

Gear pump / Motor gear pump

FL, FLI, FLIS, U, UI, UIS

MZ, MZE, MZI, MZN, MZIR

Code 30xx; 31xx

Revision 08-2022

Original operating and assembly manual



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The **gear pumps / motor gear pumps** are subsequently called a **device**.

1. Technical data

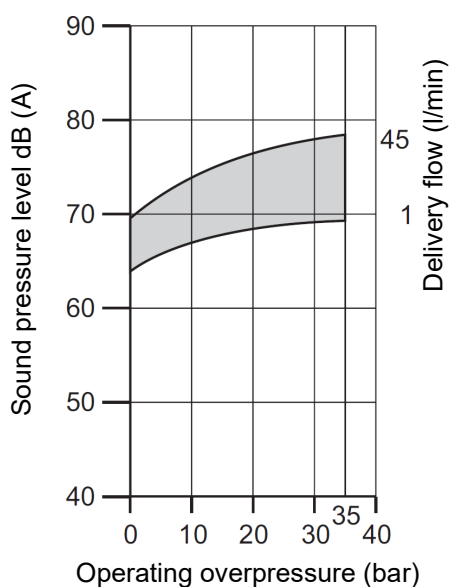
1.1 General

Purity class of the lubricant to be filled in: ISO 4406: ≤ 19/17/14
 Viscosity of the lubricant: see data sheet
 Weight: see data sheet
 Speed range: see data sheet
 Direction of rotation: see data sheet and directional arrow on the device
 Delivery flow: see data sheet
 Operating temperature: see data sheet
 Maximum suction head: 1 meter

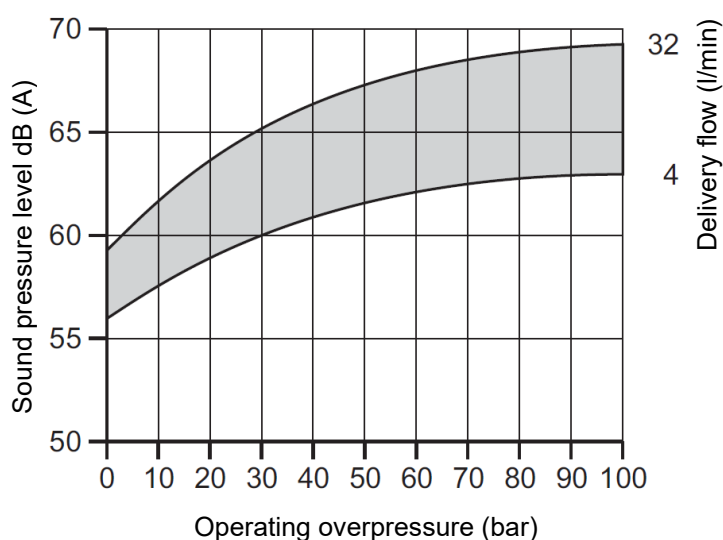
For further details and technical data, refer to the data sheet of the gear pump or motor gear pump.

1.2 Sound pressure level

Sound pressure level gear pump



Sound pressure level internal gear pump



The sound pressure level was measured at a 1 m distance in the test room at 1400 r.p.m. and an oil viscosity of 38 mm²/s.

1.3 Operating overpressure

Refer to the data sheets of the gear pump or the motor gear pump for the single values for the admissible operating overpressure.

2. Applicable documents

Technical documentation of individual parts enclosed:

Datasheet for the device

Caution!

Please pay attention to these documents for any work on and with the device!

3. General safety instructions

Everybody who is in charge of the assembly, start-up, maintenance and operation of the device must read these instructions carefully. Furthermore, this manual must always be available at the site of operation!

Basic instructions for setup, operation and maintenance can be found below.

3.1 Safety instructions

Observe the general safety instructions within this key chapter as well as the special safety instructions in other chapters of this operating and assembly manual.



Warning of electrical voltage.



Safety instructions, which might cause hazards to persons in case of non-observance, are marked with the general danger symbol.



This symbol warns of hot surfaces.



Warning of suspended loads.



Warning of material damage due to electrostatic discharge! Marks potential risks which may result in material damage, if not avoided.

