNL.DIN 7603	GYL	T		0703090065	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16	1	STK	E	2-KUGELVENTIL 2-BALL VALVE	DN 5 HU-H 16DX32	0001/0020		4	0100550007	

LEWA	DOSIERPUMPE METERING PUMP		0100550000/4G/00	0100550007	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

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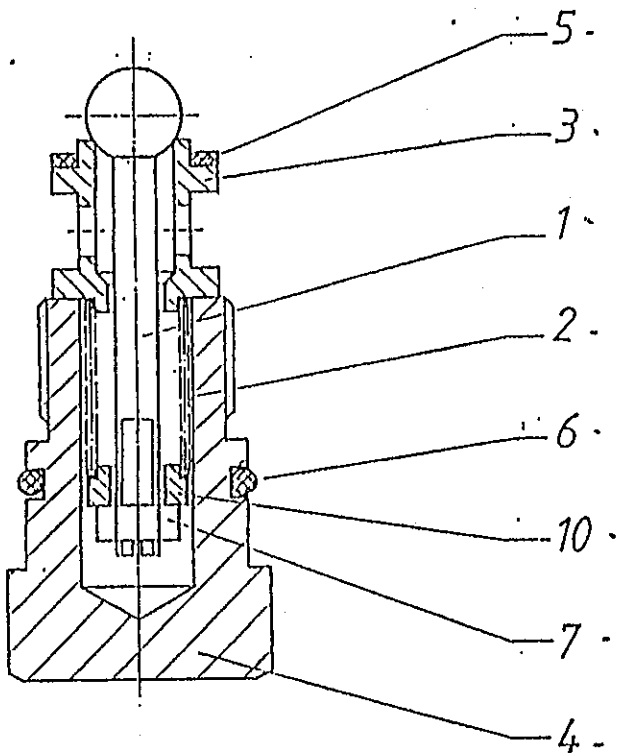
form conforms DIN 24420



Änderung	Datum	Änderungstext	Mitteilungs-Nr.
1	12.5.82	Pos. geänd.	8526

Text s. Blatt
Instructions
see sheet

Hydraulikschnüffelventil DN5
für Kompaktmembranpumpe
hydraulic snift valve DN5
for compact diaphragm pump

LEWA

043473 0000/4G/01

11.03.99/AM-WAL 00

erstellt/gepr. issued/checked 4) V50 deutsch–englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1 001	1	STK		VENTILSTOESSEL VALVE STEM	FCH/EKH/ELH/EH 7DX38	0001/0321	U V	4	044922 0002	
2 002	1	STK	E	DRUCKFEDER THRUST SPRING	DN 3/5 HK 7,4DX15	FEDERST.	T	3	016388 0203	
3 003	1	STK	V	VENTILSITZ VALVE SEAT	F.SCHNUEFF.VENTIL 12DX13	1.0715	T	4	044712 0091	
4 004	1	STK		VENTILGEHAEUSE VALVE HOUSING	F.SCHNUEFF.VENTIL 17X19X28	1.4104	T	4	044714 0014	
5 005	1	STK	V	DICHTRING SEAL RING	A8X12X1 DIN 7603	CU	T		072299 0095	
6 006	1	STK	V	O-RING O-RING	12,42X1,78 T.NR.014	FPM-70(VA)	T		073124 0104	
7 007	1	STK		SECHSKANTMUTTER HEXAGON NUT	M3 ISO 10511	ST-ZN	T		071055 0143	
8 010	1	STK		FEDERTELLER SPRING PLATE	4ID/6AD 7,2DX3	1.0715	T	4	044713 0091	
9										
10										
11										
12										
13										
14										
15										
16	1	STK	E	HYDR.-SCHNUEFFELVENTIL HYDRAUL.SNIFT.VLE	DN 5 0,5BAR M2.. 18DX46	0091/0321		4	043473 0006	

LEWA	DOSIERPUMPE METERING PUMP		0434730000/4G/01	043473 0006	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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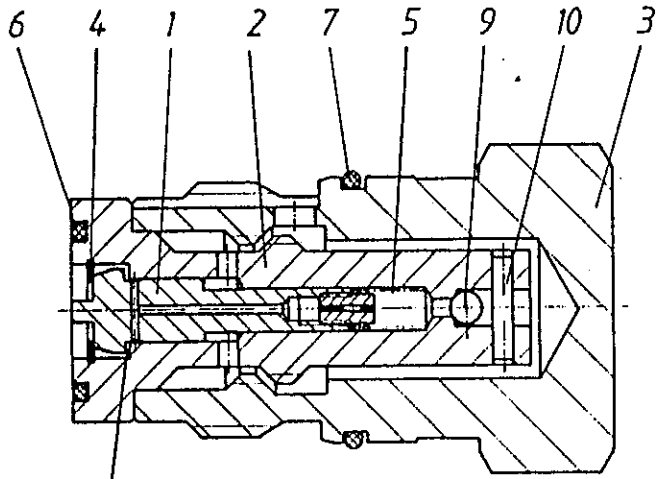
3) Zeichnungs-Format
draw.size DIN A0–A4

4) Aenderungs-Index
revision

5) Variante
variation

Formular entspr. DIN 24420
form conforms DIN 24420



Pos.1 mit Pos.2 bei Montage eingeläppt, Körnung min. 600

pos. 1 lapped with pos. 2 during assembly, 600 grain min.

pos. 1 avec pos. 2 rodé au montage, granulomètrie min. 600

② Vor dem Montieren in den Pumpenkopf, Teil 2 u. 3 miteinander verschrauben bis Axialspiel vorhanden

Parts 2 and 3 must be screwed together until axial play exists before installation in pump head

Avant le montage de la tête, visser la pièce 2 dans la pièce 3 jusqu'à libérer le filletage

Zeichnung-Nr. / Drawing No.	Intern	Ä-Index
054 618 0002	3G	02

	Datum	Name
Gezeichnet	9.8.85	Vt
Geprüft		
Normgepr.	19.3.15	

Text siehe Blatt
Instructions see sheet
Texte voir feuille

Gasausschleusventil
degassing valve
clapet de purge

LEWA
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Ver-Nr. / Pre-No. / Pré-No.	Schnittbild-Nr. / Section drawing-No. / Plan coupe-No.
532	054 610 0002

Änderung	Datum	Änderungstext	Mitteilungs-Nr.
2	28.6.89	Text neu / new	11653
1	8.4.87	Läppangabe neu, lapping instruction new	10 950

A 181a

11.03.99/AM-WAL

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no. 1	Menge quantity 2	Mengen-einheit unit of quantity 3	1) A	Benennung designation 4	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension 5	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2) B	Gr. LEWA-Intern C	F 3) D	Ident-Nr. ident-no. 2) 6	Bemerkungen remarks 7
1 001	1	STK		KOLBEN PLUNGER	H=0,4 MM 8DX29	0097/0178	U V	4	0568320002	
2 002	1	STK		ZYLINDER CYLINDER	F.ENTL.VENT. 21DX44	1.0503-2.2	T	3	0568450158	
3 003	1	STK		SCHRAUBE SCREW	F.ENTL.VENT.EK/EL 27X31,2X46	1.4104	T	3	0555090014	
4 004	1	STK	E	SICHERUNGSRING CIRCLIP	9X0,8 DIN 472	FST	T		0811260130	
5 005	1	STK	V	VENTILFEDER VALVE SPRING	0,3BAR STAT 3,7DX14,4	FEDERST.	T	3	0555830203	
6 006	1	STK	V	O-RING O-RING	12,42X1,78 T.NR.014	FPM-70(VA)	T		0731240104	
7 007	1	STK	V	O-RING O-RING	20,35X1,78 T.NR.019	FPM-70(VA)	T		0732700104	
8 009	1	STK	V	KUGEL BALL	3D DIN 5401	1.3541 H	T		0730690004	
9 010	1	STK		SPANNSTIFT CLAMP PIN	2X10-A ISO 8752	FST	T		0729410130	
10										
11										
12										
13										
14										
15										
16	1	STK		GASAUSSCHLEUSVENTIL DEGASSING VALVE	HUB 0,4/0,3BAR 27X31,2X52	0158/0178		3	0568500003	

LEWA	DOSIERPUMPE METERING PUMP		0546180002/3G/02	0568500003	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

1) V=Verschleißteil E=Ersatzteil
V=wearing part E=sparepart
Es gelten die LEWA-Verkaufs- u. Lieferbedingungen. LEWA sales and delivery conditions apply

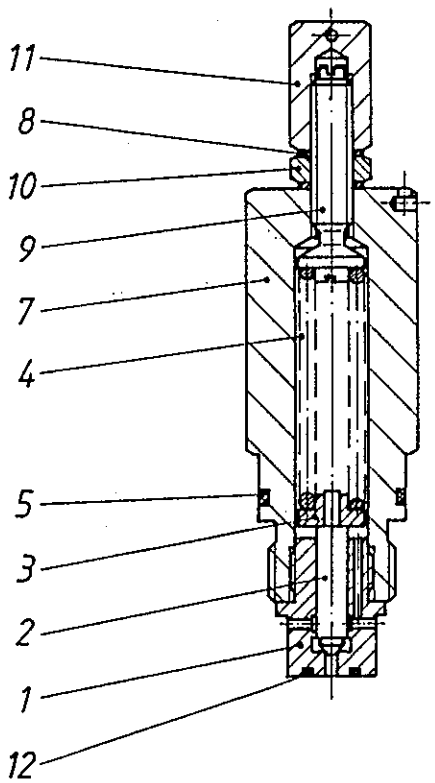
2) Bei Bestellung Ident-Nr., Teilelisten-Nr. u. Auftr.-Nr. angeben
when ordering ident-no., group-parts-list and order-no.

3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
revision

5) Variante
variation

Formular entspr. DIN 24420
form conforms DIN 24420



Änderung	Datum	Änderungstext	Mitteilungs-Nr.

