KFG, KFGS, KFGL piston pump

For automotive lubrication

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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: Electrically operated pump for the supply of lubricants within a centralized lubrication system
Type: KFG; KFGS; KFGL pump
Item number: 772-*...., 6772-*...., KFG*....

Furthermore, the following directives and standards were applied in the respective applicable areas:

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, 12.01.2023

Jürgen Kreutzkämper
Manager, R&D
Germany

Stefan Schürmann
Manager, PD
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: Electrically operated pump for the supply of lubricants within a centralized lubrication system
Type: KFG; KFGS; KFGL pump
Item number: 772-*...., 6772-*...., KFG*....

Furthermore, the following regulations and standards were applied in the respective applicable areas:

- 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
EN 60947-5-2:2007/A1:2012			
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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. Any essential health and safety requirements not listed here are not relevant to this product.

Table 1

Appendix to Declaration of Incorporation

Valid for: KFG* lubricant feed pumps

No.:	Essential health and safety requirement	Applicable:	Fulfilled:
1.1.1	Definitions	Yes	Yes
1.1.2	Principles of safety integration	Yes	Yes
1.1.3	Materials and products	Yes	Partially[1)]
1.1.5	Design of machinery to facilitate its handling	Yes	Yes
1.1.6	Ergonomics	Yes	Partially[2)]
1.2	Control systems	Yes	Yes
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	Yes	Yes
1.3.1	Risk of loss of stability	Yes	Yes
1.3.2	Risk of break-up during operation	Yes	Partially[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	Yes	Yes
1.5.1	Electricity supply	Yes	Yes
1.5.6	Fire	Yes	Yes
1.5.8	Noise	Yes	Yes
1.5.11	External radiation	Yes	Yes
1.5.13	Emissions of hazardous materials and substances	Yes	Yes
1.5.15	Risk of slipping, tripping, or falling	Yes	Yes
1.6	Servicing		
1.6.1	Machinery maintenance	Yes	Yes
1.6.2	Access to operating positions and servicing points	Yes	Partially[4)]
1.6.4	Operator interventions	Yes	Yes
1.7	Information	Yes	Yes
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)] Not completely fulfilled: Hazards due to the lubricant used must be assessed by the operator on the basis of the Safety Data Sheet (SDS) and, if necessary, protective measures must be taken.

[2)] Not completely fulfilled: 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)] Not completely fulfilled: The operator must protect the lubrication system against excessive pressure. For this purpose, every pump element must be fitted with a pressure limiting valve with an opening pressure of max. 200 bar or max. 300 bar (depending on the pump element used).

[4)] Not completely fulfilled: The operator must ensure that the pump is integrated into the higher-level machine in such a way that the pump can be operated without danger.

Masthead

Manufacturer
SKF Lubrication Systems Germany GmbH
Email: Lubrication-germany@skf.com
www.skf.com/lubrication

Berlin Plant
Motzener Strasse 35/37
12277 Berlin
Germany
Tel. +49 (0)30 72002-0
Fax +49 (0)30 72002-111

Walldorf Plant
Heinrich-Hertz-Strasse 2-8
69190 Walldorf, Germany
Germany
Tel.: +49 (0) 6227 33-0
Fax: +49 (0) 6227 33-259

Authorized local distributors
- Great Britain -
SKF (U.K.) Limited,
2 Canada Close, Banbury, Oxfordshire,
OX16 2RT, GBR.

- North America -
SKF Lubrication Business Unit
Lincoln Industrial
5148 North Hanley Road, St. Louis,
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.
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.

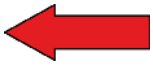
1.8 Prohibition of certain activities

- 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

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

Fig. 1	
	Risk of dangerous electrical voltage (for VAC pumps only)
	Risk of wrapping, pinching, crushing, or shearing when the reservoir lid is open (only for reservoirs with filling from above)
	Risk of injury from spring tension (only for pumps with a follower plate)
	Direction of rotation of the pump (stirring paddle)
	Read the instructions (before initial filling of a pump with double-lip follower plate delivered without lubricant)

Possible safety markings on the product

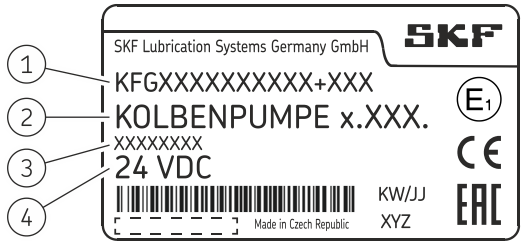
NOTE

Further to the findings of the workplace risk evaluation the operating company has to attach additional markings (e. g. warnings, signs giving orders, prohibition signs or labelling as specified by CLP / GHS), where appropriate.

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.

Fig. 2



Type plate

1 Order number (type identification code)
2 Type designation
3 Customer item number
4 Power supply

Table 2

Table for copying out the type plate

Type designation:	
Order number:	
Item number:	

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)

1.13 Note on Low Voltage Directive

The protection objectives of the Low Voltage Directive 2014/35/EU are met in accordance with Annex I, No. 1.5.1 of the Machinery Directive 2006/42/EC.

1.14 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).

1.15 Note on UKCA marking

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

1.16 Note on ECE mark

The ECE test mark (E1) confirms that an ECE type approval (components requiring approval on motor vehicles) has been granted for a product which bears this mark on its type plate.

1.17 Note on EAC marking

The EAC conformity marking confirms the product's conformity with the applicable legal provisions of the Eurasian customs union.

1.18 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).

1.19 Emergency shutdown

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

1.20 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.

1.21 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

1.22 Residual risks

Table 3

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 lifting gear.
Personal injury / property damage due to tilting or falling product due to non-compliance with specified torques.	B C 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 spilled, leaked lubricant.	B C D F G H K	Be careful when connecting or disconnecting the lubricant lines. Use only hydraulic screw unions and lubrication lines suitable for the specified pressure. Do not mount lubrication lines on moving parts or chafe points. If this cannot be avoided, use anti-kink coils and/or conduits.
Fire hazard or damage to the pump from operation with damaged electrical components, such as power leads and plugs.	B C D E F G H	Inspect electrical components for damage prior to initial use and then at regular intervals. Do not install cables on moving parts or chafe points. If this cannot be avoided, use anti-kink coils and/or conduits.

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 General

Pump units of the KFG, KFGS, and KFGL series are electrically driven piston pumps with integrated reservoir and with or without an integrated control unit.

so the pump is always able to supply demand-based lubrication to centralized lubrication systems with progressive metering devices and to single-line systems.

The pump units differ in terms of the size and type of lubricant reservoir, the lubricant filling and their control and function monitoring.

3.2 Design

Pump units of the KFG, KFGS and KFGL series are characterized by their compact construction and are divided into the assemblies for pump housing, lubricant reservoir, control unit, and fill level monitoring.
A short description of the individual assemblies follows below.

3.2.1 Pump housing

The pump housing contains, among other things, the pump drive, control unit (KFGS, KFGL) and three lubricant outlets for installing a maximum of three pump elements. One pressure limiting valve can be attached to each pump element.
When used in single-line systems (MonoFlex), a pressure relief valve with an integrated pressure limiting valve is attached to the pump element (max. 2 lubrication zones per pump with KFGL).
An optional fill connection can be installed on the pump housing using the alternative connections, to allow filling of the pump when used at low temperatures. A grease return can also be attached.
In the case of the KFGS and KFGL designs, a control screen is mounted on the front side.

3.2.2 Lubricant reservoir

The lubricant reservoir is available in 2 kg, 6 kg, 8 kg, 10 kg, 15 kg and 20 kg sizes. These are made of transparent plastic.

The lubricant reservoirs have fill level markings that allow the fill level to be monitored visually.

The pump fill level can be monitored using an integrated rocker switch.

3.2.3 Fill level monitoring

For monitoring of the minimum pump fill level, there are two lubricant level switches to choose from:
- Mechanical lubricant level switch W1 (type identification code 1)
- Mechanical lubricant level switch W1G with signal smoothing and dry contact (type identification code 2, only for versions without control unit).

The lubricant level switches are suitable for lubricants up to NLGI Grade 2.
The output signal only communicates the following:
- Reservoir full (filled)
- Reservoir empty

3.2.4 KFGS and KFGL control units

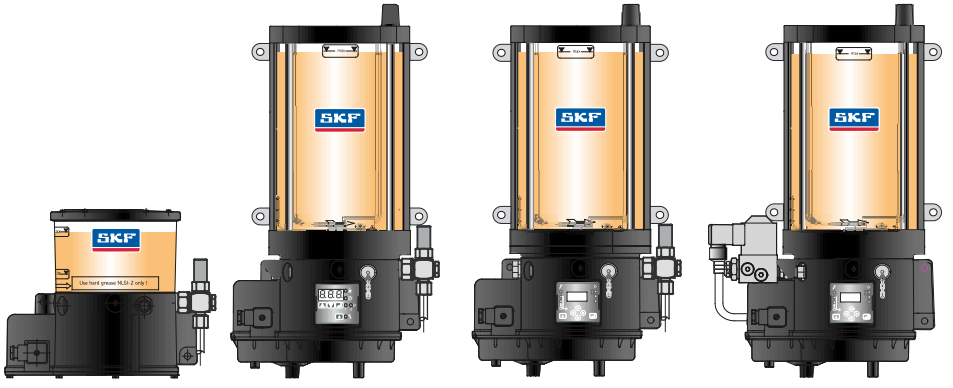
Pump units of the KFGS series are equipped with an IG502-2-I integrated control unit with a control display.

Parameters for pause times (timer), pause pulses (counter) and pump cycle times (contact) can be entered through the control unit.

The KFGL's control unit, model LC502, allows up to three lubrication zones to be lubricated independently. Sectional lubrication is available for differing lubricant requirements; the lubrication lines can be controlled and monitored individually.

3.3 Overview

Fig. 3



Pump units of the KFG series

3.3.1 KFG pump units

Pump units of the KFG series are reservoir pump units without an integrated control unit.
With the KFG pump unit, the fill level monitoring signals are processed by a system provided by the customer.
The pump is available in various voltage designs.
On pumps for single-line systems, an electrical pressure relief valve is additionally installed on the pump housing, which ensures that pressure is relieved as required after the feeding operation.

3.3.2 KFGS pump units

Pump units of the KFGS series are reservoir pump units with an IG502-2-I integrated control unit with a control display.

Parameters for pause times (timer), pause pulses (counter) and pump cycle times (contact) can be entered through the control unit.
An piston detector is used to monitor the feeding operation on progressive systems.

Fill level monitoring of the pump units is done with the lubricant level switches: see section Fill level monitoring, Page 49.
Monitoring signals for the minimum fill level are processed by the integrated KFGS control.

3.3.3 KFGL pump units

Pump units of the KFGL series are reservoir pump units with an LC502 integrated control unit with a control display.

The control unit is pre-programmed with standard settings and easy to operate The control unit can be used to set the pump run time in two ways:

- based on pump speed.
- based on time or machine cycles (load-dependent).

Sectional lubrication is available for differing lubricant requirements; the lubrication lines can be controlled and monitored individually. The LC502 also offers a wide range of options for monitoring functions and processes, with up to three lubrication zones able to be monitored independently.

The LC502 is fitted with integrated temperature overload protection and continuous system monitoring with fault detection and fault analysis.

A piston detector is used to monitor the feeding operation on progressive systems; a pressure switch is used for single-line systems.

Fill level monitoring of the pump units is done with the lubricant level switches: see section Fill level monitoring, Page 49.
Monitoring signals for the minimum fill level are processed by the integrated KFGL control.

3.4 Functional description in progressive systems

3.4.1 KFG pump unit

A general progressive metering device system consists of the following components:

- Pump unit, pump element, pressure limiting valve and fill level monitoring.
- Lubrication lines, consisting of main and possibly branch lines. as well as lubrication point lines.
- Progressive metering devices.

When the pump is switched on, it supplies lubricant from the lubricant reservoir to the lubricant outlet.

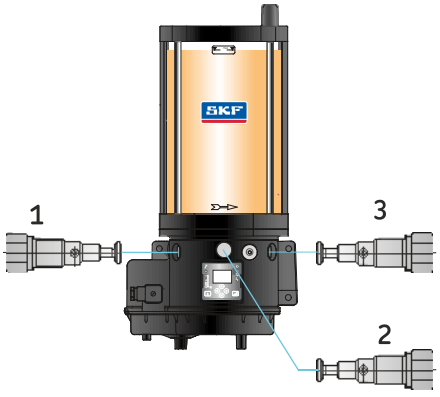
The pump element attached to the outlet delivers the lubricant further, into the downstream main line.

The lubricant flows through the main line to the progressive metering device. There, the lubricant is distributed according to the volume required by the lubrication point being supplied.

In progressive systems with a main metering device and secondary metering device, the lubricant coming from the pump unit is delivered to the main metering device. The main metering device distributes the lubricant to the secondary metering devices according to their individual volume requirements. From there, the lubricant flows to the lubrication points.

3.4.1.1 Pump element

Fig. 4

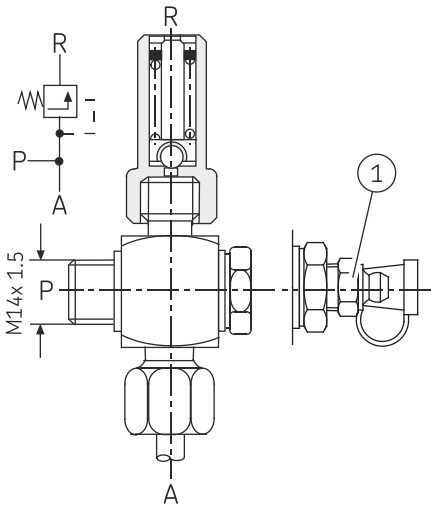


Layout of pump elements

The pump element delivers the lubricant then passes it to the downstream progressive metering device. Pump elements which differ in terms of lubricant discharge are available, depending on the quantity of lubricant required (see section Nominal delivery rates, Page 26).