Caution!

This heading is used if improper or general non-observance of the operating and assembly manual, instructions, specified workflow and the like might result in damage.

Notice!

This term is used to point out particular details.

Instructions and notes directly attached to the device have to be strictly observed and kept in readable condition!

3.2 Qualification and training of staff



The staff in charge of operation, maintenance, inspection and assembly have to be qualified accordingly. Competence, responsibilities and supervision of staff must be clearly defined by the operator. In case the staff does not have the necessary knowledge it has to be instructed and trained accordingly. The operator is obliged to ensure that the staff fully understands the contents of this user information.

3.3 Hazards in case of non-observance of the safety instructions



Results of **non-observance** of the **safety instructions** can be **hazards to persons**, for the environment and the device. Non-observance of the safety instructions may result in the loss of any liability claims. The non-observance could more specifically result in the following hazards (for example):

- Failure of important device functions.
- Failure of prescribed methods regarding maintenance and repair.
- Danger to persons by electrical, mechanical and chemical effects.
- Danger to the environment by leakage of hazardous substances.

3.4 Obligations of the operator / user



- If movable, rotating, hot or cold parts of the device bear risks, the customer must protect these parts against contact. This protection must not be removed.
- Any leakages of hazardous substances must be drained in a way that no risks for persons or the environment arise.
- Observe all legal provisions.
- Hazards due to electricity are to be excluded.
- Examination of pipes and hoses regarding safe provision, use, proper assembly and function has to be carried out according to regionally applicable directives. Inspection intervals may not be exceeded.
- Defective pipes or hoses must be replaced immediately and professionally.
- Hydraulic hoses and polyamide pipes are subject to natural aging and have to be exchanged in regular intervals according to the manufacturer's specifications.
- A safety data sheet of the currently used lubricant must be provided at the device.

3.5 Safety instructions for maintenance, inspection and assembly



All **maintenance, inspection and assembly work** may only be carried out by **qualified personnel** who is sufficiently informed by thorough reading of the user information.

Any work at the device may generally only be carried out at **complete standstill** and in **pressureless** as well as **disconnected condition**. Furthermore, appropriate **personal protective equipment** (goggles among others) is necessary. The shutdown procedure of the device as described in the manual must be strictly followed.

Secure the device against intentional or unintentional recommissioning during maintenance or repair. All safety and protection arrangements have to be put back in place again immediately after completion of the work.

Environmentally hazardous media must be disposed of professionally and according to the relevant legal provisions. **Polluted** and **contaminated surfaces** have to be cleaned before maintenance. Please wear protective equipment to that purpose. See the lubricant manufacturers' safety data sheets hereto, respectively the data sheets provided by the manufacturers of auxiliaries and working materials.



Check the surface temperature of the device as a possible heat transfer bears the **risk of burns**. Wear heat resistant protective gloves!

Open flame and fire are strictly forbidden during maintenance, inspection and repair due to fire hazard.

3.6 Unauthorized modification and production of spare parts



Modification, repair and alterations of the device are only accepted after manufacturer feedback. **Original spare parts** and authorized accessories from the manufacturer contribute to **safety**. The use of other parts can result in the loss of any liabilities for the resulting consequences. BEKA does not assume liability for parts that are retrofit by the operator.

3.7 Inadmissible modes of operation

Operational safety of the device is only guaranteed when it is appropriately applied as indicated in the operating and assembly manual. Never exceed or fall below the limit values, as stated in the technical data.

3.8 Electrostatic discharge



Avoid electrostatic discharge! There are electronic components could be integrated into the devices which might be destroyed by electrostatic discharge. Observe the safety precautions against electrostatic discharge according to DIN EN 61340-5-1/-3. Ensure that the environment (persons, workplace and packing) is well grounded when handling these devices.

3.9 General hazard warning – residual risk



All components are designed according to valid regulations for the construction of technical systems with regard to operational safety and accident prevention. Nevertheless, their use can lead to hazards for the user or third parties as well as other technical facilities. Therefore the device may only fulfill its intended purpose in a **technically perfect and faultless condition**. This has to happen in adherence to the relevant safety regulations as well as the operating and assembly manual. **Inspect** the device and its attachment parts **regularly** and **check** them for possible **damage** or **leakages**. **Liquids** could **escape under high pressure** from pressurized components which become **leaky**.