1986	gezeichnet drawn signature	geprüft checked control	Normgepr. check.f.stand. cont.sel.norm.
Datum date	7.10.	7.10.	20.10.
Name nom	jg	Hw	Kn

Text siehe Blatt
Instructions see sheet
Texte voir feuille

Druckbegrenzungsventil
press. relief valve
limiteur pression

LEWA®
LEWA Herbert Ott GmbH + Co
D-7250 Leonberg bei Stuttgart

Vor-Nr. Pre-No. Pré-No.	Schnittbild-Nr. Section drawing-No. Plan coupe-No.
030	056375 | 0000

11.03.99/AM-WAL 01

erstellt/gepr. issued/checked 4) V50 deutsch-englisch

Pos.Nr. item.no.	Menge quantity	Mengen-einheit unit of quantity	1)	Benennung designation	Nenngröße, Normteilkurzbezeichnung Fremdteilkennzeichen und Abmessungen nominal size, denomination of standard parts sub-contractor designation and dimension	Gruppen-Teilelisten-Nr. oder Werkstoff group-parts-list no. or material 2)	Gr. LEWA-intern	F 3)	Ident-Nr. ident-no. 2)	Bemerkungen remarks
1	2	3	A	4	5	B	C	D	6	7
1 001	1	STK	V	VENTILSITZ VALVE SEAT	DN3 F. DBV 19DX26	1.2842	T	3	1030840242	
2 002	1	STK		VENTILKOLBEN VALVE PISTON	AL 6DX30	1.7131-2.2	T	4	0563710178	
3 003	1	STK		FEDERTELLER SPRING PLATE	AL 13DX6	1.0503-2.2	T	4	0563720158	
4 004	1	STK	V	VENTILFEDER VALVE SPRING	DN3,0 70-250BAR 11,4DX48	FEDERST.	T	3	0563680203	
5 005	1	STK	V	O-RING O-RING	23,47X2,62 T.NR.119	FPM-70(VA)	T		0732560104	
6 007	1	STK		VERSCHRAUBUNG SCREWED FITTING	M16X1 F.DBV 30X33,53X77	1.4104	T	3	0563730014	
7 008	2	STK	V	DICHTRING SEAL RING	A8X12X1 DIN 7603	POM	T		0722990135	
8 009	1	STK		EINSTELLSCHRAUBE ADJUSTING SCREW	M8X1 F.DBV DN1,8 13DX41	1.4122	T	4	0563740010	
9 010	1	STK		SECHSKANTMUTTER HEXAGON NUT	M8X1 ISO 8675	A4-50	T		0709790578	
10 011	1	STK		SECHSKANTMUTTER HEXAGON NUT	M8X1 13X14,4X24	1.4104	T	4	0558780014	
11 012	1	STK	V	O-RING O-RING	7,65X1,78 T.NR.011	FPM-70(VA)	T		0731220104	
12										
13										
14										
15										
16	1	STK	E	DRUCKBEGRENZUNGSVENTIL PRESSURE LIMIT VALVE	DN3 70-250 BAR 30X34,6X122	0178/0242		3	0563750007	

LEWA	DOSIERPUMPE METERING PUMP		0563750000/3G/00	0563750007	A	333159 00100000	1 von 1 of
Hersteller manufacturer	Benennung des Erzeugnis denomination of product	Betriebsanleitung operating instruction	Zeichnungs-Nr. drawing-no.	Gruppen-Teilelisten-Nr. group parts list no. 2)	5) G	Auftrags-Nr. order-no. 2)	Blatt page / Blättern pages

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3) Zeichnungs-Format
draw.size DIN A0-A4

4) Aenderungs-Index
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5) Variante
variation

Formular entspr. DIN 24420
form conforms DIN 24420

SIEMENS

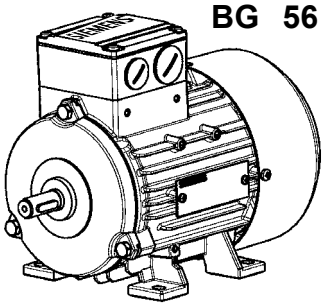
Drehstrommotoren
Three-phase AC Motors
Moteurs triphasés
Motores trifásicos
Motori trifasi
Trefasmotorer

Betriebsanleitung Operating instructions
Instructions de service
Instrucciones para el manejo
Manuale d'uso
Bruksanvisning

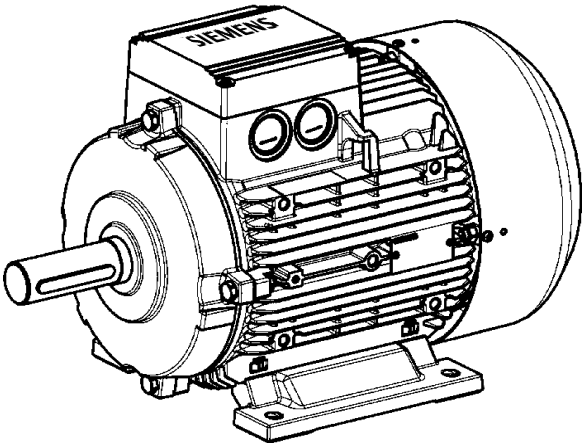
1LA6, 1LA7/9, 1LP7/9, 1PP7/9

1MA6/7, 1MF6/7

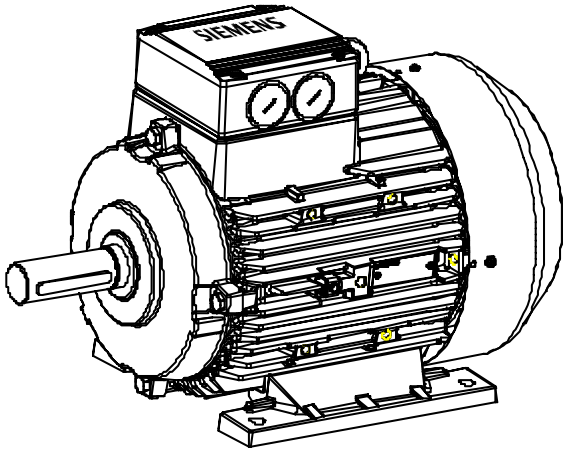
BG 56 ... 90 L - IM B3



BG 100 ... 160 L - IM B3



BG 100 ... 160 L - IM B3
1LA6, 1MA6



Baugrößen (BG) / Frame sizes (BG) / Désignation de carcasse (BG)
Tamaños constructivos (BG) / Grandezza costruttiva (BG) / Konstruktionsstorlekar (BG)

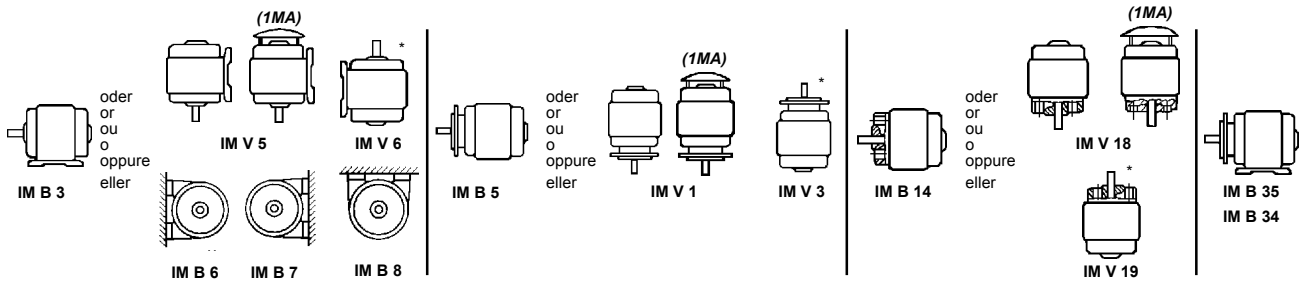


Fig. 1 Bauformen / Types of construction / Formes de construction Formas constructivas / Forme costruttive / Monteringssätt

** s. "4 EEx e Motoren"/see "4 EEx e motors"/voir "4 Moteurs EEx e " / véase "4 Motores EEx e "/cfr. "4 Motori EEx e " / se "EEx e-Motorer"*

Ausgabe / Edition 10.01

Bestell - Nr. / Order No.: 610.43 428.21.d

DEUTSCH / ENGLISH / FRANÇAIS / ESPAÑOL / ITALIANO / SVENSKA

gegen unzulässige Erwärmung zu schützen. Die Schutzeinrichtung ist auf den Bemessungsstrom einzustellen. Bei Wicklungen in Dreieckschaltung werden die Auslöser in Reihe mit den Wicklungssträngen geschaltet und auf den 0,58fachen Bemessungsstrom eingestellt. Ist diese Schaltung nicht möglich, sind zusätzliche Schutzmaßnahmen erforderlich (z. B. Thermischer Maschinenschutz).

*Die **Schutzeinrichtung** muß bei blockiertem Läufer innerhalb der für die jeweilige Temperaturklasse angegebenen t_E-Zeit abschalten.*

*Elektrische Maschinen für **Schweranlauf** (Hochlaufzeit > 1,7 x t_E-Zeit) sind entsprechend den Angaben der Konformitätsbescheinigung durch eine Anlaufüberwachung zu schützen.*

***Thermischer Maschinenschutz** durch direkte Temperaturüberwachung der Wicklung ist zulässig, wenn dies bescheinigt und auf dem Leistungsschild angegeben ist.*

*Bei **polumschaltbaren Motoren** sind für jede Drehzahlstufe getrennte, gegenseitig verriegelte Schutzeinrichtungen erforderlich. Empfohlen werden Einrichtungen mit dem Prüfbericht einer zugelassenen Prüfstelle.*

In Deutschland wird beim Errichten elektrischer Anlagen in explosionsgefährdeten Bereichen auf DIN 57165/VDE 0165 und ElexV hingewiesen! Im Ausland sind die entsprechenden Landesvorschriften zu beachten!

