GROENEVELD-BEKA
LUBRICATION SYSTEMS BY TIMKEN

BEKA-MAX

Grease lubrication pump

PICO

without control unit

Version 05-2022

Original operating and assembly manual

BAL2175_PICO_without_control_unit_0522_EN 10158407

Table of contents

1. Technical data . . . 4
2. General safety instructions . . . 5
2.1 Safety instructions . . . 5
2.2 Qualification and training of staff . . . 5
2.3 Hazards in case of non-observance of the safety instructions . . . 6
2.4 Obligations of the operator / user . . . 6
2.5 Safety instructions for maintenance, inspection and assembly . . . 6
2.6 Unauthorized modification and production of spare parts . . . 7
2.7 Inadmissible modes of operation . . . 7
2.8 Electrostatic discharge . . . 7
2.9 General hazard warning – residual risk . . . 7
3. Intended use . . . 8
4. Scope of warranty . . . 8
5. Transport and storage . . . 9
6. Assembly instructions . . . 9
6.1 Connection of lines . . . 9
6.2 Power connection . . . 9
6.2.1 Connection diagram for version with follow-up piston and bayonet plug-type connection . . . 10
6.2.2 Connection diagram for version with agitator blade and bayonet plug-type connection . . . 10
6.2.3 Connection diagram for version with follow-up piston and Hirschmann plug-type connection . . . 11
6.2.4 Connection diagram for version with agitator blade and Hirschmann plug-type connection . . . 11
6.3 Assembly of pump elements . . . 12
6.3.1 Disassembly of a pump element . . . 13
6.3.2 Assembly of a pump element . . . 14
7. Start up . . . 15
7.1 Lubricants . . . 15
7.2 Filling with lubricant . . . 15
7.2.1 Initial filling of devices with follow-up piston . . . 16
7.2.2 Filling of the device . . . 18
7.3 Check of rotational direction of the device . . . 19
7.4 Ventilation of the lubrication system . . . 20
8. Functional description . . . 20
8.1 Lubrication systems . . . 20
8.1.1 Progressive lubrication systems . . . 20
8.1.2 Multi-line lubrication systems . . . 20
8.1.3 Mixed lubrication systems . . . 20
8.2 Setup of the device . . . 22
8.3 Functional description of the device . . . 23
8.3.1 Functional description for version with follow-up piston . . . 23
8.3.2 Functional description for version with agitator blade . . . 24
8.4 Pump elements . . . 24
8.4.1 Pump elements PE-120 FV . . . 25
8.4.2 Pump elements PE-60 F, PE-120 F and PE-170 F . . . 26
8.4.3 Order numbers of the pump elements for progressive lubrication systems . . . 27
8.4.4 Pump elements PE-5, PE-10, PE-15, PE-25 and PE-50 . . . 28
8.4.5 Code of the pump elements for multi-line lubrication systems . . . 29
8.5 Pressure limiting valves . . . 30
8.5.1 Pressure limiting valves without micro switch . . . 30
8.5.2 Pressure limiting valves with micro switch . . . 31

8.6 Level monitoring . . . 33
8.6.1 Level monitoring for devices with follow-up piston . . . 33
8.6.2 Level monitoring for devices with agitator blade . . . 33
9. Retrofitting of an integrated control unit . . . 33
10. Maintenance . . . 34
10.1 General maintenance . . . 34
10.2 Lubricant change . . . 34
11. Shutdown . . . 34
12. Disposal . . . 34
13. Troubleshooting . . . 35
14. Spare part list and drawing . . . 35
15. Dimensional drawing . . . 36
16. Code . . . 37
17. Declaration of incorporation . . . 38-39
18. Details of the manufacturer . . . 40

1. Technical data

General:

Delivery rate per stroke and outlet: . . . . . depending on pump element (see chapter 8.4 „Pump elements“)
No. of outlets: . . . . . pump elements PE-5 to PE-50: . . . . . max. 8
. . . . . pump elements PE-60 F to PE-170 F: . . . . . max. 2
Pressure connection: . . . . . Ø4 mm, Ø6 mm or thread M10x1 (multi-line lubrication systems)
. . . . . Ø6 mm, Ø8 mm or thread G1/4" (progressive lubrication systems)
Lubricant: . . . . . greases up to NLGI cl. 2
. . . . . (greases with solids content on request)
Operating pressure: . . . . . max. 200 bar (multi-line lubrication systems)
. . . . . max. 300 bar (progressive lubrication systems)
Pressure limiting valve: . . . . . set to 290 bar (progressive lubrication systems)
Operating temperature: . . . . . -35°C up to +70°C
Transport and storage temperature: . . . . . -40°C up to +70°C
Reservoir material: . . . . . plastic, transparent
Reservoir size: . . . . . 1,5 l
Effective volume: . . . . . 1,2 l
Installation position: . . . . . optional (version with follow-up piston)
. . . . . reservoir in a vertically upright position (version with agitator blade)
Level monitoring: . . . . . with, installed in pump body (version with follow-up piston)
. . . . . without (version with agitator blade)
Rotational direction of the agitator blade: . . . . . clockwise
Degree of protection: . . . . . IP 65
Weight: . . . . . approx. 4,8 kg
. . . . . (without pump element, without grease filling, depending on equipment)

Motor:

Supply voltage: . . . . . 12 or 24 V DC
Current load max.: . . . . . 6,3 A at 12 V
. . . . . 3,3 A at 24 V
Pump speed: . . . . . 15 r.p.m

The **grease lubrication pump PICO** is subsequently called a **device**.

2. General safety instructions

Everybody who is in charge of the assembly, start-up, maintenance and operation of the device must read these instructions carefully prior to assembly and start-up of the device at the machine! Furthermore, this manual must always be available at the site of operation!
Basic instructions for setup, operation and maintenance can be found below.

2.1 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!

2.2 Personnel qualification and training

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.

2.3 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.

2.4 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. Please also refer to the data or safety data sheets of the respective manufacturers.
- 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.
- Observe the universally valid Ordinance on Hazardous Substances in its latest version.

2.5 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.

2.6 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. Groeneveld-BEKA does not assume liability for parts that are retrofit by the operator.

2.7 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.

2.8 Electrostatic discharge

Avoid electrostatic discharge! There are electronic components 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.

2.9 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**.

3. Intended use

Caution!

The device is part of a central lubrication system. It serves **for conveying lubricant for the lubrication** of machines as described in this operating manual. The device is approved for **industrial** and **commercial** use **only**.
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**. Groeneveld-BEKA is not liable for personal injury or damage of machine resulting thereof.

The device was manufactured in compliance with Machinery Directive 2006/42/EG. The customer has to check whether further guidelines apply for the area of application and site of operation. If the device is not in conformity with these guidelines, it may not be put into operation.

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** and **accident prevention** 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.

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

4. 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 and assembly 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 Groeneveld-BEKA.

Caution!

Guaranty and warranty will expire for any damage of the device caused by improper lubricant (e.g. wear of piston, piston jamming, blockades, brittled sealings etc.).
Groeneveld-BEKA will generally not accept guaranty claims for any damage caused by lubricants, even though those have been laboratory tested and released by Groeneveld-BEKA, as such damage (e.g. by over-stored or incorrectly stored lubricants, batch fluctuations, etc.) cannot be verified or reconstructed later.

5. 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.
The device may only be transported completely empty.

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**.

Notice!

When storing the device pay attention that the storage area is cool and dry in order to avoid corrosion of the individual parts of the device.
Observe the storability of the contained lubricant for devices which are filled with lubricant. Exchange the lubricant when it is over-stored (separation of oil and soap).

6. Assembly instructions

Check the device for possible transport damage and for completeness before the assembly. Any installed equipment for transportation safety has to be removed.

Comply with the following conditions when assembling a complete machine from this device and other components. Mind a proper and eco-friendly assembly without impairment of persons' health and safety:

Devices with agitator blade have to be assembled balanced at both sides at the setup location and the r**eservoir has to be in an upright position** in order to ensure a safe operation! Devices with follow-up piston do **not** have to be assembled in a vertically upright position. 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, e.g. for filling with lubricant.
Special measures concerning noise prevention or oscillation reduction do not have to be taken.

6.1 Connection of lines

- Professional layout!
- When using pipes, observe that they are clean, seamless and of precision steel!
- Assemble the pipes professionally and free from distortion!
- Pay attention to pressure tightness of fittings!
- All components must be approved for max. operating pressure (see chapter 1. „Technical data“).

6.2 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 connection diagram!

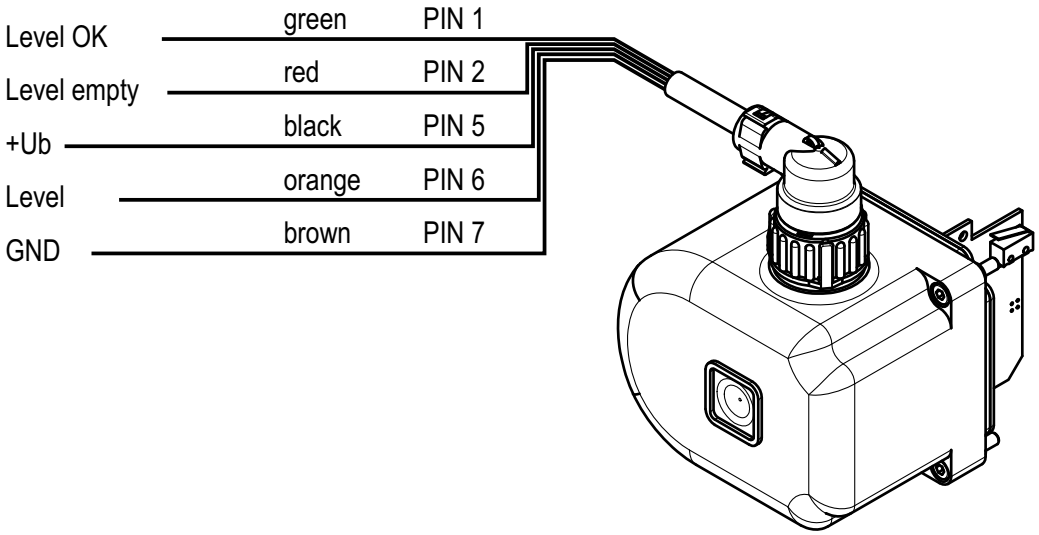
Notice!

The device can be supplied with **bayonet plug-type connection** or with **Hirschmann plug-type connection**.
The **connection plug** and a **10 m long connection cable** are included in the scope of delivery for both versions.

The following listed connection diagrams are valid for standard versions.
Other connection diagrams may be valid for special versions. These are available on request.

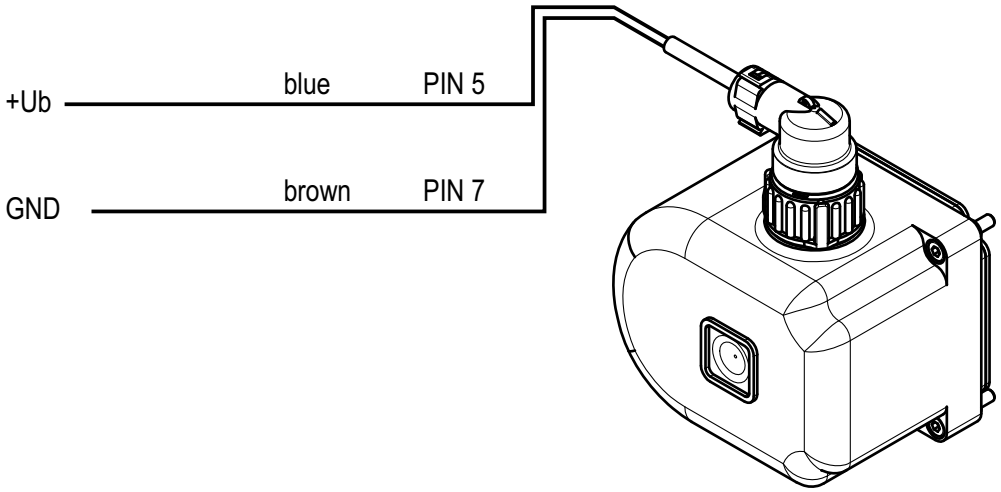
6.2.1 Connection diagram for version with follow-up piston and bayonet plug-type connection

Fig. 1:



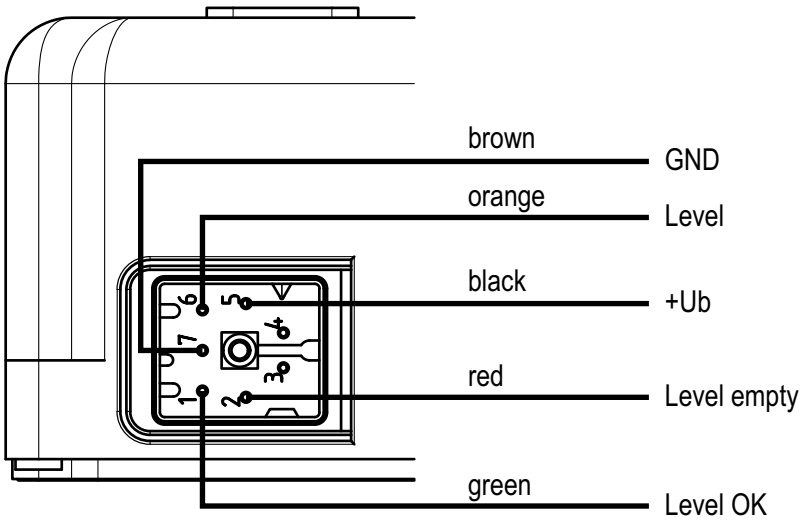
6.2.2 Connection diagram for version with agitator blade and bayonet plug-type connection

Fig. 2:



6.2.3 Connection diagram for version with follow-up piston and Hirschmann plug-type connection

Fig. 3:



6.2.4 Connection diagram for version with agitator blade and Hirschmann plug-type connection

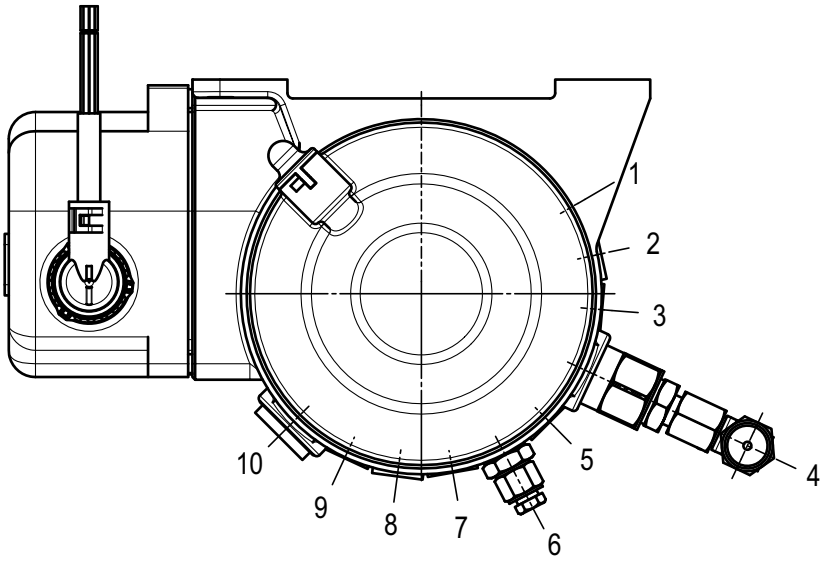
Fig. 4:

Special version, available on request.