4. Intended use

Caution!

The device is approved as central lubrication unit only in order to deliver lubricants in **the industrial or commercial use**.

Only operate the device if it is installed in/at another machine and operated together with it.

Only lubricants which comply with the machine manufacturer's specifications may be conveyed.

The device must only be used according to the technical data (see chapter 1 „Technical data“). The values may never exceed or fall below the values mentioned in the technical data. Never operate the device without lubricant.

Unauthorized modifications of the device are **not permitted**. BEKA is not liable for personal injury or damage of machine resulting thereof.

The intended use also includes:

- paying attention to all chapters and notes in the operating and assembly manual.
- carrying out all maintenance work.
- **observing** all relevant instructions for **work safety, accident prevention** and **environmental protection** during all life cycles of the device.
- having the necessary professional training and authorization of your company to operate the device and to carry out the necessary work on the device.

Caution!

Another use or a use beyond this scope is deemed improper.

5. Scope of warranty

Warranties regarding operational safety, reliability and performance will only be granted by the manufacturer if the device is used according to the regulations and under the following conditions:

- Assembly, connection and maintenance are only carried out by authorized and qualified staff.
- The device is only used according to the operating manual.
- Never exceed or fall below the limit values as defined in the technical data.
- Modifications and repairs at the device may only be done by BEKA.

Guaranty and warranty will expire for any damage of the device caused by improper lubricant (e.g. increased wear, piston jamming, blockades, brittled sealings etc.).

Caution!

BEKA will generally not accept guaranty claims for any damage caused by lubricants, even though those have been laboratory tested and released by BEKA, as such damage (e.g. by over-stored or incorrectly stored lubricants, batch fluctuations, etc.) cannot be verified or reconstructed later.

6. Transport and storage

Use suitable lifting devices for transport.

Do not **throw** the device or expose it to **shocks**.

Secure the device against toppling down or slipping during transport.



Observe all valid safety and accident prevention regulations for the transport. Wear suitable **protective equipment** if necessary. **Keep adequate distance to suspended loads**. The transport help or the elevating device must have the **adequate carrying capacity**.

The storage sites have to be cool and dry for the storage of the device in order to prevent corrosion at single parts of the device. The device has to be filled with lubricating oil when it is stored for a longer period of time (> 6 months) and the suction as well as the pressure connection have to be locked.

7. Assembly instructions

The device has to be checked for possible transport damage, completeness and ease of movement prior to assembly. Any installed equipment for transportation safety has to be removed. The device can be installed acc. to the data sheet. Corresponding dedendum angles and pump supports can be supplied.



Comply with the following conditions for assembly of the device in order to obtain a properly built together machine of all parts without compromise of safety or persons' health:

Assemble the device in balance on the installation location in order to ensure safe operation. Observe the information on the fastening holes given in the dimensional drawing. When selecting the set-up location, please mind that the device should be protected against ambient and mechanic influences. Ensure full access to the device.

7.1 Measure for noise and vibration reduction

In order to achieve a noise and vibration reduction, the following measures can be taken:

- Use of hoses at pressure outlet.
- Use of pump supports with damping properties.
- Use of damping rings and damping rails.
- Sufficient dimensioning of suction and pressure lines.

7.2 Suction filter

Caution!

BEKA recommends the attachment of a suction filter with the mesh size 100 µm to the suction line (not included in scope of delivery). The device is protected from contaminations and its lifetime is extended by this.

7.3 Connection of lines

- All pipelines have to be thoroughly cleaned prior to installation.
- Assemble the pipes professionally and free from distortion!
- When using pipes, observe that they are clean, seamless and of precision steel!
- Do not exceed admissible flow speed of max. 1 m/s in the suction line and max. 5 m/s in the pressure line (for more details contact the pipe manufacturer).
- Pay attention to pressure tightness of fittings!
- All components must be approved for max. operating pressure (see technical data).