*Der **Betrieb am Umrichter** muß ausdrücklich bescheinigt sein. Die gesonderten Herstellerhinweise sind unbedingt zu beachten. Für die Zündschutzart EExe müssen Motor, Umrichter und Schutzeinrichtungen als zusammengehörig gekennzeichnet und die zulässigen Betriebsdaten in der gemeinsamen Prüfbescheinigung festgelegt sein (VDE 0165).*

*Die vom **Umrichter erzeugten Spannungsspitzen** können durch das installierte Verbindungskabel zwischen Umrichter und elektrischer Maschine in ihrer Größe ungünstig beeinflußt werden. In dem System Umrichter-Kabel-elektrische Maschine darf der Maximalwert der Spannungsspitzen an den Anschlußklemmen der Maschine den in den gesonderten Herstellerhinweisen genannten Wert nicht überschreiten. Des weiteren ist die **EMV-Richtlinie** einzuhalten.*

*Reparaturen müssen in **Siemens-Werkstätten** durchgeführt oder von einem amtlich **anerkannten Sachverständigen** abgenommen werden. Die Arbeiten sind durch ein zusätzliches Reparaturschild zu kennzeichnen.*

***Ersatzteile** mit Ausnahme genormter, handelsüblicher und gleichwertiger Teile (z. B. Wälzlager) dürfen nur **Originalersatzteile** (s. Ersatzteilliste) verwendet werden: dies gilt insbesondere auch für Dichtungen und Anschlußteile.*

General note

The data and recommendations specified in all the instructions supplied (**"Information on safety and commissioning"**), and in **all other related instructions**, must always be observed in order to avoid **hazardous situations** and the **risk** of possible injury or damage.

Furthermore, the **pertinent national, local** and **plant-specific regulations** and **requirements** should be kept in mind!

Special designs and **other versions** may vary in technical details! If in doubt, be sure to contact the manufacturer, quoting the **type designation** and **serial number (No. E ..., see rating plate)**, or have maintenance work done by one of the SIEMENS Service Centres.

1 Description

1.1 Application

Normal use of the standard motors:

The motors are designed to comply with degree of protection IP55 (degree of protection indicated on rating plate). They are suitable for installation in dusty and damp environments. The insulation is tropicalized. If they are properly stored or installed outdoors, special weatherproofing measures are not usually required for these motors. They must however be protected against intense sunlight, e.g. by means of a canopy.

Ambient temperature	-30°C ... +60°C
Site altitude	≤ 1000 m

1.2 Construction and mode of operation

Motor types:

1LA- and *1MA* motors are self-ventilated (with fans). 1PP motors are self-ventilated either by separate fans arranged on the rotors, such as for service as fan motors, or by external fans.

1LP and *1MF* motors are non-ventilated (without fans).

The feet on **foot-mounted motors** are bolted onto the frame (see Fig. 2).

For this reason, **rearranging the feet** (such as for changing the position of the terminal box - see Fig. 5) is only possible with frame sizes 100L to 160L. In this case, threads will have to be cut in the existing drilled holes in the frame to receive the feet. However, the support faces of the feet may have to be remachined or provided with shims to ensure that the motor is level.

Where **brake motors** are concerned, please also observe the brake operating instructions.

2 Operation

Before starting any work on the machine, be sure to isolate it from the power supply.

2.1 Transport, storage

The motors should always be lifted at **all lifting eyes** during transport.

For lifting machine sets (such as built-on gearboxes, fan units), always use the lifting eyes or lifting pegs provided! Machine sets may not be lifted by suspending the individual machines! Check the lifting capacity of the hoist!

If, after delivery, the motors are stored for more than 4 years under favourable conditions (kept in a dry place free from dust and vibration) prior to commissioning, the **rolling-contact bearings** should be regreased. Under unfavourable conditions, this period is considerably shorter.

If necessary, any **unprotected, machined surfaces** (flanging surface, shaft end, etc.) should be treated with an **anti-corrosion agent.**

If necessary, the **insulation resistance** of the winding should be checked, see Section 2.5.

2.2 Installation

After installation, **screwed-in lifting eyes** should either be removed or tightened down.

In the case of **motors installed vertically**, additional measures must be taken to ensure that no water can penetrate along the shaft.

Quiet running: Exact alignment of the coupling and a well-balanced transmission element (coupling, pulleys, fans, etc.) are essential for quiet vibration-free running. If necessary, the whole motor and transmission element should be balanced.

BG90S/L: The rear feet of motors of type of construction IM B3 have double holes in order to ensure that these machines adhere to the standard foot dimensions. On the other hand, all feet of motors of type of construction IM B3 with side-mounted terminal box (special designs) have double holes. This enables the standard hole clearances to be maintained even when the terminal box is arranged on the left-hand side (see Fig. 10).

BG71...90L: In the case of 1LA, 1LP and 1LP motors, **the top part of the terminal box** can be turned through 4x90 degrees.

BG100...160L: The terminal box moulded onto the motor frame cannot be turned. If the **top part of the terminal box is retrofitted** (Fig. 2 - 5.90), the box can be turned through **4 x 90 degrees**.
In the case of **motors with a bolted-on terminal box**, the top part of the box can be turned through **4 x 90 degrees**.

2.3 Balancing, transmission elements

A suitable device should always be used for fitting and removing the transmission elements (couplings, pulleys, pinions, etc.) (Fig. 7).

As standard, the rotors are dynamically balanced with the half featherkey.

When fitting the transmission element, keep the type of balance in mind! (Option: F = balanced with **full** featherkey)

The transmission elements must be balanced in accordance with ISO 1940!

If the transmission elements are balanced with a half featherkey, the visible, protruding part of the featherkey T_P must be cut back (see Fig. 9).

⚠ **The usual measures should be taken to guard transmission elements from touch. If a motor is started up without the transmission element attached, the featherkey should be secured to prevent it being thrown out.**

2.4 Electrical connection

NOTE: If the **openings for cables and leads in the terminal box** are sealed with a "skin" of cast iron, it must be shaken out using a suitable tool (see Fig. 4)!

Care must be taken not to damage the terminal box, the terminal board, the cable connections, etc. inside the terminal box!

See Fig. 4 for details of the screwed connections for cables and leads.
An adapter must be screwed in for PTC thermistor connections!

The **terminal box** must be sealed so that it is **dust and water-tight**.

The system voltage and the frequency must agree with the data given on the rating plate. Voltage or frequency deviations of ±5% and ±2% respectively from the rated voltage and frequency values are permitted without needing to derate the output. The connection and arrangement of the terminal links must agree with the diagram provided in the terminal box.
Connect the earthing conductor to the terminal with the ⏚ marking.
Wherever terminal clips are used (for example, to DIN 46282), arrange the conductors so that the clips are virtually level on both sides. This method of connection means that the ends of single conductors must be bent in the shape of a U or be fitted with a cable lug (see Fig. 6.1). This also applies to the green-yellow protective earthing conductor and the outer earthing conductor (see Fig. 6.2).

Please refer to Fig. 5 for the tightening torques for the screwed electrical connections - terminal board connections (except for terminal strips).

The anti-condensation heater must not be switched on during operation.

2.5 Checking the insulation resistance

The insulation resistance of the windings must be measured prior to initial startup of the motor, or after long periods of storage or standstill (approx. 6 months).

While the measurement is being taken and immediately afterwards, some of the terminals carry dangerous voltages and must not be touched.

Insulation resistance
- The **minimum insulation resistance** of new, cleaned or repaired windings with respect to ground is 10 Mohms.
- The **critical insulation resistance** R_{crit} is calculated first by multiplying the rated voltage U_N, e.g. 0.69 kV AC, with the constant factor (0.5 Mohms/kV):
  R_{crit} = 0.69 kV * 0.5 Mohms/kV = 0.345 Mohms.

Measurement
The **minimum insulation resistance** of the windings to ground is measured with 500 V DC. The winding temperature should then be 25°C ± 15 °C.
The **critical insulation resistance** should be measured with 500 V DC with the winding at operating temperature.

Checking
If the **minimum insulation resistance** of a new, cleaned or repaired motor, which has been stored or at standstill for a prolonged period of time, is less than 10 Mohms, this may be due to humidity. The windings must then be dried.

After long periods of operation, the **minimum insulation resistance** may drop to the **critical insulation resistance**. As long as the measured value does not fall below the calculated value of the **critical insulation resistance**, the motor may continue in operation. If it does, the motor must be stopped immediately.

The cause must be determined, and the windings or winding sections repaired, cleaned or dried as necessary.

2.6 Commissioning

NOTE: Electromagnetic compatibility

Emitted interference: Where the **torque is very uneven** (the drive of a piston-type compressor, for example), the inevitable result is a non-sinusoidal motor current, whose harmonics can lead to excessive system perturbation and thus excessive emitted interference.

In the case of **converter-fed motors**, interference is emitted to a greater or lesser degree, depending on the converter version concerned (type, interference suppression measures, manufacturer). The instructions of the converter manufacturer regarding electromagnetic compatibility must be heeded at all times. If the use of a shielded motor cable is recommended, the shield will have the greatest effect if it is conductively connected over a large area on the metal terminal box of the motor (with a screwed metal conduit thread). Noise voltages may occur on the sensor leads of motors with integrated sensors (e.g. PTC thermistors) as a result of the converter.

Noise immunity: If the **motor has an integrated sensor** (e.g. a PTC thermistor), the owner is responsible for ensuring adequate **noise immunity** by choosing a suitable sensor signal lead (possibly with shielding, connected like the motor supply lead) and evaluator.

The data and recommendations specified in all the instructions supplied (**"Information on safety and commissioning"**), and in **all other related instructions**, must always be observed **prior to commissioning!**

After motor installation, the brake, if fitted, should be checked for proper functioning.

3 Maintenance

Safety precautions

⚠ **Before starting any work on the motor or other equipment, particularly before opening covers over live parts, the motor must be properly isolated from the power supply. Besides the main circuits, any additional or auxiliary circuits that may be present must also be isolated.**
The usual "5 safety rules" (as set forth in DIN VDE 0105) are:
- Isolate the equipment
- Take effective measures to prevent reconnection
- Verify equipment is dead
- Earth and short-circuit
- Cover or fence off adjacent live parts

The precautions listed above should remain in force until all maintenance work is finished and the motor has been fully assembled.

NOTE: Where motors are fitted with closed condensed water openings, these should be opened from time to time to allow any accumulated condensed water to drain away.

Condensed water openings should always be at the lowest point of the motor!

Fitting new bearings, type of grease
Under normal operating conditions, with horizontally mounted motors and the following coolant temperatures and motor speeds, the bearings should be changed at the intervals [h] specified below:

Frame sizes		25°C	40°C
71...160L:	... 1800 rev/min	approx. 40,000 h	approx. 20,000 h
	... 3600 rev/min	approx. 20,000 h	approx. 10,000 h

NOTE: The permissible axial and transverse forces (see Catalog) must **not** be exceeded!
Irrespective of the number of operating hours, the rolling-contact bearing should be renewed every 3 years because of grease ageing.