6.3 Assembly of the pump elements

Different pump elements can be installed into the device (see chapter 8.4 „Pump elements“).

Fig. 5:



The pump elements PE-60 F, PE-120 F, PE-170 F and PE-120 FV can be screwed into the outlets 4 and 10 (see fig. 5).

The pump elements PE-5, PE-10, PE-15, PE-25 and PE-50 can be screwed into the outlets 1 to 3 and 5 to 9 (see fig. 5).

Remove the screw plug with an Allen key AF 10 (outlets 4 and 10, see fig. 5) or AF 6 (outlets 1 to 3 and 5 to 9, see fig. 5) from the outlet into which you want to screw in the pump element.

Exchange the sealing of the pump element in order to avoid that damaged sealings are reused.

Notice!

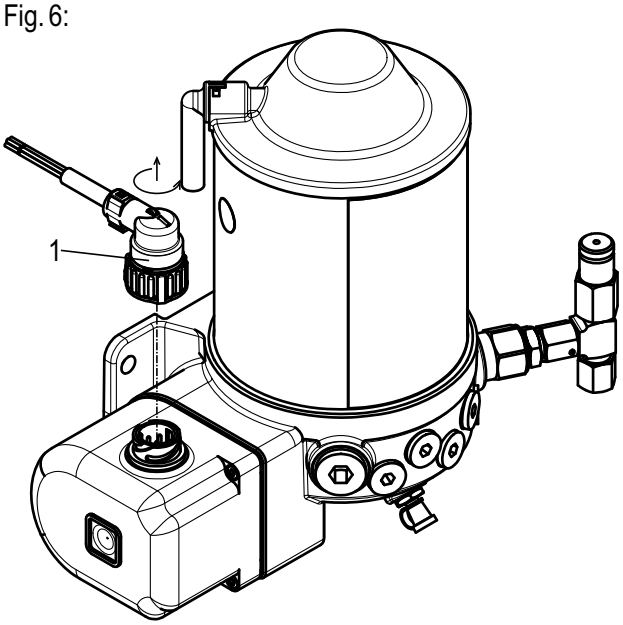
When the pump elements PE-5 to PE-50 are ordered separately, the sealing is not included in the scope of delivery and has to be ordered separately if needed (see chapter 8.4.5 „Code of the pump elements for multi-line lubrication systems“).

In the following, the disassembly and assembly of the pump elements is described at the example PE-120 F.

6.3.1 Disassembly of a pump element

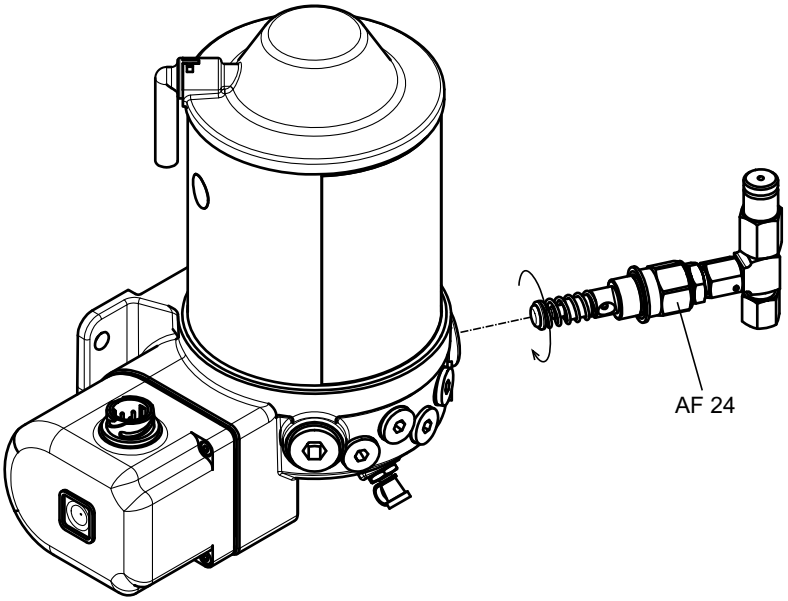
A) Disconnect the device from the power supply (pos. 1, see fig. 6) and secure it against recommissioning.

Fig. 6:



B) Unscrew the pump element.

Fig. 7:



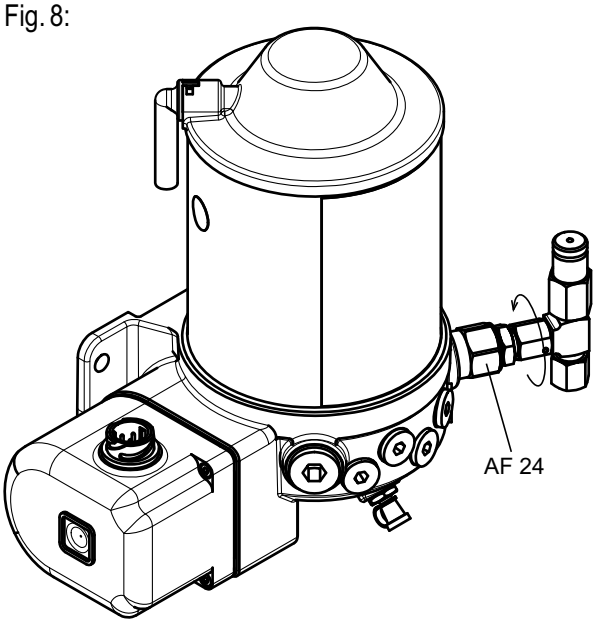
Caution!

Make sure that the piston of the pump element does not remain in the pump housing!
If the piston remains in the pump housing, the eccentric may be damaged or the device might block.

6.3.2 Assembly of a pump element

C) Exchange the sealing, screw in the pump element and adjust it until the desired position has been reached. Tighten the pump element with the below indicated tightening torque (see fig. 8).

Fig. 8:

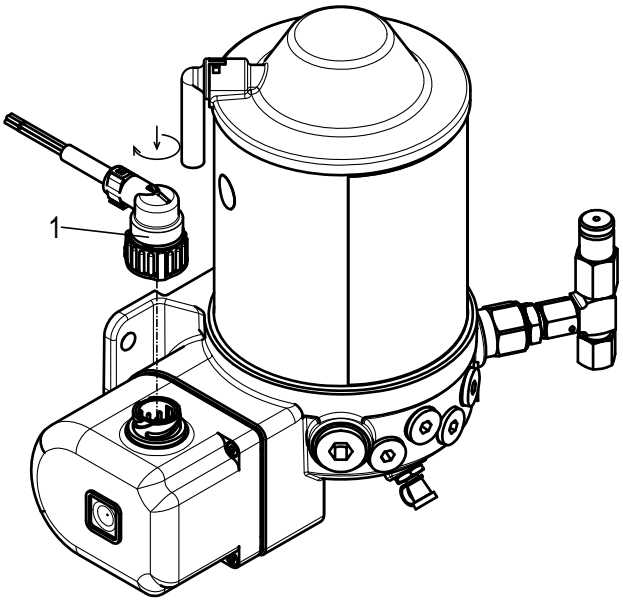


Notice!

Tighten the pump elements PE-5 to PE-50 with a tightening torque of 20 Nm ±10%.
Tighten the pump elements PE-60 F to PE-170 F and PE-120 FV with a tightening torque of 45 Nm ±10% an.

D) Reconnect the device to the power supply (pos. 1, see fig. 9)

Fig. 9:



Initiate a trial run and let the device operate with open outlets until the lubricant leaks out bubble-free.

7. Start up

7.1 Lubricants

The device is designed for standard multi-purpose greases up to NLGI cl. 2.

- Use lubricants with high-pressure additives.
- Only use lubricants of the same soaping criteria.
- Do not use any lubricants with solids content (lubricants with solids content on request, e.g. graphite or MoS2)

7.2 Filling with lubricant

- Fill the lubricant reservoir with clean lubricant at the filling nipple or a filling connection!
- 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.
- Check the level several times in equal intervals during the first hours of operation and refill lubricant, if necessary.
- Pay attention to utmost cleanness when refilling the reservoir!

Caution!

By default, you receive the device with a basic filling. The procedure for filling devices with basic filling can be found in chapter 7.2.2 „Filling of the device“.
If the device has no basic filling, observe the procedure for the initial filling for devices with follow-up pistons which is described in chapter 7.2.1 „Initial filling of devices with follow-up piston“. You can proceed as described in chapter 7.2.2 „Filling of the device“ for the initial filling of devices with agitator blade.

7.2.1 Initial filling of devices with follow-up piston

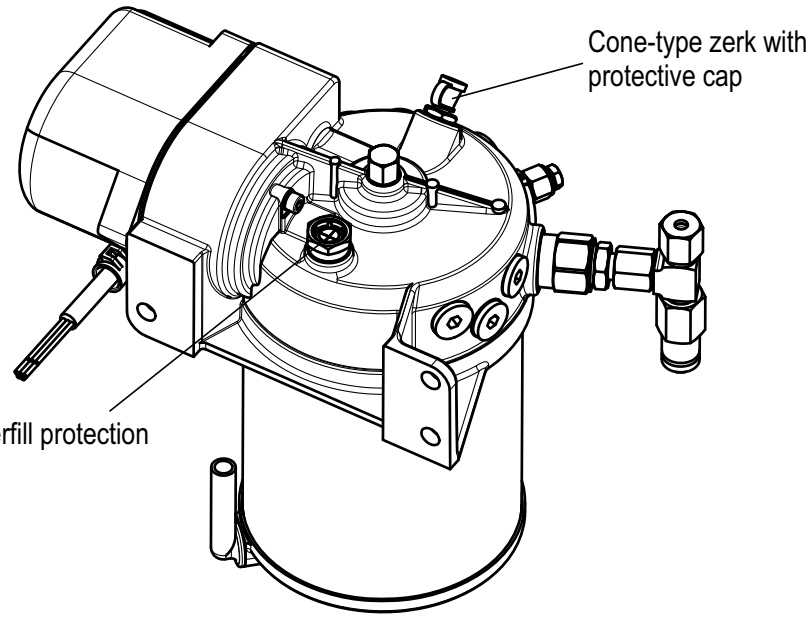
Use a standard grease pump (hand lever grease gun) for the initial filling of the device with follow-up piston and fill the device via the cone-type zerk.

Caution!

Pay attention to utmost cleanliness at the initial filling of the device. Only fill in clean lubricant. When dirt particles get into the device, the pistons of the pump elements can wear, which results in the destruction of the pump elements. The dirt particles can also get into the lubrication system and can clog lines or connected progressive distributors.

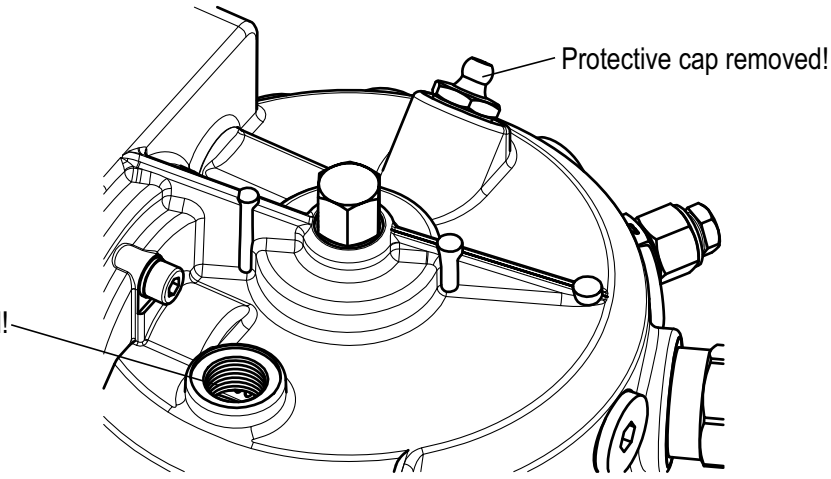
A) Connect the device according to the connection diagram (see chapter 6.2 „Power connection“) and turn it around so that the reservoir cover points down (see fig. 10).