7.3.1 Suction line

- The static pressure at the suction connection of the device may never be below -0.4 bar (0.6 bar absolutely).

Caution!

If this value is fallen below, there might be cavitation in the device.

- The suction line must be absolutely airtight and as straight as possible.
- The suction line should always end several centimeters below the minimum oil level in the reservoir and should still have a sufficient distance to the bottom of the reservoir.
- Observe maximum suction head of 1 meter.

7.4 Device with free shaft end

Caution!

The devices are not designed for radial load at the drive shaft. A belt or gear drive is inadmissible. The drive has to take place using a suitable coupling. Misalignments of the shaft should not be bigger than 0.2 mm. Although different manufacturers of drive couplings indicate that a bigger misalignment can be compensated via the coupling, the reset force of the coupling causes a radial load on the connecting shaft. This can lead to damage at the device. The diameter tolerance of the shaft end is j6 at the standard versions. The coupling hub should have a diameter tolerance of H7. Refer to the data sheet for special tolerances. Blows on the shaft end are inadmissible and can cause a serious damage at the device!

7.5 Leakage oil connection

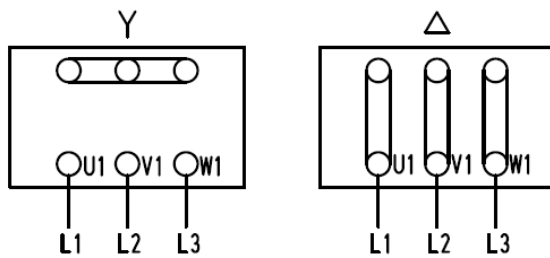
For devices with leakage oil connection ensure that leaking leakage oil can drain off without counter pressure. The leakage oil has to be collected professionally and properly without contaminating the environment.

7.6 Power connection



- Power supply must be done by a professional electrician!
- Electrical device components must be wired professionally!
- Compare voltage details with the existing mains voltage!
- Equipotential bonding must be done professionally by the operator via an according ground connection!
- Wire the device according to the circuit diagram!

Standard operating connection electric motor:



Refer to the data sheet for the connection diagram for special motors.

8. Start up

The start-up may only be done when all hazards at the customer's site by the device have been eliminated (see chapter 3.4 Obligations of the operator / user). The device must always be able to suck in sufficient clean lubricant and may not run dry.

8.1 Filling with lubricant

- The lubricant viscosity must correspond to the specifications in the data sheet.
- Used lubricants must not corrode the material of the seals.
- It is advantageous to fill the device and the suction line with lubricant prior to switching on the motor. For this, the drive shaft has to be rotated manually.
- Observe the machine manufacturer's lubricant details! Only use lubricants according to machine manufacturer's specifications!
- Collect leaking lubricant in a suitable reservoir and dispose it professionally!
- Observe the safety data sheet of the lubricant manufacturer!
- The lubricant viscosity changes with the operating temperature.
- Pay attention to utmost cleanness when refilling lubricant!

8.2 Check of rotational direction

- Compare the direction of rotation of the fan with the direction arrow!
- If the direction of rotation is wrong, check the connection to the terminal box and change it, if necessary!

Caution!

Longer operation in the **wrong direction** of rotation or a dry run will cause motor and **pump damage!**

8.3 Ventilation of the lubrication system

- Ventilate the whole lubrication system on first start-up and after each lubricant change!
- Switch on device.
- The ventilation is now done by a pressureless operation at opened outlets of the system!
- The liquid level in the reservoir has to be observed until the system has been entirely ventilated. It must not fall below the suction minimum.
- Operate the device until lubricant escapes from the pressure connection without air inclusions.

