FF and FB multi-line pump units

for use in progressive centralized lubrication systems

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Read these instructions before installation or start-up of the product and keep them readily available for later consultation!

Original EC Declaration of Incorporation in accordance with Directive 2006/42/EC, Appendix II Part 1 B

The manufacturer hereby declares at its sole responsibility that the partly completed machinery conforms to the essential health and safety requirements of the Machinery Directive 2006/42/EC, Annex I, marked in the Annex to the EC Declaration of Incorporation as applicable and fulfilled at the time of placing on the market.
The special technical documents were prepared following Annex VII part B. Upon justifiable request, these special technical documents can be forwarded electronically to the respective national authorities. The authorized company for the compilation of the technical documentation is the manufacturer.

Designation: Multi-line pump unit
Type: Pump FF, FB
Item number: 773-*; 769-*; 767-* except for 767-030-*

Furthermore, the following directives and standards were applied in the respective applicable areas:
2006/42/EC: Machinery Directive
2011/65/EU: RoHS II
2014/30/EU: Electromagnetic Compatibility

EN ISO 12100:2010	EN 60204-1:2018	EN 61000-6-2:2005/AC:2005	EN 61000-6-4:2007/A1:2011
EN 61131-2:2007	EN 809:1998+A1:2009/AC:2010	EN 60034-1:2010/AC:2010	EN 60947-5-1:2004/A1:2009
EN 60947-5-2:2007/A1:2012			
EN IEC 63000:2018			

The partly completed machinery must not be put into service until it has been established that the machinery into which it is to be incorporated is in compliance with the provisions of the Machinery Directive 2006/42/EC and all other applicable Directives.

Walldorf, 03.02.2021
Jürgen Kreutzkämper
Manager, R&D
Germany

Stefan Schürmann
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Germany South

Manufacturer: SKF Lubrication Systems Germany GmbH, Heinrich-Hertz-Str. 2-8, 69190 Walldorf, Germany

Original UK Declaration of incorporation according to the Supply of Machinery (Safety) Regulations 2008 No. 1597 Annex II

The manufacturer hereby declares under sole responsibility that the partly completed machinery complies with the essential health and safety requirements of UK legislation Supply of Machinery (Safety) Regulations 2008 No. 1597 Annex I, marked in the Annex to the EC Declaration of Incorporation as applicable and fulfilled at the time of placing on the market.
The special technical documents were prepared following Annex VII part B. Upon justifiable request, these special technical documents can be forwarded electronically to the respective national authorities. The authorized company for the compilation of the technical documentation is SKF (U.K.) Limited, 2 Canada Close, Banbury, Oxfordshire, OX16 2RT, GBR.

Designation: Multi-line pump unit
Type: Pump FF, FB
Item number: 773-*; 769-*; 767-* except for 767-030-*

Furthermore, the following regulations and standards were applied in the respective applicable areas:
Supply of Machinery (Safety) Regulations 2008 No. 1597
Electromagnetic Compatibility Ordinance 2016 No. 1091
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 No. 3032

EN ISO 12100:2010	EN 60204-1:2018	EN 61000-6-2:2005/AC:2005	EN 61000-6-4:2007/A1:2011
EN 61131-2:2007	EN 809:1998+A1:2009/AC:2010	EN 60034-1:2010/AC:2010	EN 60947-5-1:2004/A1:2009
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Appendix to Declaration of Incorporation in accordance with 2006/42/EC, Annex II, No. 1 B

Description of the essential health and safety requirements according to 2006/42/EC, Annex I, which have been applied and fulfilled:

Table 1

Appendix to Declaration of Incorporation
Piston pumps with reservoir, with/without external motor, without control unit
Types: P205, P208, P212, P215, P230, ZPUxx, JM, FF, FB, FK, RA, TA, TB

No.:	Essential health and safety requirement	Applicable:	Fulfilled:
1.1	Principles		
1.1.2	Principles of safety integration	Yes	Yes
1.1.3	Materials and products	Yes	Not completely fulfilled [1)]
1.1.5	Design of machinery to facilitate its handling	Yes	Yes
1.1.6	Ergonomics	Yes	Not completely fulfilled [2)]
1.2	Control systems		
1.2.1	Safety and reliability of control systems	Yes	Yes
1.2.3	Starting	Yes	Yes
1.2.6	Failure of the power supply	Yes	Yes
1.3	Protection against mechanical hazards		
1.3.1	Risk of loss of stability	Yes	Yes
1.3.2	Risk of break-up during operation	Yes	Not completely fulfilled [3)]
1.3.4	Risks due to surfaces, edges or angles	Yes	Yes
1.3.7	Risks related to moving parts	Yes	Yes
1.3.9	Risks of uncontrolled movements	Yes	Yes
1.5	Risks due to other hazards		
1.5.1	Electricity supply	Yes	Yes
1.5.6	Fire	Yes	Yes
1.5.8	Noise	Yes	Yes
1.5.13	Emissions of hazardous materials and substances	Yes	Yes
1.5.15	Risk of slipping, tripping, or falling	Yes	Not completely fulfilled [4)]
1.6	Servicing		
1.6.1	Machinery maintenance	Yes	Yes
1.6.2	Access to operating positions and servicing points	Yes	Not completely fulfilled [5)]
1.6.4	Operator interventions	Yes	Yes
1.7	Information		
1.7.1	Information and warnings on the machinery	Yes	Yes
1.7.1.1	Information and information devices	Yes	Yes
1.7.2	Warning of residual risks	Yes	Yes
1.7.3	Marking of machinery	Yes	Yes
1.7.4	Operating instructions/assembly instructions	Yes	Yes
1.7.4.1	General principles for the drafting of operating instructions/assembly instructions	Yes	Yes
1.7.4.2	Contents of the operating instructions/assembly instructions	Yes	Yes
1.7.4.3	Sales literature	Yes	Yes

[1)] The product is designed for operation with non-hazardous media. The owner-operator must check whether the lubricant used has certain hazardous effects (such as sensitization). The installation of a drip pan could be required. Pressure-relief valves must also be used.

[2)] The operator must ensure that the pump is integrated into the higher-level machine in such a way that the pump can be operated and filled ergonomically.

[3)] The operator must protect the lubrication system against excessive pressure. This should be done by fitting every pump element with a pressure limiting valve with suitable opening pressure (see the “Technical data” for the pump in question).

[4)] Not relevant inside the incomplete machine (pump), only outside the partially completed machine. The machine's owner or operator is responsible here.

[5)] The owner-operator must ensure that the pump is integrated into the main machine in such a way that it can be operated without danger.

Masthead

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MO. 63134 USA

- South America -
SKF Argentina Pte. Roca 4145,
CP 2001 Rosario, Santa Fe

Warranty
The instructions contain no statements regarding the warranty or liability for defects. That information can be found in our General Terms of Payment and Delivery.

Training
We conduct detailed training in order to enable maximum safety and efficiency. We recommend taking advantage of this training. For further information, contact your authorized SKF dealer or the manufacturer.

Table of contents

Safety alerts, visual presentation, and layout

While reading these instructions, you will encounter various symbols, illustrations, and text layouts intended to help you navigate and understand the instructions. Their meaning is explained below.

Safety alerts:
Activities that present specific hazards (to life and limb or possible damage to property) are indicated by safety alerts. Always be sure to follow the instructions given in the safety alerts.

⚠ DANGER
These safety alerts indicate an imminent danger. Ignoring them will result in death or serious injury

⚠ WARNING
These safety alerts indicate potentially imminent danger. Ignoring them could result in death or serious injury

⚠ CAUTION
These safety alerts indicate potentially imminent danger. Ignoring them could result in minor injury

NOTICE
These safety alerts indicate a potentially harmful situation. Ignoring them could result in damage to property or malfunctions

Illustrations:
The illustrations used depict a specific product. For other products, they may have the function of a diagram only. This does not alter the basic workings and operation of the product.

Text layout:
- **First-order bulleted lists:** Items on a bulleted list start with a solid black dot and an indent.
  - **Second-order bulleted lists:** If there is a further listing of subitems, the second-order bulleted list is used.

1 **Legend:** A legend explains the numbered contents of an illustration, presented as a numbered list. Items in a legend start with a number (with no dot) and an indent.
  - **Second-order legend:** In some cases, the numbered contents of an image represent more than just one object. A second-order legend is then used.

1. **Instruction steps:** These indicate a chronological sequence of instruction steps. The numbers of the steps are in bold and are followed by a period. If a new activity follows, the numbering starts again at "**1.**"
  - **Second-order instruction steps:** In some cases, it is necessary to divide up a step into a few substeps. A sequence of second-order instruction steps is then used.

1. Safety instructions

1.1 General safety instructions

- Putting the products into operation or operating them without having read the instructions is prohibited. The operator must ensure that the instructions are read and understood by all persons tasked with working on the product or who supervise or instruct such persons. Retain the instructions for further use.
- The product may only be used in awareness of the potential dangers, in proper technical condition, and according to the information in this manual.
- Any faults that could affect safety must be remedied according to responsibility. The supervisor must be notified immediately in case of malfunctions outside one's individual scope of responsibility.
- Unauthorized modifications and changes can have an unpredictable effect on safety and operation. Unauthorized modifications and changes are therefore prohibited. Only original SKF spare parts and SKF accessories may be used.
- Any unclear points regarding proper condition or correct assembly/operation must be clarified. Operation is prohibited until issues have been clarified.
- The components used must be suitable for the intended use and the applicable operating conditions, e.g. max. operating pressure and ambient temperature range, and must not be subjected to torsion, shear, or bending.

1.2 General electrical safety instructions

- Electrical devices must be kept in proper condition. This must be ensured by periodic inspections in accordance with the relevant applicable standards and technical rules. The type, frequency, and scope of the inspections must be determined in accordance with the risk assessment to be carried out by the operator. Work on electrical components may be performed only by qualified electricians. Connect the electrical power only in accordance with the valid terminal diagram and in observance of the relevant regulations and the local electrical supply conditions.
- Work on electrical components may be performed only in a voltage-free state and using tools suitable for electrical work. Do not touch cables or electrical components with wet or moist hands.
- Fuses must not be bridged. Always replace defective fuses with fuses of the same type.
- Ensure proper connection of the protective conductor for products with protection class I. Observe the specified enclosure rating.
- The operator must implement appropriate measures to protect vulnerable electrical devices from the effects of lightning during use. The electrical device is not furnished with a grounding system for the dissipation of the respective electric charge and does not have the voltage strength necessary to withstand the effects of lightning.

1.3 General behaviour when handling the product

- Familiarize yourself with the functions and operation of the product. The specified assembly and operating steps and their sequences must be observed.
- Keep unauthorized persons away.
- Wear personal protective equipment always.
- Precautionary operational measures and instructions for the respective work must be observed.
- In addition to these Instructions, general statutory regulations for accident prevention and environmental protection must be observed.
- Precautionary operational measures and instructions for the respective work must be observed. Uncertainty seriously endangers safety.
- Safety-related protective and safety equipment must not be removed, modified or affected otherwise in its function and is to be checked at regular intervals for completeness and function.
- If protective and safety equipment has to be dismantled, it must be reassembled immediately after finishing the work, and then checked for correct function.
- Remedy occurring faults in the frame of responsibilities. Immediately inform your superior in the case of faults beyond your competence.
- Never use parts of the centralized lubrication system or of the machine as standing or climbing aids.

1.4 Intended use

Supply of lubricants.
Supply of lubricant to lubrication points.
Spare parts should only be used to replace faulty components of identical construction.
The product is intended solely for installation in another machine.
Use is only permitted within the scope of commercial or economic activity by professional users, in compliance with the specifications, technical data, and limits specified in this manual.

1.5 Persons authorized to use the product

Operator
A person who is qualified by training, knowledge and experience to carry out the functions and activities related to normal operation. This includes avoiding possible hazards that may arise during operation.

Specialist in electrics
Person with appropriate professional education, knowledge and experience to detect and avoid the hazards that may arise from electricity.

Specialist in mechanics
Person with appropriate professional education, knowledge and experience to detect and avoid the hazards that may arise

during transport, installation, start-up, operation, maintenance, repair and disassembly.

1.6 Foreseeable misuse

Any usage of the product other than as specified in this manual is strictly prohibited. Particularly prohibited are:

- Use of non-specified consumables, contaminated lubricants, or lubricants with air inclusions.
- Use of C3 versions in areas with aggressive, corrosive substances (e.g., high salt load).
- Use of plastic parts in areas with high exposure to ozone, UV light, or ionizing radiation.
- Use to supply, convey, or store hazardous substances and mixtures as defined in the CLP Regulation (EC 1272/2008) or GHS with acute oral, dermal, or inhalation toxicity or substances and mixtures that are marked with hazard pictograms GHS01-GHS06 and GHS08.
- Use to supply, convey, or store Group 1 fluids classified as hazards as defined in the Pressure Equipment Directive (2014/68/EU) Article 13 (1) a).
- Use to supply, convey, or store gases, liquefied gases, dissolved gases, vapors, or fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible operating temperature.
- Use in an explosion protection zone.
- Use without proper securing against excessively high pressures, in the case of pressurized products.
- Use outside of the technical data and limits specified in this manual.