Fig. 10:



B) Remove the overfill protection and the protective cap of the cone-type zerk (see fig. 11).

Fig. 11:



C) Take the device into operation.

Operate the filling gun until lubricant leaks out visibly at the outlet (see fig. 13).

Connect the filling gun to the cone-type zerk and fill the device until lubricant leaks out at the opening of the overfill protection (see fig. 12).

Fig. 12:

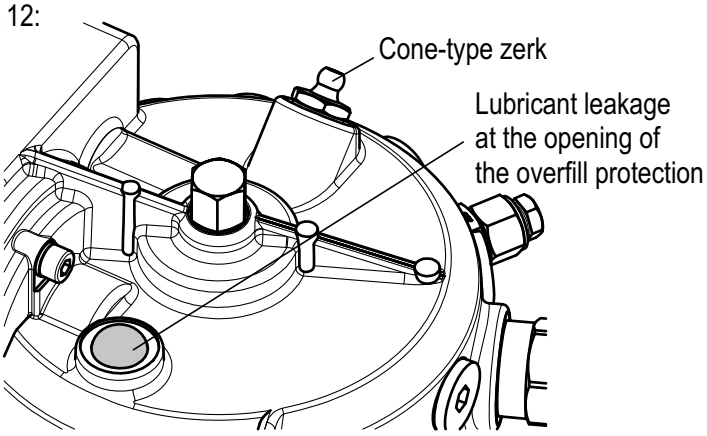
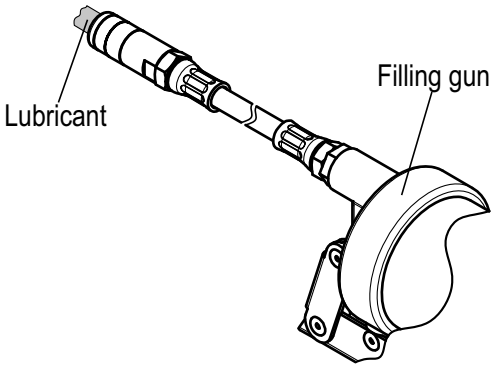
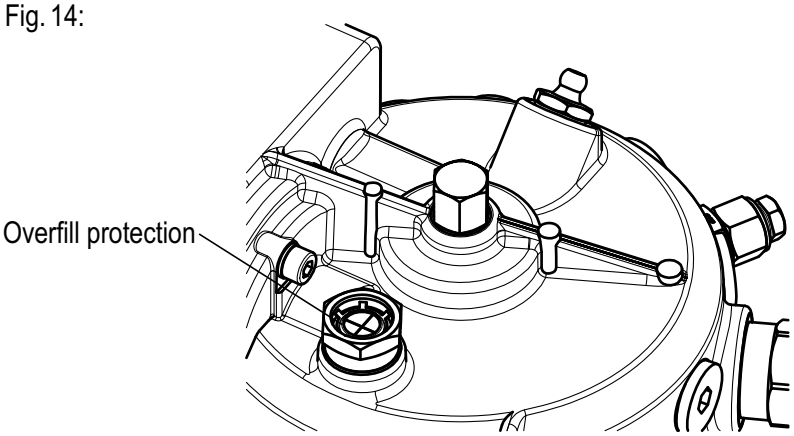


Fig. 13:



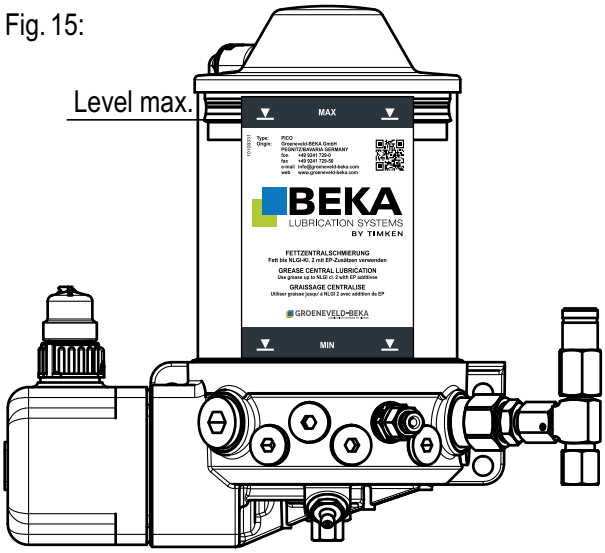
D) Screw the overfill protection back in and tighten it with a tightening torque of 15 Nm ±10%.

Fig. 14:



E) Turn the device around again and fill it up to the maximum level (see fig. 15). Put the protective cap back on the cone-type zerk after finishing the filling process.

Fig. 15:



Caution!

Avoid overfilling the device; otherwise lubricant might leak out which can cause environmental damage!

7.2.2 Filling of the device

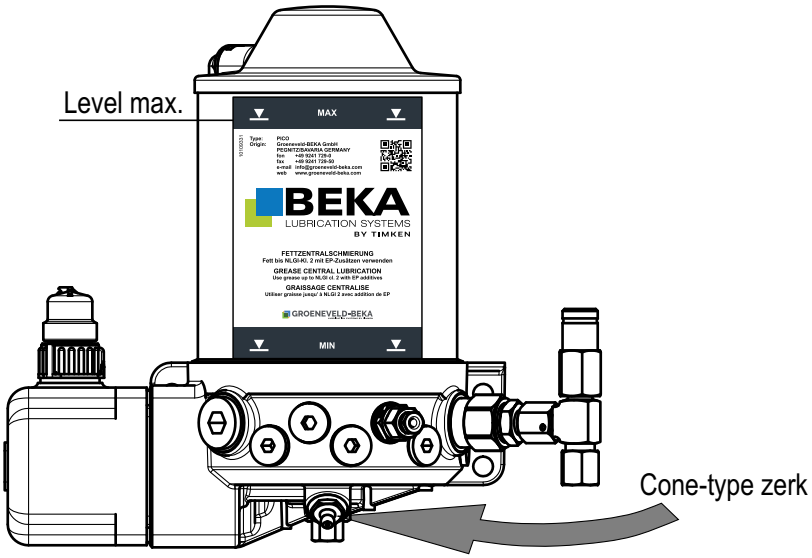
Caution!

Pay attention to utmost cleanliness when filling the device. Only fill in clean lubricant. When dirt particles get into the device, the pistons of the pump elements can wear, which results in the destruction of the pump elements. The dirt particles can also get into the lubrication system and can clog lines or connected progressive distributors.
Avoid overfilling the device; otherwise lubricant might leak out which can cause environmental damage!

A) Filling via the cone-type zerk with a filling gun (standard)

Remove the protective cap of the existing cone-type zerk, connect a suitable filling gun (manually operated or pneumatic) to this one and fill the device up to the maximum level (see fig. 16). Put the protective cap back on the cone-type zerk after finishing the filling process.

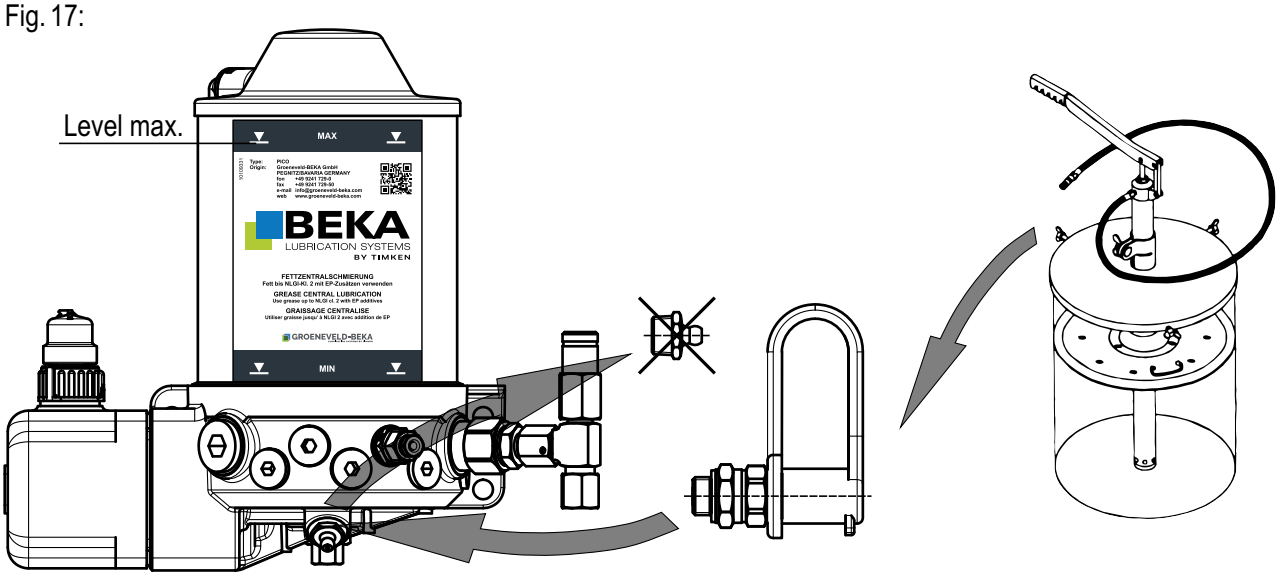
Fig. 16:



B) Filling via the filling connection G1/4

Remove the cone-type zerk and replace it by a filling connection G1/4 (order no.: 10125524). Connect a suitable filling pump to the filling connection G1/4 and fill the device up to the maximum level (see fig. 17).

Fig. 17:



C) Filling via the filling set PICO Fill

The filling set PICO Fill (order no.: 10164249) has been developed for an easy and quick filling of the device. It consists of a filling connection M20x1,5 (order no.: 10103087) and a filling gun (order no.: 10125287).

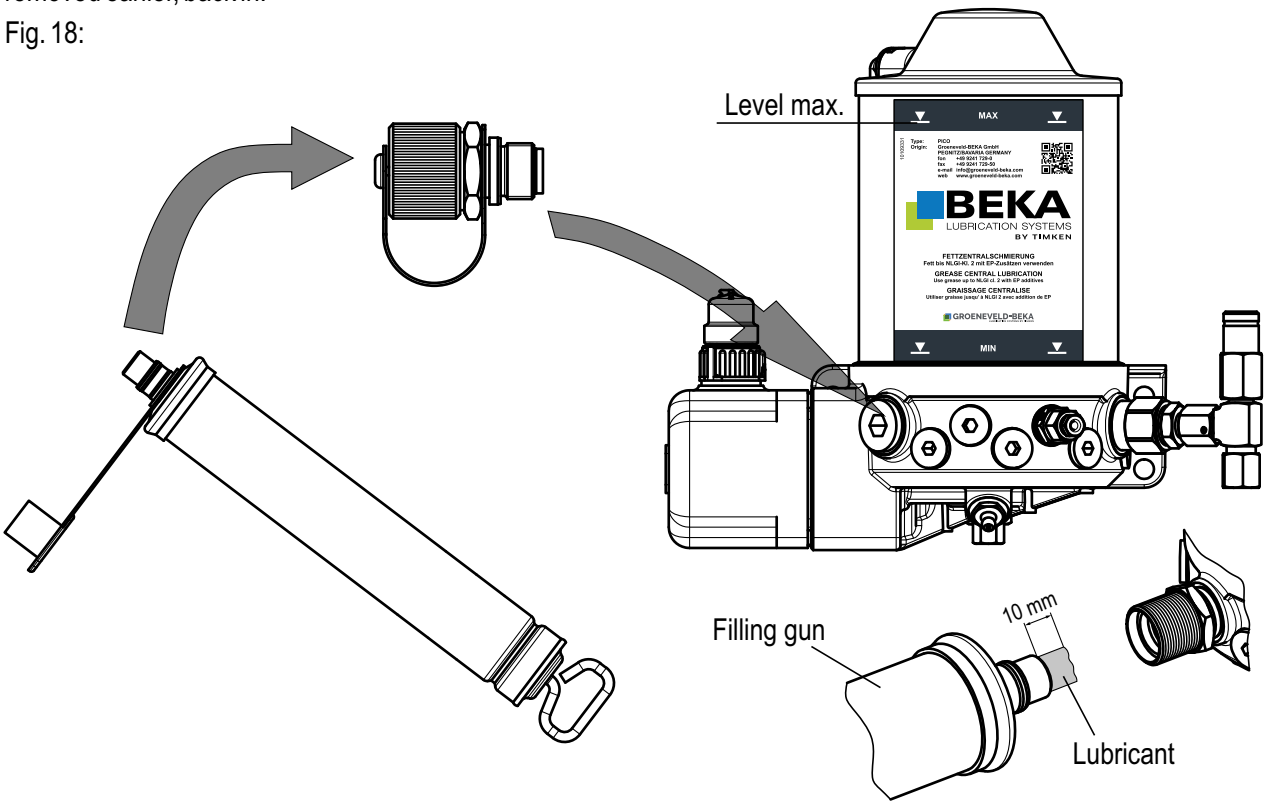
Remove the screw plug from the outlet 4 or 10 (see fig. 5 in chapter 6.3 „Assembly of the pump elements“) and screw in the filling connection M20x1,5.

Operate the filling gun until the lubricant leaks out visibly at the outlet (approx. 10 mm, see fig. 18).

Connect the filling gun to the filling connection M20x1,5 and fill the device up to the maximum level.

Remove the filling connection M20x1,5 after finishing the filling process and screw the screw plug, which had been removed earlier, back in.