8.4 Limits of use

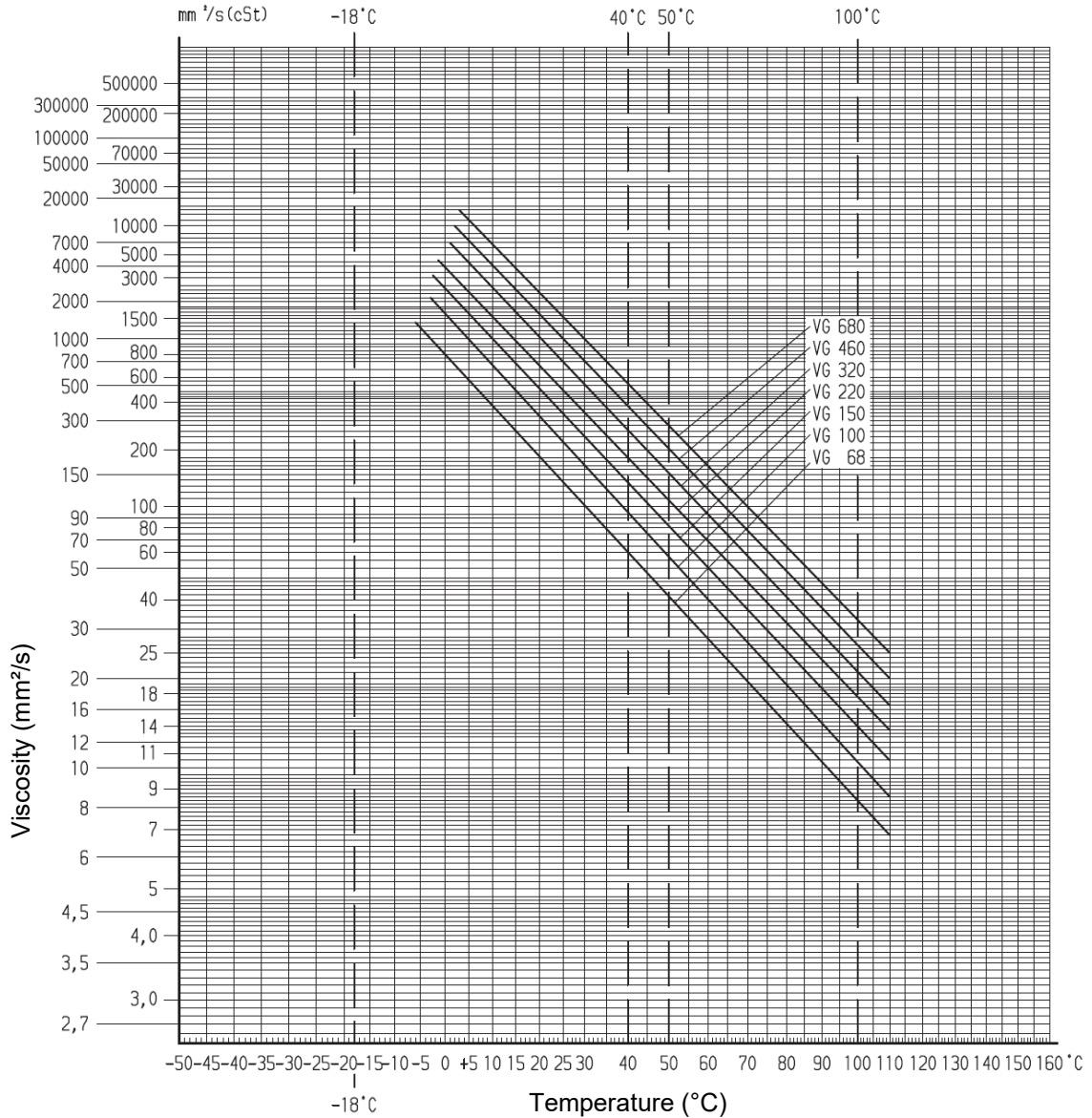
The devices can be operated permanently at the indicated operating overpressure. Clean lubricant must always be supplied without abrasive contents. Observe the viscosity and temperature ranges which are indicated in the technical data. These can reach differing values depending on the relevant design of the pipe cross sections of the suction and pressure line.

Caution!

The device should be secured against overload by a pressure limiting valve. The setting of the pressure limiting valve is done under control with a pressure gauge.

8.5 Lubricant temperature and viscosity

The lubricant temperature should be -20°C to $+80^{\circ}\text{C}$ for gear pumps and -5°C to $+70^{\circ}\text{C}$ for internal gear pumps depending on the viscosity of the lubricant. The ideal temperature range is at $+30^{\circ}\text{C}$ to $+50^{\circ}\text{C}$. An oil cooler might have to be installed in order to limit the temperature. The following diagram illustrates which ratio the lubricant temperature and lubricant viscosity have to each other.