In the case of motors **operating under special conditions**, such as a vertical motor position, heavy vibration, sudden load changes, frequent reversing operation, etc., the bearing should be changed at considerably more frequent intervals than the operating hours stated above.

The motors feature deep-groove ball bearings which are provided with cover plates (2ZC3 version). The cover plate material should withstand temperatures from -30 °C to +150 °C, e.g. polyacryl-rubber (ACM).

Type of grease for standard machines: UNIREX N3 (Esso); synthetic greases must conform to DIN 51825-K3N.

Special greases should be indicated on the rating plate or on a separate plate.

Dismantle the motor to the extent necessary. Pull off the rolling-contact bearing with a suitable device (see Fig. 7). Clean the journal!

Heat the rolling-contact bearing evenly to about 80-100 °C and press on. Heavy blows (such as with a hammer, etc.) should be avoided.

Any **worn sealing elements** (such as the shaft sealing ring, etc.) should also be renewed.

If **springless radial shaft sealing rings** are used, the replacement sealing rings must also be of the springless type.

Regreasing device

In the case of **motors with a regreasing device**, take note of the information given on the rating plate or the lubrication instruction plate! The bearings should be relubricated while the motor is running!

4 1MA and 1MF motors with increased EExe protection

The information in italics is intended to serve as supplementary or special information on these types of motors.
The increased hazards in areas which are exposed to the danger of explosion or firedamp necessitate that the general notes on safety and commissioning are carefully complied with.
Electrical machines which are protected against explosion are in line with the standards EN 60034 (VDE 0530) and EN 50014 to 50020. It is permitted to use these machines in areas exposed to the danger of explosion only in accordance with the stipulations of the responsible authority which also determines whether a danger of explosion exists (division into zones).
If the relevant certification is supplemented by an X, any special stipulations in the certificate of conformity are to be complied with.
The cable entries must be approved for the explosion-endangered area and be secured to prevent accidental loosening. Unused openings are to be closed with approved plugs.
In the case of 1MA-motors, a cover to prevent foreign bodies from falling into the motor-fan cowl (see DIN EN 50014) is to be located on the end of the shaft at the top, e.g. types of construction IMV3, IMV6 and IMV19 (see Fig. 1). This cover must not hinder cooling of the motor by its fan.
Unless other information regarding type of operation and tolerances is given on the test certificate or on the rating plate, electrical machines are designed for continuous operation and normal, rarely recurring starting procedures during which no excessive temperature increases occur. The motors must only be used for the type of operation indicated on the rating plate.
Section A in EN 60034-1 (VDE 0530, Part 1) - voltage ± 5 %, frequency ± 2 %, waveform, power-system symmetry - must be complied with in order to ensure that any increase in temperature remains within the permitted limits. Greater deviations from the rated values can lead to non-permissible increases in the temperature of the machine and must be indicated on the rating plate.
The temperature class of the motor given on the rating plate must agree with the temperature class of the inflammable gas which may occur.
Each machine is to be protected in all phases against non-permissible temperature increases by means of a current-dependent, time-delayed circuit-breaker with phase-failure protection to VDE 0660 or an equivalent device. The protective device is to be set to the rated current. In the case of delta-connected windings, the trips are to be connected in series with the winding phases and set to 0.58 times the rated current. If such a circuit is not possible, additional protective measures are necessary (e.g. thermal machine protection).
If the rotor is blocked, the protection device must switch off the machine within the time t_E indicated for the respective temperature class.
***Electrical machines for heavy starting** (power-up time > 1.7 x t_E) are to be protected according to the stipulations of the certificate of conformity by means of a starting-cycle monitoring circuit.*
Thermal machine protection by means of direct temperature monitoring of the winding is permissible if this is certified and indicated on the rating plate.
***In the case of pole-changing motors**, separate and reciprocally locked protective devices are necessary for each speed step. Devices with the test report of an approved testing agency are recommended.*
In Germany, please refer to DIN 57165/VDE 0165 and ElexV when erecting electrical installations in areas exposed to the danger of explosion. In countries other than Germany, the relevant national regulations are to be complied with in each case!
***Operation on a converter must be certified.** The separate instructions of the manufacturer must be complied with. For EExe type of protection, the motor, converter and protective devices must be marked to show they belong together and the permissible operating data must be specified in the shared test certificate (VDE 0165).*

DEUTSCH

Ersatzteile, vom Werk lieferbar (s. Bestellbeispiel)

1.00 Lagerung AS
.40 Lagerschild
.43 Wellendichtring
.47 Dichtung
.58 Federscheibe
.60 Wälzlager
.61 Federband für Lagerschildnabe (nicht immer vorhanden)

3.00 Läufer, komplett
.88 Paßfeder für Lüfter

4.00 Ständer, komplett
.07 Gehäusefuß, rechts
.08 Gehäusefuß, links
.18 Leistungsschild
.19 Schraube
.20 Abdeckung
.30 Kontaktwinkel
.31 Erdungswinkel

5.00 Klemmenkasten, komplett
.03 Dichtung
.10 Klemmenbrett, komplett
.11 Klemmleiste (z. B. für Kaltleiteranschluß)
.44 Klemmenkasten-Oberteil
.53 Verschlußstopfen
.70 Klemmbügel
.71 Klemmbügel
.83 Dichtung
.84 Klemmenkasten-Deckel
.85 Dichtung
.89 Schraube
.90 Klemmenkastenoberteil 4x90 Grad drehbar, komplett (für nachträglich Anbau)
.92 Klemmenkasten-Deckel
.93 Dichtung
.95 Klemmenkasten-Oberteil
.98 Dichtung

6.00 Lagerung BS
.10 Wälzlager
.11 Federband für Lagerschildnabe (nicht immer vorhanden)
.20 Lagerschild
.23 Wellendichtring

7.00 Belüftung, komplett
.04 Lüfter
.40 Lüfterhaube

Auf- und Abziehvorrichtungen für Wälzlager, Lüfter und Abtriebselemente sind nicht lieferbar!

ENGLISH

Spare parts, available from the works (see order example)

1.00 Bearing, drive end
.40 Endshield
.43 Shaft sealing ring
.47 Seal
.58 Resilient preloading ring
.60 Rolling-contact bearing
.61 Spring band for endshield hub (not always provided)

3.00 Rotor, complete
.88 Featherkey for fan

4.00 Stator, complete
.07 Frame foot, right
.08 Frame foot, left
.18 Rating plate
.19 Bolt
.20 Cover
.30 Contakt angele
.31 Earthing angele

5.00 Terminal box, complete
.03 Seal
.10 Terminal board, complete
.11 Terminal strip(e.g. for PTC thermistor connection)
.44 Top part of terminal box
.53 Plug
.70 Terminal clip
.71 Terminal clip
.83 Seal
.84 Terminal box cover
.85 Seal
.89 Screw
.90 Top part of terminal box, can be turned through 4 x 90 degrees, complete (for retrofitting)
.92 Terminal box cover
.93 Seal
.95 Top part of terminal box
.98 Seal

6.00 Bearing, non-drive end
.10 Rolling-contact bearing
.11 Spring band for endshield hub (not always provided)
.20 Endshield
.23 Shaft sealing ring

7.00 Ventilation, complete
.04 Fan
.40 Fan cowl

The devices for pressing on and pulling off the rolling-contact bearings, the fan and the transmission elements cannot be ordered!

FRANÇAIS

Pièces de rechange, livrables par l'usine (voir exemple de commande)

1.00 Palier côté entraînement
.40 Flasque-palier
.43 Bague d'étanchéité
.47 Joint
.58 Rondelle élastique
.60 Roulement
.61 Lame élastique pour moyeu du flasque (pas toujours présente)

3.00 Rotor, complet
.88 Clavette pour ventilateur

4.00 Stator, complet
.07 Patte de la carcasse, droite
.08 Patte de la carcasse, gauche
.18 Plaque signalétique
.19 Vis
.20 Recouvrement
.30 Equerre de contact
.31 Equerre de mise à la terre

5.00 Boîte à bornes, complète
.03 Joint
.10 Plaque à bornes, complète
.11 Bornier (par ex. pour sonde CTP)
.44 Partie supérieure de la boîte à bornes
.53 Bouchon
.70 Etrier de serrage
.71 Etrier de serrage
.83 Joint (torique sur (HA 180...200)
.84 Couvercle de la boîte à bornes
.85 Joint
.89 Vis
.90 Parie supérieure de la boîte à bornes, orientable de 4 x 90 °, complète (pour montage ultérieur)
.92 Couvercle de la boîte à bornes
.93 Joint
.95 Partie supérieure de la boîte à bornes
.98 Joint

6.00 Palier côté opposé à l'entraînement
.10 Roulement
.11 Lame élastique pour moyeu du flasque (pas toujours présente)
.20 Flasque-palier
.23 Bague d'étanchéité

7.00 Ventilation, complète
.04 Ventilateur
.40 Capot du ventilateur

Les dispositifs d'emmanchement et d'extraction pour roulements, ventilateurs et organes de transmission ne sont pas livrables.

Normteile sind nach Abmessung, Werkstoff und Oberfläche im freien Handel zu beziehen.
Standard commercially available parts are to be purchased in accordance with the specified dimensions, material and surface finish.
Les **pièces normalisées** peuvent être obtenues dans le commerce d'après leurs dimensions, le matériau et l'état de surface.
Las **piezas estándar** se comprarán en comercios del ramo según las dimensiones, material y superficie especificados.
Le **parti standard** sono reperibili sul mercato secondo le dimensioni, il materiale e la finitura della superficie.
Normerade detaljer kan erhållas i öppna handeln, och skall specificeras beträffande storlek, material och ytbehandling.