Fig. 18:

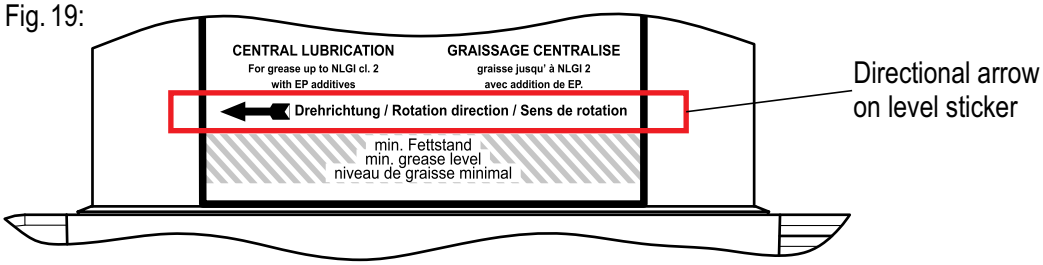


7.3 Check of rotational direction of the device

- Compare the rotational direction of the agitator blade with the directional arrow on the level sticker (see fig. 19) for devices with agitator blade.
- Check the electrical connections of the device at a wrong rotational direction and change these if necessary.

Caution! The **motor** and the **device** will be **damaged** when they are operated in the **wrong rotational direction** for a longer time!

Fig. 19:



7.4 Ventilation of the lubrication system

- Ventilate the whole lubrication system on first start-up and after each lubricant change!
- Ventilation is done by operating the system in pressureless condition and with open system outlets!
- Operate the device until lubricant escapes from the pressure connection without air inclusions.

8. Functional description

8.1 Lubrication systems

The device can be used for the lubrication in progressive lubrication systems, multi-line lubrication systems or in mixed lubrication systems.

Up to two lubrication circuits, which are independent from each other, can be connected to the device at installation into a progressive lubrication system.

Up to 8 lube points can be supplied with lubricant when the device is used in a multi-line lubrication system.

Both systems can also be combined with the device (mixed lubrication system).

8.1.1 Progressive lubrication systems

Progressive lubrication systems are lubrication systems which can process lubricants up to NLGI cl. 2.

A progressive lubrication system mainly consists of a lubrication pump and one or several progressive distributors. The lubrication pump supplies the lubricant into a main distributor. This distributor distributes the lubricant in the correct relation to the secondary distributors, which redistribute the lubricant to the lube points.

If one lube point does not take any lubricant from the distributor, the distributor blocks. Pressure builds up in the system by this. The system pressure is limited to 290 bar by a pressure limiting valve at the pump element (see fig. 20, pos. 11 and pos. 12). The system is thereby protected from being damaged by too high pressure.

8.1.2 Multi-line lubrication systems

Multi-line lubrication systems are lubrication system which can process lubricants up to NLGI cl. 2.

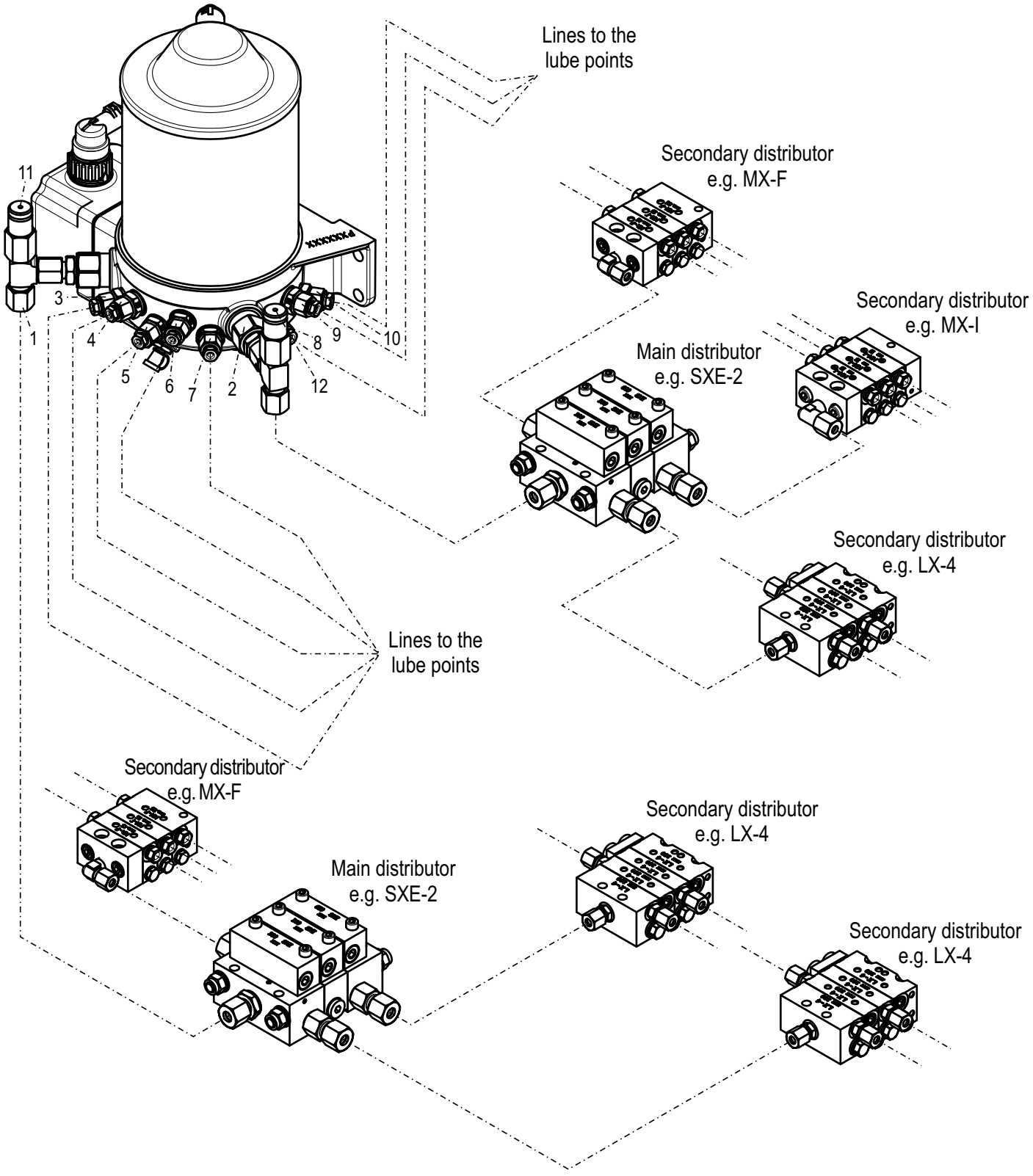
A multi-line lubrication system mainly consists of a lubrication pump and several lubrication lines which are connected directly to the lube points. Each lube point requires its own pump element at the lubrication pump (see fig. 20, pos. 3 up to pos. 10).

8.1.3 Mixed lubrication systems

A progressive lubrication system and a multi-line lubrication system can be connected to the device at the same time; this is called a mixed lubrication system.

One lubrication circuit with progressive distributors can each be connected to the pump elements pos. 1 and pos. 2 (see fig. 20). One lube point can each be connected to the pump elements pos. 3 to pos. 10 (see fig. 20).

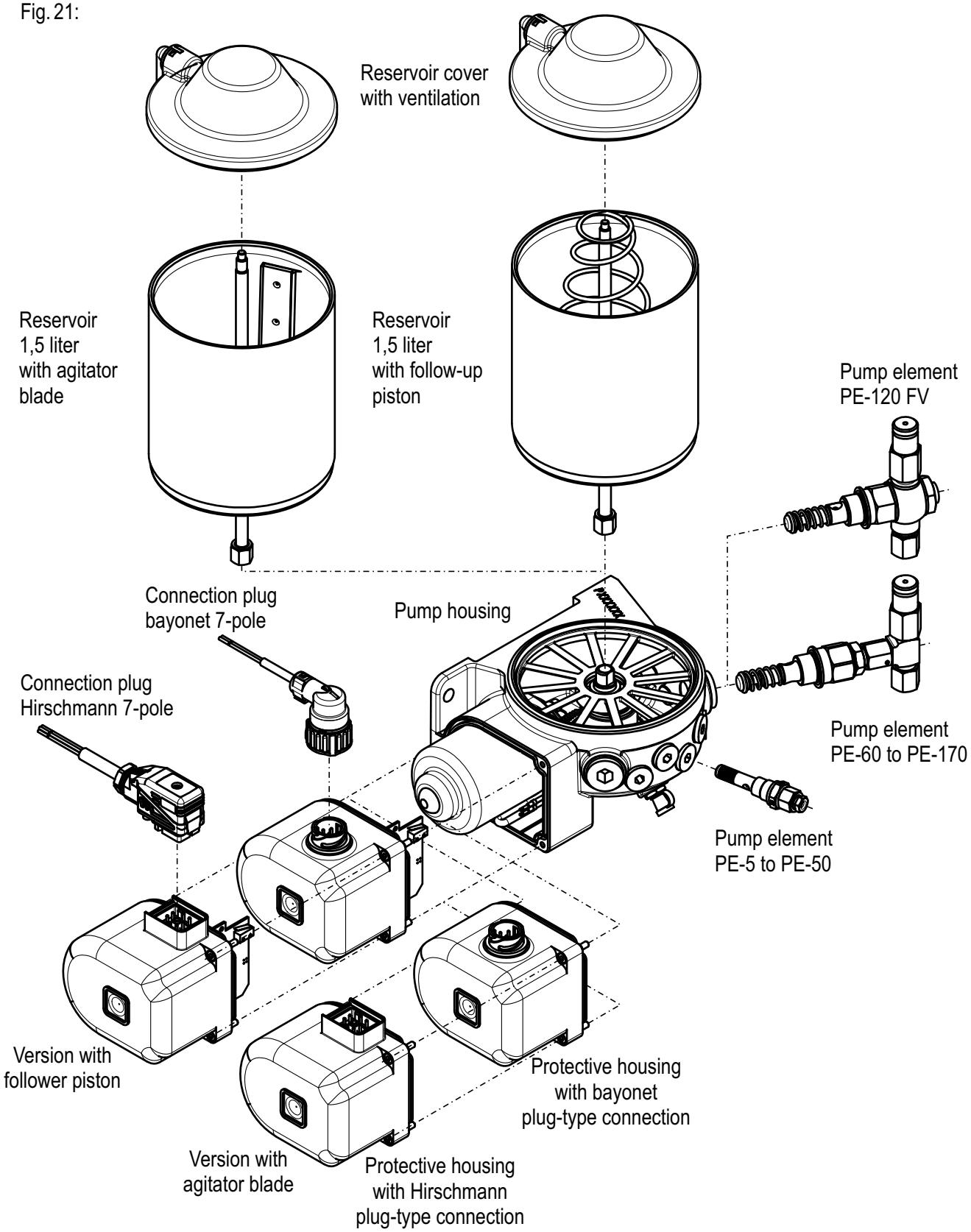
Fig. 20:



8.2 Setup of the device

The device mainly consists of 6 assemblies (see fig. 21).

Fig. 21:



8.3 Functional description of the device

8.3.1 Functional description of the version with follow-up piston

The following listed positions can be found in fig. 22.

A DC motor optionally with 12 or 24 V DC (pos. 1) drives the eccentric shaft (pos. 3) via a worm drive (pos. 2). The delivery pistons (pos. 4) of the integrated pump elements are pushed into the pump element body (pos. 5) by the rotary movement and the eccentricity of the shaft (= delivery stroke). The delivery pistons return into their initial position by the compression springs (pos. 6) and suck new lubricant from the reservoir (= suction stroke).

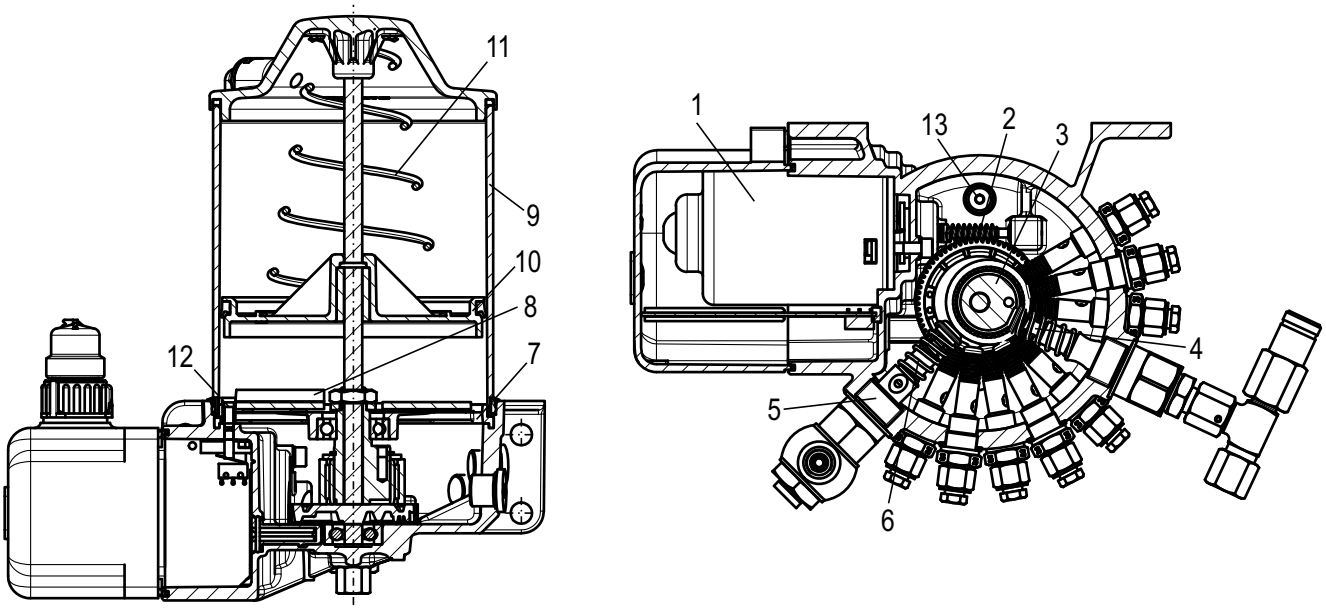
Non-return valves are integrated in the pump elements which prevent that lubricant, which has already been displaced, is sucked back. An agitator blade (pos. 8), which is firmly connected with the eccentric shaft, is located over the centering ring (pos. 7), which is used as grease strainer. The agitator blade pushes the lubricant towards the pump elements. There is a follow-up piston (pos. 10) in the reservoir (pos. 9) which is pushed by a conical compression spring (pos. 11) onto the lubricant. By this, the follow-up piston pushes the lubricant evenly to the agitator blade or to the pump elements. It is therefore not strictly necessary to assemble the device vertically.