1.7 Referenced documents

In addition to this manual, the following documents must be observed by the respective target group:

- Company instructions and approval rules

If applicable:

- Safety data sheet of the lubricant used
- Project planning documents
- Supplementary information regarding special designs of the pump. This you will find in the special system documentation.
- Instructions for other components for setting up the centralized lubrication system.

In addition to this manual, the following documents must be observed by the respective target group:

- Company instructions and approval rules

If applicable:

- Safety data sheet of the lubricant used
- Project planning documents
- Supplementary information regarding special designs of the pump. You can find this in the special system documentation.
- Instructions for other components for setting up the centralized lubrication system.
- SKF app for monitoring and setting Bluetooth-enabled SKF pumps. You can find the SKF app in the Apple App Store and the Google Play Store. Following registration, use of the app is free of charge.

1.8 Prohibition of certain activities

- Replacement of or modifications to the pistons of the pump elements
- Repairs or modifications to the drive
- Alterations to the control circuit board beyond adjustment of lubrication times and interval times or replacement in case of defect
- Alterations to the power supply board beyond replacement in case of defect

1.9 Painting plastic components and seals

The painting of any plastic components and seals of the products described is prohibited. Completely mask or remove plastic components before painting the main machine.

1.10 Safety markings on the product

No safety markings on the product

NOTE

In accordance with the results of the workstation risk assessment, additional labels (e.g., warnings, safety signs, prohibition signs, or labels in accordance with CLP/GHS) are to be attached by the operator if necessary.

1.11 Note on the type plate

The type plate provides important data such as the type designation, order number, and sometimes regulatory characteristics. To avoid loss of this data in case the type plate becomes illegible, it should be entered in the manual.

1.12 Notes on CE marking

CE marking is effected following the requirements of the applied directives requiring a CE marking:

- 2014/30/EC Electromagnetic Compatibility
- 2011/65/EU Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS II)
- 2006/42/EC Machinery directive

1.13 Note on Pressure Equipment Directive

Due to its performance characteristics, the product does not reach the limit values defined in Article 4, Paragraph 1, Subparagraph (a) (ii) and is excluded from the scope of Pressure Equipment Directive 2014/68/EU in accordance with Article 1, Paragraph 2 Subparagraph (f).

1.14 Note on UKCA marking

The UKCA conformity marking confirms the product's conformity with the applicable legal provisions of Great Britain.

1.15 Note on China RoHS mark

The China RoHS mark confirms that there is no danger to persons or the environment from the regulated substances contained within for the intended period of use (year number shown in the circle).

1.16 Emergency shutdown

This is done by a course of action to be defined by the operator.

1.17 Assembly, maintenance, fault, repair

Prior to the start of this work, all relevant persons must be notified of it. At a minimum, the following safety measures must be taken before any work is done:

- Unauthorized persons must be kept away
- Mark and secure the work area
- Cover adjacent live parts
- Dry any wet, slippery surfaces or cover them appropriately
- Cover hot or cold surfaces appropriately

Where applicable:

- Depressurize
- Isolate, lock and tag out
- Check to ensure live voltage is no longer present
- Ground and short-circuit

The product should be protected as much as possible from humidity, dust, and vibration, and should be installed so that it is easily accessible. Ensure an adequate distance from sources of heat or cold. Any visual monitoring devices present, such as pressure gauges, min./max. markings, or oil level gauges must be clearly visible. Observe the mounting position requirements.

Drill required holes only on non-critical, non-load-bearing parts of the operator's infrastructure. Use existing holes where possible. Avoid chafe points. Immobilize any moving or detached parts during the work. Adhere to the specified torques.

If guards or safety devices need to be removed, they must be reinstalled immediately following conclusion of work and then checked for proper function.

Check new parts for compliance with the intended use before using them.

Avoid mixing up or incorrectly assembling disassembled parts. Label parts. Clean any dirty parts.

1.18 First start-up, daily start-up

Ensure that:

- All safety devices are fully present and functional
- All connections are properly connected
- All parts are correctly installed
- All warning labels on the product are fully present, visible, and undamaged
- Illegible or missing warning labels are immediately replaced

1.19 Residual risks

Table 2

Residual risks

Residual risk	Possible in lifecycle	Avoidance / Remedy
Personal injury / property damage due to falling of hoisted parts	A B C G H K	• Unauthorized persons must be kept away. Nobody is allowed to be present below hoisted parts. Lift parts using suitable and tested lifting gear.
Personal injury/property damage due to tilting or falling product due to non-compliance with specified torques	B C D E F G	• Adhere to the specified torques • Mount the product only on components with a sufficient load-carrying capacity. • If no torques are specified, use those specified for the screw size for screws of strength class 8.8.
Personal injury / property damage due to electric shock	B C D E F G H	• Inspect power cables for damage prior to initial use and then at regular intervals. • Before connecting the pump unit, de-energize all relevant electrical components. Observe any discharge times. • Do not install the cable on moving parts or wearing spots. If this cannot be avoided, use anti-kink coils and/or conduits.
Personal injury / property damage due to spilled, leaked lubricant	B C D E F G H K	• Be careful when filling the reservoir and then connecting or disconnecting the lubricant lines. • Use only hydraulic screw unions and lubrication lines suitable for the specified pressure. • Do not install lubrication lines on moving parts or chafe points. If this cannot be avoided, use flexible hose lines or anti-kink coils and/or conduits. • Promptly apply suitable binding agents and then remove the spilled or leaked lubricant. • Follow operational instructions for handling the lubricants and contaminated parts.
Injury from contact with the stirring paddle when filling the pump	C D F	• Preferably fill via the fill connection. Fill from the top, only when the paddle is motionless, and with the pump de-energized. Do not reach into the reservoir while filling.
Injury from hot/faulty motor	E F G	• Switch off the pump. Let parts cool off; remedy the cause.
Injury due to spring tension in reservoirs with a follower plate	F G H	• Wait until tension has been relieved on the spring as much as possible (i.e., the reservoir is empty) before removing a reservoir with a follower plate. Provide a suitable protective measures when loosening the reservoir, e.g., a retaining strap. Do not work with your head directly above the reservoir.

Lifecycle phases: A = Transport, B = Assembly, C = First start-up, D = Operation, E = Cleaning, F = Maintenance, G = Malfunction, repair, H = Shutdown, K = Disposal

2. Lubricants

2.1 General information

Lubricants are selected specifically for the relevant application. The manufacturer or operator of the machine should ideally make the selection in consultation with the supplier of the lubricant. If you have no or little experience in selecting lubricants for lubrication systems, please contact us. We would be happy to assist you in selecting suitable lubricants and components to build a lubrication system optimized for your particular application. Consider the following points when selecting/using lubricants. This will spare you potential downtime and damage to the machine or lubrication system.

2.2 Material compatibility

The lubricants must generally be compatible with the following materials:

- Plastics: ABS, CR, FPM, NBR, NR, PA, PET, PMMA, POM, PP, PS, PTFE, PU, PUR
- Metals: steel, gray cast iron, brass, copper, aluminum

2.3 Temperature properties

The lubricant used must be suitable for the specific ambient temperature of the product. The viscosity approved for proper functioning must neither be exceeded at low temperatures nor fall too low at high temperatures. For the approved viscosity, see the “Technical data” chapter.

2.4 Aging of lubricants

Based on past experience with the lubricant used, checks should be conducted at regular intervals defined by the operator, to determine whether the lubricant needs to be replaced due to aging processes (oil separation). In case of doubt regarding the continued suitability of the lubricant, it must be replaced before the system is started up again. If you do not yet have any experience with the lubricant used, we recommend conducting a check after just one week.

2.5 Avoidance of faults and hazards

To avoid faults and hazards, please observe the following:

- When handling lubricants, observe the relevant safety data sheet (SDS) and any hazard labeling on the packaging.
- Due to the large number of additives, some lubricants that meet the pumpability requirements specified in the manual are not suitable for use in centralized lubrication systems.
- Whenever possible, always use SKF lubrication greases. They are ideal for use in lubrication systems.
- Do not mix lubricants. This can have unpredictable effects on the properties and usability of the lubricant.
- Use lubricants containing solid lubricants only after technical consultation with SKF.
- The lubricant’s ignition temperature has to be at least 50 kelvin above the maximum surface temperature of the components.

2.6 Solid lubricants

Solid lubricants may only be used after prior consultation with SKF. When solid lubricants are used in lubrication systems, the following rules generally apply:

Graphite:

- Maximum graphite content 8%
- Maximum grain size 25 µm (preferably in lamellar form)

MoS2:

- Maximum MoS2 content 5%
- Maximum grain size 15 µm

Copper:

- Lubricants containing copper are known to lead to coatings forming on pistons, bore holes, and mating surfaces. This can result in blockages in the centralized lubrication system.

Calcium carbonate:

- Lubricants containing calcium carbonate are known to lead to very heavy wear on pistons, bore holes, and mating surfaces.

Calcium hydroxide:

- Lubricants containing calcium hydroxide are known to harden considerably over time, which can lead to failure of the centralized lubrication system.

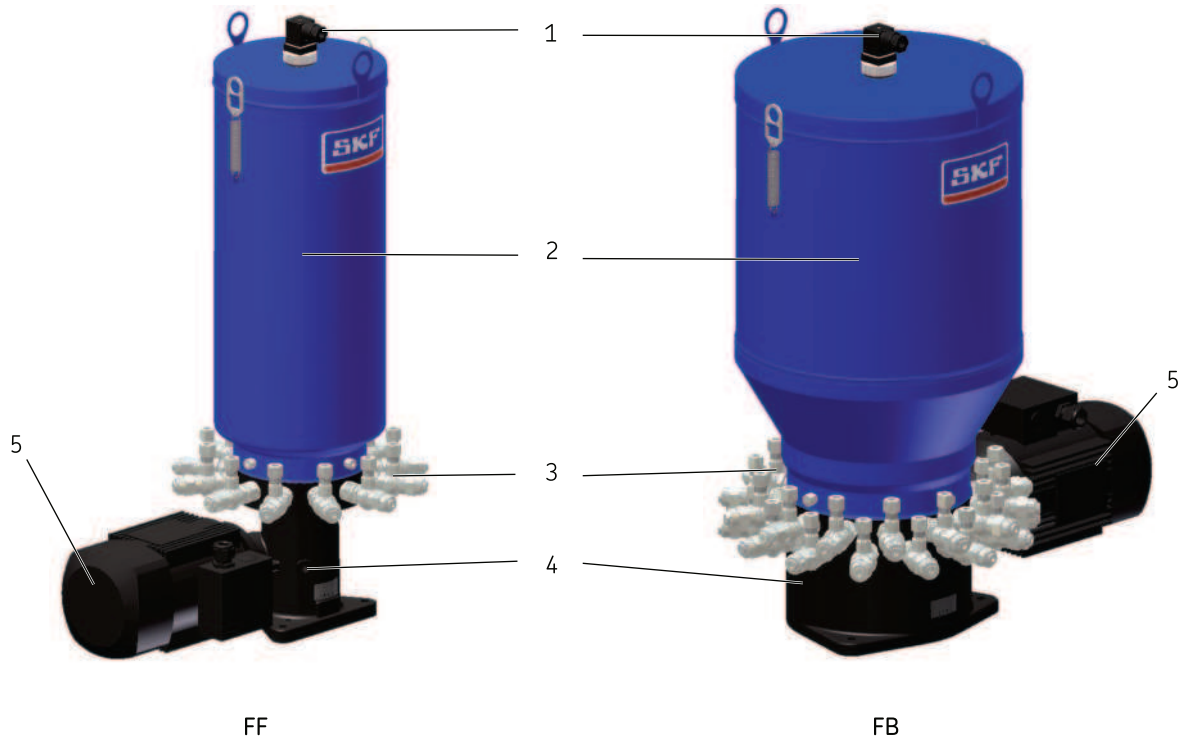
PTFE, zinc, and aluminum:

- For these solid lubricants, it is not yet possible to define any limit values for use in lubrication systems on the basis of existing knowledge and practical experience.