4.05 (s. Fig. 3) DIN 125
4.10, 4.38, 5.78 DIN 128
7.12 DIN 471
6.02 DIN 472
4.04 (s. Fig. 3) DIN 580

1.49, 4.11, 4.39, 5.19, 5.49, 5.79, 5.91, 5.94, 6.29, 7.49 DIN 912, DIN 931, DIN 933, DIN 7985
3.38 DIN 6885

5.52, 5.54, 5.96, 5.97 DIN 46 320
1.60, 6.10 DIN 625 Lagertyp: / Type of bearing: / Type de roulement: / Tipo de cojinete: / Tipo di cuscinetto: / Lagertyp:

Fig. 2

ESPAÑOL

Piezas de recambio, suministro desde fábrica (v. ejemplo de pedido)

1.00 Rodamiento D
.40 Escudo portacojinetes
.43 Anillo obturador
.47 Sello
.58 Arandela flexible
.60 Rodamiento
.61 Cinta elástica para el cubo del escudo portacojinetes (no se emplea siempre)

3.00 Rotor, completo
.88 Chaveta para ventilador

4.00 Estator, completo
.07 Pata derecha de la carcasa
.08 Pata izquierda de la carcasa
.18 Placa de características
.19 Tornillo
.20 Tapa
.30 Angular de contacto
.31 Angular exterior de puesta a tierra

5.00 Caja de bornes, completa
.03 Sello
.10 Placa de bornes, completa
.11 Regletero (p. ej. para conexión con termistor PTC)
.44 Parte superior de la caja de bornes
.53 Tapón
.70 Pisacables
.71 Pisacables
.83 Sello
.84 Tapa de la caja de bornes
.85 Sello
.89 Tornillo
.90 **Parte superior de la caja de bornes, girable en 4 x 90 grados, completa** (para montaje posterior)
.92 Tapa de la caja de bornes
.93 Sello
.95 Parte superior de la caja de bornes
.98 Sello

6.00 Rodamiento N
.10 Rodamiento
.11 Cinta elástica para el cubo del escudo portacojinetes (no se emplea siempre)
.20 Escudo portacojinetes
.23 Anillo obturador

7.00 Sistema de ventilación, completo
.04 Ventilador
.40 Capota del ventilador

¡No se pueden suministrar los dispositivos para calar y extraer los rodamientos, ventiladores y órganos de accionamiento!

ITALIANO

Parti di ricambio disponibili da magazzino (vedere esempi di ordinazione)

1.00 Cuscinetti lato albero
.40 Coperchio del cuscinetto
.43 Anello di tenuta dell'albero
.47 Anello di tenuta
.58 Anello elastico
.60 Cuscinetto a rotolamento
.61 Nastro elastico per il mozzo dello scudo di supporto (non sempre inserito)

3.00 Rotore completo
.88 Chiavetta per ventilatore

4.00 Statore completo
.07 Piede di sostegno destro
.08 Piede di sostegno sinistro
.18 Targhetta dei dati
.19 Vite
.20 Coperchio
.30 Angolare di contatto
.31 Angolare di messa a terra

5.00 Cassetta terminale completa
.03 Guarnizione
.10 Morsettiera completa
.11 Morsettiera ad es. per il collegamento di termistori PTC
.44 Parte superiore della cassetta terminale
.53 Tappon
.70 Staffa
.71 Staffa
.83 Anello di tenuta
.84 Coperchio della cassetta terminale
.85 Guarnizione
.89 Vite
.90 **Parte superiore della cassetta orientabile 4 volte di 90°, completa (per montaggio successivo)**
.92 Coperchio della cassetta terminale
.93 Guarnizione
.95 Parte superiore della cassetta terminale
.98 Guarnizione

6.00 Cuscinetti lato opposto albero
.10 Cuscinetti a rotolamento
.11 Nastro elastico per il mozzo dello scudo di supporto (non sempre inserito)
.20 Coperchio dei cuscinetti
.23 Anello di tenuta dell'albero

7.00 Ventilatore completo
.04 Ventilatore
.40 Cappa del ventilatore

I dispositivi per il calettamento e l'estrazione di cuscinetti, ventilatori e elementi di trasmissione non possono essere ordinati!

SVENSKA

Reservdelar, kan levereras från fabriken (se beställningsexempel)

1.00 Lager AS
.40 Lagersköld
.43 Axeltätring
.47 Packning
.58 Fjäderbricka
.60 Rullager
.61 Fjäderband för lagersköldsnav (finns ej alltid)

3.00 Rotor, komplett
.88 kil för fläkt

4.00 Stator, komplett
.07 Fot för hus, höger
.08 Fot för hus, vänster
.18 Märkskylt
.19 Skruv
.20 Lock
.30 Kontaktvinkel
.31 Jordingsvinkel

5.00 Uttagslåda, komplett
.03 Packning
.10 Kopplingsplint, komplett
.11 Kontaktplint (t.ex. för anslutning av PTC-termistor)
.44 Överdel till uttagslåda
.53 Avslutningspropp
.70 Klämbygel
.71 Klämbygel
.83 Packning
.84 Lock till uttagslåda
.85 Packning
.89 Skruv
.90 **Överdel till uttagslåda 4 x 90 grader vridbar, komplett (för montering i efterhand)**
.92 Lock till uttagslåda
.93 Packning
.95 Överdel till uttagslåda
.98 Packning

6.00 Lager BS
.10 Rullager
.11 Fjäderband för lagersköldsnav (finns ej alltid)
.20 Lagersköld
.23 Axeltätring

7.00 Ventilation, komplett
.04 Fläkt
.40 Fläktkåpa

På- och avdragningsanordningar för rullager, fläkt och drivdonselement kan inte levereras!

Bestellbeispiel
Order example
Exemple de commande
Ejemplo de pedido
Esempio di ordinazione
Beställningsexempel