If the reservoir is empty, the follow-up piston pushes onto a feeler (pos. 12), which actuates a switch. The switch sends a signal which can be used for switching off the device, for a visual or acoustic warning or for an individual use.

The device can be filled via a cone-type zerk which is located in the pump housing. In order to avoid an overfilling of the device, a pressure limiting valve (pos. 13) is integrated in the pump housing which is used as overfill protection.

Refer to chapter 7.2 „Filling with lubricant“ for further information on filling the device.

Fig. 22:



8.3.2 Functional description of the version with agitator blade

The following listed positions can be found in fig. 23.

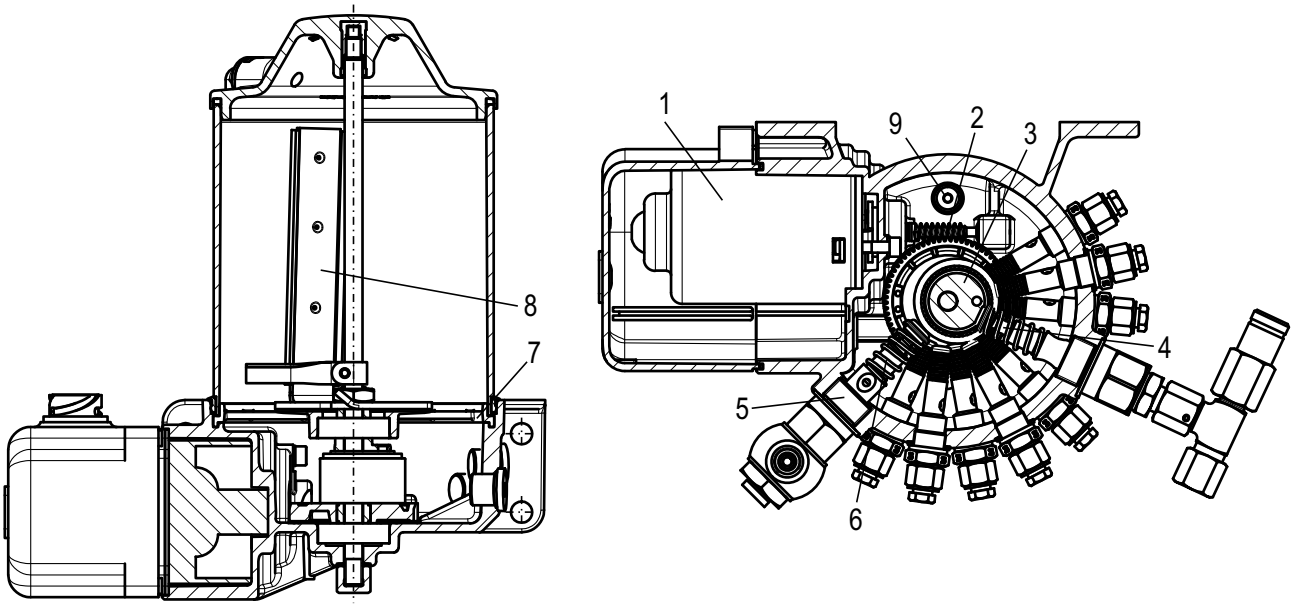
A DC motor optionally with 12 or 24 V DC (pos. 1) drives the eccentric shaft (pos. 3) via a worm drive (pos. 2). The delivery pistons (pos. 4) of the integrated pump elements are pushed into the pump element body (pos. 5) by the rotary movement and the eccentricity of the shaft (= delivery stroke). The delivery pistons return into their initial position by the compression springs (pos. 6) and suck new lubricant from the reservoir (= suction stroke).

Non-return valves are integrated in the pump elements which prevent that lubricant, which has already been displaced, is sucked back. An agitator blade (pos. 8), which is firmly connected with the eccentric shaft, is located over the centering ring (pos. 7), which is used as grease strainer. The agitator blade pushes the lubricant towards the pump elements.

The device can be filled via a cone-type zerk which is located in the pump housing. In order to avoid an overfilling of the device, a pressure limiting valve (pos. 9) is integrated in the pump housing which is used as overfill protection.

Refer to chapter 7.2 „Filling with lubricant“ for further information on filling the device.

Fig. 23:



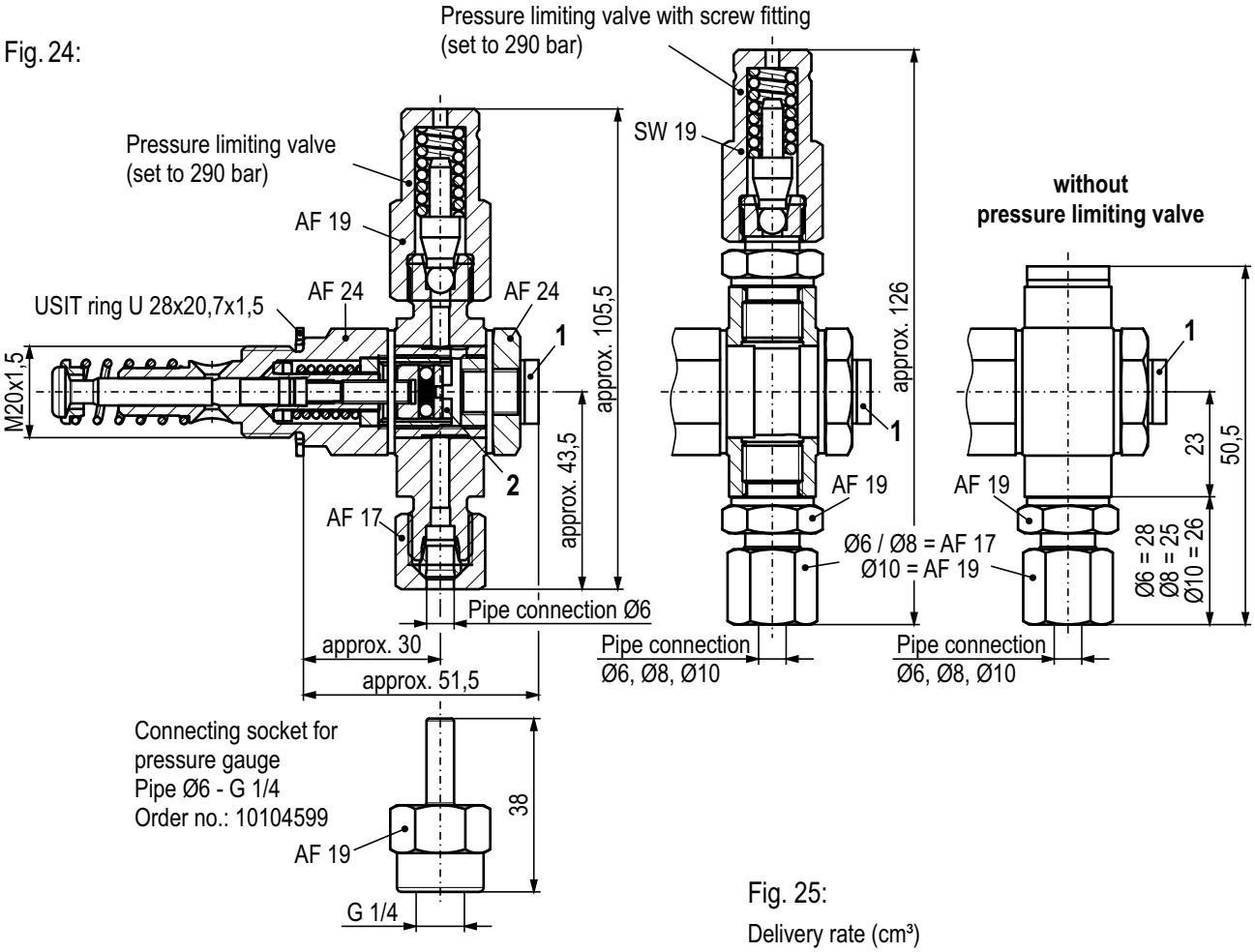
8.4 Pump elements

Two different construction types of pump elements can be installed into the device, depending on for which lubrication system or for which lubrication system combination the device is used.

8.4.1 Pump elements PE-120 FV

The pump element PE-120 FV is intended for the use in progressive lubrication systems. The delivery rate of this pump element can be set in the range from 0,04 cm³/stroke to 0,12 cm³/stroke. The pump element is deliverable with different pipe connections and with or without pressure limiting valve (see fig. 24).

Fig. 24:



Setting the delivery rate

- Remove the screw plug (1, see fig. 24) with an Allen key AF 5.
- Adjust the set screw (2, see fig. 24) with a screwdriver up to the required delivery rate.
- Turning clockwise reduces the delivery rate; turning counterclockwise increases the delivery rate.
- A revolution of the set screw corresponds to two detents. The set screw can be adjusted by a maximum of 6 detents (3 revolutions, see fig. 25).
- Retighten the set screw (1) incl. sealing ring with a tightening torque of 15 Nm ± 10% after setting the delivery rate.

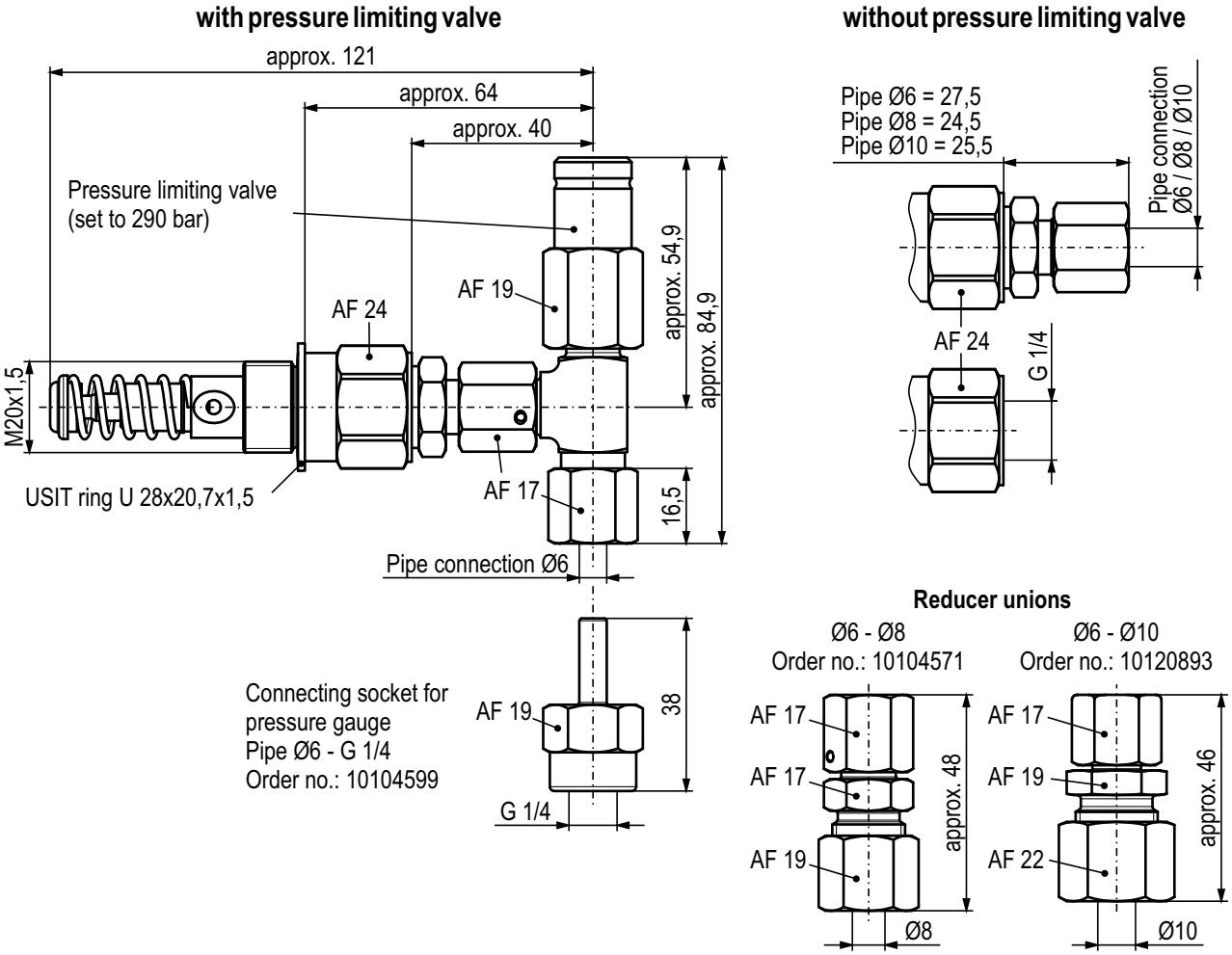
Fig. 25:

Notice! **The pump element PE-120 FV is set to full stroke ex works.**

8.4.2 Pump elements PE-60 F, PE-120 F and PE-170 F

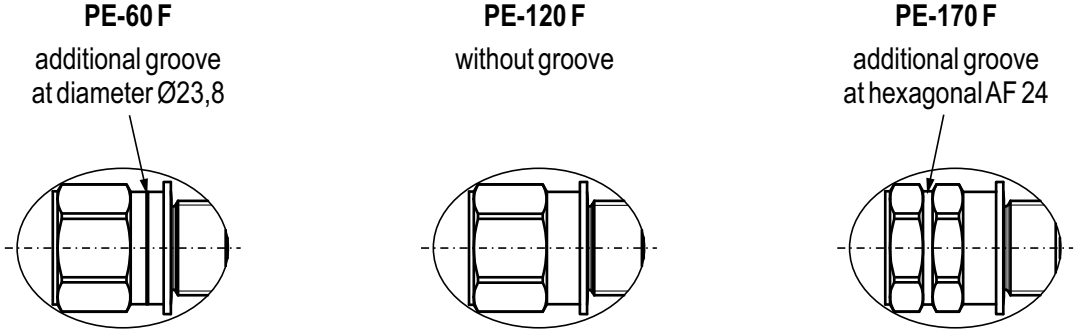
The pump elements PE-60 F, PE-120 F and PE-170 F are intended for the use in progressive lubrication systems. The delivery rate of these pump elements is set to 0,06 cm³/stroke (PE-60 F), 0,12 cm³/stroke (PE-120 F) or 0,17 cm³/stroke (PE-170 F) and cannot be adjusted. The pump elements are deliverable with different pipe connections and with or without pressure limiting valve (see fig. 26).