3. Overview, functional description

3.1 Overview

Fig. 1



FF and FB pump units

1 Fill level control/lubricant level switch/ultrasonic sensor
2 Lubricant reservoir
3 Pump elements with ring connection
4 Fill connection
5 Pump motor with electrical connection

3.2 Function

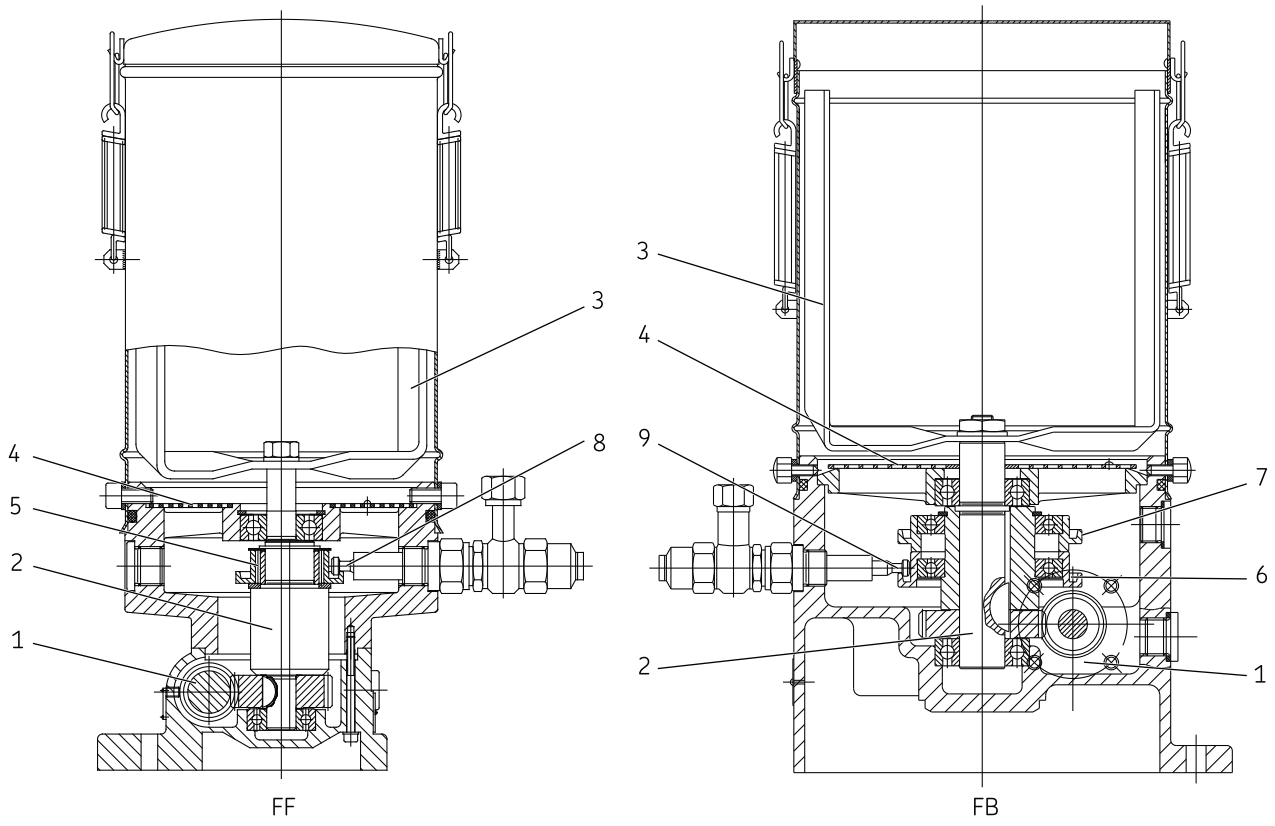
3.2.1 Pump operation

(→ Fig. 2)
The pump is driven by a worm drive (**1**) consisting of a worm and related worm gear. The worm gear drives the eccentric drive shaft (**2**) with the fitted stirring paddle (**3**). The stirring paddle (**3**) pushes the lubricant through the strainer (**4**) into the pump's inlet chamber.

The eccentric drive shaft (**2**) has a guide ring running on needle bearings (FF (**5**)) (two guide rings running on ball bearings FB (**6**,**7**)) to hold the delivery piston heads of the pump elements (FF (**8**)) (FB (**9**)).

The eccentric motion of the guide ring(s) forcibly moves the attached pump element delivery pistons.

Fig. 2



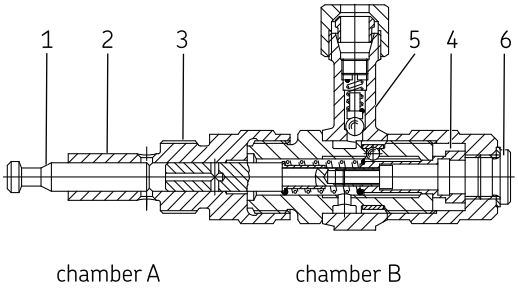
Sectional view of FF and FB

3.2.2 Pump element operation

(→ Fig. 3)
The delivery piston is forcibly actuated as described in "Pump operation." In the suction stroke position (as illustrated), the cross hole of the control piston (3) is closed. At the start of the pressure stroke, the delivery piston (1) closes the suction bore. The suctioned lubricant in chamber A is pressed against the spring-loaded control piston (3). The cross hole in the control piston (3) is opened. The lubricant passes through the cross and longitudinal holes of the control piston (3) under pressure, entering chamber B, where it flows through the ring duct and the check valve (5) to the outlet. Once the pressure stroke is complete, the suction stroke of the delivery piston (1) begins.

This movement of the delivery piston (1) also brings the control piston (3) back to its initial position by the force of the spring. The suction stroke movement of the delivery piston (1) generates negative pressure in chamber A. When the suction bore opens, the lubricant flows into chamber A due to the negative pressure.
The pump element is now prepared for the next lubrication cycle.

Fig. 3



Pump element design
1 Delivery piston
2 Screw-in cylinder
3 Spring-loaded control piston
4 Setting sleeve
5 Ring piece with check valve
6 Plug screw

4. Technical data

Table 3

Technical data for FB

Designation	Values
Mounting position	Vertical
Ambient and lubricant temperature range	-15 °C to + 40 °C [1]
Reservoir	
– Drive position B/H	6, 15 or 30 kg
– Drive position E	6 or 15 kg
Number of pump elements	
– Lower row	1 to 12
– Upper row	13 to 24
Filling	Via fill connection G 1/2"
Weight empty, without pump elements	
– FB 06	Approx. 26 kg
– FB 15	Approx. 28 kg
– FB 30	Approx. 30 kg
Gearbox 1M	
Type	Worm drive, dual-stage
Gear ratios	105:1; 288:1; 720:1
Gearbox 2M	
Type	Worm drive, single-stage
Gear ratios	45:1
Motor	See section 4.2 and the name plate [2]
Pump	
Type	Multipiston pump with 1 to 24 outlet ports
Pump elements	
Delivery volume	
Piston Ø 6	0.027 to 0.08 cm^3/stroke
Piston Ø 8	0.050 to 0.15 cm^3/stroke
Piston Ø 10	0.077 to 0.23 cm^3/stroke
Operating pressure	
Piston Ø 6	Max. 350 bar
Piston Ø 8	Max. 200 bar
Piston Ø 10	Max. 125 bar
Lubricants [3]	Mineral oils (base oils) or environmentally compatible oils from ISO VG 46 to greases of NLGI Grade 3
Operating viscosity (oil)	> 50 to 5000 mm^2/s
Worked penetration (grease)	> 220 1/10 mm
Max. flow pressure	< 750 mbar
Proportion of solid lubricants in accordance with DIN 51825 lubricant specification	< 5%

1) At higher ambient temperatures, note that there is reduction in (motor) performance of approx. 1% per Kelvin.

2) Other specifications available on request.

3) Synthetic and biodegradable oils or greases require approval from SKF.

Table 4

Technical data for FF

Designation	Values
Mounting position	Vertical
Ambient and lubricant temperature range	-15 °C to + 40 °C [1]
Reservoir	4 or 10 kg
Number of pump elements	1 to 12
Filling	Via fill connection G 3/8"
Weight empty	
– FF 04	Approx. 15 kg
– FF 10	Approx. 20.5 kg
Gearbox 1M	
Type	Worm drive, dual-stage
Gear ratios	80:1; 150:1; 300:1; 600:1
Gearbox 2M	
Type	Worm drive, single-stage
Ratio	33:1
Motor	See section 4.2 and the name plate [2]
Pump	
Type	Multipiston pump with 1 to 12 outlet ports
Pump elements	
Delivery volume	
Piston Ø 6	0.027 to 0.08 cm^3/stroke
Piston Ø 8	0.050 to 0.15 cm^3/stroke
Piston Ø 10	0.077 to 0.23 cm^3/stroke
Operating pressure	
Piston Ø 6	Max. 350 bar
Piston Ø 8	Max. 200 bar
Piston Ø 10	Max. 125 bar
Lubricants [3]	Mineral oils (base oils) or environmentally compatible oils from ISO VG 46 to greases of NLGI Grade 3
Operating viscosity (oil)	> 50 to 5000 mm^2/s
Worked penetration (grease)	> 220 1/10 mm
Max. flow pressure	< 750 mbar
Proportion of solid lubricants in accordance with DIN 51825 lubricant specification	< 5%

1) At higher ambient temperatures, note that there is reduction in (motor) performance of approx. 1% per Kelvin.
2) Other specifications available on request.
3) Synthetic and biodegradable oils or greases require approval from SKF.

4.1 Technical data for lubricant level switch

Table 5

Technical data for lubricant level switch

Designation	Values
Lubricant level switch A	
Design	Microswitch with three switching points (maximum, minimum pre-warning, minimum) and dip stick
Switched current, max.	15 A AC / 10 A DC
Switching voltage, max.	250 V AC/30 V DC
1. Maximum fill level	Contact 1+2 open Contact 1+3 open
2. Fill level pre-warning	Contact 1+2 closed Contact 1+3 open
3. Minimum fill level	Contact 1+2 closed Contact 1+3 closed
Connection diagram	Plug, EN 175301-803 (DIN 43650)
Enclosure rating	IP 65
Fill level switch E	
Design	Reed contact for monitoring minimum level
Form of contact	Changeover contact
Switching capacity, max.	60 W/VA
Switching voltage, max.	230 V DC/AC
Switched current, max.	1 A
Connection diagram	Plug, EN 175301-803 (DIN 43650)
Enclosure rating	IP 65
Lubricant level switch F	
Design	reed contact for monitoring minimum and maximum level
Form of contact	NC contact/NO-contact
Switching capacity, max.	60 W/VA
Switching voltage, max.	230 V DC/AC
Switched current, max.	1 A
Connection diagram	Plug, EN 175301-803 (DIN 43650)
Enclosure rating	IP 65
Lubricant level switch W	
Design	Reed contact for monitoring minimum level
Form of contact	Changeover contact
Switching capacity, max.	15 W/VA
Switching voltage, max.	240 V AC/120 V DC
Switched current, max.	1 A
Connection diagram	Plug, EN 175301-803 (DIN 43650)
Enclosure rating	IP 65
Lubricant level switch H	
Design	Reed contact with three switching points (maximum, minimum pre-warning, minimum)
1. Maximum fill level	NO contact
2. Fill level pre-warning	NO contact
3. Min. fill level	Changeover contact
Switching capacity, max.	60 W/VA
Switching voltage, max.	10-30 V DC/AC
Switched current, max.	1 A
Connection diagram	Plug, EN 175301-803 (DIN 43650)

Table 5

Technical data for lubricant level switch

Designation	Values
Enclosure rating	IP 65
Analog ultrasonic sensor U3	
Blind zone	0 to 65 mm
Operating range, max.	500 mm
Sensing range	600 mm
Opening angle of switching loop	See table 17
Ultrasonic frequency	approx. 400 Hz
Reproducibility	± 0.15 %
Operating voltage U_B	9 V to 30 V DC, reverse polarity resistant
Residual ripple	± 10 %
No-load power consumption	≤ 40 mA
Housing	PBT, polyester
Enclosure rating	IP67
Setting option	LCA-2 with LinkControl (optional)
Display elements	LED D2 green (teach-in) LED D1 green/red object in/outside analog window
Operating temperature	-40°C to +70°C
Current output 4-20 mA	R_L ≤ 100 Ω at 9 V ≤ U_B ≤ 15 V R_L ≤ 500 Ω at U_B ≥ 15 V, rising/falling characteristics
Voltage output 0-10 V	R_L ≤ 100 kΩ at U_B ≥ 15 V short-circuit proof, rising/falling characteristics

4.2 Motor ratings

4.2.1 FB pumps

Table 6

Motor ratings, 1M design

Rated speed [rpm]	Frequency [Hz]	Rated power [kW]	Rated voltage [V]	Rated current [A]	Order codes
1 000	50	0.25	230/400	1.91/1.1	AG
			290/500	1.45/0.84	AL
			400/690	1.07/0.62	AP
1 500		0.25	230/400	1.36/0.78	AF
			290/500	1.08/0.62	AK
			400/690	0.78/0.45	AO

Note!
This data refers to three-phase motors from VEM. There may be differences with motors from other manufacturers.

Table 7

Motor ratings, 2M design

Rated speed [rpm]	Frequency [Hz]	Rated power [kW]	Rated voltage [V]	Rated current [A]	Order codes
1 000	50	0.25	230/400	1.91/1.10	AG
			290/500	1.45/0.84	AL
			400/690	1.07/0.62	AP
1 500		0.37	230/400	1.84/1.06	AF
			290/500	1.47/0.85	AK
			400/690	1.06/0.62	AO

Note!
This data refers to three-phase motors from VEM. There may be differences with motors from other manufacturers.

4.2.2 FF pumps

Table 8

Motor ratings, 1M design

Rated speed [rpm]	Frequency [Hz]	Rated power [kW]	Rated voltage [V]	Rated current [A]	Order codes
1 000	50	0.09	230/400	0.80/0.46	AG
			290/500	0.64/0.37	AL
			400/690	0.46/0.26	AP
1 500		0.18	230/400	1.13/0.65	AF
			290/500	0.90/0.52	AK
			400/690	0.65/1.07	AO

Note!
This data refers to three-phase motors from VEM. There may be differences with motors from other manufacturers.