1.40 Lagerschild
1LA7 163-4AA60
Nr. E4A6 4567 890077

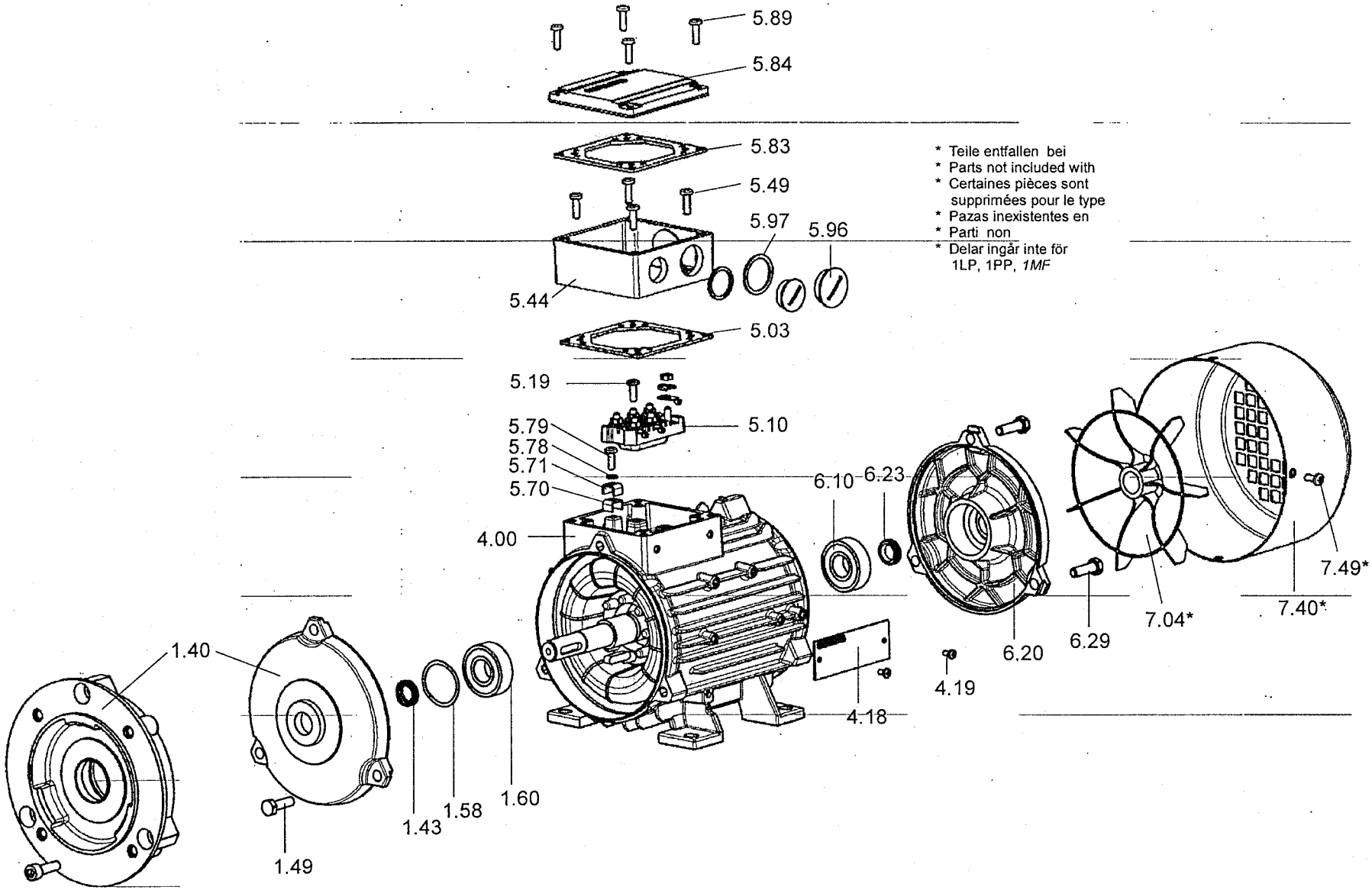


Fig. 2 BG 71...90L

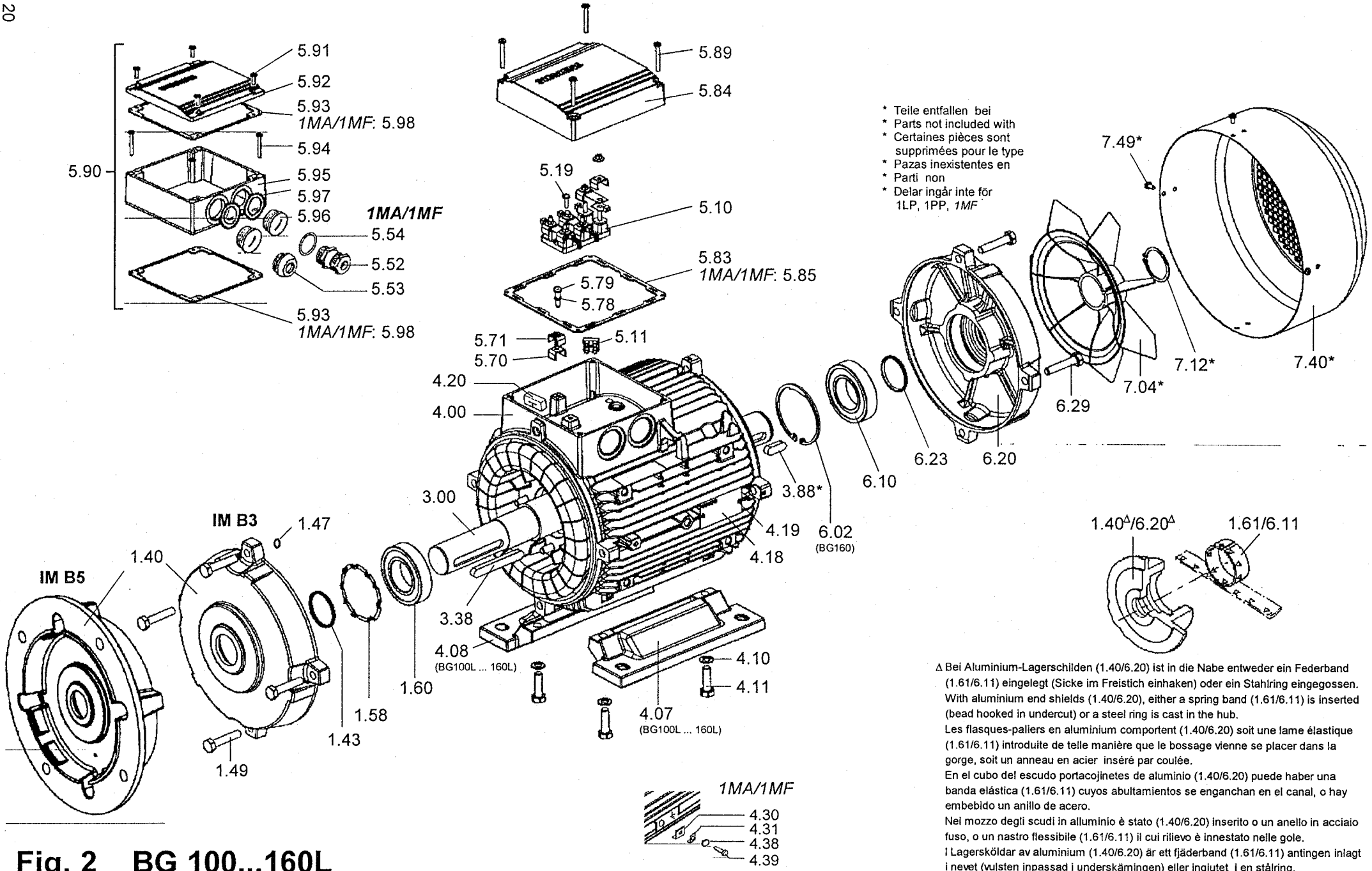
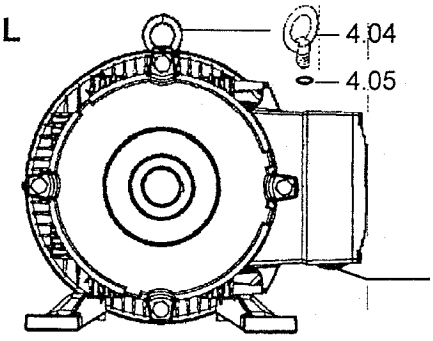


Fig. 2 BG 100...160L

Δ Bei Aluminium-Lagerschilden (1.40/6.20) ist in die Nabe entweder ein Federband (1.61/6.11) eingelegt (Sicke im Freistich einhaken) oder ein Stahlring eingegossen.
With aluminium end shields (1.40/6.20), either a spring band (1.61/6.11) is inserted (bead hooked in undercut) or a steel ring is cast in the hub.
Les flasques-paliers en aluminium comportent (1.40/6.20) soit une lame élastique (1.61/6.11) introduite de telle manière que le bossage vienne se placer dans la gorge, soit un anneau en acier inséré par coulée.
En el cubo del escudo portacojinetes de aluminio (1.40/6.20) puede haber una banda elástica (1.61/6.11) cuyos abultamientos se enganchan en el canal, o hay embebido un anillo de acero.
Nel mozzo degli scudi in alluminio è stato (1.40/6.20) inserito o un anello in acciaio fuso, o un nastro flessibile (1.61/6.11) il cui rilievo è innestato nelle gole.
I Lagersköldar av aluminium (1.40/6.20) är ett fjäderband (1.61/6.11) antingen inlagt i nevet (vulsten inpassad i underskämingen) eller ingjutet i en stålring.

BG 100...160L

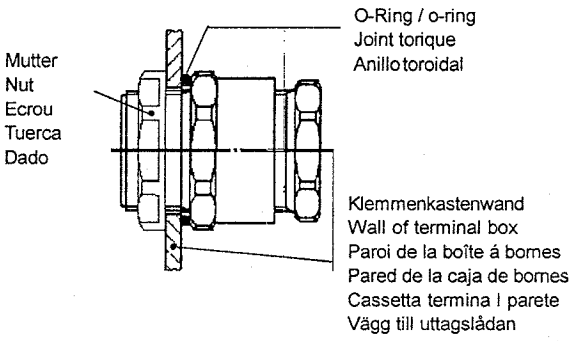


z. B. Öffnung für Kabel und Leitungen - unten
e.g. opening for cables and leads - bottom
p. e. traversées pour câbles et conducteurs - en bas
p. ej abertura pasacables - abajo
ad es. passaggio per conduttori e cavi - parte inferiore
t.ex. öppning för kabel och ledningar - nedtill

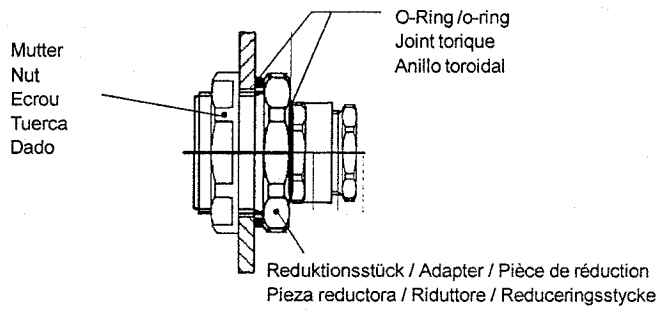
Fig. 3 **Ausführung mit seitlich angeordnetem Klemmenkastenoberteil (4x90° drehbar)**
Motor with top part of terminal box mounted on side (can be turned through 4x90°)
Exécution avec partie supérieure de la boîte á bornes disposé sur le côté
Motor con la parte superior de la caja de bornes adosada lateralmente (puede girarse 4x90°)
Esecuzione con parte superiore della cassetta terminale disposta lateralmente (orientabile 4x90°)
Utförande med överdel till uttagslådan (4x90° vridbar) monterad på sidan

---

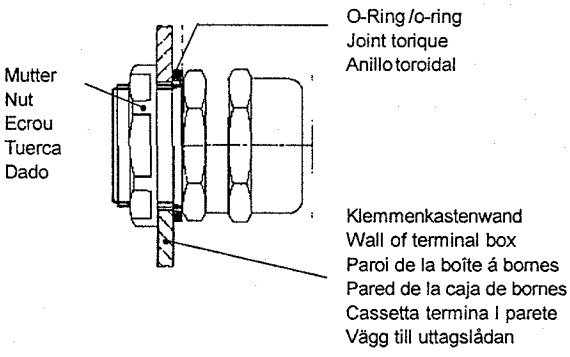
Verschraubungen mit Mutter (z. B. DIN 46 320)
Screwed connections with nut (e.g. DIN 46 320)
Presse-étoupe avec écrou (p.e. DIN 46320)
Uniones atornilladas con tuerca (p. ej DIN 46329)
Collegamenti a vite con dado (es DIN 46 320)
Skruvförband med mutter (t.ex. DIN 46 320)



Kaltleiterverschraubungen mit Reduktionsstück und Mutter (z. B. DIN 46 320)
Screwed PTC thermistor connections with adapter and nuts (e.g. DIN 46 320)
Presse-étoupe pour sonde CTP avec pièce de réduction (p. e. DIN 46320)
Conexión de termistor PTC con reductor y tuercas (p.ej. DIN46320)
Collegamenti a vite per termistori PTC con riduttore e dado (ad es. DIN 46 320)
Skruvförband för PTC-termistor med reduceringsstycke och mutter (t.ex. DIN 46 320)



1MA/1MF: EEx e - bescheinigte Verschraubung mit Mutter
1MA/1MF: EEx e - certify screwed connections with nut
1MA/1MF: EEx e - certifier presse-étoupe avec écrou
1MA/1MF: EEx e - certificar uniones atornilladas con tuerca
1MA/1MF: EEx e - certificare collegamenti a vite con dado
1MA/1MF: EEx e - intyga skruvförband med mutter



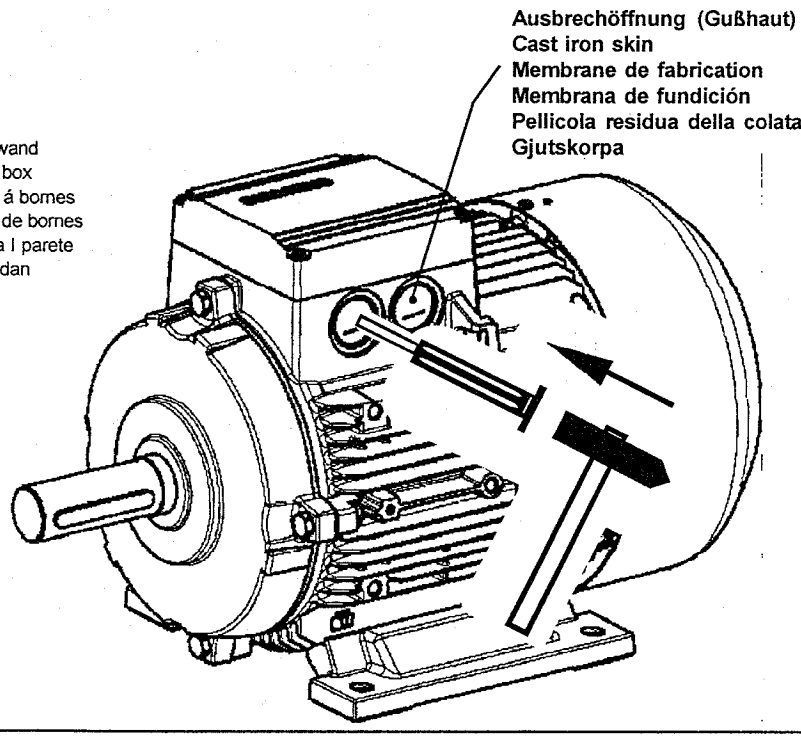


Fig. 4 BG 100...160L

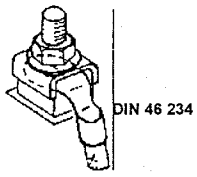
Ausschlagen der Öffnungen für Kabel und Leitungen im Klemmenkasten
Knocking out the openings for cables and leads in the terminal box
Rupture des membranes de fabrication aburant les entées de câbles et de conducteurs sur la boîte á bornes
Martillando las aberturas pasacables de la caja de bornes
Asportare la pellicola per cavi e conduttori nella cassetta terminale
Utslagning av öppningarna för kabel och ledningar i uttagslådan