Fig. 26:



Each type of pump element has its own marking in order to enable a visual differentiation (see fig. 27).

Fig. 27:



8.4.3 Order numbers of the pump elements for progressive lubrication systems

Pump element	Pipe connection	Order no. (PE* w/o PLV**)	Order no. (PE* with PLV**)
PE-60 F	Ø6 mm	2152990671000	10165712
	Ø8 mm	2152990671101	2152990671004
	Ø10 mm	2152990671102	2152990671005
	G 1/4	10132469	2152990671006
PE-120 F	Ø6 mm	10164848	10136405
	Ø8 mm	10147838	2185990610001
	Ø10 mm	10164224	10178380
	G 1/4	10119820	10170001
PE-170 F	Ø6 mm	10137168	10117173
	Ø8 mm	10137172	10137194
	Ø10 mm	10137174	10137199
	G 1/4	10122889	10137202
PE-120 FV	Ø6 mm	2185990630100	10126548
	Ø8 mm	2185990630101	2185990630002
	Ø10 mm	2185990630102	2185990630003
	G 1/4	2185990630103	2185990630001

* PE = Pump element
** PLV = Pressure limiting valve

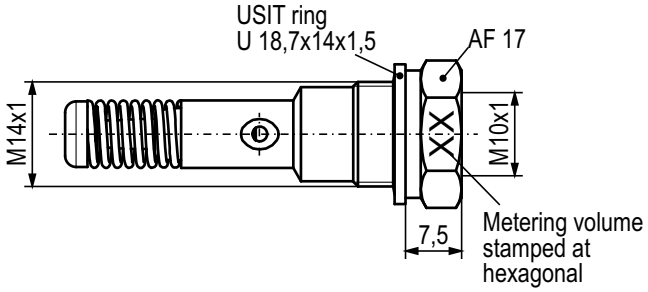
Notice! When these pump elements are ordered separately, the sealing is already included in the scope of delivery and does not have to be ordered separately.

8.4.4 Pump elements PE-5, PE-10, PE-15, PE-25 and PE-50

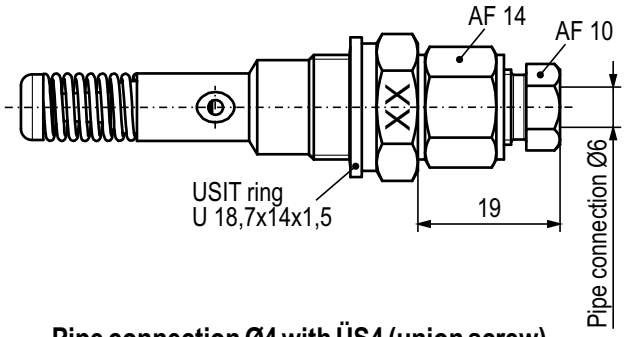
The pump elements PE-5, PE-10, PE-15, PE-25 and PE-50 are intended for the use in multi-line lubrication systems. The delivery rate of these pump elements is set to 5 mm³/stroke (PE-5), 10 mm³/stroke (PE-10), 15 mm³/stroke (PE-15), 25 mm³/stroke (PE-25) or 50 mm³/stroke (PE-50) and cannot be adjusted. The pump elements are deliverable with different pipe connections (see fig. 28).

Fig. 28:

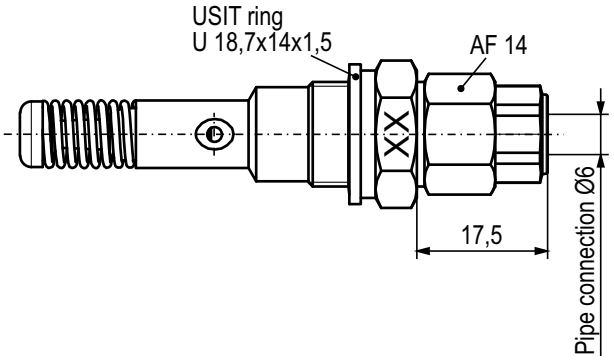
Thread connection M10x1



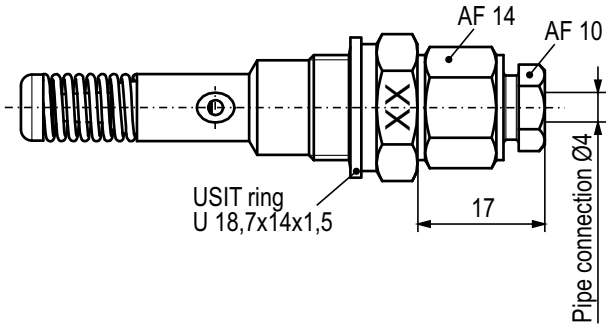
Pipe connection Ø6 with ÜS6 (union screw) and DKR6 (double conical ring)



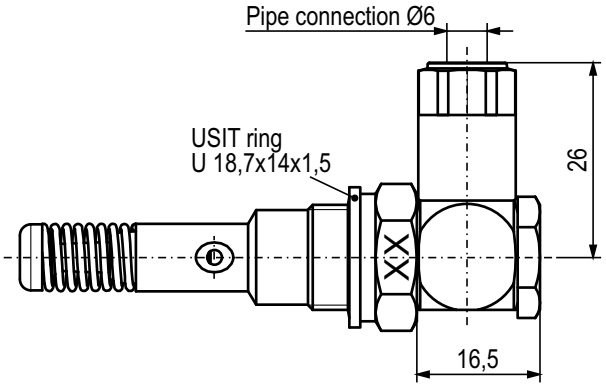
Straight plug-type connection for Ø6



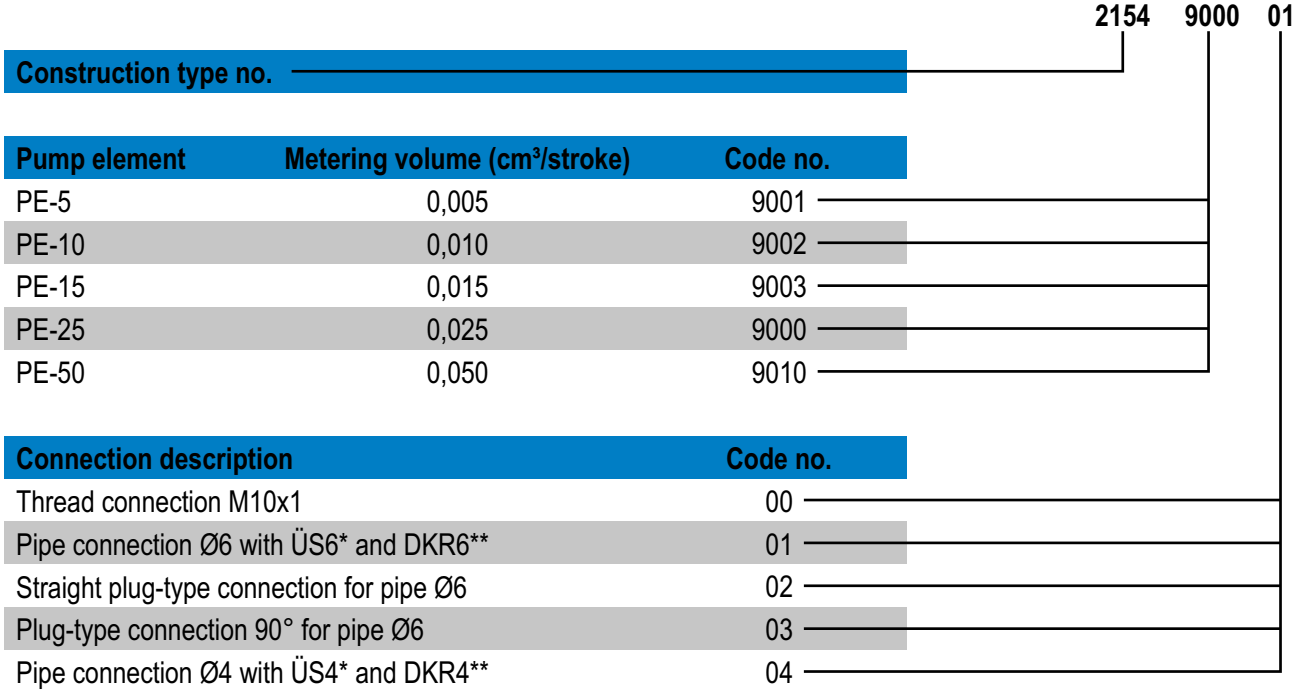
Pipe connection Ø4 with ÜS4 (union screw) and DKR4 (double conical ring)



Plug-type connection 90° for pipe Ø6



8.4.5 Code of the pump elements for multi-line lubrication systems



Pump element	Metering volume (cm³/stroke)	Code no.
PE-5	0,005	9001
PE-10	0,010	9002
PE-15	0,015	9003
PE-25	0,025	9000
PE-50	0,050	9010

Connection description	Code no.
Thread connection M10x1	00
Pipe connection Ø6 with ÜS6* and DKR6**	01
Straight plug-type connection for pipe Ø6	02
Plug-type connection 90° for pipe Ø6	03
Pipe connection Ø4 with ÜS4* and DKR4**	04

* ÜS = Union screw
** DKR = Double conical ring

Notice!

When the pump elements are ordered separately, the sealing is not included in the scope of delivery and has to be ordered separately if needed:
USIT ring U 18,7 x 14 x 1,5, order no.: 10100744

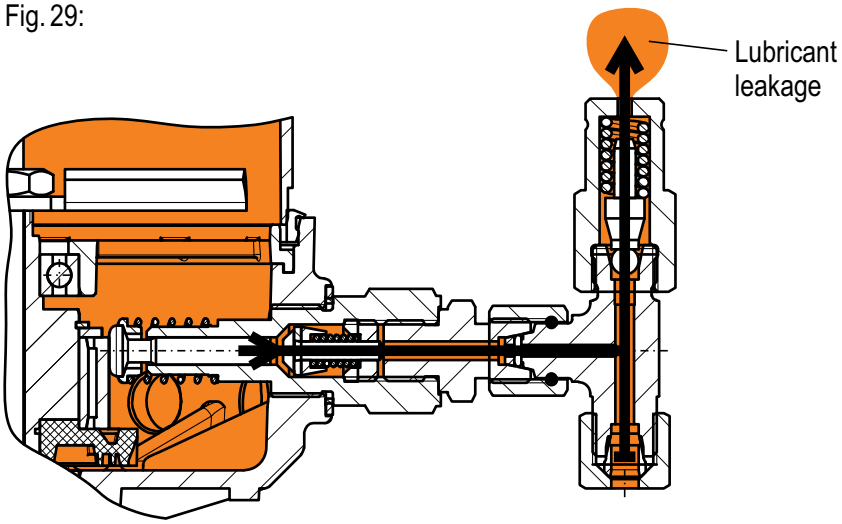
8.5 Pressure limiting valves

The individual lubrication circuits can be secured by a pressure limiting valve which can be attached at the pump elements PE-60 F, PE-120 F, PE-170 F and PE-120 FV when the device is used in a progressive lubrication system.

8.5.1 Pressure limiting valves without micro switch

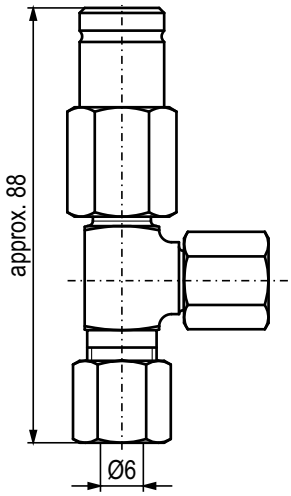
If the pressure in the lubrication system exceeds the value set at the pressure limiting valve, the pressure limiting valve opens and the lubricant leaks out at the top at the valve (see fig. 29).

Fig. 29:

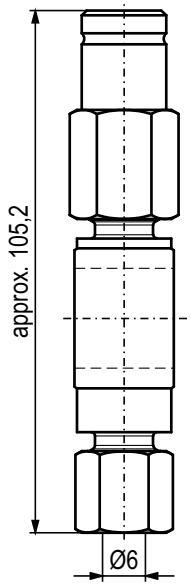


Lubricant can leak out at the pressure limiting valve under high pressure (290 bar)!
Wear corresponding personal protective equipment (e.g. safety goggles) and keep out of the direct area of the pressure limiting valve when there is a malfunction at the device.
Only work at the device when it is in a disconnected and pressureless state!