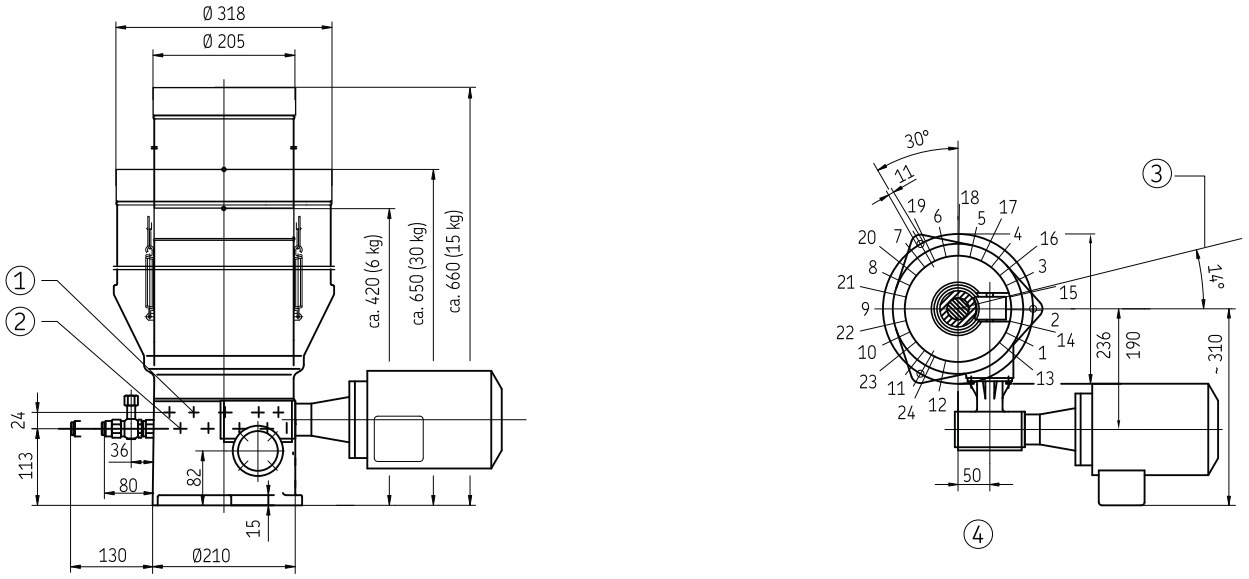
Table 9

Motor ratings, 2M design

Rated speed [rpm]	Frequency [Hz]	Rated power [kW]	Rated voltage [V]	Rated current [A]	Order codes
750	50	0.12	230/400	1.27/0.73	AH
			290/500	0.34/0.58	AM
			400/690	0.73/1.26	AQ
1 000		0.25	230/400	1.91/1.10	AG
			290/500	0.51/0.88	AL
			400/690	0.10/0.17	AP

Note!
This data refers to three-phase motors from VEM. There may be differences with motors from other manufacturers.

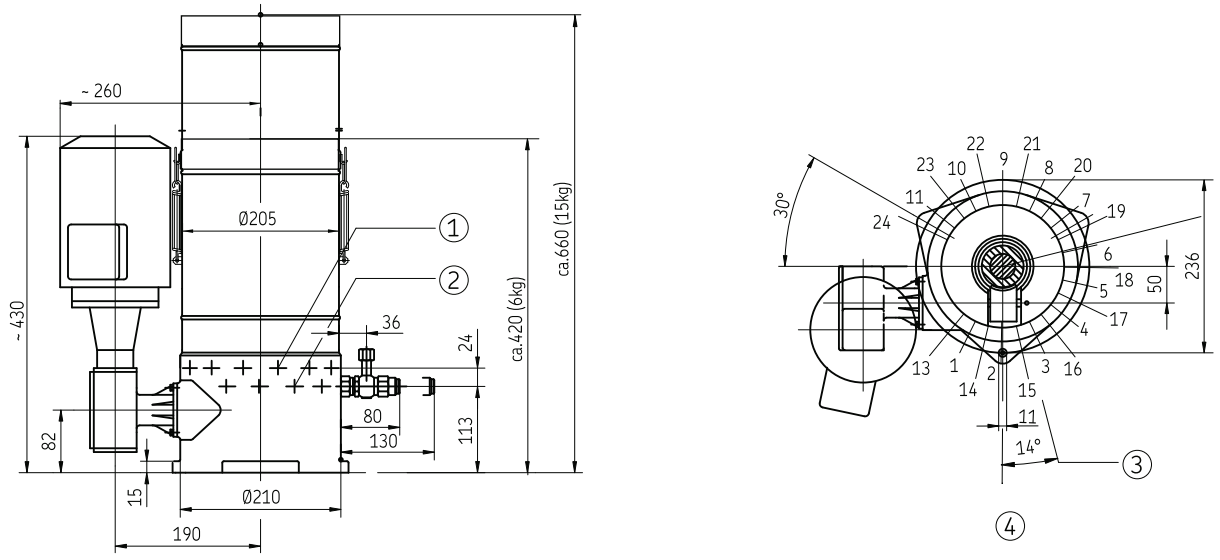
Fig. 4



Multi-line pump unit FB, 1M, drive position B

1 Pump elements, rows 13–24
2 Pump elements, rows 1–12
3 Fill connection G 1/2"
4 Position of pump elements

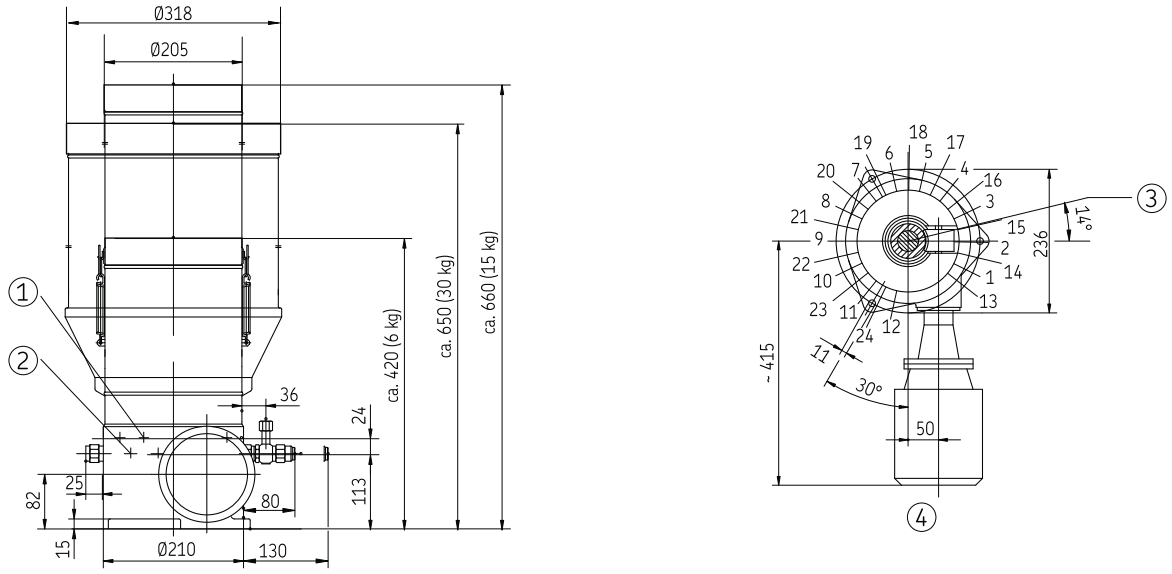
Fig. 5



Multi-line pump unit FB, 1M, drive position E

1 Pump elements, rows 13–24
2 Pump elements, rows 1–12
3 Fill connection G 1/2"
4 Position of pump elements

Fig. 6



<***Multi-line pump unit FB, 2M, drive position H***

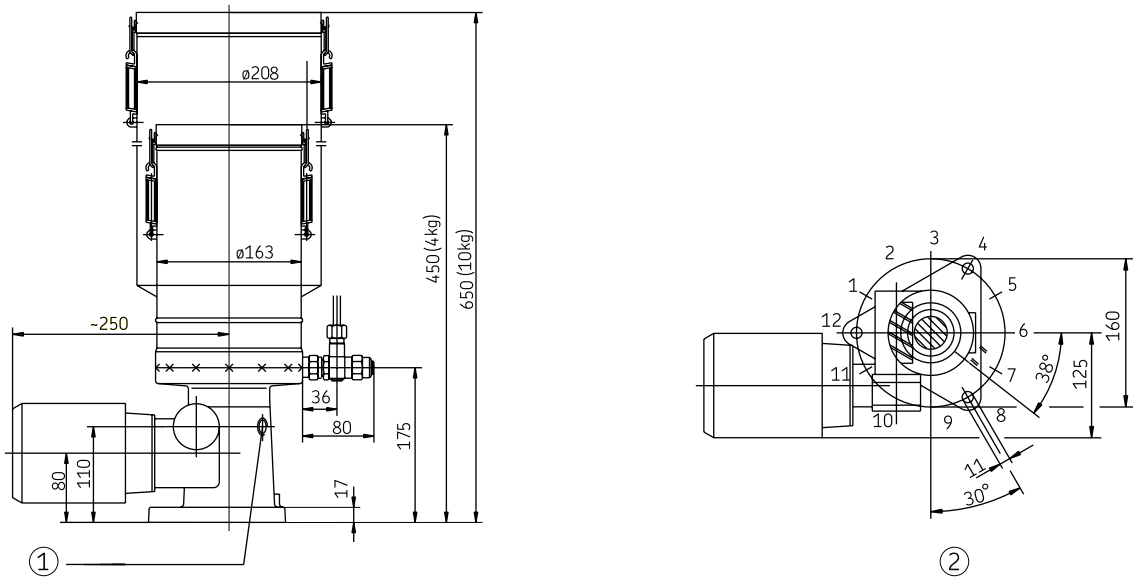
1 Pump elements, rows 13–24

2 Pump elements, rows 1–12

3 Fill connection G 1/2"

4 Position of pump elements

Fig. 7

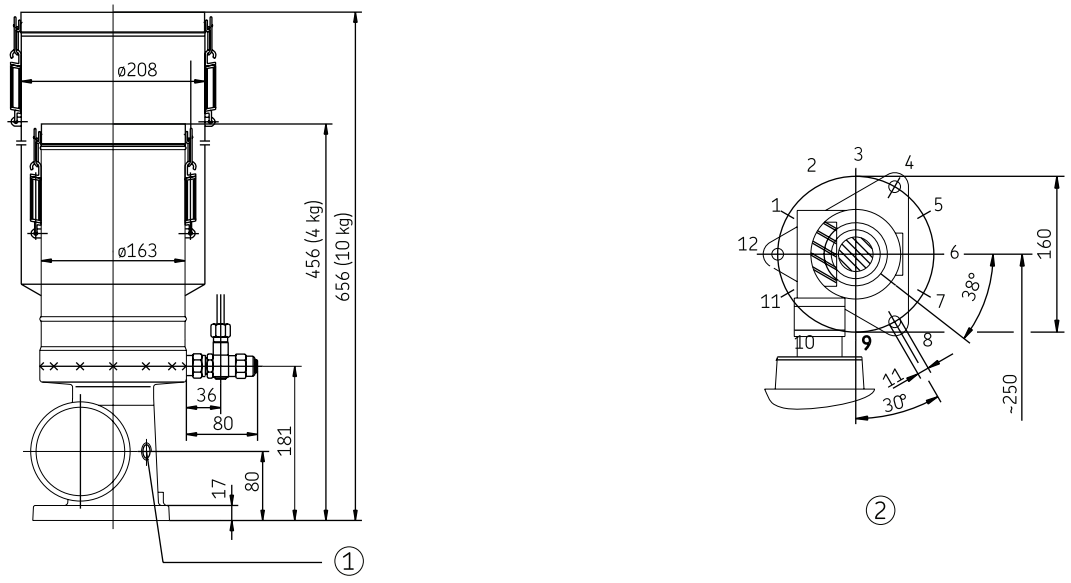


Multi-line pump unit FF, 1M

1 Fill connection G 3/8"

2 Position of pump elements

Fig. 8



Multi-line pump unit FF, 2M

1 Fill connection G 3/8"

2 Position of pump elements

5. Delivery, returns, storage

5.1 Delivery

After receipt of the shipment, it must be inspected for any shipping damage and for completeness according to the shipping documents. Immediately inform the transport carrier of any shipping damage. The packaging material must be preserved until any discrepancies are resolved.

5.2 Return shipment

Before return shipment, all contaminated parts must be cleaned. If this is not possible or practical, e.g. if it would impede fault detection in the case of complaints, the medium used must always be specified. In the case of products contaminated with hazardous substances as defined by GHS or CLP regulations, the safety data sheet (SDS) must be sent with the product and the packaging must be labelled in accordance with GHS/CLP. There are no restrictions for land, air, or sea transport. The choice of packaging should be based on the specific product and the stresses to be expected during transport (e.g., necessary anti-corrosion measures in the case of shipment by sea). In the case of wooden packaging, the applicable import regulations and the IPPC standards must be observed. Required certificates must be included in the shipping documents. The following information, as a minimum, must be marked on the packaging of return shipments.

Fig. 9

Marking of return shipments

5.3 Storage

The following conditions apply to storage:

- Dry, low-dust, vibration-free, in closed rooms
- No corrosive, aggressive substances at the storage location (e.g., UV rays, ozone)
- Protected against animals (insects, rodents)
- If possible, keep in the original product packaging
- Protected from nearby sources of heat or cold
- In the case of large temperature fluctuations or high humidity, take appropriate measures (e.g., heating) to prevent the condensation of water
- Before usage, check products for damage that may have occurred during storage. This applies in particular to parts made of plastic (due to embrittlement).