3.4.1.2 Pressure limiting valve (DBV)

Fig. 5



Pressure limiting valve

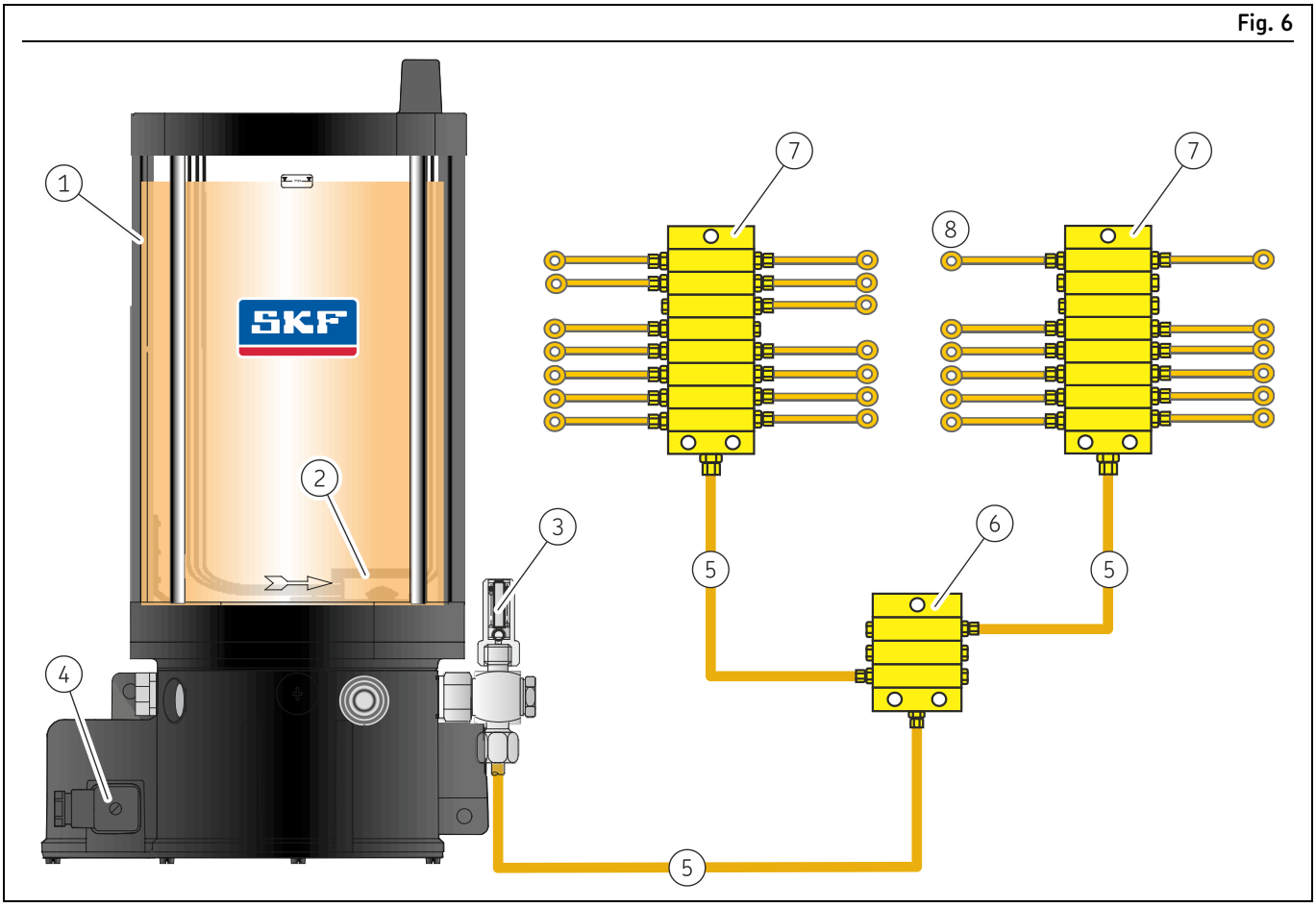
A pressure limiting valve must be installed on the pump element on progressive systems to prevent excessive operating pressure in the lubrication system.

If the operating pressure exceeds the opening pressure of the pressure limiting valve (see section Pressure limiting valve, Page 27), the valve opens and the lubricant flows back (on versions with a return line) into the lubricant reservoir.

A further option are pressure limiting valves with an emergency lubricant nipple (Fig. 5/1). These can be actuated manually to provide the lubrication system with adequate lubricant in case of power failure or a defective pump.

Example of progressive system with KFG pump unit

Fig. 6



Progressive system with KFG pump unit

1 KFG pump unit
2 Lubricant level switch
3 Pump element with pressure limiting valve
4 Electrical pump connection
5 Lubrication lines
6 Main metering device
7 Secondary metering device
8 Lubrication points

3.4.2 Progressive system with a KFGS or KFGL pump unit

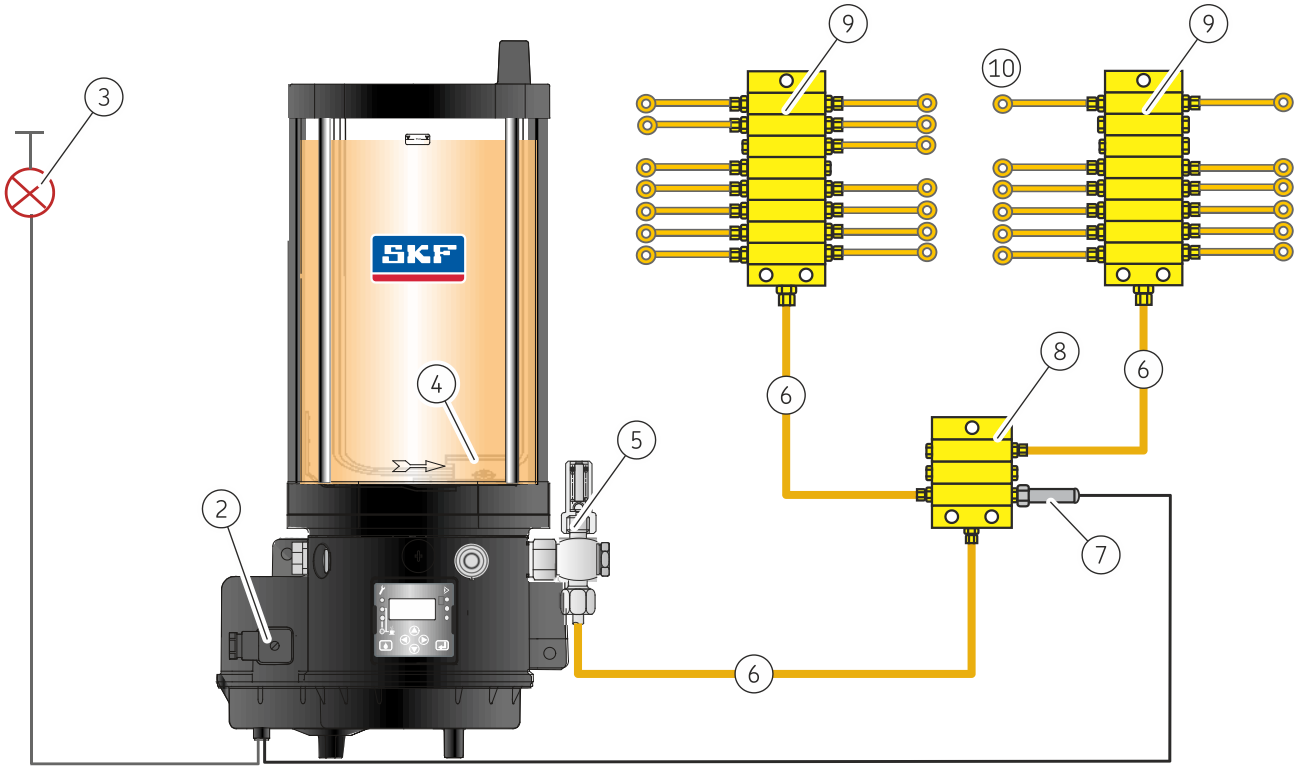
The general functional description for progressive systems with a KFG pump unit also applies for the design with KFGS and KFGL pump control.

The control unit integrated into the pump housing allows the following additional configuration, monitoring and connectivity options:

- Pause time and pump run time can be adjusted independently, including on monitored systems
- Recording of remaining intervals and remaining lubrication times
- Data backup in case of voltage failure
- Non-volatile memory with PIN code protection
- Option of connecting a magnetic piston detector (standard) or inductive piston detector, to monitor the functioning of metering devices
- Connectivity for external pushbutton
- Internal fill level monitoring, lubrication cycle stop and fault notification remain on control display in case the level falls below minimum
- Fault memory

Example of progressive system with KFGS/KFGL pump unit

Fig. 7



progressive system with KFGS/KFGL pump unit

1 KFGS/KFGL pump unit
2 Power supply
3 Fault indicator light
4 Lubricant level switch
5 Pump element with pressure limiting valve
6 Lubrication lines
7 Piston detector
8 Main metering device
9 Secondary metering device
10 Lubrication points

3.5 Functional description in single-line systems

3.5.1 KFG-Pump unit with grease follower plate technology

A general single-line system consists of the following components:

- Pump unit with pump element, pressure limiting valve, pressure relief valve and fill level monitoring
- Main lubrication line
- Single-line metering devices.

When the pump is switched on, it supplies lubricant from the lubricant reservoir to the lubricant outlet.

The connected pump element meters the lubricant and supplies it to the main line through the pressure-relief valve attached to the pump unit.

The lubricant flows through the main line to the single-line metering devices, where it is metered and passed to the lubrication points. This is performed during or after the pump cycle time, depending on the type of metering devices used (prelubrication or relubrication metering devices).

The pressure relief valve switches after pressure build-up is complete. After the main line has been relieved, the pump unit is now prepared for another lubrication cycle.

3.5.1.1 Pump element

The pump element delivers the lubricant according to the capacity of the connected single-line metering devices. There are both prelubrication metering devices and relubrication metering devices.

3.5.1.2 Pressure-relief valve

In order to allow another lubrication cycle after metering is complete, the main line must first be relieved of pressure, which also relieves the downstream single-line metering devices. The main line and single-line metering devices relieve into the lubricant reservoir.

3.5.1.3 Pressure limiting valve

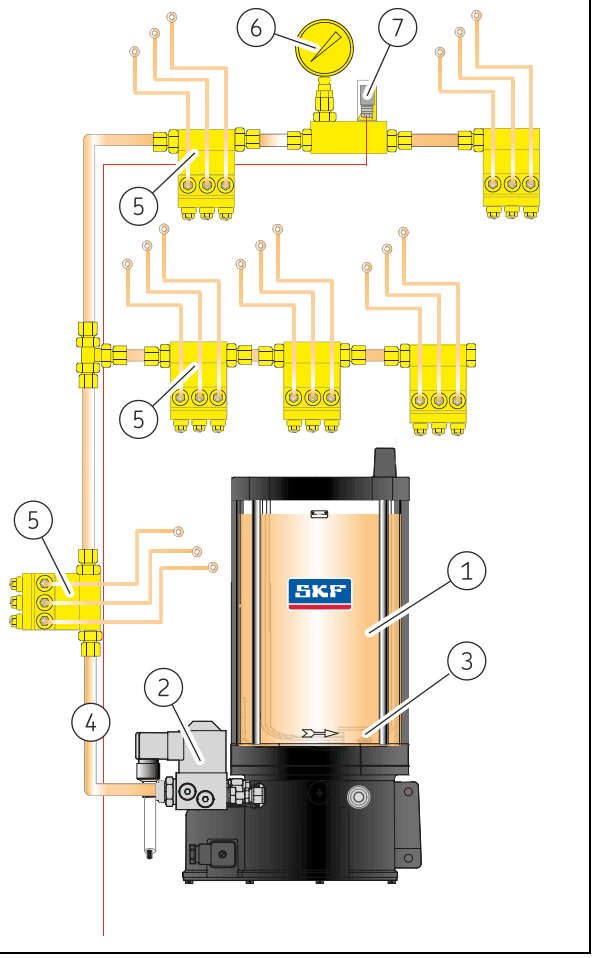
Fig. 8

Pressure relief valve/pressure limiting valve

A pressure limiting valve can be installed single-line systems to prevent excessive operating pressure in the lubrication system. If the operating pressure exceeds the opening pressure of the pressure limiting valve (see section Pressure relief valve with integrated pressure limiting valve, Page 29), the valve opens. The lubricant escapes through the valve or flows back into the lubricant reservoir. This protects the pump unit against overload.

Example of a single-line system with KFG pump unit

Fig. 9



Single-line system with KFG pump unit

1 KFG pump unit
2 Pump element with pressure relief valve with integrated pressure limiting valve
3 Lubricant level switch
4 Main lubrication line
5 Single-line metering device
6 Pressure gauge for monitoring of pressure build-up
7 Pressure switch for changeover of pressure (build-up) monitoring

3.5.2 Single-line system with a KFGL pump unit

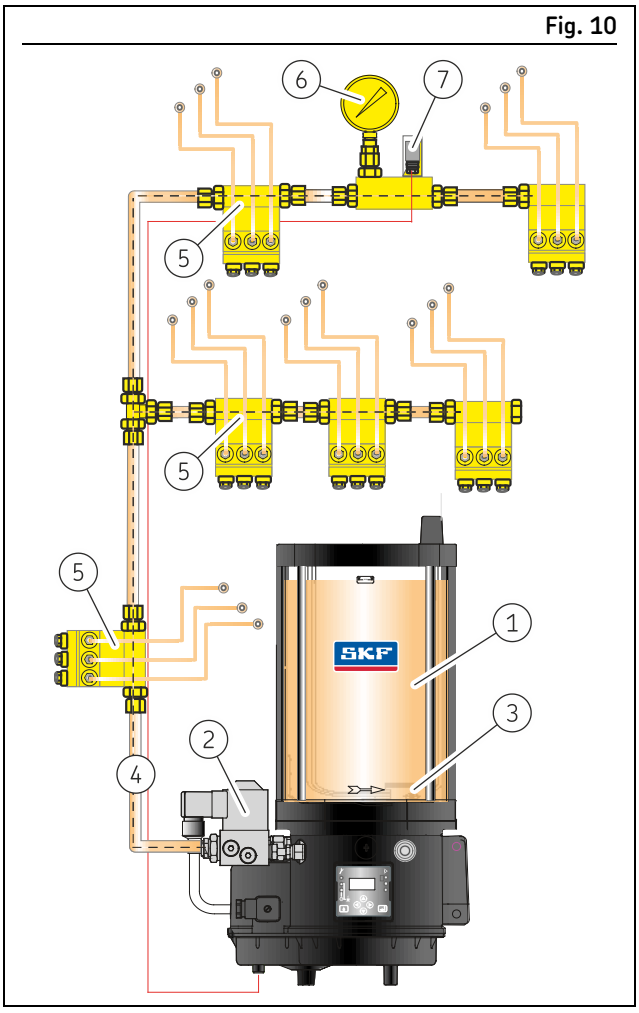
The general functional description for single-line systems with a KFG pump unit also applies for the design with KFGL pump control.

The LC502 control unit integrated into the pump housing allows the following additional configuration, monitoring and connectivity options:

- Pause time and contact time can be adjusted independently for pressure-monitored and pressure-controlled systems
- Adjustment of setting times and parameters on a control display
- Recording of remaining intervals and remaining lubrication times
- Multizone systems possible
- Extensive fault monitoring/diagnosis
- Recording of fault notifications (diagnostics memory)
- Data backup in case of voltage failure
- Non-volatile memory with PIN code protection
- Connectivity for pressure switch
- Fill level monitoring, lubrication cycle stop and fault notification remain on control display in case the level falls below minimum.

Example of a single-line system with KFGL pump unit

Fig. 10



Single-line system with KFGL pump unit

1 KFGL pump unit with LC502 control unit
2 Pump element with pressure relief valve with integrated pressure limiting valve
3 Lubricant level switch
4 Main lubrication line
5 Single-line metering device
6 Pressure gauge for monitoring of pressure build-up
7 Pressure switch for changeover of pressure (build-up) monitoring

4. Accessories

Accessories are used to extend, supplement the functional range or to assemble the product.