9. Functional description

9.1 General

The basic element of a gear pump are the gears, of which one is driven. The gears are exactly installed in the pump housing and cover on ground surfaces. A radial shaft seal, which is relieved from pressure towards the suction side, is used as seal at the shaft. Bearing and shaft seal of the device are lubricated by the lubricant. An additional equipment with pressure limiting valve is possible.

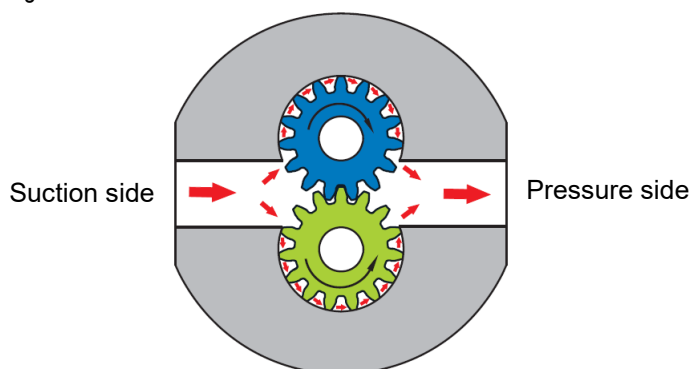
9.2 Functional principle

The device operates according to the positive displacement principle.

Gear pumps are self-priming. The positive displacement process is initially done without noticeable pressure build-up. The operating pressure is only set in by external influences (e.g. delivery heights, viscosity of the lubricant, counter pressure of the lube points etc.).

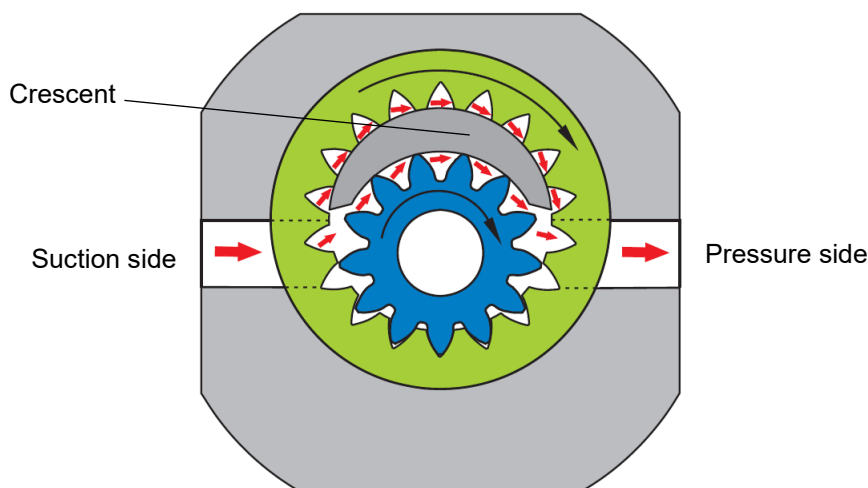
9.2.1 External gear pump

At the external gear pump, there are two adjoining gears with external gearing working. When a gear (blue) is driven, both gears move and a vacuum arises. The lubricant is sucked in from the suction side and is delivered between the housing and the gears to the pressure connection. The lubricant transport is done by moving the lubricant into the tooth gap alongside the gear chamber wall by which an even lubricant supply is guaranteed.



9.2.2 Internal gear pump

The driving gear (blue) moves eccentrically in the internal gearing of a toothed ring (green) at the internal gear pump. The lubricant is delivered in two chambers between the tooth gaps of both gears from the suction side to the pressure side, whereas the teeth are sealed by the crescent.



10. Maintenance



Disconnect the device from power supply before **maintenance or repairs**.

Only carry out **maintenance and repair** in **complete device standstill** and **pressureless condition**.

Check the surface temperature of the device to avoid the **risk of burns** by radiant heat. Wear heat-resistant gloves and safety goggles! Clean soiled or contaminated surfaces before maintenance, wearing protective equipment if necessary! Secure the device against recommissioning during maintenance and repair work!