5.4 Storage temperature range

For parts not filled with lubricant, the permitted storage temperature is the same as the permitted ambient temperature range (see “Technical data”).

5.5 Storage conditions for products filled with lubricant

For products filled with lubricant, the permitted storage temperature range is:

minimum	+ 5 °C	[+41 °F]
maximum	+ 35 °C	[+95 °F]

If the storage temperature range is not maintained, the following steps for replacing the lubricant may not lead to the desired result under certain circumstances.

5.5.1 Storage period up to 6 months

Filled products can be used without implementing additional measures.

5.5.2 Storage period between 6 and 18 months

Pump:

- Connect the pump to a power source
- Switch on the pump and run it until lubricant comes out of every outlet without air bubbles
- Disconnect the pump from the power source
- Remove and dispose of the lubricant that came out

Lines:

- Remove pre-installed lines
- Ensure that both ends of the line are open
- Fill the lines completely with fresh lubricant

Metering devices:

NOTE

Due to the large number of different metering devices, no universally valid statement can be made regarding the removal of the old lubricant and correct bleeding after filling with new lubricant. The instructions can be found in the technical documentation of the specific metering device used.

5.5.3 Storage period more than 18 months

To prevent faults, the manufacturer should be consulted before start-up. The basic procedure for removal of the old lubrication filling corresponds to that for storage periods between 6 and 18 months.

5.6 Declaration of decontamination

If the product came in contact with harmful substances, make sure to thoroughly clean the product before returning it to us. Due to statutory provisions and for the safety of our employees and operation facilities we further need a fully completed and signed “Declaration of decontamination”.

6. Assembly

6.1 General

⚠ WARNING

Personal injury / property damage due to tilting

Never tilt or drop any multi-line pump units

NOTICE

Observe the technical data

For assembly, observe the technical specifications in the "Technical data": see section 4.

Only qualified technical personnel may install, operate, maintain, and repair the multi-line pump units described in the assembly instructions.

Qualified technical personnel are persons who have been trained, assigned, and instructed by the operator of the final product into which the multi-line pump units described here are incorporated. Such persons are familiar with the relevant standards, rules, accident prevention regulations, and operating conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid potential hazards.

Before assembling/setting up the multi-line pump unit, the packaging material and any shipping braces (e.g., plugs) must be removed. The packaging material must be preserved until any discrepancies are resolved.

6.2 Setup and attachment

⚠ WARNING

System pressure

Damage and injury from excessive system pressure

The fittings used to connect the lubrication line should be rated for the maximum operating pressure of the lubrication unit. If they are not, the lubrication line system needs to be protected from excessive pressure by means of a pressure-relief valve.

The multi-line pump unit should be protected from humidity and vibration and should be mounted so that it is easily accessible, allowing all further installation work to be done without difficulty.

Ensure that there is adequate air circulation to prevent excessive heating of the multi-line pump unit. For the maximum permissible ambient temperature, see the "Technical data" (→ section 4.).

Ensure adequate space for refilling lubricant into the lubricant reservoir.

The multi-line pump unit must be mounted vertically in accordance with the specifications of the documentation. The fill level of the lubricant reservoir, pressure gauges, oil level glasses, and other visual monitoring equipment must be clearly visible.

During installation and especially when drilling, always pay attention to the following:

- Existing supply lines must not be damaged by assembly work
- Other units must not be damaged by assembly work
- The gear pump unit must not be installed within range of moving parts
- The gear pump unit must be installed at an adequate distance from sources of heat
- Maintain safety clearances and comply with local regulations for assembly and accident prevention

6.2.1 Assembly of the FF and FB pump unit

The FF and FB multi-line pump units must be installed on a level surface. The pump's base plate must not be under stress. Sufficient space must be provided during installation for later servicing and maintenance work.

When the reservoir is empty and its cover is removed, the stirring paddle of the lubrication pump should be visible, so that the functioning and direction of rotation of the pumps can be checked by switching the pumps on briefly.

In the case of pumps with electrical monitoring of the grease or oil level, the clearance required above the pump could be up to 400 mm, depending on the height of the reservoir.

The installed pump elements are set for full stroke, with the ring pieces with the check valve (→ Fig. 101) pointing upwards. The cap nut (SW 24 mm) (→ Fig. 10/2) keeps the ring piece pressed against the screw socket (→ Fig. 10/3). If you want to point the ring piece in a different direction, loosen the cap nut and tighten it again to the specified torque (→ section 9.5) after moving the ring piece around.

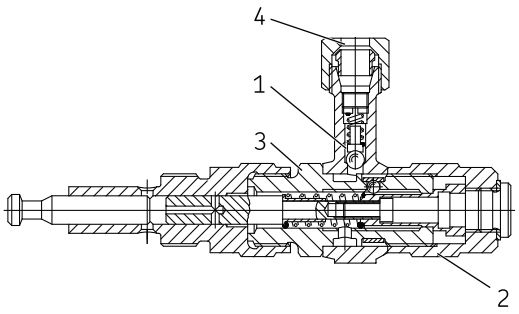
The number of pump elements can also be changed later. That requires the pump to be shut down (→ section 9.). Internal threads for installing pump elements have to be sealed off with plug screws M 20 x 1.5 (→ section 14.) if not in use.

NOTICE

Pump elements

Pump elements must not be connected to the connection for the lubrication line (→ Fig. 10/4).

Fig. 10



Sectional view of pump elements

1 Ring piece with check valve
2 Cap nut
3 Screw socket
4 Lubrication line connection

⚠ CAUTION

Reservoir cover

The reservoir cover must be installed before turning on or commissioning the FF and FB multi-line pump units. The stirring paddle may cause injury if the reservoir cover is not installed.

⚠ CAUTION

Drilling

When drilling the assembly holes, you must be careful of any supply lines or other units, as well as of other hazards such as moving parts.
Maintain safety clearances and comply with local regulations for assembly and accident prevention.

The multi-line pump units are installed using 3 screws (and washers). If M10 tapped bores are used to fasten the unit, the screws must have a minimum length of 20 mm.

Fastening material to be provided by the customer:

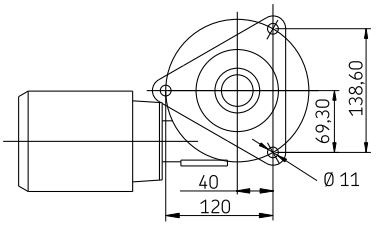
- Hexagon head screws (3×) acc. to DIN933-M10x20-8.8
- Washers (4×) acc. to DIN 125-B10.5-St

1. Drill assembly holes (M10) according to the assembly drawing (→ Fig. 10and 11) and the conditions on the mounting surface
2. Clean the surface to remove drilling chips
3. Place the pump unit on the mounting surface and roughly align it
4. Pass hexagon head screws (3×) acc. to DIN933-M10x20-8.8 with matching washers (4×) acc. to DIN 125-B10.5-St through the mounting holes on the pump baseplate, and apply the screws to the M10 threads on the mounting surface
5. Gently tighten the hexagon head screws (3×)
6. Align the pump unit, then tighten the hexagon head screws to the following torque
– Tightening torque 50 Nm

Table 10

FF, minimum installation clearance and assembly holes

	FF/4 kg [cm]	FF/10 kg [cm]
Ultrasonic sensor U3	55	60
Fill level control G	68	115
Fill level control S	70	90
Fill level switch E	60	110
Fill level switch F	75	115
Fill level switch H	80	120
Fill level switch A	80	125
Fill level switch W	60	85

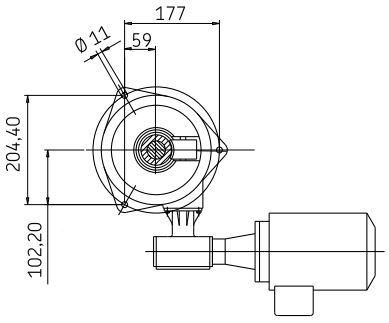


The assembly holes are the same for all models of the FF pump units.

Table 11

FB, minimum installation clearance and assembly holes

	FB/6 kg [cm]	FB/15 kg [cm]	FB/30 kg [cm]
Ultrasonic sensor U3	50	80	75
Fill level control G	70	120	110
Fill level control S	70	85	85
Fill level switch E	67	115	100
Fill level switch F	60	115	105
Fill level switch H	75	125	115
Fill level switch A	80	125	120
Level switch J	-	-	130
Fill level switch W	65	100	90



The assembly holes are the same for all models of the FB pump units.

6.3 Electrical connections

⚠ WARNING

Electric shock

Disconnect the product from the power supply before any work on electrical components

Electrical connections for the unit may only be established by qualified and trained personnel authorized to do so by the operator.

- The local electrical operating conditions and local regulations (e.g., DIN, VDE) must be observed.
- Disconnect the product from the power supply before any work on electrical components.
- The available line voltage (supply voltage) must match the specifications on the rating plate of the motor or the rating plate of the electrical components.
- Check the fuse protection of the electrical circuit. Use only fuses with the prescribed amperage,

6.3.1 Electric motor connection

SKF multi-line pump units are driven by electric motors.

Consult the motor's rating plate for the electrical characteristics of the motor, such as rated power, rated voltage, and rated current. Observe the guidelines in EN 60034-1 (VDE 0530-1) for operation at the limits of the ranges A (combination of ±5% voltage deviation and ±2% frequency deviation) and B (combination of ±10% voltage deviation and +3/-5% frequency deviation). This applies especially with regard to heating and deviations in operating parameters from the ratings on the motor's rating plate. The limits must never be exceeded.

Be sure to connect the motor so as to guarantee a continuously safe electrical connection (no protruding wire ends); use the assigned cable end fittings (e.g. cable lugs, wire end ferrules). Select connecting cables conforming to DIN VDE 0100, taking into account the rated current and the conditions of the specific system (e.g. ambient temperature, type of routing etc. in accordance with DIN VDE 0298 and IEC / EN 60204-1). Details regarding electrical connection of the motor to the power supply, especially terminal and connector pin assignment, can be taken from the documentation for the feed pump unit.

When establishing electrical connection of the pump motor, be mindful of the correct direction of rotation of the motor.

NOTICE

Direction of rotation

If the direction of motor rotation is marked on the feed pump unit by an arrow indicator, the motor's direction of rotation must match the arrow.

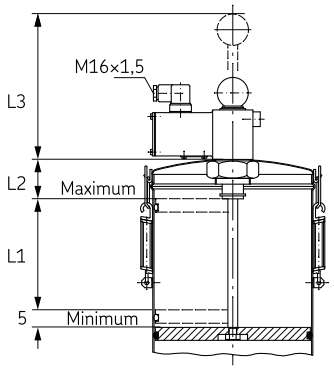
1. Connect the pump unit motor according to the specifications on the motor rating plate and the motor characteristics (→ Table 4.2).

6.3.2 Connection of lubricant level switches

Table 12

Lubricant level switches A and A.. 4.. (with cable break protection)

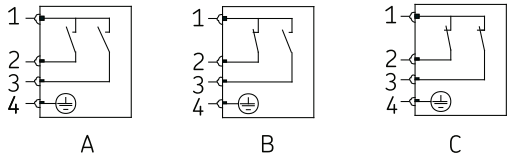
Reservoir size [kg]	**L1** [mm]	**L2** [mm]	**L3 max.** [mm]
6 (FB)	105	50	200
15 (FB)	340	50	345
30 (FB)	285	50	380
4 (FF)	125	40	230
10 (FF)	330	40	440



Electrical connections

Fill level switch A

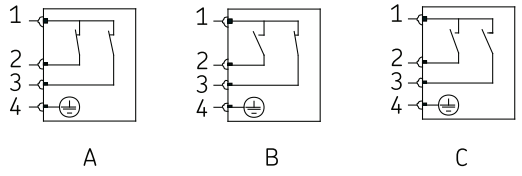
1 Supply voltage +
2 Signal output "above minimum"
3 Signal output "minimum"
4 PE Protective earth



A Switch position at maximum
B Switch position at pre-warning
C Switch position at minimum

Fill level switch A.. 4..