Table 4

Accessories

Designation	Data	Item number
M12x1 plug, 4-pin, with 5 m cable	4x 0.25 mm^2, enclosure rating IP 67 (mounted)	179-990-719
Double-pin plug (T-connector)	Double-pin plug (two-way distributor, for connecting to the M12x1 plug on the pump with 2x M12x1 outputs for piston detector and separate control light)	179-990-700
M12x1 socket	without cable, with 4 pins, enclosure rating IP 67 (mounted)	179-990-371
M12x1 angle plug	without cable, with 4 pins, enclosure rating IP 67 (mounted) 179	179-990-372
M12x1 plug, straight	with 5 m cable, 4x 0.25 mm^2, enclosure rating IP 68 (mounted)	179-990-600
M12x1 angle plug	with 5 m cable, 4x 0.25 mm^2, enclosure rating IP 68 (mounted)	179-990-601
Cable socket, gray, to DIN 43650 / ISO 4400, with 6 m cable	Type A, ground position 0°	664-34977-9
Cable socket, black, to DIN 43650 / ISO 4400, with 6 m cable	Type A, ground position 180°	664-36862-8
Cable socket, gray, to DIN 43650 / ISO 4400, with 10 m cable	Type A, ground position 0°	664-36078-9
Cable socket, black, to DIN 43650 / ISO 4400, with 10 m cable	Type A, ground position 180°	664-36078-7
Cable socket, black, to DIN 43650 / ISO 4400, with 12 m cable	Type A, ground position 180°	664-85220-1
Cable socket, black, to DIN 43650 / ISO 4400, with 20 m cable	Type A, ground position 180°	664-85323-5
Cable socket to DIN 43650 / ISO 4400	Type A, pivoted, without LED, 1.5 mm2, line diameter 6 to 9 mm	179-990-034
Cable socket to DIN 43650 / ISO 4400	Type A, pivoted, without LED, 1.5 mm2, line diameter 4.5 to 7 mm	179-990-147

NOTE

Additional data and electrical plug-in connections are available in brochure No. 1-1730-EN "Electric Plug-and-Socket Connectors."

Table 5

External control units and cable sets

Application	Items	Type designation, item number
Centralized lubrication systems for commercial vehicles	IG502-2-E electronic control unit. Universal control and monitoring unit for vehicles	IG502-2-E
Centralized lubrication systems for commercial vehicles	Electronic control unit ST-102 for cab installation for single-line, dual-line, and progressive systems	ST-102
Cable set for IG502-2-E	For systems with piston pumps from the KFG series	997-000-185

NOTE

The operating instructions/functional description of the corresponding control unit must be observed.

5. Technical data

5.1 General technical data

Table 6

Technical data of the pump

Parameter	Values
	12/24 VDC
Maximum back pressure	300 bar
Ambient temperature[1]	
• with spring-return pump elements:	-25 °C to +70 °C
• with positively actuated pump elements:	-30 °C to +70 °C
Pump elements	Max. 3
Reservoir material	PMMA
Mounting position[2]	Vertical
Sound pressure level	< 70 dB (A)
Duty type/cycle as defined by IEC 60034-1, DIN EN 60031-1, and VDE 0530-1	S1 continuous operation
Nominal speed[3]	• 12 VDC: 15 rpm, ±2 rpm • 24 VDC: 17 rpm, ±3 rpm
Mechanical lubricant level switch	NLGI Grade 2
Type identification code 1 (W1)	Fault notification via pulse
Mechanical lubricant level switch with signal smoothing, type identification code 2 (W1G)	NLGI Grade 2 Fault notification via energized contact
Electrically controlled pressure relief valve	12 VDC or 24 VDC, see Pressure relief valve with integrated pressure limiting valve, Page 49

Electrical data of the pump

Parameter	Values	
	12 VDC	**24 VDC**
Enclosure rating[4]	IP56	IP56
Rated voltage	12 VDC	24 VDC
Power consumption (load-dependent)[5]	2.4 A	1.25 A
Power consumption (maximum)	< 5 A	< 2.5 A
Starting current (approx. 20 ms)	9 A	4.5 A
Maximum pre-connected fuse[6], [7]	5.0 A (slow)	4.0 A (slow)
Motor operating voltage	12 VDC	24 VDC

[1] The specified ambient temperature range requires that the lubricant used can be pumped at the given ambient temperature.

[2] If the pump is expected to be installed in inclined position: The maximum filling (“MAX” mark) must be reduced in accordance with the inclination to be expected (e.g., with construction or agricultural machinery). The minimum filling (“MIN” mark) must be increased starting with an expected inclination > 30°, otherwise functional impairments may arise due to a reduced amount of lubricant the suction area of the pump.

[3] The values given here apply for a temperature of 20 °C, back pressure of 50 bar and greases of NLGI Grade 2.

[4] The specified enclosure rating of the pump requires the use of connection sockets and plugs suitable for that enclosure rating and corresponding cables. If connection sockets and cables with a lower protection rating are used, the lowest of the protection ratings will apply.

[5] Typical value for an ambient temperature of 25 °C and an operating pressure of 150 bar

[6] Fuse in accordance with DIN 72581 T3

[7] Conductor: cross-section 1.5 mm^2, length ≤ 12 m

NOTE

Protective measures that must be taken for operation according to the intended use in machinery for KFG, KFGS, KFGL... 24 VDC:

- Protective Extra Low Voltage (PELV)

Table 7

Reservoir size	Weight (empty)	Weight (filled)
2 kg reservoir	6 kg	Approx. 7.5 kg
6 kg reservoir	7 kg	Approx. 13.5 kg
8 kg reservoir	11 kg	Approx. 18.5 kg
10 kg reservoir	14 kg	Approx. 27 kg
15 kg reservoir	16 kg	Approx. 34.5 kg
20 kg reservoir	18 kg	Approx. 41.5 kg

5.2 Nominal delivery rates

Fig. 11

Pump elements with spring-return pistons

Pump elements with positively driven pistons

Pump element designs

Table 8

Nominal delivery rate for pump elements with spring-return pistons

Number of grooves (Fig.11/1)	0	1	2	3	4
Nominal delivery rate[1)]	5.0 cm³/min	2.5cm³/min	1.8 cm³/min	1.3 cm³/min	0.8 cm³/min
Max. permiss. oper. pressure	200 bar	300 bar	300 bar	300 bar	300 bar
Item number	KFG1.U0	KFG1.U1	KFG1.U2	KFG1.U3	KFG1.U4

[1)] The values given here apply for a temperature of 20 °C, back pressure of 50 bar and greases of NLGI Grade 2.

Table 9

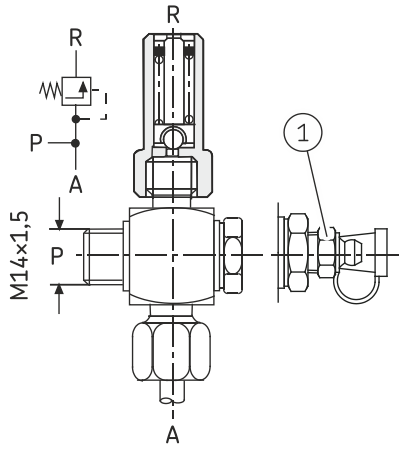
Nominal delivery rate for pump elements with positively driven pistons

Marking (Fig.11/2)	L-0	G-1	H-2	J-3
Nominal delivery rate[1)]	5.0 cm³/min	2.5cm³/min	1.8 cm³/min	1.3 cm³/min
Max. permiss. oper. pressure	250 bar	300 bar	300 bar	300 bar
Item number	KFG1.U0-E	KFG1.U1-E	KFG1.U2-E	KFG1.U3-E

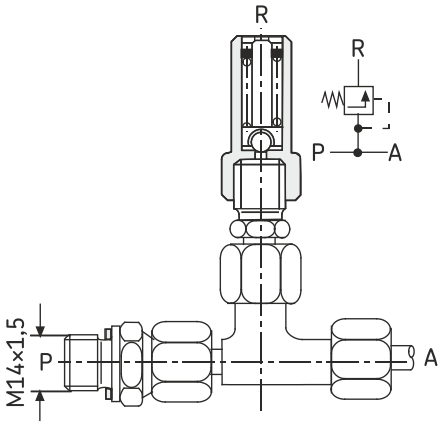
[1)] The values given here apply for a temperature of 20 °C, back pressure of 50 bar and greases of NLGI Grade 2.

5.3 Pressure limiting valve

Fig. 12



Pressure limiting valve with emergency lubrication nipple



Pressure limiting valve with T connector

Pressure limiting valves

1 Emergency lubrication nipple (optional)
A Connection for pipe Ø
P Pipe thread for pump element
R Grease discharge at overpressure

Table 10

Pressure limiting valve without emergency lubrication nipple

Tube ø [mm]	Opening pressure[1)] [bar]	Item number
6	300	161-210-012
6	200	161-210-049
8	300	161-210-018
8	200	161-210-050
10	300	161-210-035
10	200	161-210-051
G 1/4”	300	161-210-036
G 1/4”	200	161-210-059

Table 11

Pressure limiting valve with emergency lubrication nipple

Tube ø [mm]	Opening pressure[1)] [bar]	Item number
6	300	161-210-014
6	300	161-210-025

[1)] Opening pressure ±10 %

Table 12

Pressure limiting valve with T connector

Tube ø [mm]	Opening pressure[1)] [bar]	Item number
6	300	161-210-038
6	200	161-210-032
8	300	161-210-039
8	200	161-210-031
10	300	161-210-016
10	200	161-210-030

Table 13

Pressure limiting valve with pressure gauge (not shown)

Tube ø [mm]	Opening pressure[1)] [bar]	Item number
6	300	161-210-046
8	300	161-210-047
10	300	161-210-048

[1)] Opening pressure ±10 %

5.4 Pressure relief valve with integrated pressure limiting valve

Table 14

Pressure relief valve with integrated pressure limiting valve

Parameter	Values	
	Pressure relief valve 12 VDC	**Pressure relief valve 24 VDC**
Input voltage	12 VDC	24 VDC
Coil voltage	—	—
Rated capacity	26 W	26 W
Rated current	2.18 A	1.2 A
Duty cycle	100 %	100 %
Enclosure rating	IP65	IP65
Plug-in connection	acc. to DIN EN 17530-803	acc. to DIN EN 17530-803
Set pressure on pressure limiting valve	200 bar	200 bar

5.5 Lubricant level switch

Table 15

Technical data for lubricant level switch

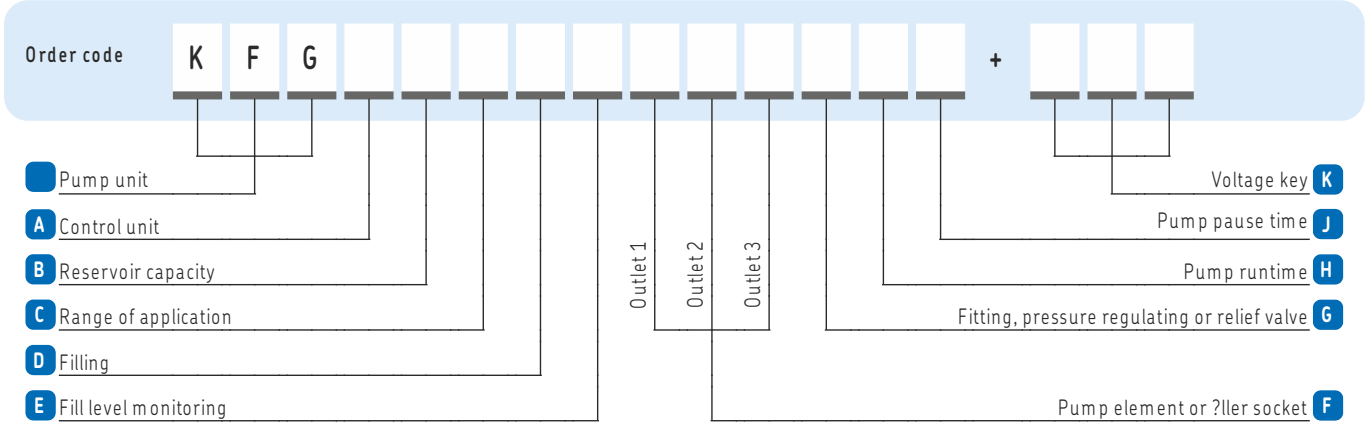
Parameter	Values		
	Type identification code 1 (W1)	**Type identification code 2 (W1G)[1]**	
Design	Magnetic rocker with dry reed contact	Magnetic rocker with signal smoothing, with either dry or wet contact depending on configuration	
Potential	Dry	Dry	Wet
Contact	NO contact	Changeover contact	Changeover contact
Switching voltage	Maximum 24 VDC	Maximum 30 VDC	–
Operating voltage	–	–	10 to 30 VDC
Switched current	Maximum 25 mA; resistive load only[2]	Maximum 2 A	≤ 200 mA
Switching capacity	Maximum 0.6 W	Maximum 60 W	–
Internal power consumption	–	–	6 to 12 mA
Voltage drop	–	–	≤ 1,8 V at 200 mA
Connection for KFG without control unit	7-pin circular connector[3]	7-pin circular connector[3]	
Connection for KFG with control unit	Internal connection	Internal connection	

[1] Only for pumps without integrated control

[2] No inductive load, no lamp load (control light)

[3] For the cable socket, see section **Accessories**, Page 23

5.6 Type identification code for pump KFG



Control unit

	Design	System family open	SKF ProFlex	SKF MonoFlex
A	None control unit	X	X	X
	IG502-2-I	S	S	–
	LC 502	–	L	L

Pump element / Filler socket

	Design	Spring-return piston	Positively driven piston
F	without pump element	X	Y
	0,8 cm³/min	D	–
	1,3 cm³/min	C	J
	1,8 cm³/min	B	H
	2,5 cm³/min	A	G
	5,0 cm³/min	E	L
	socket for ?lling cylinder (not for rotary application)	W	V

Pump cycle time / Interval time

	Control unit	none	IG502-2-I/LC502
H	Runtime [1]	9	E (4 min)
J	Interval time [1]	9	B (1 h)

[1] Factory setting, additional setting times ? Tables on page 8

Reservoir capacity, ?eld of application, lubricant ?lling ?ll level monitoring and voltage key

	Range of application	Rotary	Industry	Vehicle
C		R	M	F
B	2 kg	–	1	1
	4 kg	2	–	–
	6 kg	3	3	3
	8 kg	4	4	4
	10 kg	5	5	5
	12 kg	6	–	–
	15 kg	7	7	7
	20 kg	–	8	8
D	without lubricant	–	X	X
	grease NLGI-Klasse 2 [2]	A	A	A
	customized grease	F	F	F
E	without ?ll level monitoring	X	X	X
	mechanically (minimum)	–	1	1
	mechanically with signal smoothing (minimum) [3]	–	2	2
	capacitive (minimum)	–	3 [4]	–
	cylinder switch	4	–	–
K	12 VDC	–	–	912
	24 VDC	924	924	924
	230 VAC (100–273 VAC)	486	486	–

[2] Typical grease for vehicle lubrication, not for capacitive ?ll level monitoring (3)
[3] Possible only with the variant without control unit (KFGX)
[4] Possible only in combination the reservoir capacities 2 kg and 6 kg

Fitting, pressure restriction valve (PRV) and relief valve [5] for attachment to the pump element

	System family	SKF ProFlex	SKF ProFlex	SKF ProFlex	SKF ProFlex	SKF ProFlex	SKF ProFlex	SKF MonoFlex [6]	SKF MonoFlex [6]
	Design	Without attach-ments	With straight connector	PRV 200 bar with straight connector	PRV 200 bar with SKF plug connector	PRV 300 bar with straight connector [7]	PRV 300 bar with SKF plug connector [7]	Pressure relief valve with PLV 200 bar and straight connector	Pressure relief valve with PRV 200 bar and SKF plug connector
G	M14×1,5 [8]	X	–	–	–	–	–	–	–
	G 1/4" [8]	B	–	–	–	G	–	W	–
	6 mm	–	C	–	–	H	F	–	S
	8 mm	–	D	M	P	J	L	V	T
	10 mm	–	E	N	–	K	–	U	–
	12 mm	–	–	O	–	–	–	–	–

[5] For technical reasons, the ?rst pump element must always be installed at Outlet 1 in SKF MonoFlex systems.
[6] If the relief valve is con?gured together with several pump elements, then the lines leading from the pump elements will be joined together ahead of the relief valve.
[7] Not possible in combination with the pump elements E and L
[8] Female thread

6. Delivery, returns, storage

6.1 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.