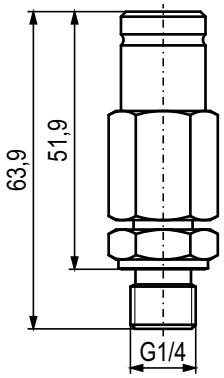
Fig. 30:



Pressure limiting valve
for PE-60 F, PE-120 F and PE-170 F
set to 290 bar
Order no.: 10101726



Pressure limiting valve for PE-120 FV
set to 290 bar
Order no.: 10135641



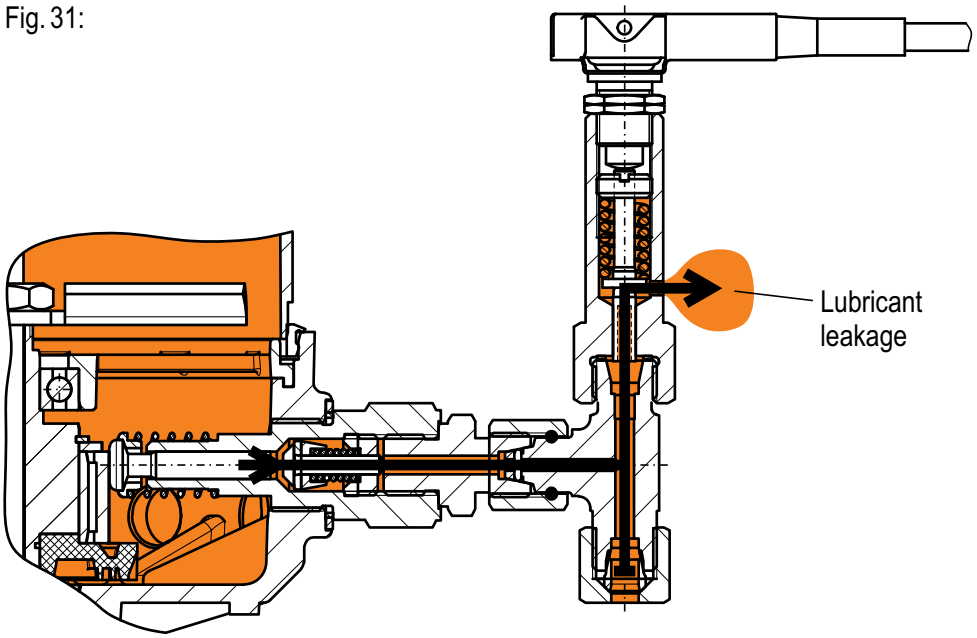
Pressure limiting valve
with fitting, for PE-120 FV
set to 290 bar
Order no.: 10106803

8.5.2 Pressure limiting valves with micro switch

The maximum operating pressure in the lubrication system can be electronically monitored by a micro switch which is attached at the pressure limiting valve.

The micro switch is operated when the pressure in the lubrication system exceeds the value set at the pressure limiting valve (see fig. 31). The emitted signal of the micro switch can be used customer specifically, e.g. for switching off the device.

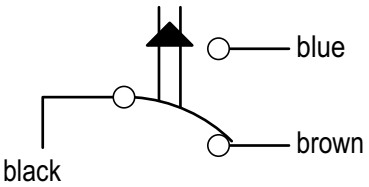
Fig. 31:



Technical data of the micro switch

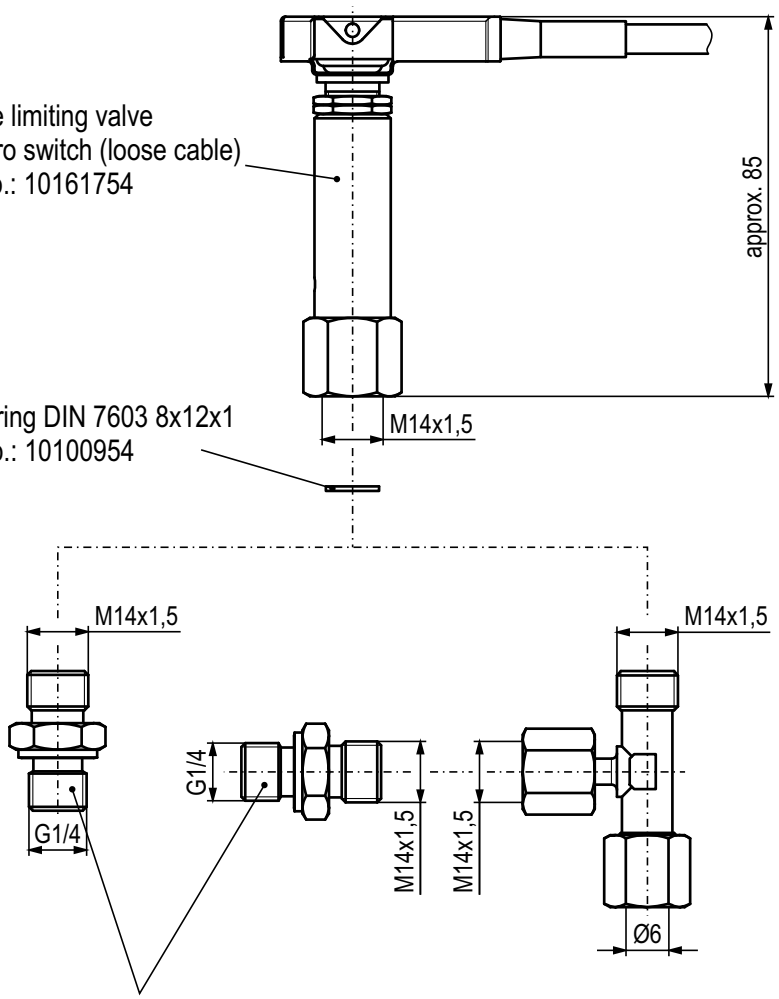
Supply voltage:	10 to 60 V DC
Current load max.:	I = 1,7 A
Contact type:	changeover contact
Temperature range:	-25°C to +85°C
Degree of protection:	IP 67
Connection:	cable 0,5 m long, welded (standard)

Connection diagram



Lubricant can leak out at the pressure limiting valve under high pressure (290 bar)!
Wear corresponding personal protective equipment (e.g. safety goggles) and keep out of the direct area of the pressure limiting valve when there is a malfunction at the device.
Only work at the device when it is in a disconnected and pressureless state!

Fig. 32:



Socket for pump element
PE-120 FV
(only for pipe Ø8 and pipe Ø10,
no socket is needed for pipe Ø6!)
Order no.: 10103671

Adjustable union tee
for pump elements
PE-60 F, PE-120 F and PE-170 F
Order no.: 10105538

8.6 Level monitoring

8.6.1 Level monitoring for devices with follow-up piston

A level monitoring is installed in devices with follow-up piston by default (see fig. 33).

When the reservoir of the device is empty, the follow-up piston (1) pushes onto a feeler (2). This feeler actuates a switch (3) which sends a signal. The emitted signal can be used for switching off the device, for a visual or acoustic warning or for an individual use by the customer.

The current level can additionally be checked visually at the level sticker (see fig. 34).

Fig. 33:

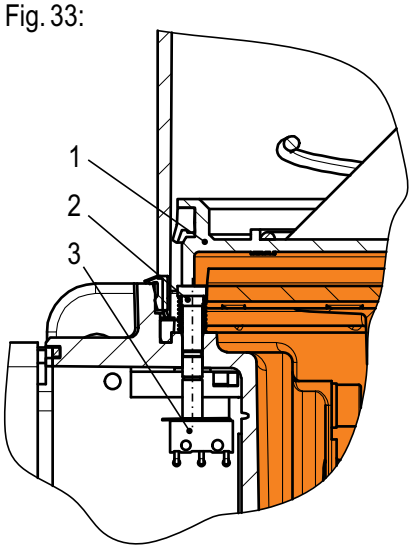


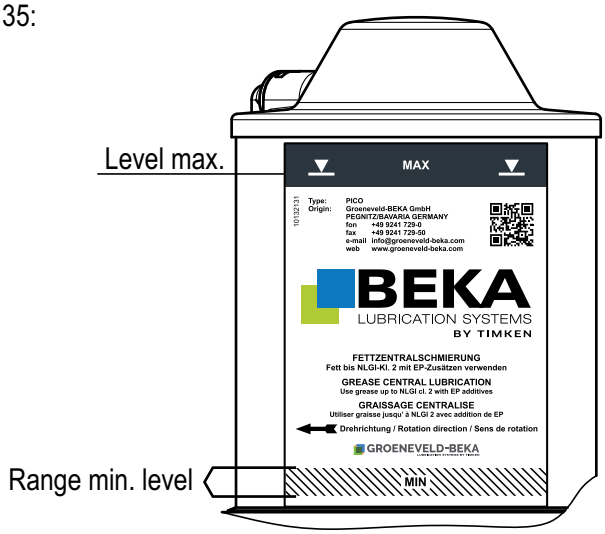
Fig. 34:

8.6.2 Level monitoring for devices with agitator blade

The installation of an electronic level monitoring is impossible for devices with agitator blade!

The level can only be visually checked at the level sticker (see fig. 35).

Fig. 35:



9. Retrofitting of an integrated control unit

There is the possibility of retrofitting an integrated control unit at the device.

The corresponding information on the reconstruction of the device and on the integrated control unit are available on request.

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 Lubricant change

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

- Check the level regularly and refill clean lubricant as necessary, see chapter 7. „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, Groeneveld-BEKA devices could contain batteries. Professionally and properly disposed batteries will be recycled. They contain important raw materials.

13. Troubleshooting

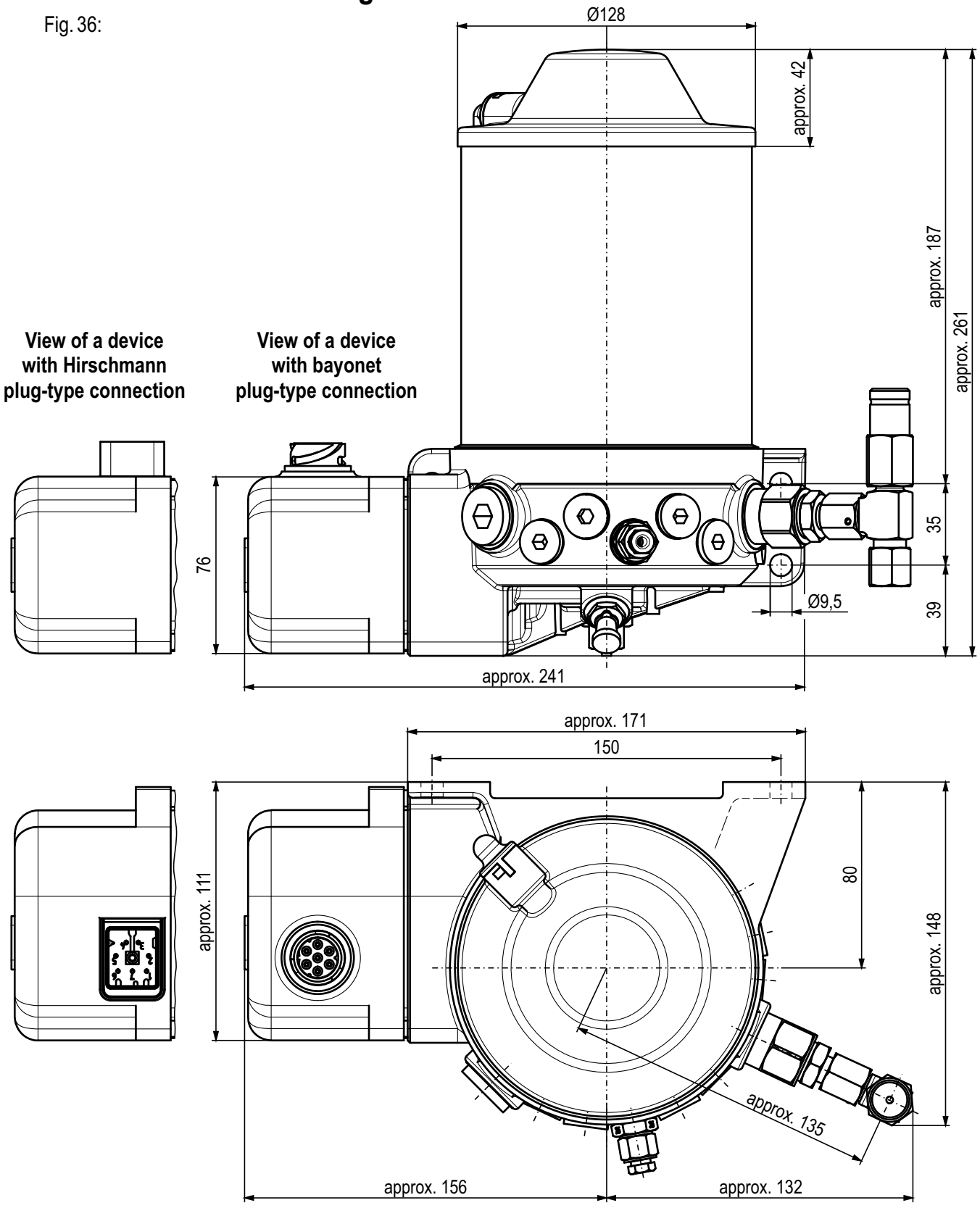
Malfunction	Possible cause	Possible remedy
Device does not operate	No power supply	Possibly renew fuse if installed
	Electrical line interrupted	Renew electrical line
	Device defective	Renew device
Device operates, but does not supply lubricant	Air pocket in delivery piston	Ventilate device
	Air pocket in reservoir	Ventilate device
	Reservoir empty	Fill reservoir
	Pump element defective	Renew pump element
No grease collar at any lube point	Device does not operate	See malfunction „Device does not operate“
	Lubrication system blocked	See malfunction „Lubricant leakage at pressure limiting valve“
No grease collar at several lube points	Supply lines to secondary distributor burst or leaky	Renew lines
	Fittings leaky	Retighten or renew fittings
Device‘s speed reduced	High system pressure	Check lubrication system / lube point (no damage)
	Supply voltage too low	Check supply voltage
Lubricant leakage at pressure limiting valve	System pressure too high	Check lubrication system
	Progressive distributor blocked	Renew affected progressive distributor
	Lubrication system blocked	Repair clogged / firm lube point
	Valve spring broken	Renew pressure limiting valve
Level monitoring sends a signal although the reservoir is filled	Level monitoring defective	Send device to Groeneveld-BEKA for repair
Device does not switch off although the reservoir is empty	Level monitoring defective	Send device to Groeneveld-BEKA for repair
	No level monitoring installed (devices with agitator blade)	Fill reservoir, ventilate device

14. Spare part list and drawing

Spare part lists and drawings are available on request.
Please indicate the article number of the device.