1 Supply voltage +
2 Signal output "above minimum"
3 Signal output "minimum"
4 PE Protective earth

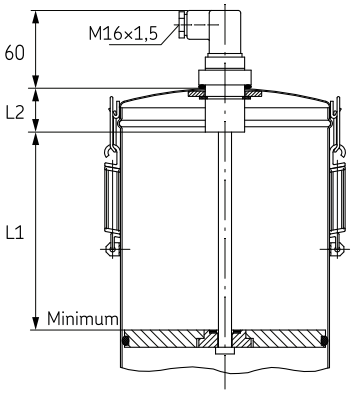


A Switch position at maximum
B Switch position at pre-warning
C Switch position at minimum

Table 13

Fill level switch E

Reservoir size [kg]	**L1** [mm]	**L2** [mm]
6 (FB)	114	25
15 (FB)	300	25
30 (FB)	225	25
4 (FF)	119	23
10 (FF)	300	43



Electrical connections

1 Supply voltage +
2 Signal output "above minimum"
3 Signal output "minimum"
4 PE Protective earth

A Switch position at minimum
B Switch position above minimum

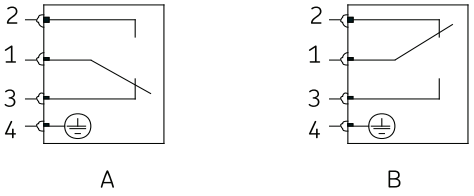
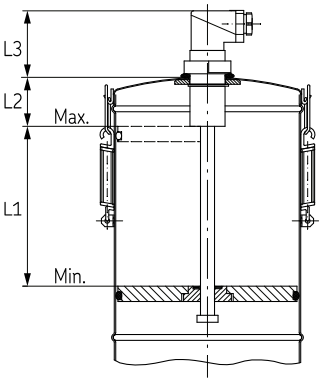


Table 14

Fill level switch F

Reservoir size [kg]	**L1** [mm]	**L2** [mm]	**L3** [mm]
6 (FB)	114	25	60
15 (FB)	300	25	60
30 (FB)	225	25	60
4 (FF)	129	25	56
10 (FF)	310	45	60



Electrical connections

1 Supply voltage +
2 Signal output "Maximum"
3 Signal output "minimum"
4 PE Protective earth

A Switch position at maximum
B Switch position between minimum and maximum
C Switch position at minimum

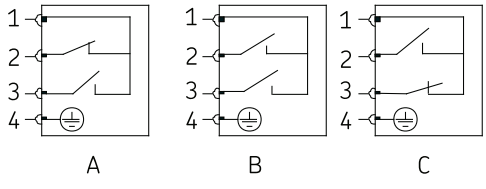
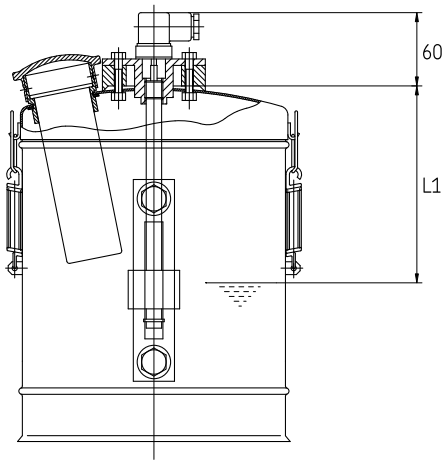


Table 15

Fill level switch W

Reservoir size [kg]	**L1** [mm]
6 (FB)	150
15 (FB)	400
30 (FB)	370
4 (FF)	155
10 (FF)	315



Electrical connections

1 Signal output "minimum"
2 Signal output "above minimum"
3 Supply voltage +
4 PE Protective earth

A Switch position above minimum
B Switch position at minimum

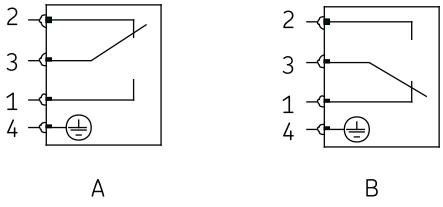
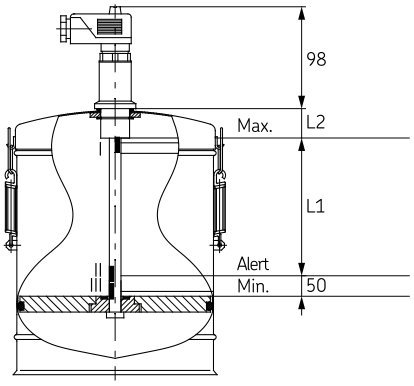


Table 16

Fill level switch H

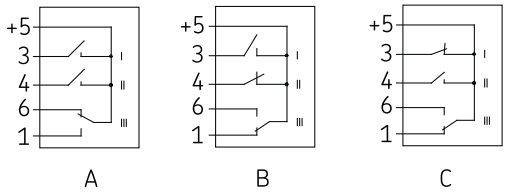
Reservoir size [kg]	**L1** [mm]	**L2** [mm]
6 (FB)	70	45
15 (FB)	310	45
30 (FB)	180	57
4 (FF)	79	260
10 (FF)	25	45



Electrical connections

1 Connection for supply voltage
2 Signal output "Maximum"
3 Signal output "Pre-warning"
4 Signal output "Minimum"
5 Supply voltage +

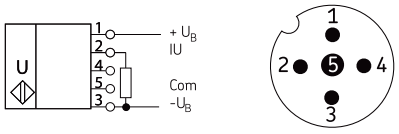
A Switch position at minimum
B Switch position at pre-warning
C Switch position at maximum



Ultrasonic sensor U3

1 Analog output
4-20 mA or 0-10 V
PIN assignment with view of sensor plug

PIN 1	$+U_B$
PIN 3	$-U_B$

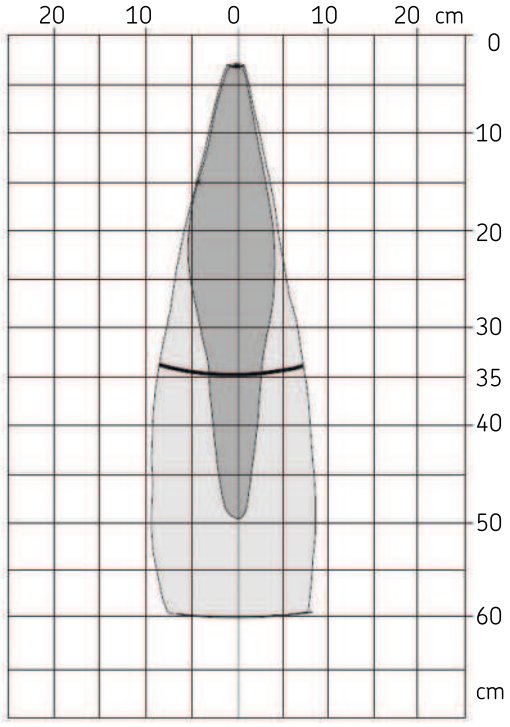


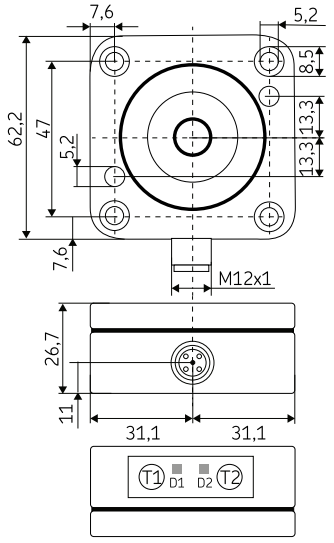
Connection V15 plug connector (M12x1), 5-pin

Sensing range

Sensing range in centimeters

The dark gray areas indicate the range in which the normal reflector (conduit) is reliably detected. This is the typical operating range of the sensors. The light gray areas represent the range in which a large reflector, such as a grease follower plate, is still detected, provided it is optimally aligned to the sensor. No evaluation is possible outside the light gray area.





6.4 Lubrication line connection

The lubrication line must be connected to the lubrication unit in such a way that no forces can be transferred to the assembled lubrication unit (stress-free connection).

⚠ CAUTION

Pressure

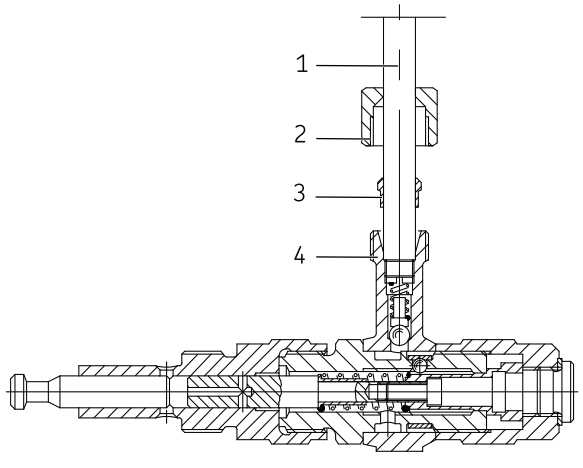
The fittings used to connect the lubrication line should be rated for the maximum operating pressure of the lubrication unit. If they are not, the lubrication line system needs to be protected from excessive pressure by means of a pressure-relief valve.

For operating pressures up to 45 bar as can occur especially in single-line piston metering systems, SKF fittings for solderless pipe unions can be used (double tapered sleeves or tapered sleeves). For higher operating pressures up to 250 bar as can occur especially in progressive centralized lubrication systems, SKF cutting-sleeve screw unions conforming to DIN 2353 can be used. If using fittings from other manufacturers, pay careful attention to the assembly instructions and technical specifications provided by the manufacturer.

6.4.1 Assembly of the lubrication lines

1. Deburr the connecting end of the lubrication line (Fig. 11/1)
2. Detach the union nut (Fig. 11/2) and cutting sleeve (Fig. 11/3) from the ring piece (Fig. 11/4)
3. Insert the lubrication line (Fig. 11/1) into the union nut (Fig. 11/2) and the cutting sleeve (Fig. 11/3)
4. Insert the lubrication line (Fig. 11/1), union nut (Fig. 11/2), and cutting sleeve (Fig. 11/3) into the ring piece (Fig. 11/4)
5. Apply the union nut (Fig. 11/2) to the thread of the ring piece (Fig. 11/4) and gently tighten the union nut (Fig. 11/2) by hand
6. Tighten the union nut (Fig. 11/ 2) with an open-end wrench

Fig. 11



Lubrication line connection

6.5 Lubrication line routing

When routing the main lubricant lines and the feed lines, observe the following instructions in order to ensure that the entire centralized lubrication system functions smoothly.

The main lubricant line must be dimensioned in accordance with the maximum operating pressure occurring in the lubrication unit used and the displacement of that lubrication unit. If possible, the main lubricant line should rise upward from the lubrication unit and be ventable at the highest point on the lubrication line system.

Metering devices at the end of the main lubricant line must be installed such that the outlets of the metering devices point upwards. If the system configuration requires that the lubricant metering devices be arranged below the main lubricant line, they should not be placed at the end of the main lubricant line.

The pipes, tubes, shutoff valves, directional control valves, fittings, etc. that will be used must be designed for the maximum operating pressure of the lubrication unit, the permissible temperatures, and the lubricants that will be fed. The lubrication line system also needs to be protected from excessive pressure by means of an overpressure valve.

All components of the lubrication line system such as pipes, hoses, shut-off valves, directional control valves, fittings, etc. must be carefully cleaned before assembly. No seals in the lubrication line system should protrude inwards in a way that disrupts the flow of the lubricant and could allow contaminants to enter the lubrication line system.

Lubrication lines should always be arranged so that air inclusions cannot form anywhere. Avoid changes in the cross-section of the lubrication line from small to large cross-sections in the flow direction of the lubricant. When the cross-section does change, the transition should be gentle.

The flow of lubricant in the lubrication lines should not be impeded by the incorporation of sharp bends, angle valves, or flap valves. Unavoidable changes in the cross-section in lubrication lines must have smooth transitions. Sudden changes of direction should be avoided if possible.

⚠ CAUTION

Lubricant coming out
Risk of slipping and injury

Centralized lubrication systems must always be free of leaks. Leaking lubricant is hazardous due to the risk of slipping and injury. Beware of any lubricant leaking out during assembly, operation, maintenance, or repair of centralized lubrication systems. Leaks must be sealed off without delay.

⚠ CAUTION

Lubricant coming out
Risk of contamination of waterways and soil

Lubrication lines must always be free of leaks. Lubricants can contaminate soil and waterways. Lubricants must be used and disposed of properly. Observe the local regulations and laws regarding the disposal of lubricants.

NOTE

Follow the safety instructions on the lubricant's safety data sheet. The safety data sheet for a lubricant can be requested from the lubricant manufacturer.

7. First start-up

In order to warrant safety and function, a person assigned by the operator must carry out the following inspections.

Immediately eliminate detected deficiencies. Deficiencies may be remedied by an authorized and qualified specialist only.

7.1 Inspections before first start-up

Table 18

Checklist: Inspections before first start-up

Inspections to be performed	YES	NO
Electrical connection established correctly.	☐	☐
Mechanical connection established correctly.	☐	☐
The performance characteristics for the aforementioned connections match the specifications in the "Technical data".	☐	☐
All components, e.g. lubrication lines, are pre-filled with the correct lubricant and correctly installed.	☐	☐
No apparent damage, contamination, or corrosion.	☐	☐
Product is protected by a suitable pressure limiting valve.	☐	☐
Any dismantled protective and monitoring equipment is fully reinstalled and functional.	☐	☐
All warning labels on the product are present and in proper condition.	☐	☐
The lubricant used matches the permissible specifications of the pump and the intended use.	☐	☐

7.2 Inspections during first start-up

Table 19

Checklist: Inspections during first start-up

Inspections to be performed	YES	NO
No unusual noises, vibrations, moisture accumulation, or odors present.	☐	☐
No undesired discharge of lubricant at connections (leakage).	☐	☐
Lubricant is fed without bubbles.	☐	☐
The bearings and friction points requiring lubrication receive the planned lubricant volume.	☐	☐

7.3 Commissioning

7.3.1 Fill the reservoir with oil

1. Remove the reservoir cover (Fig. 12/1) (with grease follower plate if applicable (Fig. 12/2)) and place it aside
2. Fill the reservoir (Fig. 12/3) with oil (see section 12) up to about 1 cm above the strainer (Fig. 12/4)

⚠ CAUTION

Motor direction of rotation

The direction of driveshaft rotation is indicated on each pump by an arrow. This marking ensures the correct direction of rotation of the worm drive and stirring paddle for each pump type. The pump should never be put into operation without the reservoir cover fitted properly in place.