6.2 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. 13

Marking of return shipments

6.3 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).

6.4 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”).

6.5 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.

6.5.1 Storage period up to 6 months

Filled products can be used without implementing additional measures.

6.5.2 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.

6.5.3 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.

7. Assembly

7.1 General safety instructions

NOTICE

Damage to components due to improper installation

- 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.

NOTICE

Electrical interference fields

On the pump units' electrical connections, ensure that appropriate measures prevent interference between signals due to inductive, capacitive, or electro-magnetic couplings.

- Shielded cables must be used in places where electrical interference fields can distort signal transmissions despite separate laying of cables.
- The rules and empirical values for "EMC-compliant" cabling must be taken into consideration.

Observe the safety instructions and the technical data in this manual. Additionally, during assembly pay attention to the following:

- Only qualified and authorized technical personnel may install the products described in this manual.
- Adhere to safety distances and legal prescriptions on assembly and prevention of accidents.
- Possibly existing visual monitoring devices, e.g. pressure gauges, MIN/MAX markings, oil inspection glasses must be clearly visible.
- Protect the product against humidity, dust and vibrations.
- Install the product in an easily accessible position. This facilitates other installations, control and maintenance work.

7.2 Mechanical connection

7.2.1 Minimum mounting dimensions

The minimum clearance height for installation depends on the reservoir design.

To ensure enough space for maintenance work and for any disassembly of the pump unit, add at least 20 mm additional clearance onto the total height of the pump (minimum clearance height for installation).

Table 16

Minimum clearance height [mm]

Size	Without control unit (KFG)	With control unit (KFGL/KFGS)
2 kg	250	301
6 kg	363	415
8 kg	610	660
10 kg	735	785
15 kg	960	1010
20 kg	1140	1190

See also Fig. 15and Fig. 16.

7.2.2 Setup and attachment

The pump unit should be installed in a place protected from contamination, water splashes, and vibrations.
Any assembly holes must be made according to the diagram on the following page.
Design specifications and conditions of the manufacturer and the object must be observed when installing the pump unit.

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

- Existing supply lines must not be damaged by the installation work.
- Other units must not be damaged by the installation work.
- The product must not be installed within range of moving parts.
- Ensure an adequate distance from sources of heat or cold.
- Maintain safety clearances and comply with local regulations for installation and accident prevention.

Drilling template
A drilling jig can be ordered (item number 951-130-115).

Mounting equipment
Install the pump units on the machine using three (4 kg/6 kg), four (8 kg/10 kg), or six (12 kg/15 kg) M8 8.8 screws with a minimum length of 20 mm.

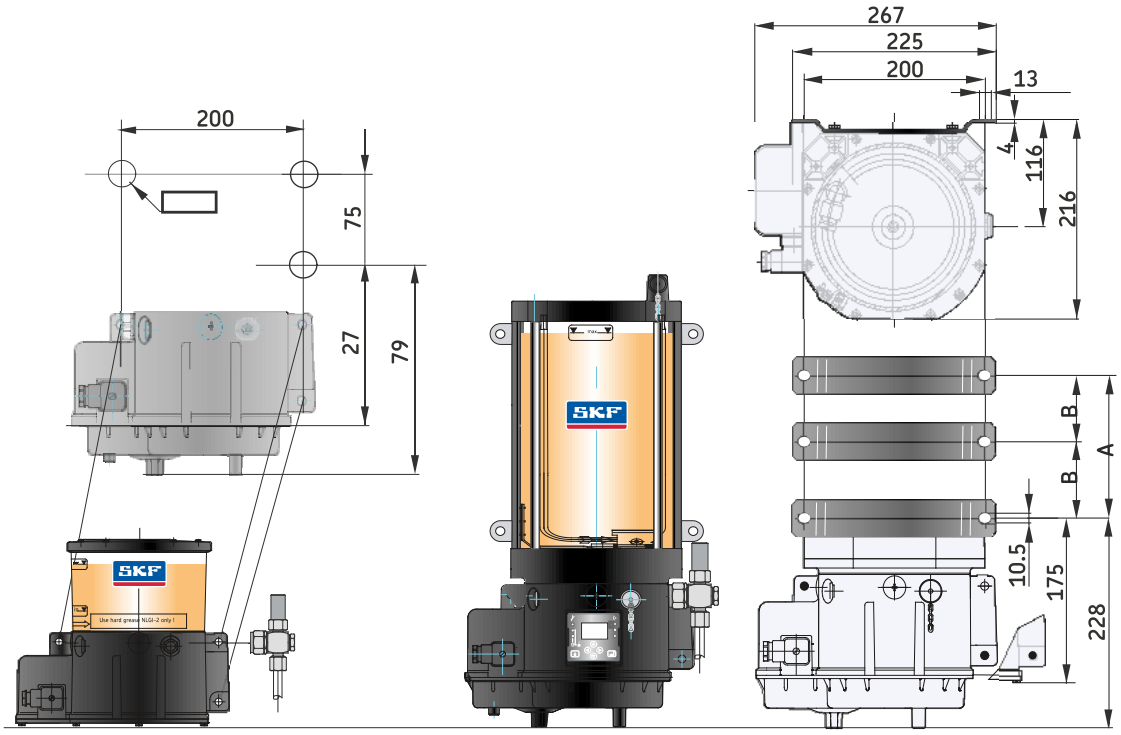
Fastening material to be provided by the customer:

- Hexagon head screws (3x, 4x or 6x) per DIN 933-M8x...-8.8
- Washers (3x, 4x or 6x) per DIN 125-B8,4-St

NOTE
The torque of the fastening screws depends on the customer's installation.
Make sure that torque is adequate when installing the pump unit!

7.2.3 Mounting diagram

Fig. 14



Mounting diagram

Table 17

Mounting diagram – Dimensions

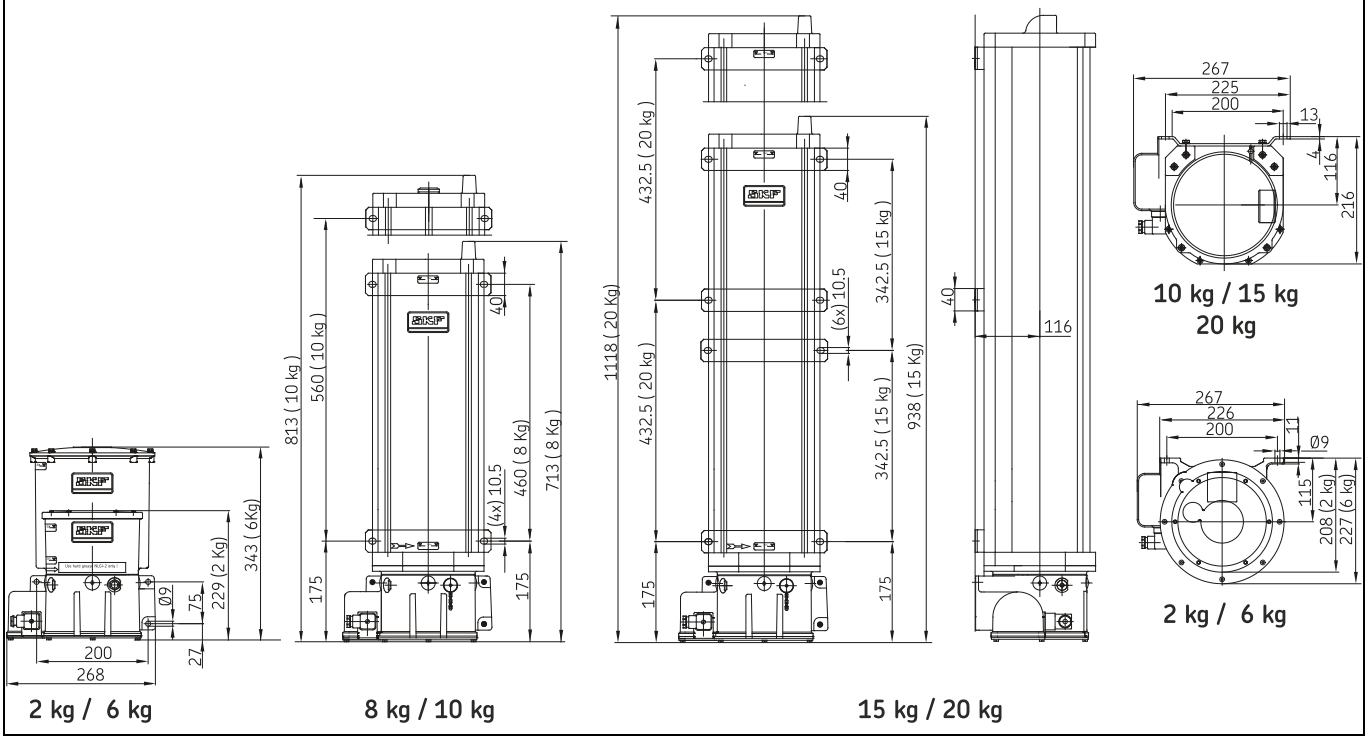
Size	Dim. A [mm]	Dim. B [mm]
8 kg	350	
10 kg	460	—
15 kg	—	342.5
20 kg	—	432.5

NOTE

For note on fastening hardware,see section Mounting equipment, Page 33.
For dimension “A” 4 fixing screws are required; dimension “B” requires 6 screws.

7.2.4 KFG dimensions

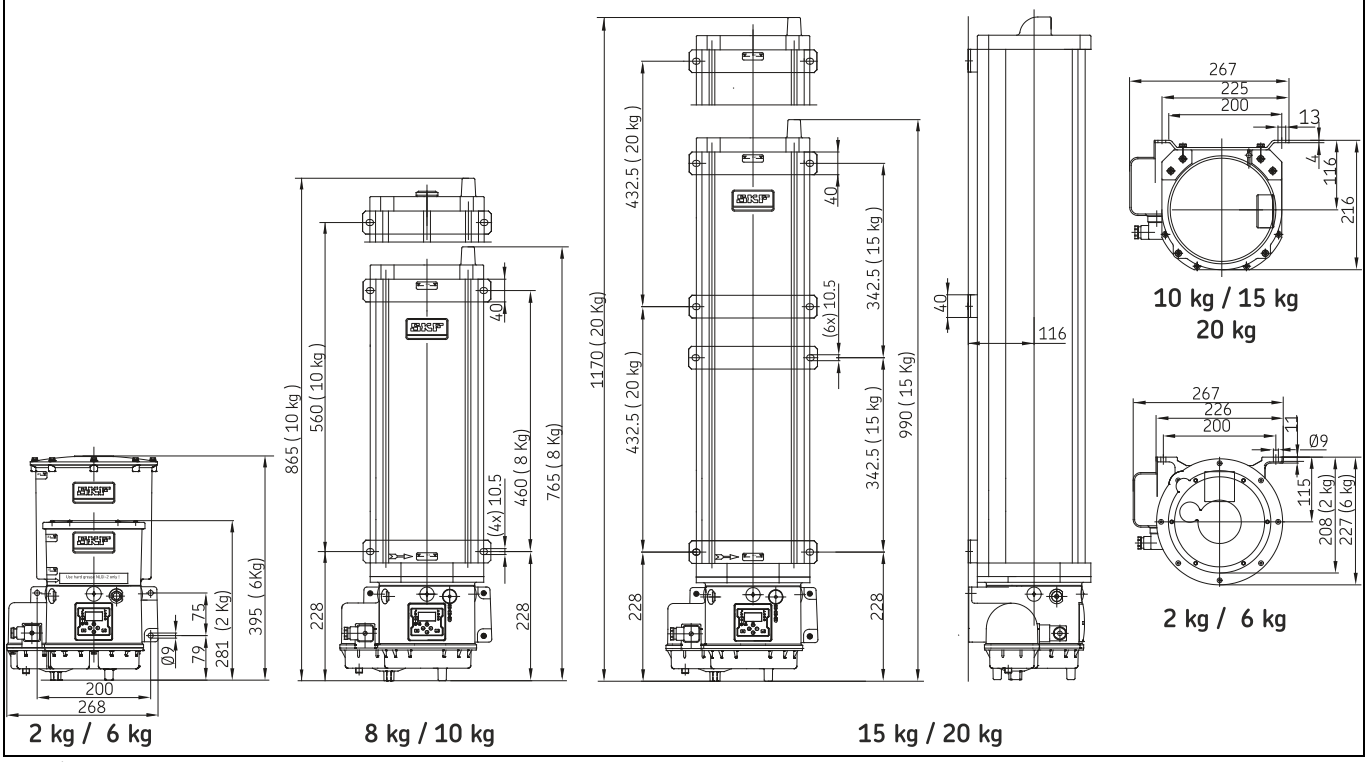
Fig. 15



KFG dimensions in mm

7.2.5 KFGL/KFGS dimensions

Fig. 16



KFGL/KFGS dimensions in mm

7.3 Pump elements of the KFG series

KFG pump units can be equipped with up to three pump elements.

Depending on the pump unit's application (ProFlex/MonoFlex) and configuration (KFG/KFGS/KFGL), the pump elements may each be able to be connected to a single, independent lubrication zone, and/or linked together to form a shared zone.

The pump elements are available in two types of design: with spring return pistons or positively driven pistons.
In both types, the pistons are actuated by a cam disc. In the spring return design, the piston of the pump element is pressed against the cam disc by a spring.
In the positively driven design, on the other hand, the piston is slotted into the cam disc, which is especially practical when the unit is used at very low temperatures.

The pump elements are available in different models for different delivery rates. A grease return or a fill connection can be attached in place of a pump element. A plug screw (DIN 910-M20x1,5-5.8) with sealing ring (DIN 7603-A20x24-Al) can also be fitted if desired.