15. Dimensional drawing

Fig. 36:



16. Code

2185 . X . X . X . XX . XXXX

Construction type no.	**2185**

Motor voltage	**12 V DC**	**24 V DC**
with Hirschmann plug-type connection	1	2
with bayonet plug-type connection	3	4

Pump elements*			
Outlet position	**4**	**10**	**4+10**
without	0	0	0
PE-120 F	1	2	3
PE-120 FV	4	5	6
PE-120 F (pos. **4**) + PE-120 FV (pos. **10**)	-	-	7
PE-120 F (pos. **10**) + PE-120 FV (pos. **4**)	-	-	8

Reservoir capacity (l)	**1,5**
Effective volume (l)	**1,2**
Version with follow-up piston	1
Version with agitator blade	4

Integrated control unit	**without**
Code no.	10

Special version	
Code no.	0000

* with pressure limiting valve

Notice!

Pump elements, which are not selectable in the above-listed code, have to be ordered separately (see chapter 8.4.3 „Order numbers of the pump elements for progressive lubrication systems“ or chapter 8.4.5 „Code of the pump elements for multi-line lubrication systems“). Please also indicate the desired installation position per pump element (see fig. 5 in chapter 6.3 „Assembly of the pump elements“).

17. Declaration of incorporation

GROENEVELD-BEKA
LUBRICATION SYSTEMS BY TIMKEN

Einbauerklärung für unvollständige Maschinen

(nach EG-RL 2006/42/EG)

Der Hersteller: Groeneveld-BEKA GmbH
Beethovenstrasse 14
91257 Pegnitz / Germany
Tel.: +49 9241 729-0

erklärt hiermit, dass folgende unvollständige Maschine:

Produktbezeichnung:	FETTSCHMIERPUMPE
Typenbezeichnung:	PICO
Bestellschlüssel:	2185 ...
Seriennummer:	von A00001 bis Z99999

den folgenden grundlegenden Anforderungen der Richtlinie **Maschinen (2006/42/EG)** entspricht: Anhang I, Artikel 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, und 1.5.1.

Folgende harmonisierte Normen wurden angewandt:

DIN EN 809: 2012-10

DIN EN ISO 12100: 2011-03

Folgende sonstige Spezifikationen/Normen wurden angewandt:

VDE 0530-1: 2011-02

ECE Genehmigung
Folgende Pumpentypen wurden von der TÜV Süd Automotive GmbH getestet und durch das Kraftfahrt-Bundesamt (KBA) zur Verwendung genehmigt.
PICO mit PICO-tronic 12V 2185 ....
PICO mit PICO-tronic 24V 2185 ....
PICO mit PICO-troniX1 12V 2185 ....
PICO mit PICO-troniX1 24V 2185 ....
Das Genehmigungszeichen lautet (E1) 10R-057978

Die Schutzziele der Richtlinie **Elektrische Betriebsmittel 2014/35/EU** wurden gemäß Anhang I, Nr. 1.5.1 der Maschinenrichtlinie eingehalten.

Die unvollständige Maschine darf erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass die Maschine, in welche die unvollständige Maschine eingebaut werden soll, den Bestimmungen der Richtlinie Maschinen (2006/42/EG) entspricht.
Die zur Maschine gehörenden speziellen technischen Unterlagen nach Anhang VII Teil B wurden erstellt.

Der Hersteller (Abt. Dokumentation, Tel.: +49 9241 729-8779 E-Mail: documentation@groeneveld-beka.com) verpflichtet sich, die speziellen Unterlagen zur unvollständigen Maschine einzelstaatlichen Stellen auf Verlangen elektronisch zu übermitteln.

Pegnitz, den 30.09.2021

ppa. J. Brendel (Engineering Director / Authorized Officer)

Declaration of incorporation for partly completed machinery
(acc. to EC directive 2006/42/EC)

The manufacturer: Groeneveld-BEKA GmbH Beethovenstrasse 14
91257 Pegnitz / Germany Tel.: +49 9241 729-0

hereby declares that the following partly completed machinery:

Product description:	FETTSCHMIERPUMPE
Type designation:	PICO
Order key	2185 ...
Serial number:	from A00001 to Z99999

complies with the following essential requirements of the machinery directive (2006/42/EC):
Annex I, article 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, and 1.5.1.

The following harmonized standards have been applied:
DIN EN 809: 2012-10 DIN EN ISO 12100: 2011-03
The following other specifications/standards have been applied:

VDE 0530-1: 2011-02

ECE authorization
The following pump types have been tested by TÜV Süd Automotive GmbH and were approved for use by the Federal Office for Motor Vehicles (KBA).

PICO with PICO-tronic 12V 2185 ...
PICO with PICO-tronic 24V 2185 ...
PICO with PICO-troniX1 12V 2185 ...
PICO with PICO-troniX1 24V 2185 ...

The approval mark is: E1 10R-057978

The protection targets of the directive for electric equipment 2014/35/EU have been observed according to annex I, no. 1.5.1 of the machinery directive.
The partly completed machinery may only be put into service when it has been established that the machine, into which the partly completed machinery shall be installed, corresponds to the machinery directive (2006/42/EC).
The special technical documentation for the machine has been prepared according to annex VII part B.
The manufacturer (documentation department, phone +49 9241 729-8779, e-mail: documentation@groeneveld-beka.com) commits itself to pass the special documentation for partly completed machinery electronically on to individual national authorities upon request.

Pegnitz, 30.09.2021

ppa. J. Brendel (Engineering Director / Authorized Officer)

Dichiarazione di incorporazione per quasi-macchina
(secondo Direttiva Machine 2006/42/CE)

Il produttore: Groeneveld-BEKA GmbH Beethovenstrasse 14
91257 Pegnitz / Germania Tel.: +49 9241 729-0

dichiara con la presente che la seguente quasi-macchina:

Denominazione prodotto:	FETTSCHMIERPUMPE
Denominazione modello:	PICO
Numero d'ordinazione:	2185 ...
Numero di serie:	da A00001 a Z99999

è conforme alle disposizioni della direttiva per quasi-macchina (2006/42/CE):
Allegato I, Articoli 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, e 1.5.1.

Le seguenti norme armonizzate sono state applicate:
DIN EN 809: 2012-10 DIN EN ISO 12100: 2011-03
Le seguenti ulteriori specifiche/norme sono state applicate:

VDE 0530-1: 2011-02

Autorizzazione ECE
I seguenti tipi di pompa sono stati testati da TÜV Süd Automotive GmbH e sono stati approvati per l'uso da parte dell'Ufficio Federale per i Veicoli a Motore (KBA).

PICO con PICO-tronic 12V 2185 ...
PICO con PICO-tronic 24V 2185 ...
PICO con PICO-troniX1 12V 2185 ...
PICO con PICO-troniX1 24V 2185 ...

Il marchio dell'omologazione è E1 10R-057978

La direttiva di sicurezza sulle normative elettriche 2014/35/UE viene rispettata secondo l'allegato I, Nr. 1.5.1 per la quasi-macchina.
La quasi-macchina può essere attivata solo dopo aver appurato che l'impianto in cui deve essere installata sia conforme alle direttive dell'impianto. (2006/42/CE).
La documentazione tecnica specifica relativa alla quasi-macchina si trova nella parte B dell'allegato VII.
Il produttore (reparto documentazione, tel.: +49 9241 729-8779 e-mail: documentation@groeneveld-beka.com) si impegna a trasmettere elettronicamente su richiesta ai singoli organismi nazionali la specifica documentazione tecnica relativa alla quasi-macchina.

Pegnitz, 30.09.2021

ppa. J. Brendel (Engineering Director / Authorized Officer)

Déclaration d'incorporation pour quasi-machines
(selon Directive Machines 2006/42/CE)

Le fabricant : Groeneveld-BEKA GmbH Beethovenstrasse 14
91257 Pegnitz / Allemagne Tél.: +49 9241 729-0

déclare par la présente que la quasi-machine suivante:

Désignation du produit:	FETTSCHMIERPUMPE
Désignation du type:	PICO
Numéro de commande:	2185 ...
Numéro de série:	du A00001 au Z99999

est conforme aux exigences essentielles suivantes de la directive machines (2006/42/CE):
annexe I, articles 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, et 1.5.1.

Les normes harmonisées suivantes ont été appliquées:
DIN EN 809: 2012-10 DIN EN ISO 12100: 2011-03
Les autres spécifications/normes suivantes ont été appliquées:

VDE 0530-1: 2011-02

Autorisation ECE
Les types des pompes étaient testés par TÜV Süd Automotive GmbH et permettaient pour l'utilisation par l'Office Fédéral des véhicules (KBA).

PICO avec PICO-tronic 12V 2185 ...
PICO avec PICO-tronic 24V 2185 ...
PICO avec PICO-troniX1 12V 2185 ...
PICO avec PICO-troniX1 24V 2185 ...

La référence d'autorisation est E1 10R-057978

Les objectifs de protection de la directive matériel électrique 2014/35/UE ont été respectés conformément à l'annexe I, n°1.5.1 de la directive machines.
La quasi-machine ne doit pas être mise en service avant que la machine finale dans laquelle elle doit être incorporée ait été déclarée conforme aux dispositions de la directive machines (2006/42/CE).
La documentation technique spéciale pour la machine a été constituée conformément à l'annexe VII, partie B.
Le fabricant (département documentation, tél. : +49 9241 729-8779 e-mail : documentation@groeneveld-beka.com) s'engage à transmettre par voie électronique aux autorités nationales qui en feront la demande la documentation concernant la quasi-machine.

Pegnitz, 30.09.2021

ppa. J. Brendel (Engineering Director / Authorized Officer)

Declaración de incorporación para cuasi máquinas
(según Directiva Máquinas 2006/42/CE)

El fabricante: Groeneveld-BEKA GmbH Beethovenstrasse 14
91257 Pegnitz / Alemania Tel.: +49 9241 729-0

declara por medio de la presente que la siguiente cuasi máquina:

Denominación del producto:	FETTSCHMIERPUMPE
Denominación del tipo:	PICO
Número de pedido:	2185 ...
Número de serie:	de A00001 hasta Z99999

cumple los siguientes requisitos fundamentales de la directiva sobre maquinaria (2006/42/CE): Anexo I, Artículos 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4 y 1.5.1.

Se han aplicado las siguientes normas armonizadas:
DIN EN 809: 2012-10 DIN EN ISO 12100: 2011-03
Se han aplicado las siguientes especificaciones/normas adicionales:

VDE 0530-1: 2011-02

Autorización ECE
Los siguientes tipos de bombas han sido testadas por TÜV Süd Automotive GmbH y han sido aprobadas para ser utilizadas por la oficina federal para vehículos de motor (KBA)

PICO con PICO-tronic 12V 2185 ....
PICO con PICO-tronic 24V 2185 ....
PICO con PICO-troniX1 12V 2185 ...
PICO con PICO-troniX1 24V 2185 ...

El certificado de aprobación es: E1 10R-057978

Los objetivos de protección de la directiva relativa a material eléctrico 2014/35/UE se han cumplido de conformidad con el Anexo I, nº 1.5.1 de la directiva sobre maquinaria.
La cuasi máquina no debe ponerse en servicio hasta que se haya comprobado que la máquina donde debe instalarse la cuasi máquina cumple las disposiciones de la directiva sobre maquinaria (2006/42/CE).
Se ha elaborado la documentación técnica específica perteneciente a la máquina según el Anexo VII, Parte B.
El fabricante (Dpto. Documentación, tel.: +49 9241 729-8779 e-mail: documentation@groeneveld-beka.com) se obliga a facilitar electrónicamente la documentación específica de la cuasi máquina a organismos nacionales cuando así lo requieran.

Pegnitz, 30.09.2021

ppa. J. Brendel (Engineering Director / Authorized Officer)

18. Details of the manufacturer

Groeneveld-BEKA GmbH

Beethovenstraße 14
91257 PEGNITZ / Bayern
Germany

Tel. +49 9241 729-0
FAX +49 9241 729-50

POSTFACH 1320
91253 PEGNITZ / Bayern
Germany

http://www.groeneveld-beka.com
E-Mail: info-de@groeneveld-beka.com

Our range of supply:

Gear pumps
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
Wheel flange central lubrication systems
Rolling mill central lubrication systems
Commercial vehicle lubrication
Progressive distributors
Control and monitoring units