3. Switch on the lubrication pump briefly (for about 1 second) and check the direction of rotation
4. Install the reservoir cover (Fig. 12/1) (with grease follower plate if applicable (Fig. 12/2)) on the reservoir (Fig. 12/3)

7.3.2 Reservoir with grease

NOTICE

Filling

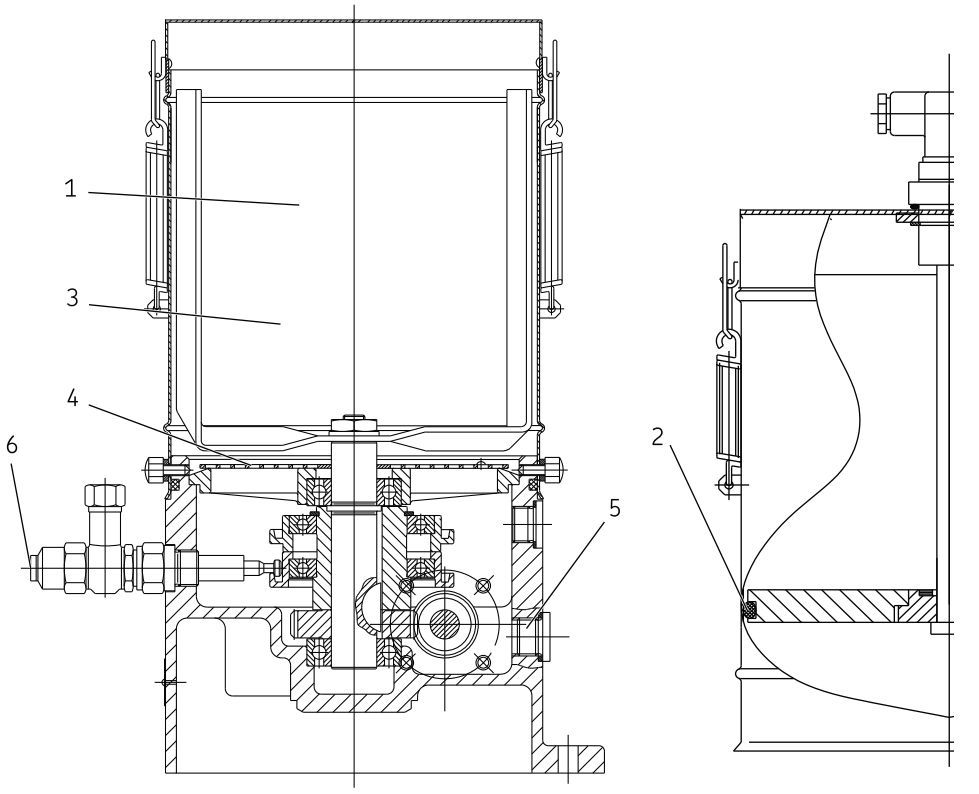
The grease lubrication pump must be filled through the fill connection (Fig. 12/5). It must not be filled through the reservoir cover (Fig. 12/1).

1. Fill the reservoir (Fig. 12/3) with grease (see section 12) through the fill connection (Fig. 12/5)

7.3.3 Vent the pump elements

1. Remove the plug screws (Fig. 12/6) from all the pump elements
2. Start the grease lubrication pump (switch it on)
3. Allow pump to run until bubble-free grease (or oil) can be seen discharging from all pump elements.
4. Insert and tighten the plug screws (Fig. 12/6) on all the pump elements
5. Shut down the grease lubrication pump (switch it off).

Fig. 12



Venting

7.4 Varying the delivery volume

The pump elements are factory-set to maximum pump output. After commissioning, the output can be adjusted to meet output requirements, as described in the following.

1. Removing the plug screw
- Remove the plug screw (Fig. 13/1) using a hexagon socket screw key (size 8 mm)

2. Adjust the delivery volume
- Place a hexagon socket screw key (size 6 mm) on the setting sleeve (Fig. 13/2)

NOTICE

Setting

When adjusting: Clockwise rotation results in decreased delivery volume, counterclockwise rotation results in increased delivery volume. The pump element's delivery volume may be reduced to 1/3 of its maximum delivery volume. This corresponds to clockwise rotation of the setting sleeve (Fig. 13/2) by eight notches. With settings below 1/3 of maximum delivery volume, fluctuations in delivery volume cannot be ruled out.

- Using the hexagon socket screw key, adjust the setting sleeve (Fig. 13/2) for the required delivery volume (notches 1 to 8, see Fig. 14).
- For delivery volume adjustment, the setting sleeve is divided into 8 notch positions (making one full revolution). It is possible to feel the setting sleeve engaging in each notch position.

3. Attach the plug screw
- Insert the plug screw (Fig. 13/1) and tighten it using a hexagon socket screw key (size 8 mm)

Fig. 13

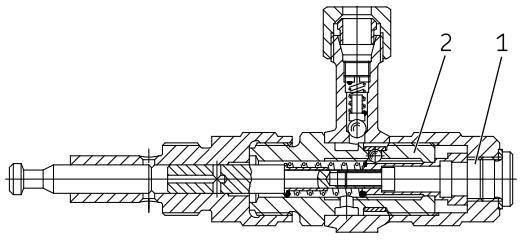
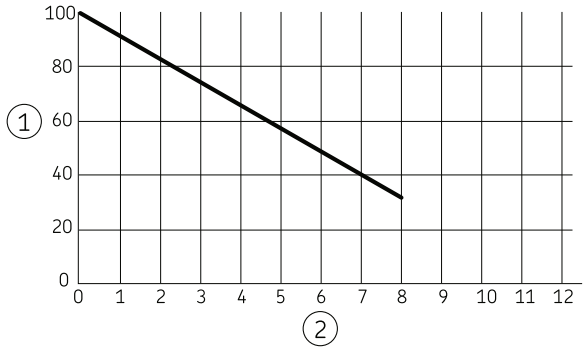


Fig. 14



Delivery volume chart
1 Delivery volume [%]
2 Notch position

7.5 Configuration of U3 ultrasonic sensor

The max./min. switching points are factory-set based on the reservoir size of the pump unit. If the switching points need to be adjusted by the user, the parameters must be set as described below.

7.5.1 Setting with teach-in

The ultrasonic sensor has internal temperature compensation. Due to specific heat of the sensor, the temperature compensation reaches its optimum operating point after approximately 30 minutes of running time.

If there is an object (grease follower plate) within the set window limits of the analog output, LED D1 lights up green; if the object is outside of the window limits, LED D1 lights up red.

The sensor can also be returned to its factory settings.

An LCR-2 LinkControl adapter and the LinkControl adapter software for Windows can optionally be used to make all teach-in settings and other sensor settings.

NOTICE

SKF factory settings

Teach-in activated
Output characteristic falling edge

Table 20

LED states

Normal operation, meaning the object to be detected is inside the set window limits

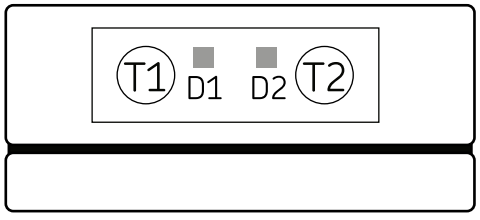
	D1	D2
Normal operation	Green	Off
Pos.1, full	Red	Off
Pos.2, empty	Red	Off

NOTE
If the T1 pushbutton is not pressed, the sensor returns to normal operation after 5 minutes. All the changes made up to that point will be accepted.

7.5.1.1 Deactivate/activate Teach-in

1.Turn off the supply voltage.
2.Press the T1 pushbutton (→ Fig. 15) and at the same time turn on the supply voltage.
3.Press the T1 pushbutton for 3 seconds.
→ Both LEDs flash at the same time
4.Release the T1 pushbutton.
→ LED D2 flashes
5.Deactivate/activate Teach-in by pressing the T1 pushbutton for 1 second.
Teach-in deactivated: LED D1 off
Teach-in activated: LED D1 on
After 10 seconds, the sensor returns automatically to normal operation. The changes are accepted.

Fig. 15

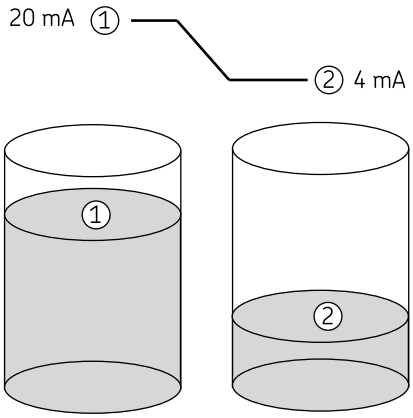


7.5.1.2 Setting window limits

1.Bring the object to be detected into position 1 (reservoir full) (→ Fig. 16).
2.Press the T1 pushbutton for 3 seconds.
→ Both LEDs flash at the same time
3.Release the T1 pushbutton.
→ The two LEDs flash alternately.
4.Bring the object to be detected into position 2 (reservoir empty).
5.Press the T1 pushbutton for 1 second.

After 10 seconds, the sensor returns automatically to normal operation. The changes are accepted.

Fig. 16



7.5.1.3 Setting the output characteristic

1.Press the T1 pushbutton for 13 seconds.
→ The two LEDs flash alternately.
2.Release the T1 pushbutton.
3.Press the T1 pushbutton for 1 second.
→ LED D2 keeps flashing
→ LED D1 on = rising output characteristic
→ LED D1 off = falling output characteristic
After 10 seconds, the sensor returns automatically to normal operation. The changes are accepted.

7.5.1.4 Resetting to factory settings

1.Turn off the supply voltage.
2.Press the T1 pushbutton and at the same time turn on the supply voltage.
3.Press the T1 pushbutton for 13 seconds.
→ The two LEDs flash alternately.
4.Release the T1 pushbutton.
All the settings will be reset and the sensor will return to normal operation.

8. Operation

8.1 General

NOTICE

Manufacturer's instructions

Observe the instructions from the machine manufacturer regarding the lubricants that are to be used.

⚠ CAUTION

Contaminated lubricant

Only fill using clean lubricant and an appropriate device. Contaminated lubricants lead to system malfunctions. The lubricant reservoir must be filled without introducing bubbles.

⚠ CAUTION

Mixed lubricant

It is recommended that a sign indicating the lubricant in use be placed over the lubricant reservoir in order to prevent accidental mixing of lubricants.

⚠ CAUTION

Lack of lubricant

Check the lubricant level. The lubricant may only be fed without bubbles.

The products described here function automatically. The lubricant transport in the lubrication lines should, however, be subjected to regular visual inspection.

The lubricant level in the lubricant reservoir should be inspected visually on a regular basis. Top up the lubricant if the lubricant level is too low.

In addition, check that:

- All safety devices are fully present and functional
- All connections are properly connected
- All parts are correctly installed
- All warning labels on the product are fully present, visible, and undamaged
- Illegible or missing warning labels are immediately replaced

9. Maintenance and repair

9.1 General

⚠ WARNING

Electric shock

Work on electrical components may be performed only by qualified electricians.

At a minimum, the following safety measures must be taken before any work on electrical components is done:

- Isolate, lock and tag out.
- Check to ensure the absence of voltage.
- Ground and short-circuit the product.
- Cover any live parts in the surrounding area.

⚠ WARNING

Hot surfaces

Risk of burns from hot surfaces

The hot surfaces of a motor could cause burns. Motor surfaces may only be touched with appropriate gloves or after the motor has been shut off for an extended time.

⚠ WARNING

System pressure

Hydraulic pressure

Lubrication systems are pressurized during operation. Centralized lubrication systems must therefore be depressurized before starting assembly, maintenance, or repair work, or any system modifications or system repairs.

NOTICE

Incorrect spare parts

Nullification of warranty

Only original SKF spare parts may be used. Unauthorized alterations and the use of non-original spare parts and accessories are prohibited and nullify the statutory warranty.

NOTICE

Lubricant

Damage due to contaminated lubricant

Only fill with clean grease. The purity of the lubricants used is the decisive factor in the service life of the pump and the lubricated machinery elements. Only fill grease via the fill connection.

SKF products are low-maintenance. All connections and fittings must be regularly inspected for proper seating to ensure proper function. If necessary, the product's exterior can be cleaned using mild cleaning agents that are compatible with the product's materials (non-alkaline, non-soap).

For safety reasons, the product must be disconnected from the power supply. Do not allow any cleaning agent to enter the interior of the product during cleaning.

The interior of the product does not need to be cleaned.

The interior of the product must be cleaned if incorrect or contaminated lubricant is accidentally filled into the product. Contact the SKF Service department if this occurs.

Dismantling of the product or individual parts of the product within the statutory warranty period is prohibited and voids any claims.

The maintenance intervals are determined depending on the specific conditions of the application.

The criteria are machine-specific settings such as lubricant quantity, ambient and operating conditions, and the purity of the lubricant used. Due to these conditions, the customer defines and maintains the maintenance intervals.

If the reservoir has been emptied, the entire system must be bled after refilling: see section 7.3 .

9.2 Maintenance schedule

Maintenance intervals vary depending on the system and are affected by environmental factors such as dust and heat. The maintenance intervals are therefore defined by the system manufacturer.