Pump units of the KFG series are generally delivered with pump elements installed.
Perform the following to later add or replace a pump element:

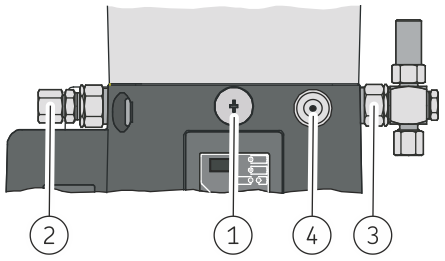
When ordering pump elements, the required delivery rate must be specified, as well as the design type (spring return pistons/positively driven pistons).
For information on the available pump elements, see section Nominal delivery rates, Page 26.

NOTICE

Damage to the pump unit

The two types of pump element, with spring return pistons and positively driven pistons, are not interchangeable!

Fig. 17

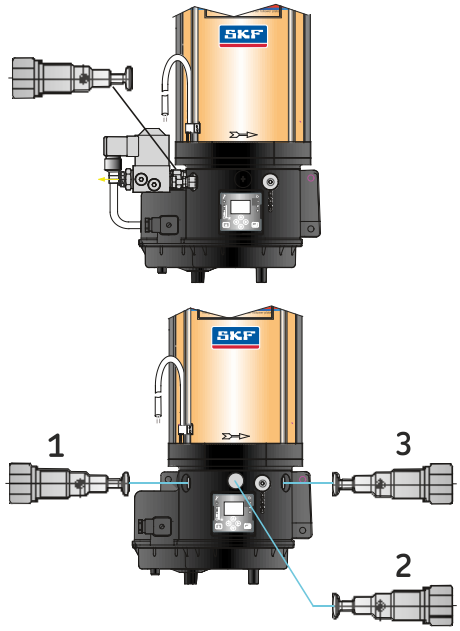


Connection for pump elements

1 Cap screw
2 Pump element with pipe connector
3 Pump element with pressure limiting valve
4 Pressure limiting valve - filling pressure

7.3.1 Pump element designs

Fig. 18

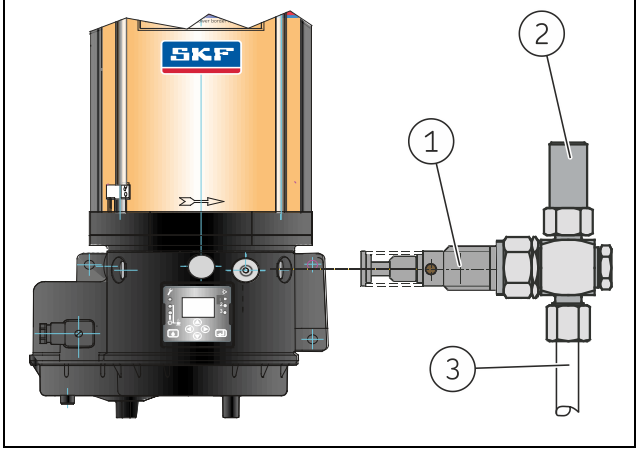


Layout of pump elements

Pump units of the KFG series are generally delivered with pump elements installed.
Perform the following to later add or replace a pump element:

7.3.2 Installing a pump element with spring-return piston

Fig. 19



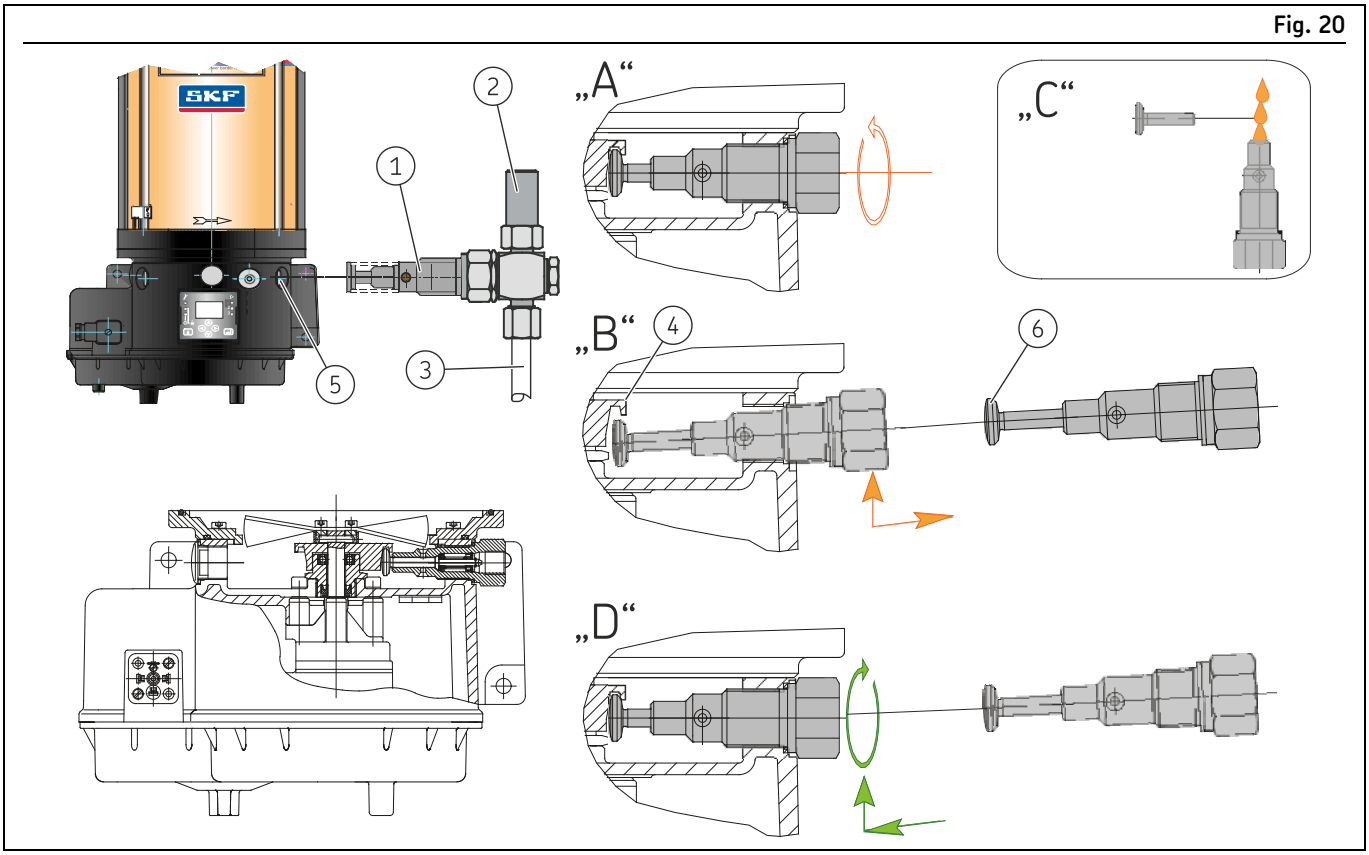
Installing a spring-return pump element

1 Pump element
2 Pressure limiting valve
3 Lubrication line

1. Turn off the pump unit.
2. Undo and remove the plug screw (if there was no pump element installed at the position previously).
3. If there is a pump element already installed at the position: undo and remove any pressure limiting valve or lubrication line attached to it.
4. Undo and remove the installed pump element.
5. Insert the new pump element into the housing bore and screw it in by hand.
6. Tighten the pump element to a torque of 35 Nm [25.8 ft·lb]
7. Switch on pump and leave running until grease without bubbles discharges from the pump element outlet.
8. Reconnect the pressure limiting valve or lubrication line to the pump element and tighten to a torque of 25 Nm [18.4 ft·lb].

7.3.3 Assembly of a pump element with positively driven pistons

Fig. 20



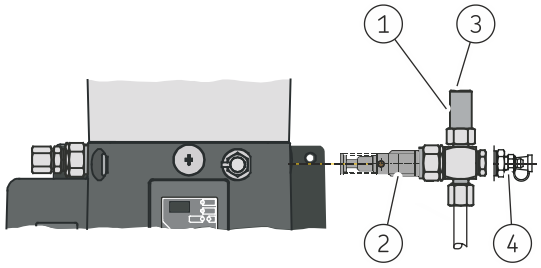
Installing a positively driven pump element

1 Pump element
2 Pressure limiting valve
3 Lubrication line
4 Guide of the eccentric ring
5 Housing bore
6 Piston

1. Turn off the pump unit.
2. Undo and remove the plug screw (if there was no pump element installed at the position previously).
3. If there is a pump element (1) already installed at the position: undo and remove any pressure limiting valve (2) or lubrication line (3) attached to it.
4. Switch off the pump as soon as the pump element to be changed (1) begins supplying lubricant. (To position the eccentric ring).
5. **"A"**: Undo the installed pump element (1) and slowly unscrew it out.
6. **"B"**: After the final turn of the screw thread, slightly raise the pump element (1) so that the piston comes out of the eccentric ring (4)
7. Carefully pull the pump element (1) out of the housing bore (5), making sure that the piston (6) is not pulled out of the pump element.
– If the piston does come loose while pulling out the pump element, remove it from the housing bore with a bar magnet (or taper-nose pliers).
8 **"C"**: Carefully pull the piston (6) out on the new pump element (1).
9. Coat the bore of the pump element lightly with grease
10. Insert the piston in the bore of the pump element, leaving as much of the piston as possible protruding from the bore.
11. **"D"**: Slowly insert the pump element (1) at an angle into the housing bore (5) until the piston bottoms out under the guide of the eccentric ring (4).
12. Straighten the pump element (1) horizontally and screw it into the housing bore (5) by hand.
13. Tighten the pump element (1) to a torque of 35 Nm [25.8 ft·lb].
14. Switch on pump and leave running until grease without bubbles discharges from the pump element outlet.
15. Connect the pressure limiting valve (2) or lubrication line (3) to the pump element (1) and tighten to a torque of 25 Nm [18.4 ft lb].

7.3.4 Pressure limiting valve (DBV)

Fig. 21



Connection for pressure limiting valve

1 Pressure limiting valve
2 Pump element
3 Grease discharge at overpressure
4 Emergency lubrication nipple (optional)

A pressure limiting valve protects the entire lubrication system against excessive system pressure. It is mounted directly on the pump element.
The cracking pressure set for this valve is 300 bar or 200 bar, depending on the valve design. If a blocked metering device or a lubrication point causes operating pressure to rise above 300 (200) bar, the valve opens, followed by a noticeable discharge of grease (
This protects the pump unit against damage.
The pressure limiting valve also serves as a form of visual system monitoring.

A further option are pressure limiting valves with an emergency lubricant nipple. These can be actuated manually to provide the lubrication system with adequate lubricant in case of power failure or a defective pump.

7.4 Filling with lubricant

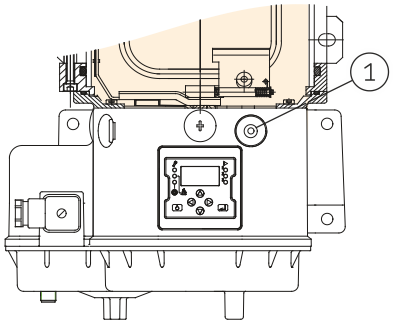
7.4.1 Filling via fill connection

NOTICE

Contamination of the lubrication system

Only fill using clean lubricant and an appropriate filling device. Contaminated lubricants can result in severe system malfunction.

Fig. 22



Filling via fill connection

1 Fill connection

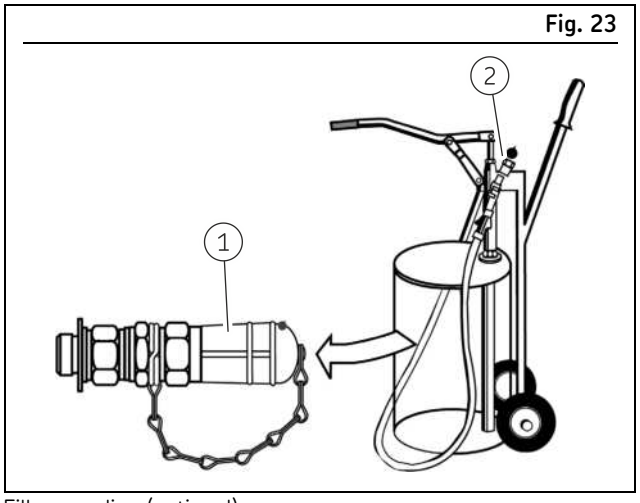
Lubricant is filled through a grease fitting on the housing. Optionally, it can be filled through a filler coupling which is likewise mounted on the reservoir housing. Alternatively, it can be filled via a filler cylinder.

Filling via fill connection

1. Connect the filling pump to the fill connection.
2. Switch on the filling pump and fill the reservoir up to just below the -MAX- marking.
  – Ensure that no air pockets form in the lubricant of the lubricant reservoir during the filling process.
3. Switch off the filling pump and remove it from the fill connection of the pump.

7.4.2 Filler coupling

Fig. 23



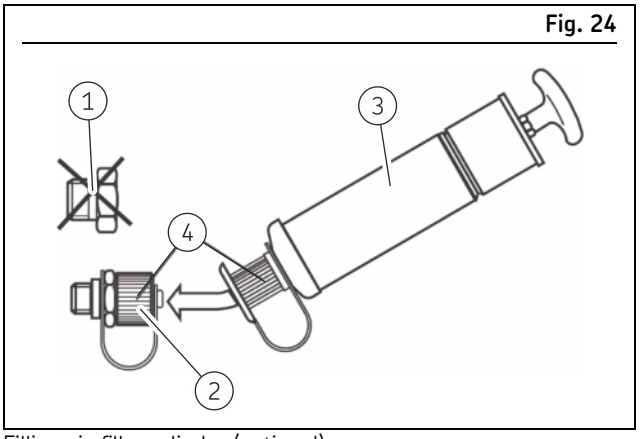
Filler coupling (optional)

1 Filler neck
2 Coupling socket

Optionally, the pump unit can be fitted with a filler neck (Item number 24-9909-0244) for filling with a filling pump.
A corresponding coupling socket (item number 995-001-500) must be mounted on the filling pump. The cap on the fill connection must be removed before filling.

7.4.3 Filling cylinder

Fig. 24



Filling via filler cylinder (optional)

1 Plug screw M20 × 1.5
2 Fill connection
3 Filler cylinder
4 Caps

Optionally, the pump unit can be filled through one of the lubricant outlets using a filler cylinder. To do this, remove the M20 x 1.5 plug screw in the lubricant outlet and replace it with a fill connection
(item number 169-000-174).
The protective caps on the connection and the filler cylinder must be removed before filling.

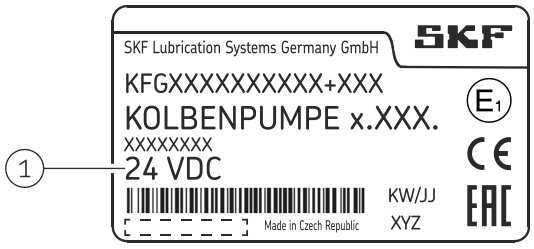
7.5 Power supply

NOTICE

Damage to components due to incorrect power supply

Compare the operating voltage with the specifications on the type plate.