Gewinde-⌀ / Thread-⌀ ⌀ du filetage / ⌀ de la rosca Diametro del filetto / Gängdimeter		M4	M5	M6	M8	M10	M12	M16
Anziehdrehmoment Tightening torque Couple de serrage Par de apriete Coppia di serraggio Åtdragningsmoment	min	0,8	1,8	2,7	5,5	9	14	27
N m	max	1,2	2,5	4	8	13	20	40

Die obigen Anziehdrehmomente gelten soweit keine anderen Werte angegeben sind!
The above values of tightening torque are applicable unless alternative values are given elsewhere.
Les couples de serrage indiqués ci-dessus sont valables pour autant qu'aucune valeur spécifique ne soit donnée.
Estos pares de apriete rigen mientras no se indiquen otros.
Le coppie di serraggio indicate qui di sopra sono valide se non sono indicati altri valori.
Ovanstående åtdragningsmoment gäller om ej andra värden angivits!

Fig. 5 **Anziehdrehmomente für Schraubenverbindungen der elektrischen Anschlüsse - Klemmenbrettanschlüsse** (außer Klemmenleisten)
Tightening torques for screwed electrical connections - terminal board connections (except for terminal strips)
Couples de serrages des bornes de la plaque à bornes (ne concerne pas les borniers)
Pares de apriete para uniones atornilladas de las conexiones eléctricas en la placa de bornes (exceptuando las regletas de bornes).
Coppie di serraggio per le viti di attacco di collegamenti elettrici / dei portamorsetti (escluse morsettiere)
Åtdragningsmoment för de elektriska anslutningarnas skruvförband (utom på kontaktplintar)

... 25 mm²



Bei Anschluß mit DIN- Kabelschuh ist dieser nach unten abzuwinkeln!

If connections are made with DIN cable lugs, bend the cable lugs downwards.

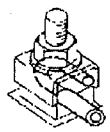
Lorsque le raccordement est réalisé par cosses DIN, celles-ci doivent être pliées vers le bas.

Si la conexión se efectúa con terminales para cables DIN, habrá que doblarlos hacia abajo.

Nel collegamento con capocorda conforme alle norme DIN, questo va piegato verso il basso.

Vid anslutning med kabelsko enl. DIN skall denna bockas nedåt.

... 10 mm²



Anschluß eines einzelnen Leiters mit Klemmbügel.

Connecting a single conductor with a terminal clip.

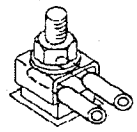
Raccordement d'un seul conducteur à une borne à étrier.

Conexión de un solo conductor con un pisacables.

Allacciamento di ogni singolo conduttore con staffa.

Anslutning av en enkelledare med klämbygel.

... 25 mm²



Anschluß von zwei etwa gleich dicken Leitern mit Klemmbügel.

Connecting two conductors of almost equal thickness with a terminal clip.

Deux conducteurs de diamètre à peu pré équivalents, raccordés à une borne à étrier.

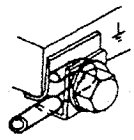
Conexión de dos conductores de diámetro aproximadamente igual, con un pisacables.

Allacciamento di due conduttori di stesso o pressocchè indentico spessore con staffa.

Anslutning av två ungefär lika tjocka ledare med klämbygel.

Fig. 6.1

... 10 mm²



Anschluß eines einzelnen Leiters unter äußerem Erdungswinkel.

Connecting a single conductor under the outer earthing angle.

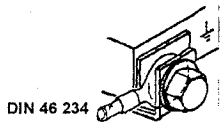
Raccordement d'un seul conducteur à une équerre extérieure de mise à la terre.

Conexión de un solo conductor bajo el angular exterior de puesta a tierra.

Allacciamento di ogni singolo conduttore sotto angolare di messa a terra esterno.

Anslutning av en enkelledare under extern jordningsvinkel.

... 25 mm²



Bei Anschluß mit DIN- Kabelschuh unter äußerem Erdungswinkel.

If connections are made with DIN cable lugs, under the outer earthing angle.

Lorsque le raccordement est réalisé par cosses DIN, à une équerre extérieure de mise à la terre.

Si la conexión se efectúa con terminales para cables DIN, bajo el angular exterior de puesta a tierra.

Nel collegamento con capocorda conforme alle norme DIN, sotto angolare di messa a terra esterno.

Vid anslutning med kabelsko enl. DIN under extern jordningsvinkel.

Fig. 6.2

Fig. 6 **Anschließbare Querschnitt je nach Klemmengröße** (ggf. reduziert durch Größe der Leitungseinführungen)
Conductor cross-sections connectable to the various terminals (may be reduced by size of cable entries)
Sections raccordables suivant la taille de la borne (réduction éventuelle par la taille des entrées de câbles)
Sección conectable según tamaño del borne (en caso dado, más pequeña debido al tamaño de las entradas de línea)
Diametri dei collegamenti a sec. delle misure dei morsetti (eventualmente sono ridotte le dimensioni delle aperture per i conduttori) **Anslutningsbara ledarareor för olika klämstorlekar** (ev. reducerat med hänsyn till genomföringens storlek)

Zwischenscheibe (Schutz der Zentrierung im Wellenende)
Spacer washer (to protect centring bore in shaft end)
Rondelle (protection du centrage en bout d'arbre)
Disco intermedio (protege el centrado en el extremo del eje)
Spessore (protezione della centratura null'estremità d'albero)
Distansbricka (skydd av centreringen I axeltappen)

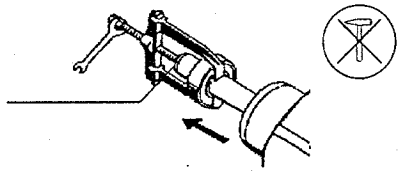
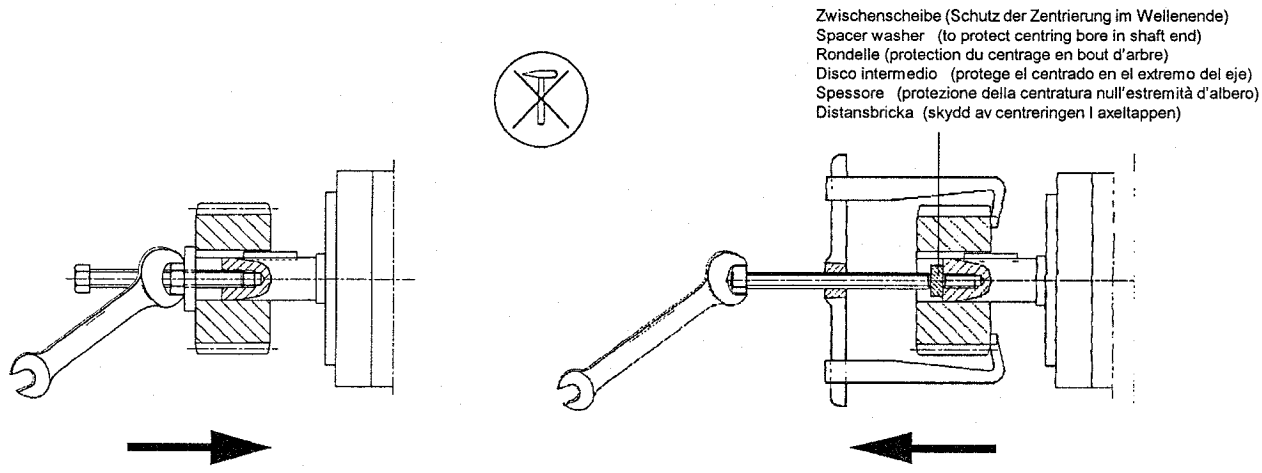


Fig. 7 **Lagerwechsel / Changing bearings / Remplacement des roulements**
Cambio de cojinetes / Sostituzione dei cuscinetti / Lagerbyte



Zum Aufziehen von Abtriebselementen (Kupplung, Zahnrad, Riemenscheibe usw.), Gewinde im Wellenende benutzen und - sofern möglich - Abtriebselemente nach Bedarf erwärmen. Zum Abziehen geeignete Vorrichtung verwenden. Es dürfen beim Auf- und Abziehen keine Schläge (z.B. mit Hammer oder ähnlichem) oder größere als die laut Katalog zulässigen radialen oder axialen Kräfte über das Wellenende auf die Motorlager übertragen werden.

Use the tapped hole provided in the end of the shaft for fitting drive components such as couplings, gearwheels, belt pulleys, etc. and, if possible, heat the components as necessary. Use a suitable puller tool for removing the components. Do not strike the components, e.g. with a hammer or similar tool, when fitting or removing them and do not exert more than the maximum value of radial or axial force - according to the catalog - transmitted to the motor bearings through the shaft extension.

Pour monter les organes de transmission (accouplements, roues dentées, poulies à courroie, etc.), utiliser le taraudage du bout d'arbre. Au besoin et lorsque cela est possible, chauffer les organes de transmission. Pour le démontage, utiliser un dispositif approprié. Aucun coup (par ex. marteau) supérieur aux efforts axiaux et radiaux admissibles mentionnés au catalogue ne doit être transmis par l'arbre aux roulements en cours de montage ou de démontage.