10.1 General maintenance

- Retighten all fittings 6 weeks after start up!
- Check all components for leakages and damage at least every four weeks!



If leakages are not repaired, lubricant **might escape under high pressure**. Remove possible puddles of lubricant immediately.

10.2 Suction filter

Caution!

The suction filter (not included in the scope of delivery) has to be cleaned regularly so that the suction vacuum does not exceed the set values because this might result in cavitation damage.

10.3 Lubricant change

Caution!

Pay attention to utmost **cleanness** when refilling lubricant!

- Check the level regularly and refill clean lubricant as necessary, see chapter start up.
- Change the lubricant according to the specifications of the lubricant manufacturer. Environmental influences like increased temperature or pollution may shorten these intervals!
- Please make sure to only use lubricants that are suitable for the device as well as the lubricated machine and that comply with the requirements of the particular operating conditions.
- In case of **different lubricant manufacturers**, ensure that the lubricant **quality** corresponds to the quality of the previously used one! As precautionary measure, drain the lubricant reservoir properly and clean it!

11. Shutdown

- Relieve the device from pressure!
- Turn off power supply!
- Have the device disconnected from power supply by a qualified electrician!
- Remove all pipes and hoses from the device and loosen all fastenings for disassembly!

12. Disposal

Notice!

Observe the disposal instructions of the lubricant manufacturer when lubricant is changed! Lubricants or cloths contaminated with lubricant, etc. must be collected in specially marked reservoirs and disposed of accordingly.

Disposal of the device must be done properly and professionally and according to the national and international laws and regulations.



Moreover, BEKA devices could contain batteries. Professionally and properly disposed batteries will be recycled. They contain important raw materials.

13. Troubleshooting

Malfunction	Possible cause	Possible remedy
Device does not aspirate	Suction line leaky	Retighten fitting; seal thread
	Level too low or suction line too short	Refill lubricant or extend suction line
	Blanking plug not removed from suction line	Remove blanking plug
	Lubricant cannot be delivered (too high viscosity and/or too low operating temperature)	Fill in lubricant with correct viscosity
	Flow resistance in the suction line too high (too high vacuum)	Expand pipe cross section, straighten suction pipe, clean suction filter, reduce suction head
	Pressure line closed or preloaded by valve so that the device cannot ventilate itself	Switch to pressureless operation or ventilate device by opening the pressure connection
	Wrong direction of rotation of drive motor	Correct direction of rotation
Supply interrupts but drive is ok	Coupling defective or incorrectly assembled	Renew coupling or assemble professionally
	Suction line leaky	Retighten fitting; seal thread
	Pump shaft damaged	Have it repaired by BEKA
	Lack of lubricant in reservoir	Refill lubricant
	Radial shaft seal worn	Renew radial shaft seal

Malfunction	Possible cause	Possible remedy
Device supplies without or with low pressure	Burst pipe under reservoir cover	Repair damage
	Heavy pump wear	Renew pump
	Suction line leaky	Retighten fitting; seal thread
	Pressure limiting valve does not close	Exchange or clean pressure limiting valve
Device is too noisy	Device aspires air	Retighten fitting of suction line; seal thread
	Coupling defective or incorrectly assembled	Renew coupling or assemble professionally
	Suction line clogged	Clean suction line and possible suction filter
	Pump defective	Renew pump
	Shaft sealing ring defective	Renew shaft sealing ring
	Cavitation in pump	Seal suction line Check lubricant level, refill lubricant if necessary Expand pipe cross section of the suction pipe

14. Spare parts

Spare part numbers are available on request. Please always indicate the data of the device when ordering spare parts. These can be found on the type plate of the device.

15. Accessories

Information on:

- Suction filters
- Pressure limiting valves
- Reservoirs
- Fittings
- Hose and pipe lines
- Pump supports

are available on request.

16. Details of the manufacturer

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- Multi-line oil pumps
- Multi-line grease pumps
- Single-line central lubrication systems
- Dual line central lubrication systems
- Oil circulation central lubrication systems
- Oil-air and spray lubrication
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