Fig. 25



Operating voltage on type plate

1 Operating voltage specification on type plate

The pump units of the KFG series are available in the voltage designs 12 VDC and 24 VDC.
The electrical voltage is connected through a 4-pin cable socket according to DIN/EN 175301-803 or a 7-pin circular connector according to DIN 72585.

7.5.1 General conditions for electrical connections

Table 18

KFG / KFGS / KFGL

Rated voltage	Power consumption (load-dependent)	Power consumption (maximum)	Pump starting current (maximum 20 ms)	Maximum pre-connected fuse
12 VDC[1)]	2.4 A[2)]	< 5 A	9.0 A	5.0 A (slow)T[3) 4)]
24 VDC[1)]	1.25 A[2)]	< 2.5 A	4.5 A	4.0 A (slow)[3) 4)]

[1)] Protective measures to be taken for operation according to intended use:
Protective Extra Low Voltage (PELV)
Standards: EN 60204 Part 1: IEC 60204-1: DIN VDE 0100 Part 410 / IEC 364-4-41: HD384.4.41

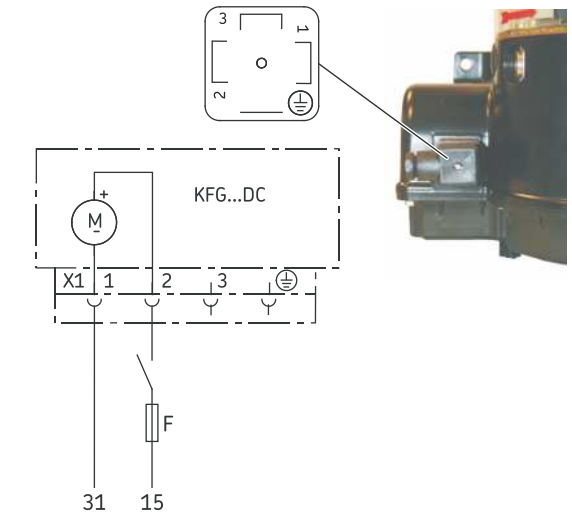
[2)] Typical value at ambient temperature 25 °C and operating pressure 150 bar

[3)] Fuse in accordance with DIN 72581 T3

[4)] Conductor: cross-section 1.5 mm^2, length ≤ 12 m

7.5.2 KFG power supply

Fig. 26



Connector pin assignment for 12/24 VDC

Table 19

Connector pin assignment for 12/24 VDC

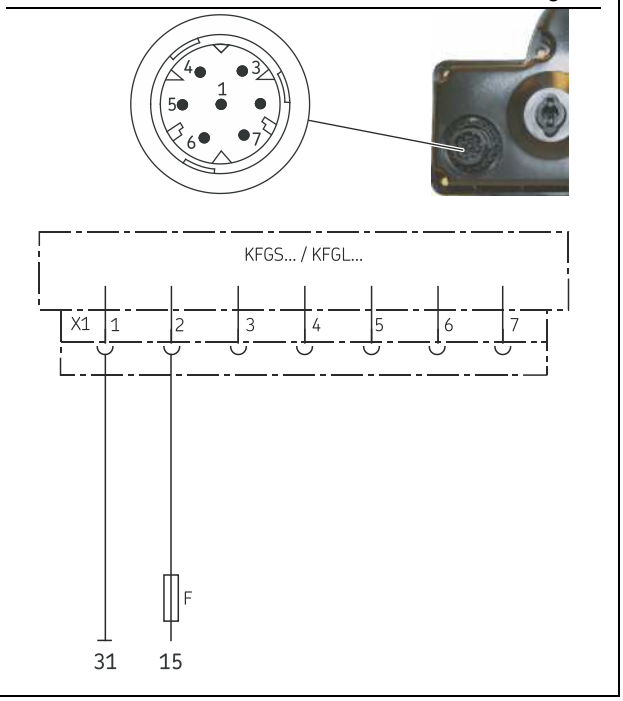
Pin	Description
1	**31** Ground for supply voltage 0 V, GND
2	**15** Supply voltage potential (ignition ON)

The electrical voltage connection is established through a 4-pin cable socket according to DIN/EN 175301-803.

On pumps with low-level signal, the power supply is connected through a 7-pin bayonet connector: see section **7.6.5.3 Electrical connection of KFG low-level signal** on page 50. The low-level signal must be processed by a system provided by the customer.

7.5.3 KFGS/KFGL power supply

Fig. 27



Connector pin assignment for 12/24 VDC

Table 20

Connector pin assignment for 12/24 VDC

Pin	Description
1	**31** Ground for supply voltage 0 V, GND
2	**15** Supply voltage potential (ignition ON)
3-7	See the following connectivity sections

The electrical connection is established via a 7-pin plug-in connection on the underside of the pump unit.

NOTE

The connector pin assignment depends on the specific operating mode and can be found in the following examples.
Unneeded conductor ends on the cable set must be individually insulated and secured so that no short to ground can occur.

7.6 Control port assignments

The following sections present the connectivity most often applied with pump series KFG, KFGS, and KFGL.

7.6.1 KFG series (external control)

The external control units listed in the section **External control units and cable sets**, Page 24are intended to be used for control of the lubrication and pause times, and for monitoring of the lubrication process.

NOTE
The operating instructions/functional description of the corresponding control unit must be observed.

7.6.2 KFGS series (integrated control)

KFGS pump unit with integrated IG502 control unit.
The electrical connection is established via a 7-pin plug-in connection on the underside of the pump unit.

Table 21

Accessories

Designation	Item number
Cable harness, in corrugated pipe, with pump-side socket, 12 m	997-000-630
Cable harness, in corrugated pipe, with pump-side socket, 16 m	997-000-650

Depending on the lubrication system, the pump control unit can run in the following control modes:
- Timer operation without system monitoring
- Timer operation with system monitoring
- Counter operation without system monitoring
- Counter operation with system monitoring

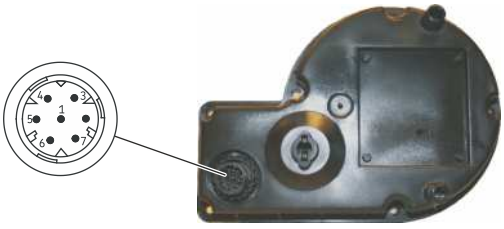
Depending on the pump unit design, an additional plug for fill level control can be integrated into the pump housing. The standard connections are presented below.

7.6.2.1 Timer mode

In timer mode, the pause time is determined by a time value. It is configured by entering a time value in hours.
The pump cycle time is configured using a time value in minutes.

The fill level monitoring unit (W1 control) is internally connected to the integrated pump control unit. A fault signal can be sent to the vehicle control/electronics system via indicator light SL2.

Fig. 28



Plug-and-socket connection according to ISO 15170-1

Table 22

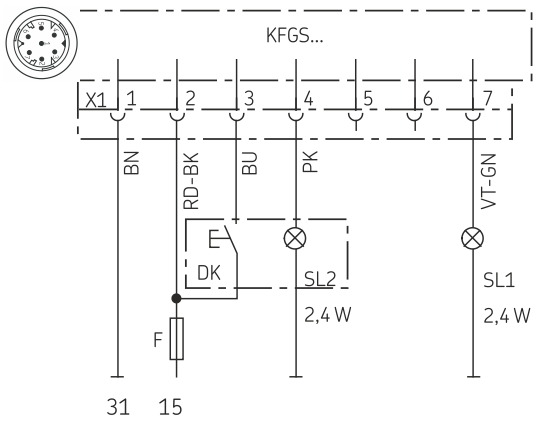
Connector pin assignment

Pin	Color code	Conductor coloring
1	BN	Brown
2	RD-BK	Red-black
3	BU	Blue
4	PK	Pink
5	YE	Yellow
6	BK	Black
7	VT-GN	Purple-green

NOTE
The connector pin assignment depends on the specific operating mode and can be found in the following examples.
Unneeded conductor ends on the cable set must be individually insulated and secured so that no short to ground can occur.

Timer operation without system monitoring

Fig. 29



Programming: tPA, tCO, COP = OFF

Connector pin assignment

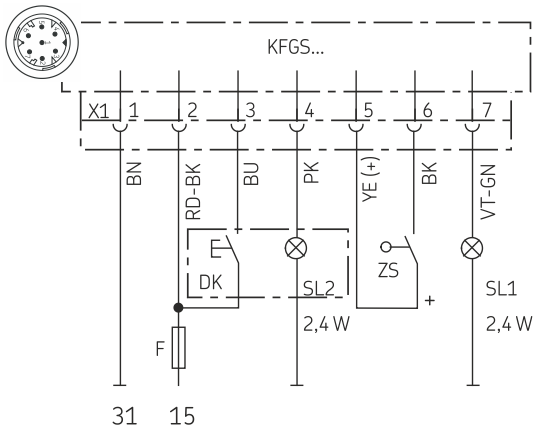
Table 23

Connector pin assignment in timer operation

Pin	Code	Assignment
1	**31**	– Supply voltage potential (0 V, GND)
2	**15**	+ Supply voltage potential "ignition ON"
3	**DK**	Pushbutton = 1. Intermediate lubrication, 2. Delete fault notification
4	**SL2**	Indicator light “malfunction”
5		–
6		–
7	**SL1**	Indicator light “pump ON”

Timer operation with system monitoring

Fig. 30



Programming: tPA, tCO, COP = CS

Connector pin assignment

Table 24

Connector pin assignment in timer operation

Pin	Code	Assignment
1	**31**	– Supply voltage potential (0 V, GND)
2	**15**	+ Supply voltage potential "ignition ON"
3	**DK**	Pushbutton = 1. Intermediate lubrication, 2. Delete fault notification
4	**SL2**	Indicator light “malfunction”
5	**ZS**	Piston detector "+"
6	**ZS**	Piston detector "signal"
7	**SL1**	Indicator light “pump ON”

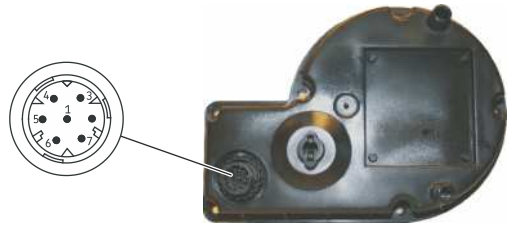
7.6.2.2 Control using machine pulses (Counter mode, load-dependent lubrication)

The duration of the pause time is determined by a pulse generator that sends pulses to the control unit based on how long the vehicle has been in use. The control unit counts the pulses that are received and starts the pump after the preset number of pulses.
The pump cycle time is defined by a time value. Both the number of pulses that determine the pause time and the pump cycle time can be configured.
The fill level monitoring unit is internally connected to the integrated pump control unit. A fault notification can be sent to the process control level via indicator light SL2.

NOTE

One pulse is counted each time the operating voltage is switched on when the pushbutton is closed in counter operation.

Fig. 31



Plug-and-socket connection according to ISO 15170-1

Table 25

Connector pin assignment

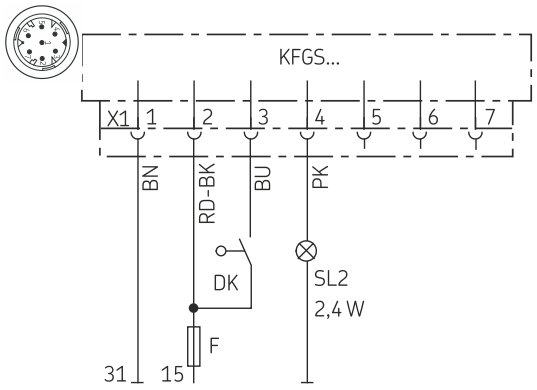
Pin	Color code	Conductor coloring
1	BN	Brown
2	RD-BK	Red-black
3	BU	Blue
4	PK	Pink
5	YE	Yellow
6	BK	Black
7	VT-GN	Purple-green

NOTE

The connector pin assignment depends on the specific operating mode and can be found in the following examples.
Unneeded conductor ends on the cable set must be individually insulated and secured so that no short to ground can occur.

Counter operation without system monitoring

Fig. 32



Programming: cPA, tCO, COP = OFF

Connector pin assignment

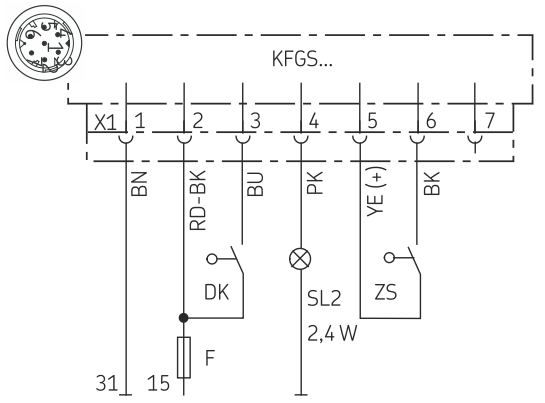
Table 26

Connector pin assignment in counter operation

Pin	Code	Assignment
1	**31**	– Supply voltage potential (0 V, GND)
2	**15**	+ Supply voltage potential "ignition ON"
3	**DK**	Pushbutton = 1. Intermediate lubrication, 2. Delete fault notification
4	**SL2**	Indicator light “malfunction”
5		–
6		–
7		–

Counter operation with system monitoring

Fig. 33



Programming: cPA, tCO, COP = CS

Connector pin assignment

Table 27

Connector pin assignment in counter operation

Pin	Code	Assignment
1	**31**	– Supply voltage potential (0 V, GND)
2	**15**	+ Supply voltage potential "ignition ON"
3	**DK**	Pushbutton = 1. Intermediate lubrication, 2. Delete fault notification
4	**SL2**	Indicator light “malfunction”
5	**ZS**	Piston detector "+"
6	**ZS**	Piston detector "signal"
7	**SL1**	Indicator light “pump ON”

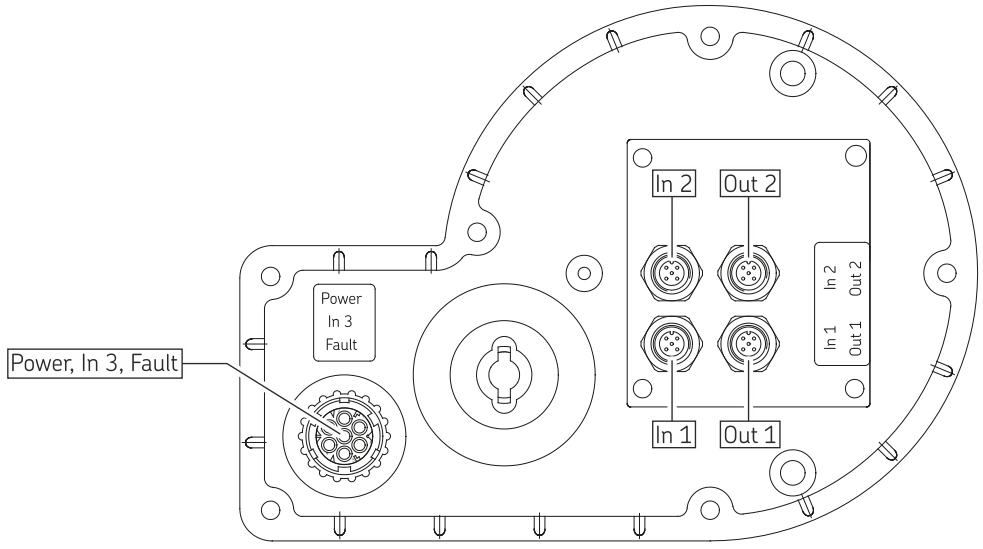
7.6.3 KFGL series

With integrated LC502 control unit

The KFGL pump unit is available in the voltage version 12/24 VDC. The KFGL pump unit can be fitted with multiple fill level indicators, with the fill level indicator for Minimum being connected to the internal pump control unit. The other fill level indicators are connected to control devices supplied by the customer. The standard connections are presented below.