Para calar los órganos de transmisión (acoplamientos, rueda dentada, polea, etc.) utilizar la rosca en el extremo del eje y - siempre que sea posible - calentar convenientemente dichos órganos. Utilizar el dispositivo adecuado para la extracción. Durante las operaciones de calado o extracción no golpear (p. ej. con martillo o similar) ni ejercer sobre los cojinetes del motor a través del extremo del eje fuerzas axiales o radiales superiores a las admisibles según catálogo.

Per calettare gli elementi di transmissione (giunti, ruote dentate, pulegge, ecc.), utilizzare il foro filettato nell'estremità d'albero e, se possibile, riscaldare gli elementi di transmissione . Per l'estrazione vanno adoperati attrezzi adatti. Sono da evitare colpi o martellate, e forze radiali o assiali trasmesse dall'estremità d'albero ai cuscinetti maggiori di quelle consentite sec. il catalogo.

Använd axeltappens gänga vid pådragning av drivdon (koppling, kugghjul, remskiva etc) och värm om möjligt upp drivdonen om så behövs. Använd lämpliga verktyg för avdragningen. Några slag (t.ex. med hammare e.dyl.) får aldrig förekomma vid på- och avdragning, och radiella och axiella krafter som är större än de som anges i katalogen får inte överföras till motorlagren via axeltappen.

Fig. 8 **Auf- und Abziehen von Abtriebselementen / Pressing on and pulling off drive elements**
Emmanchement et extraction d'organes de transmission / Calado y extracción de órganos de transmisión
Calettamento ed estrazione degli elementi di transmissione / På- och avdragning av drivdon

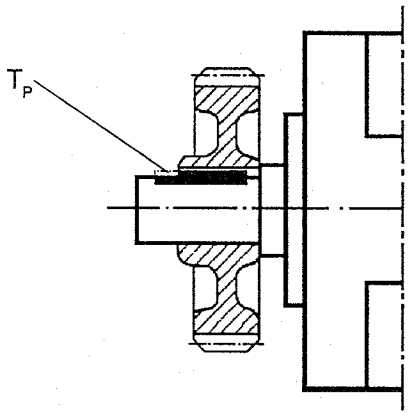
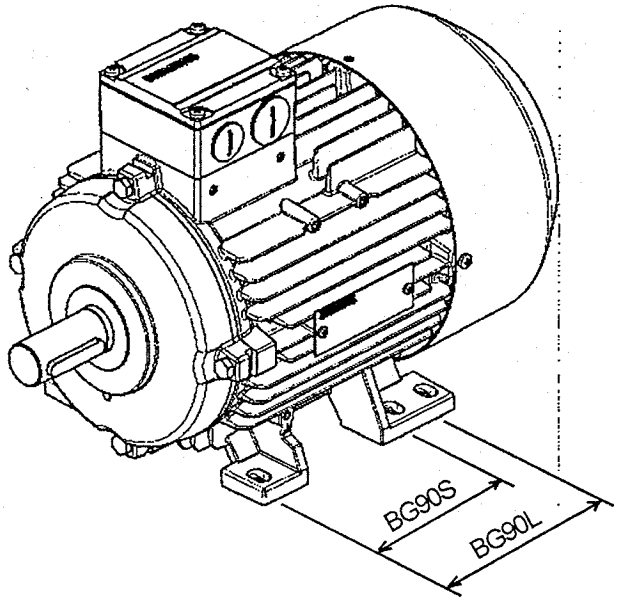
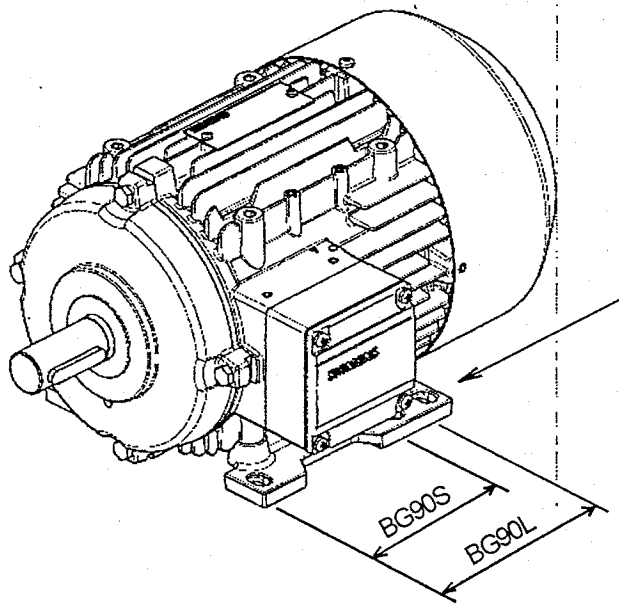


Fig. 9 **Auswuchtung mit halber Paßfeder / Balancing with half featherkey**
Equilibrage avec demi-clavette / Equilibrado con media chaveta
Equilibratura con mezza chiavetta / Balansering med halv kil





Fußloch ermöglicht 90S/L - Anbaumaße bei Klemmenkasten-anordnung links.

Hole in foot permits 90S/L mounting dimensions with terminal box arrenged on the left.

Le trou d'embase perment les cotes de fixation 90S/L quand la boîte à bornes est disposée à gauche.

El taladro en la pata posibilita el montaje según las medidas 90S/L cuando la caja de bornes se encuentra en el lado izquierdo.

Nei motori di gradezza 90S/L con cassetta morsetti disposta a sinistra, i fori nei piedini permettono il rispetto delle distanze normalizzate.

Genom hålet i foten erhålles 90S/L-mått när anslutningslådan är monterad på vanster sida.

Fig. 10 BG 90S,L

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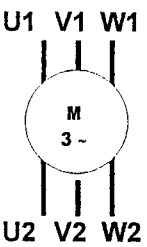
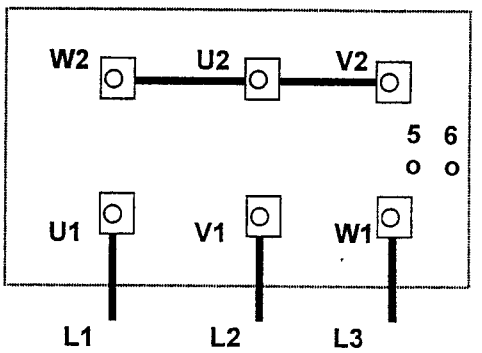
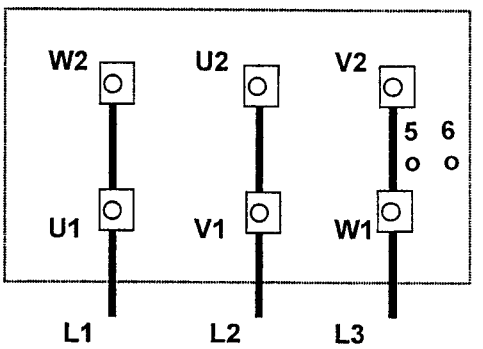
Motor-Klemmbrett
Terminal board

Y **Stern-Schaltung**
Star - connection





△ **Dreieck-Schaltung**
Delta - connection



5 - 6 **Kaltleiter – Temperaturfühler**
Nicht mehr als 2,5 V anlegen

5 - 6 **PTC thermistor sensors**
Do not apply more than 2.5 V

Klemmen-Anschlußplan
Connecting three-phase-motors

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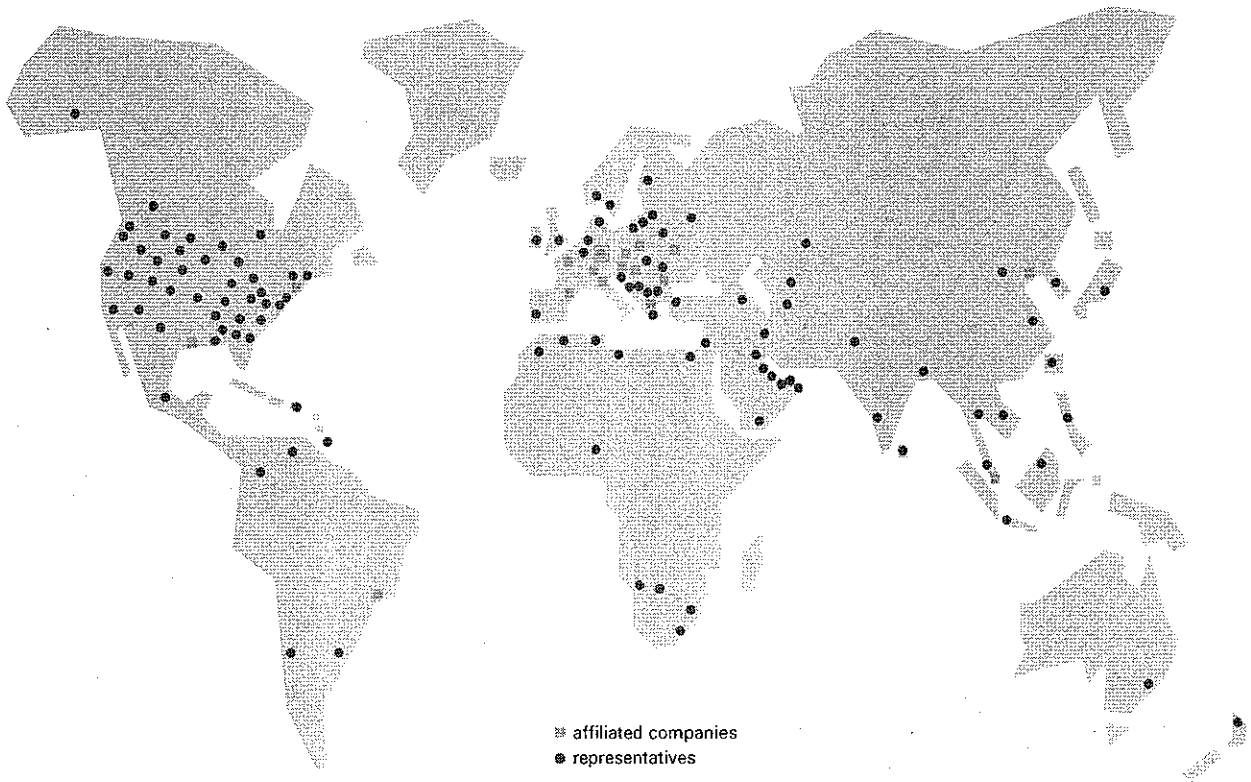

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