Table 21

Maintenance schedule

Component	Inspection	Operating hours
System	• Visually inspect the lubrication status of the bearing being lubricated	
System/pump	• Regularly inspect the system components for leaks	
Pump	• Inspect electrical cables for damage • Inspect electrical connections and contacts • Inspect fill level (lubricant reservoir)	
System/pump	Check the shelf life of the lubricant	

9.3 Service

If you encounter problems or have any questions, please contact our sales and service centers or our representatives abroad.

9.4 Removing a pump element

(→ Fig. 17)

1. Release the union nut (**6**) on the ring piece (**4**)
2. Remove the lubrication line from the ring piece (**4**)
3. Loosen the cap nut (**5**) and pull off the ring piece (**4**)
4. Loosen and remove the screw socket (**3**)
5. Carefully unscrew and remove the screw-in cylinder (**2**) from the pump housing
6. Tilt the front part of the pump element about 30° until the delivery piston (**1**) is no longer held back by the guide ring (**7**)
7. Remove the front part of the pump element using a circular motion

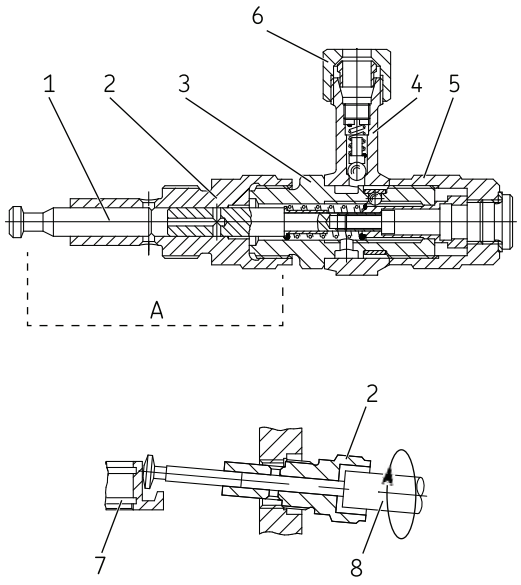
NOTE
The circular motion prevents the delivery piston from staying stuck in the grease. If the delivery piston stays stuck in the grease, remove it from the pump housing with tweezers or a magnet.

9.5 Installing a pump element

(→ Fig. 17)

1. Pull the delivery piston (**1**) out of the screw-in cylinder (**2**)
2. Place the delivery piston (**1**) somewhere out of the way, on a clean surface
3. Fill the cylinder chamber of the screw-in cylinder (**2**) with (clean) grease
4. Carefully guide the delivery piston (**1**) into the cylinder chamber of the screw-in cylinder (**2**) (about 5 to 10 mm)
5. Insert the fitting mandrel (**8**) into the screw-in cylinder (**2**)(see figure)
6. Guide the front part of the pump element into the pump element hole and align it, hooking the delivery piston (**1**) into the guide ring at the same time
7. Remove the fitting mandrel (**8**)
8. Screw the screw-in cylinder (**2**) into the pump housing
– Tightening torque: 35 Nm +2 Nm
9. Screw the screw socket (**3**) into the screw-in cylinder (**2**)
– Tightening torque: 35 Nm +2 Nm
10. Fit the ring piece (**4**) and cap nut (**5**) on the threaded socket (**3**) and tighten by hand
11. Insert the lubrication line into the ring piece
12. Tighten the union nut (**6**) by hand
13. Tighten the cap nut (**5**)
– Tightening torque: 35 Nm +2 Nm
14. Tighten the union nut (**6**)
15. Bleed the pump completely (→ section 7.3)

Fig. 17



Sectional drawing of pump element/guide ring

NOTE
For more information about the fitting mandrel, see section 14. .

10. Cleaning

10.1 Basics

Cleaning should be carried out in accordance with the operator's own company rules, and cleaning agents and devices and the personal protective equipment to be used should likewise be selected in accordance with those rules. Only cleaning agents compatible with the materials may be used for cleaning. Completely remove any cleaning agent residue left on the product and rinse with clear water. Unauthorized persons must be kept away. Use signage to indicate wet areas.

10.2 Interior cleaning

The interior normally does not need to be cleaned. The interior of the product must be cleaned if incorrect or contaminated lubricant accidentally enters the product. Please contact our Service department.

10.3 Exterior cleaning

Do not allow any cleaning fluid to enter the interior of the product during cleaning.

⚠ WARNING

Risk of fatal electric shock

Cleaning work may only be performed on products that have been de-energized first. When cleaning electrical components, be mindful of the IP enclosure rating.

⚠ WARNING

Serious injury from contact with or inhalation of hazardous substances

Wear personal protective equipment. Observe the safety data sheet (SDS) of the hazardous substance. Avoid contaminating other objects or the environment during cleaning.

If products have ultrasonic sensors, the active sensor surface must be cleaned with a cloth when it becomes contaminated.

11. Faults, causes, and remedies

The following table provides an overview of possible malfunctions and their causes. Contact the Service department of SKF if you cannot remedy the malfunction.

NOTE
Dismantling of the product or individual parts of the product within the statutory warranty period is prohibited and voids any claims.

NOTE
All assembly, maintenance, and repair work beyond this scope must be performed by SKF's Service department.

NOTE
Only original spare parts by SKF may be used. Unauthorized alterations to products and the use of non-original spare parts and accessories are prohibited.

⚠ WARNING

Electric shock

Disconnect the product from the power supply before any work on electrical components. Assembly, maintenance, and repair work may only be performed on products that have been de-energized by qualified technical personnel. The supply voltage must be switched off before opening any of the product's components.

⚠ WARNING

Burn injury hazard

Hot surfaces on a motor may cause burns. Motor surfaces may only be touched with appropriate gloves or after the motor has been shut off for an extended time.

⚠ WARNING

Pressure

Centralized lubrication systems are pressurized during operation. Centralized lubrication systems must therefore be depressurized before starting assembly, maintenance, or repair work, or any system modifications or system repairs.

Table 22

Commissioning malfunctions

Fault	Possible cause	Remedy
Delivery volume and/or delivery pressure too low without supply lines connected	Air in the pump element	• Bleed and fill (→ section 7.3)
	Driveshaft rotating in wrong direction	• Check electrical connections and voltage
	Driveshaft speed is too low	• Check electrical connections • Remove foreign substances if stirring paddle or pump element is jammed • Replace motor if necessary
No delivery (with pipe connections and supply lines not yet connected)	Air in the pump element	• Bleed the pump element
	Pump element set too low	• Set to 0 notch position
	Pump element not hooked in properly	• Remove and re-install the pump element (→ section 9.5)
	Drive motor does not run	• Check electrical connections • Clean the venting slots on the motor • Replace the geared motor if necessary

Table 23

Operational malfunctions

Fault	Possible cause	Remedy
Delivery volume or delivery pressure too low without lines connected	Air in the pump element	• Bleed and fill (→ section 7.3)
	Pump element is clogged	• See "No delivery" malfunction
	Driveshaft speed is too low	• Check electrical connections and motor voltage • Remove foreign substances if stirring paddle or pump element is jammed • Violation of the permissible operating temperature range of -15 °C to +40 °C • Replace defective motor
No delivery	Pump element is clogged	• Empty and clean the lubricant reservoir • Remove and clean the pump element with ring piece • Bleed and fill (→ section 7.3)
	Woodruff key on the drive shaft is defective	• Replace the woodruff key, and bleed the pump elements (→ section 7.3)
	Motor stopped	• Check the supply voltage, and replace the motor if necessary
	Pump element is defective	• Replace the pump element • Bleed and fill in accordance with section 7.3
	Spring pressure, delivery piston breaking loose	Install the pump element (→ section 9.5)
	Guide ring for the pump element piston heads is worn or broken	Replace the guide ring, and bleed the pump (→ section 7.3)

Table 24

Fill level control malfunctions

Fault	Possible cause	Remedy
Lubricant over grease follower plate	Seal on the grease follower plate is leaking	• Replace the seal
Lubricant comes out of the cover when filling the reservoir	No signal	• Check the cable connection, and replace the plug or cable if necessary
	"max" sensor signal ignored	• Remove the excess grease
	Seal on the grease follower plate is leaking	• Replace the seal
No "min", "max.", or pre-warning signal	Line terminal incorrect or defective	• Correct or repair the line terminal
	Plug is disconnected	• Connect the plug
	The reed contact on the switch is defective (H control)	• Change the contact rod
	Snap-action toggle switch is defective (A control)	• Replace the switch completely
	Grease follower plate is tilted	• Straighten the grease follower plate and secure it to the contact rod
	Grease follower plate is jammed	• Check the reservoir for dents and remove them if necessary

Table 25

Malfunctions on U3 ultrasonic sensor

Fault	Possible cause	Remedy
No output signal	Screw connection of U3 ultrasonic sensor to cable box is loose	• Screw the cable box into place
	Switching points are no longer programmed into the ultrasonic sensors or are set incorrectly	• Reconfigure (by teaching) the switching points for maximum, minimum pre-warning, minimum – see section 7.5
	Ultrasonic sensor is contaminated	• Remove and clean the ultrasonic sensor
	Ultrasonic sensor is defective	• Replace the ultrasonic sensor
Grease reservoir not filled to maximum	Ultrasonic sensor calibrated incorrectly	• Reconfigure (by teaching) the switching points for maximum, minimum pre-warning, minimum
Pump switches off before reaching minimum	Ultrasonic sensor calibrated incorrectly	• Reconfigure (by teaching) the switching points for minimum, minimum pre-warning, maximum – see section 7.5

12. Repairs

⚠ WARNING

Risk of injury

At a minimum, the following safety measures must be taken before any repairs:

- Unauthorized persons must be kept away
- Mark and secure the work area
- Depressurize the product

- Isolate the product, and lock and tag it out
- Check to ensure live voltage is no longer present
- Ground and short-circuit the product
- Cover any adjacent live parts

13. Shutdown, disposal

13.1 Temporary shutdown

Temporary shutdowns should be done by a course of action to be defined by the operator.

13.2 Permanent shutdown, disassembly

Permanent shutdown and disassembly of the product must be planned properly by the operator and conducted in compliance with all applicable laws and regulations.

13.3 Disposal

The waste producer/operator must dispose of the various types of waste in accordance with the applicable laws and regulations of the country in question.

14. Accessories

Table 26

Pressure limiting valves for grease (for insertion into pump elements)

Set pressure [bar]	Weight [kg/pc.]	Order No.
50	0.13	**24-2103-2273**
100	0.13	**24-2103-2344**
125	0.13	**24-2103-2345**
150	0.13	**24-2103-2342**
175	0.13	**24-2103-2272**
200	0.13	**24-2103-2346**
350	0.13	**24-2103-2271**

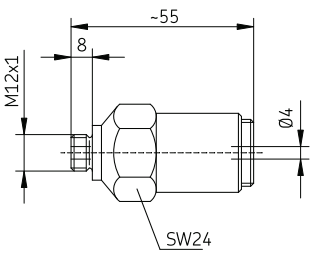


Table 27

Pump element with ring piece (for installing a pump element)

Description	Piston Ø	SW_1	SW_2	Weight [kg/pc.]	Order No.
Pump element (item 1)	6 mm	24	–	0.26	**24-1557-3680**
	8 mm	24	–	0.26	**24-1557-3681**
	10 mm	24	–	0.28	**24-1557-3683**
Ring piece (item 2) Pipe diameter	6 mm	–	14	0.10	**24-2255-2003**
	8 mm	–	17	0.08	**24-2255-2004**
	10 mm	–	19	0.10	**24-2255-2005**

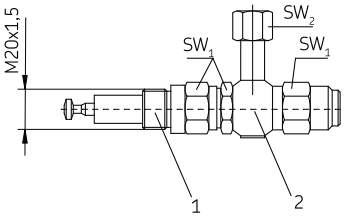


Table 28

Plug screw
(for closing unused pump outlets)

Design	Weight [kg/pc.]	Order No.
M20×1.5	0.037	**95-1520-0908**

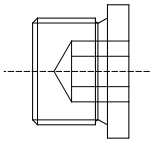


Table 29

Threaded socket for grease recirculation
(in place of a pump element to recirculate grease into pump housing)

Design	Order No.
Steel, galvanized surface, with copper (Cu) sealing ring	**95-1520-0908**

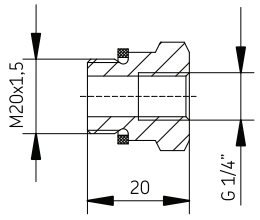
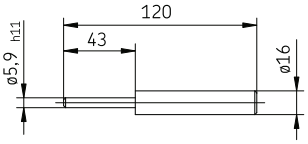


Table 30

Fitting mandrel
(Used to install a pump element)

	Order No.
	44-1827-2010



15. Appendix

15.1 China RoHS Table

Table 31

部件名称 (Part Name)	有毒害物质或元素 (Hazardous substances)					
	铅	汞	镉	六价铬	多溴联苯	多溴二苯醚
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
用钢和黄铜加工的零件 (Components made of machining steel and brass)	X	0	0	0	0	0

本表格依据SJ/T11364的规定编制 (This table is prepared in accordance with the provisions of SJ/T 11364.)

0：	表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572 规定的限量要求以下。 (Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.)
X：	表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572标准规定的限量要求。 (Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.)

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