7.6.3.1 MonoFlex single-line lubrication systems

Fig. 34



KFGL pump unit, MonoFlex programming

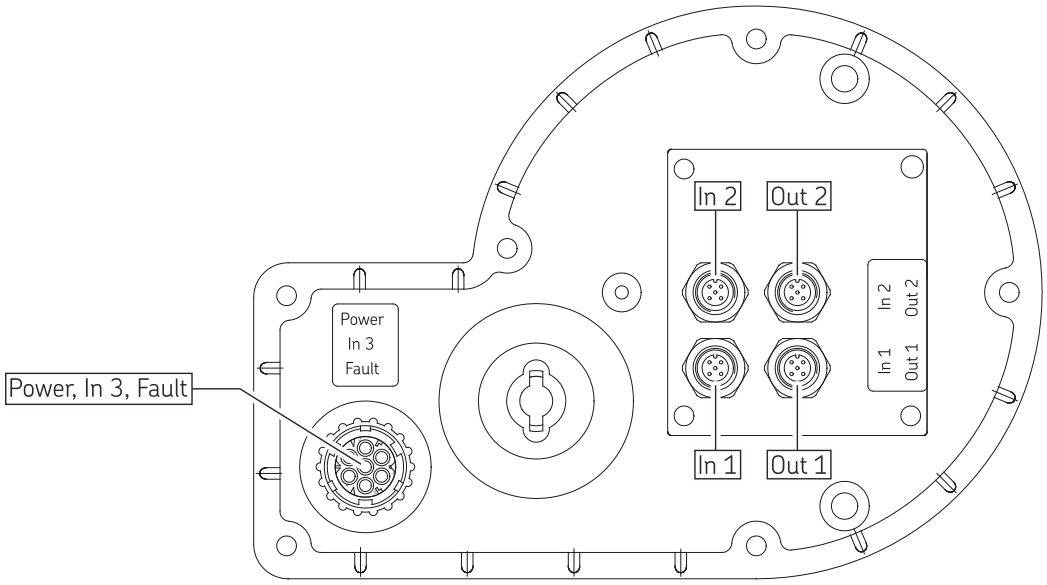
Table 28

Pin assignment, MonoFlex programming 12/24 VDC

Plug	Pin	Assignment
Power	1	0V (-)
	2	12/24 VDC (+)
Fault	3	Fault notification (-)
	4	Fault notification (+)
In 3	5	External DK (+)
	6	External DK (-)
Out 1	3	Valve (-)
	4	Valve (+)
Out 2	3	not programmed (-)
	4	not programmed (+)
In 1	1	Pressure switch 1 (+)
	4	Pressure switch 1 (-)
In 2	1	not programmed (+)
	4	not programmed (-)

7.6.3.2 KFGL ProFlex for progressive centralized lubrication systems

Fig. 35



KFGL pump unit, ProFlex programming

Table 29

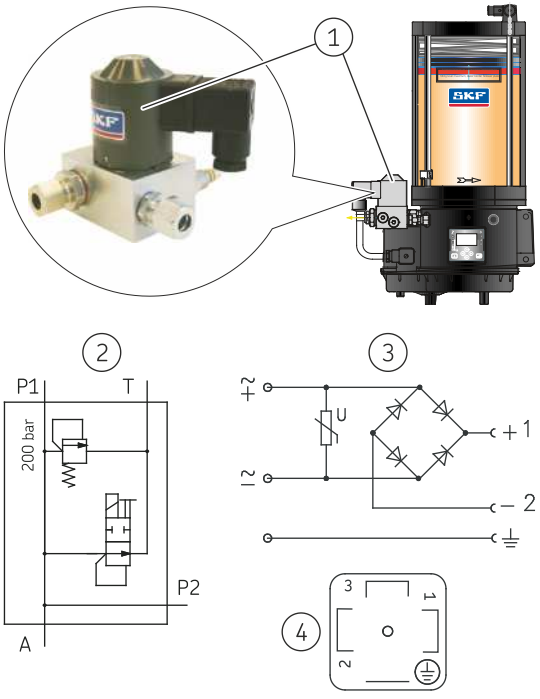
Pin assignment, ProFlex programming 12/24 VDC

Plug	Pin	Assignment	
Power	1	0V (-)	
	2	12/24 VDC (+)	
Fault	3	Fault notification (-)	
	4	Fault notification (+)	
In 3	5	External DK (+)	
	6	External DK (-)	
Out 1	3	Valve (-)	Standard model = Disabled
	4	Valve (+)	system with two main lines
Out 2	3	Valve 2 (-)	Standard model = Disabled
	4	Valve 2 (+)	system with two main lines
In 1	1	Cycle switch 1 (+)	
	4	Cycle switch 1 (-)	
In 2	1	Cycle switch 2 (+)	
	4	Cycle switch 2 (-)	

7.6.4 Pressure relief valve with integrated pressure limiting valve

(for single-line systems with VR metering devices)

Fig. 36



Pressure relief valve/pressure limiting valve

1 Pressure relief valve
2 Hydraulic diagram
3 Electrical block diagram
4 Plug-in connector per DIN EN 17530-803

Table 30

Connector pin assignment

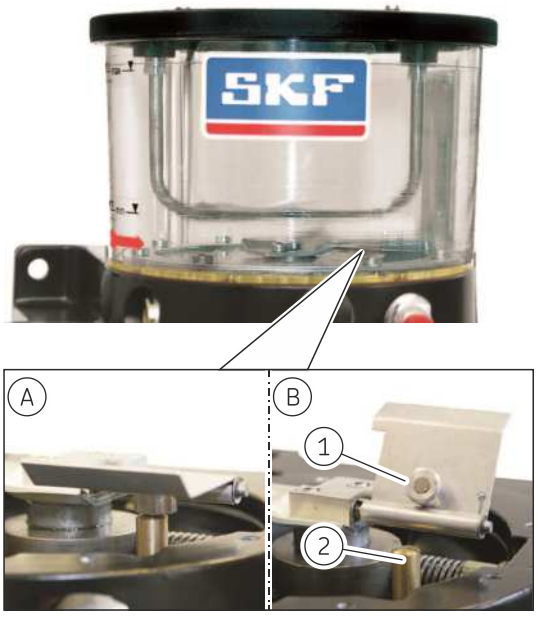
Pin		Assignment
1	**+ / ~**	Power supply +12/24 VDC / 230 VAC
2	**– / ~**	Ground / neutral conductor
3	⏚	PE protective earth conductor

NOTE

When VKR metering devices are used, a max. set pressure of 130 bar for the pressure limiting valve must not be exceeded.

7.6.5 Fill level monitoring

Fig. 37



Lubricant level switch

A Contact closed – full signal
B Contact open – low-level signal
1 Magnetic rocker
2 Reed contact / proximity switch

For the KFGS and KFGL pump units, "minimum" fill level monitoring can be fitted as a standard feature.

- Type identification code 1 (previously W1 control) for grease of NLGI Grade 2
- Type identification code 2 (previously W1G control) with signal smoothing, for grease of NLGI Grade 2

With the pump model KFG (without control unit) with fill level monitoring, the signals are processed by a system provided by the customer.

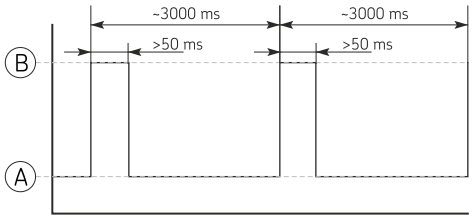
With the pump models KFGS and KFGL, lubricant level indication is connected to the pump's control unit. This effectively prevents the fill level from falling below the minimum, thus preventing any damage to the KFG pump units which could result from that.

7.6.5.1 Type identification code 1 (W1)

Max. 24 VDC, for grease of NLGI Grade 2

The W1 fill level switch is designed as a rocker switch and is integrated in the bottom of the reservoir. A magnetic rocker mounted on the stirring paddle is turned downward by the grease resistance when the reservoir is full. A pulse is created at each revolution of the stirring paddle. When the minimum level is reached, the resistance the grease exerts on the rocker subsides. The rocker turns back and the pulses are interrupted.

Fig. 38



Signal graph for fill level monitoring W1

A Contact closed – full signal
B Contact open – low-level signal

7.6.5.2 Type identification code 2 (W1G)

Dry, signal smoothing, max. 24 VDC, for grease of NLGI Grade 2

The following functions are integrated into the KFG pump unit with signal smoothing:

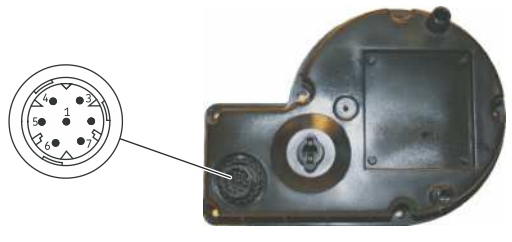
- Electrical isolation between fill level monitoring and pump voltage.
- Fill level information can also be queried during the pause time.
- Reverse voltage protection in pump feed line.
- Time-out periods.

Fill level monitoring W1G is only available with pumps without a control unit (KFGX).
The individual functions are implemented using internal jumpers according to the customer's specific pump design.
The connection is established via a 7-pin circular connector on the bottom of the pump unit.

7.6.5.3 Electrical connection of KFG low-level signal

The standard version of the KFG pump units does not include fill level monitoring.
If KFG pump units have fill level monitoring, its signals must be connected and processed externally (using a system provided by the customer). This optional version has a 7-pin connector on the pump bottom instead of the rectangular connector on the side.

Fig. 39



Connector pin assignment for fill level monitoring

Table 31

Connector pin assignment for type identification code 1 (W1)

Pin		Assignment
1	**31**	Ground for supply voltage 0 V, GND
2	**15**	**+** Supply voltage potential (ignition ON)
3	n.c.	Not assigned
4	n.c.	Not assigned
5		**+** Fill level monitoring potential
6		Fill level monitoring signal (pulses)
7	n.c.	Not assigned

Table 32

Connector pin assignment for type identification code 2 (W1G)

Pin		Assignment
1	**31**	Ground for supply voltage 0 V, GND
2	**15**	**+** Supply voltage potential (ignition ON)
3	**NC**	NC contact for fill level monitoring (pin 5 and pin 3 closed, reservoir empty)
4	**NO**	NO contact for fill level monitoring (pin 5 and pin 4 closed, reservoir full)
5	**COM**	**+** Fill level monitoring potential
6	n.c.	Not assigned
7	n.c.	Not assigned

NOTE

In the case of KFGS/KFGL pump units with integrated control, the fill level monitoring W1 is connected internally to the control.
Fill level monitoring W1G is only available with pumps without a control unit (KFGX).

7.7 Pump unit fill level control

Visual

The transparent lubricant reservoir allows for visual fill level control. This must be performed on a regular basis for safety reasons.

NOTE

The entire system must be ventilated if the reservoir has been emptied below the "min" mark.

Automatic

Pumps of the KFGS series allow for automatic fill level control. If the fill level falls below the "min" mark, the lubrication process is stopped and the fault notification "FLL" is issued on the control screen.

7.8 Connection of the lubrication line

⚠ CAUTION

Risk of slipping

Exercise caution when handling lubricants. Immediately remove and bind any leaked lubricants.

NOTICE

Damage to the higher-level machine caused by faulty planning of the centralized lubrication system

All parts for the construction of the centralized lubrication system must be designed for the maximum operating pressure that occurs, the permissible ambient temperature range, the required delivery volume, and the lubricant to be supplied.

Observe the following assembly information for safe and trouble-free operation:

- Generally valid regulations and company regulations regarding the laying of pressurized pipe and hose lines must be observed.
- Use only clean, pre-filled components and lubrication piping.
- Secure every lubricant line on the pump against excessive pressure through the use of a suitable pressure relief valve (only in the case of pumps without an internal pressure relief valve).
- The main lubricant line should be arranged ascending and be able to be bled at the highest point. Lubrication lines should always be arranged so that air inclusions cannot form anywhere.
- Install lubricant metering devices at the end of the main lubricant line such that the outlets of the lubricant metering devices point upwards wherever possible.
- 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 flow of lubricant should not be impeded by the presence of sharp bends, angle valves, flap valves, seals protruding inward, or changes in cross-section (large to small). Unavoidable changes in the cross-section in lubrication lines must have smooth transitions.
- Connect the lubricant lines in such a way that no mechanical forces are transferred to the product (stress-free connection).
- Lubrication piping is to be positioned in such a way that they cannot become kinked, pinched or frayed.

8. 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.

8.1 Inspections before first start-up

Table 33

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 lubricating grease and mounted correctly. 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	☐	☐

8.2 Inspections during first start-up

Table 34

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	☐	☐

8.3 Progressive system ventilation

1.Fill pump with lubricant.

> **NOTE**
> The initial filling (basic filling) of the pump is done at the factory.

2.Remove main lines on unit.
3.Allow pump to run until lubricant without bubbles is discharged at the straight connector.
4.Mount main lines.
5.Allow pump to run until grease can be seen discharging at all lubrication points.

8.4 Single-line system ventilation

1.Fill pump with lubricant.

> **NOTE**
> The initial filling (basic filling) of the pump is done at the factory.

2.Remove main lines (changeover valve as necessary) on unit.
3.Allow pump to run until lubricant without bubbles is discharged at the straight connector.
4.Mount main lines.
5.Remove plug screw or pressure switch at end of main / and branch lines.
6.Allow the pump to run until air is no longer discharged at the end of the main lines and branch lines.
7.Mount plug screw or pressure switch.
8.Vent lubrication lines and lubrication points and inspect for proper function.

9. Operation

9.1 KFGS control unit

9.1.1 Display and control elements of control screen

Fig. 40

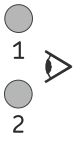
KFGS control screen

The display and control unit is protected from water splashes and mechanical damage by a transparent plastic cover. The cover must be removed to program the unit and then remounted afterwards.

The LED display is off in normal mode. It can be activated by briefly pressing one of the two buttons ▲ ▼. Current values and pre-set parameters are displayed. The display also serves to guide and prompt the operator while programming operating parameters.

Table 35

Display and control elements of the KFGS control screen

Image	Designation	Function
	Three-digit LED display	Displays parameters, values, and operating states
	PAUSE LED	Display pause time
	CONTACT LED	Indicates contact time (pump operation)
	1 = CS LED 2 = PS LED	Monitors system function via an external piston detector CS = Cycle Switch, piston detector PS = pressure build-up monitoring on progressive systems
	FAULT LED	Alarm
	UP or DOWN key	• Switch on display • Display values and parameters • Set values and parameters
	SET key	• Switch between programming mode and display mode • Confirm values
	DK button	• Trigger intermediate lubrication • Delete fault notification

9.1.1.1 LED indications

The LED display is off in normal mode. It can be activated by briefly pressing one of the two pushbuttons ▲ ▼. Current values and pre-set parameters are displayed. The display also serves to guide and prompt the operator while programming operating parameters.

Table 36

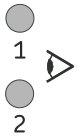
Display and control elements of the KFGS control screen

Display	Meaning	Description	Control function
tPA	t = TIMER PA = PAUSE	The control unit is functioning as a timer and is currently in PAUSE mode.	Part of lubrication cycle; entry and display value in hours.
cPA	c = COUNTER PA = PAUSE	The control unit is functioning as a counter and is currently in PAUSE mode.	Part of the lubrication cycle; the device counts the pulses from the external timer and compares them with the pre-set values.
tCO	t = TIMER CO = CONTACT	The control unit is functioning as a timer and is currently in a pump cycle (CONTACT).	CONTACT = time during which the pump delivers lubricant; entry and display value in minutes.
cCO	c = COUNTER CO = CONTACT	The control unit is functioning as a counter and is currently in a pump cycle (CONTACT).	CONTACT = time during which the pump delivers lubricant; entry and display value in pulses.
COP	C = Cycle O = OFF P = Pressure	Display the "Monitoring settings" menu	
OFF	Monitoring OFF	The CS and PS monitoring functions are switched off.	No system monitoring
CS	**C**ycle **S**witch Piston detector (progressive systems)	Piston detector monitoring is active.	The piston detector is monitored for signals during the CONTACT pump cycle.
PS	**P**ressure **S**witch Pressure switch (single-line systems)	Pressure switch monitoring is active.	The system pressure is monitored by the pressure switch during the pump cycle
FLL	**L**ow **L**evel Fault: Fill level too low	The minimum fill level in the lubricant reservoir has been reached.	
FCS	Fault Cycle Switch Fault: Piston detector	No signal from piston detector during pump cycle.	The control unit is currently in FAULT mode. The operational sequence has been stopped.
FPS	Fault Pressure Switch Fault: Pressure switch	No signal from the pressure switch during pump cycle.	The control unit is currently in FAULT mode. The operational sequence has been stopped.
Oh	Operation Hour Meter Operating hours counter	The values shown after this are the number of hours the control unit has operated.	The control unit is currently in FAULT mode. The operational sequence has been stopped.
Fh	Fault Hour Meter Fault hours counter	The values shown after this are the number of fault hours, i.e., the amount of time the vehicle or machine was operated in FAULT mode.	
bLo	Block operation	No signal from the piston detector. Unlike in normal mode, the control unit is still the monitoring sequence. A fault message is issued if the fault remains for three pump run times.	

9.1.1.2 LED display

Table 37

LED indications

LED	LED lights up = display mode	LED flashes = programming mode
	Operating voltage is present on pump unit and control unit, system is currently in operating status PAUSE.	Value for PAUSE can be changed.
	Operating voltage is present on pump unit and control unit, system is currently in operating status CONTACT (pump motor ON).	Value for CONTACT can be changed.
	**1 = CS** A cycle switch (CS) is used for system monitoring. On progressive metering devices, monitoring is performed during the pump cycle (CONTACT). The LED lights up when a signal is received.	Monitoring type can be switched off in Programming mode. COP = CS monitoring is active COP = OFF monitoring is switched off
	2 = PS A pressure switch (PS) is used for system monitoring. On single-line systems, monitoring is performed during the pump cycle. The LED lights up when a change-over signal is received.	Monitoring by pressure switch cannot be activated on progressive systems. COP = CS monitoring is active COP = OFF monitoring is switched off
	The operating voltage is present on the pump unit and control unit. The control unit is in operating status FAULT. The cause can be accessed via the LED display and shown as a fault code by pressing the pushbutton. The operational sequence has been stopped.	

9.1.1.3 Operator keys

Table 38

Functions of the operator keys

Button	Function
	Pressing during PAUSE triggers an intermediate lubrication. Fault notifications are acknowledged and deleted. Switch on the control screen in display mode.
	Call up next parameter in programming mode. Increase displayed value by 1.
	Switch on the control screen in display mode. Call up last parameter in programming mode. Reduce displayed value by 1.
	Switch between programming mode and display mode. Confirm values entered.

9.1.2 KFGS display mode

Display mode can be identified by the lit-up LED displays. The display does not flash. It is used to query the current settings and operating parameters.

Always start the display mode by briefly pressing one of the two keys ▲ ▼.

Table 39

Display mode

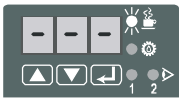
Step	Button	Display	Description
1.	▲ ▼ Press briefly		The current operating status is shown. Example: Pause Timer operation
2.	▲		Display remaining pause time for current lubrication cycle. Example: 1 h
3.	▲		Display pre-set total pause time. Example: 1.0 h (factory setting) **Note!** Display is in hours.
4.	▲		Display pump cycle time Example: Timer operation
5.	▲		Example: System is currently in operating status Pause, current **tCO** display (**t**imer **CO**ntact) not possible
6.	▲		Display of the pre-set value Example: 4 min (factory setting) **Note!** Display is in minutes
7.	▲		Display system monitoring

Table 39 (continued)

Display mode

Step	Button	Display	Description
8.	▲	 or  or 	Monitoring switched off Monitoring via piston detector Not permitted on progressive systems.
9.	▲		
10. / 11.	▲	 ▲ 	Example: 1st part of total value Note this down! 2nd part of total value Total value: 00533.8 h Maximum value: 99999.9 h
12.	▲		Display fault hours
13. / 14.	▲	 ▲ 	Example: 1st part of total value Note this down! 2nd part of total value Total value: 00033.8 h Maximum value: 99999.9 h
15.	▲	—	Display clears **Oh** and **Fh** values are stored in EEPROM and cannot be deleted.

9.1.3 KFGS programming mode

The working/pause times can be reprogrammed to adapt the lubrication intervals and the resulting lubricant quantities to specific requirements.

9.1.3.1 Start programming mode

1. Press and hold the key for more than 2 s.
2. The 3-digit LED display starts flashing.
3. Use the keys to enter the code (factory setting of code is 000).
4. Confirm your entry with .

9.1.3.2 Change lubrication interval times

Table 40

Programming mode – Change lubrication interval times

Step	Button	Display	Description
1.	Press for more than 2 s		The display flashes. Enter the code (000 factory setting)
2.	Press briefly (confirm code)		Automatic display of first parameter: "Pause in timer operation" "PAUSE" LED flashes
3.	Press briefly		Pause time 1 h (factory setting, display in hours)
4.			Set new value Example: 6.8 h = 6 h 48 min
5.	Press briefly (confirm value)		Display the next parameter: "Pump cycle time in timer operation" "CONTACT" LED flashes

Table 40 (continued)

Programming mode – Change lubrication interval times

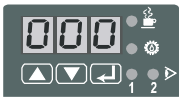
Step	Button	Display	Description
6.	Press briefly		Pump cycle time 4.0 min (factory setting) For the permissible setting range for KFG(S), see section Technical data, Page 25 (display in minutes)
7.			Set new value Example: 3 min
8.	Press briefly	—	Confirm new value
9.	Press for more than 2 s	—	Changes are written to memory, the values are activated, and the display clears

9.1.3.3 Configure system monitoring

System monitoring can be changed to activate or deactivate the monitoring functions for lubrication.
When system monitoring is active, you can select monitoring via piston detector or monitoring via pressure switch.

Table 41

Programming mode – Configure system monitoring

Step	Button	Display	Description
1.	Press for more than 2 s		The display flashes. Enter the code (000 factory setting)
2.	Press briefly (confirm code)		Automatic display of first parameter: "Pause in timer operation" "PAUSE" LED flashes
3.	Press until:		Display the "Monitoring settings" parameter
4.	Press briefly		System monitoring switched off (factory setting)
5.		 	Monitoring via piston detector "CS" LED flashes Monitoring via pressure switch "PS" LED flashes **Note:** Monitoring by pressure switch cannot be activated on progressive systems.
6.	Press briefly	—	Confirm new setting
7.	Press for more than 2 s	—	Changes are written to memory, the values are activated, and the display clears

9.1.3.4 Change operating modes

A change of operation mode means changing to timer operation, counter operation or special applications.

Table 42

Programming mode – Configure system monitoring

Step	Button	Display	Description
1.	Press for more than 2 s		The display flashes. Enter the code (000 factory setting)
2.	Press briefly (confirm code)		Automatic display of first parameter: "Pause in timer operation" "PAUSE" LED flashes
3.	Press until:		Change from pause time to counter operation (only possible with external electrical pulse generator) Values in pulses
4.	Press briefly		Display "pump cycle time in timer operation" parameter
5.			Change from pump cycle time to counter operation, special application
6.	Press briefly	—	Confirm new setting
7.	Press for more than 2 s	—	Changes are written to memory, the values are activated, and the display clears

9.1.3.5 Change access code

NOTE

This factory default code is now deleted and the new value is activated.
Write down the new value and store it in a safe place. The parameters cannot be programmed if the code is lost or forgotten. In this case, the pump unit must be sent to the dealer or authorized SKF branch office.

- Do not enter the digits 321 as the new code.

Table 43

Programming mode – Configure system monitoring

Step	Button	Display	Description
1.	Press for more than 2 s		The display flashes. Enter the code (000 factory setting)
2.	▲ ▼		Set the key number 321 (321 = factory default setting)
3.	Press briefly		Display flashes (000 factory setting)
4.	Press briefly		Display flashes
5.	▲ ▼		Set a new code Example: 666 Notice! Do not enter 321.
6.	Press briefly	—	Confirm new setting
7.	Press for more than 2 s	—	Changes are written to memory, the values are activated, and the display clears

9.1.3.6 Programming and display ranges

Table 44

Programming ranges

Parameter	Description / programming range
tPA	Pause time [1)] 0.1 h to 99.9 h
tCO	Pump run time [1)] 0.1 min to 99.9 min
cCO	Pulses [1)] 1 to 999

[1)] For the permissible setting range for KFG(S), see section General technical data, Page 25.

Table 45

Display ranges

Parameter	Description / display range
Oh	Operating hours 0.1 h to 99999.9 h
Fh	Fault hours 0.1 h to 99999.9 h

9.1.4 KFGS operating modes

9.1.4.1 Timer operation

The pause and pump operation are time-dependent.
The lubrication cycle is controlled by the pre-set, time-dependent values for PAUSE and CONTACT.

PAUSE: Values in hours
CONTACT: Values in minutes

NOTE
Set **tPA** and **tCO** in programming mode.

9.1.4.2 Counter operation

Pause time: dependent on the number of pulses, pump run time: time-dependent.
An external pulse generator must be attached as described in section Control using machine pulses (Counter mode, load-dependent lubrication), Page 44.

PAUSE: Values in pulses
CONTACT: Values in minutes

A switch opens and closes based on machine movements, revolutions, etc. A lubrication is triggered once the set number of pulses **cPA** is reached.

NOTE
Set **cPA** and **tCO** in programming mode.

9.1.4.3 Operation without system monitoring

In this operating mode, the lubrication cycle is controlled solely by the pre-set values for PAUSE and CONTACT.

NOTE
The monitoring must be switched off (parameter **cOP = OFF**). System malfunctions are not automatically detected or displayed.

9.1.4.4 Operation with system monitoring

In this operating mode, system functions are additionally monitored using external switches.
The following can be monitored:
- Fill level in the lubricant reservoir.
- Function of progressive metering device using a piston detector.

NOTE
Operational malfunctions are automatically detected and displayed. The monitoring is switched on (parameter **COP = CS** or **COP = PS**).

9.1.5 Fill level monitoring

NOTE
If fill level monitoring is installed, it is always active.

If the level in the lubricant reservoir falls below the minimum fill level, the lubricant cycle is stopped and a fault notification is issued on the control screen.

Fig. 41

Fault notification "Fill level too low"

NOTE
A unit can only be retrofitted from "without" fill level monitoring to "with" fill level monitoring in the factory, which requires that it be sent to the factory for rework.

9.1.6 Monitoring via piston detector

NOTE
Only possible for centralized lubrication systems with progressive metering devices. For greases up to NLGI Grade 2.

The piston detector monitors the movement of pistons in the progressive metering device during CONTACT time (pump cycle time). For the system diagram, see progressive system with KFGS/KFGL pump unit, Page 19.

The following monitoring setting must be activated in programming mode:

Parameter **COP = CS** (see section Configure system monitoring, Page 61).

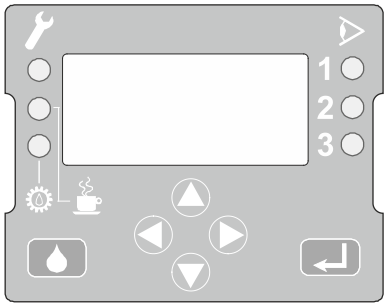
Fig. 42

Fault notification "Piston detector"

9.2 KFGL control unit

9.2.1 Display and control elements of control screen

Fig. 43



KFGS control screen

The display and control unit is protected from water splashes and mechanical damage by a transparent plastic cover. The cover must be removed to program the unit and then remounted afterwards.

Table 46

Display and control elements of the KFGS control screen

Image	Designation	Function
	Three-line LCD display	Displays parameters, values, and fault notifications
	PAUSE LED	Display pause time Yellow LED lights up = active pump pause time on at least one main line
	CONTACT LED	Indicates contact time (pump operation) Green LED lights up = active pump run time
1 2 3	1 = output 1 2 = output 2 3 = Inputs	LED output 1 or 2 lights up = pump output 1 or 2 is switched on. The lubricant is delivered via the indicated main line (1 or 2). Inputs LED lights up = signal change on input port. The LED lights up for approx. 1 second each time the signal on the input port changes.
	FAULT LED	Alarm • Red LED flashes = fault detected • Red LED lights up = fault on a signal input, no error detected on pump control unit (error is outside pump)
	Operator keys	• Menu selection (navigation) • Editing numerical values
	ENTER key	• Confirm selection • Confirm entries and values
	DK button	• Trigger intermediate lubrication • Acknowledge and delete fault notifications

9.2.1.1 Operator keys

Table 47

Functions of the operator keys

Button	Function
	Menu selection (navigation) Go to the selected menu based on direction of arrow.
	Editing numerical values (up/down arrow key) The numerical value is incremented/decremented based on direction of arrow. • Press <arrow key right> or <arrow key left> to move the cursor position to the adjacent digit. To exit the editor window without saving the current change, press the key again after reaching the last digit. • Pressing <arrow key up> increments the selected digit by one. • Pressing <arrow key down> decrements the selected digit by one. The value range for seconds and minutes can be between 0 and 59; a value between 0 and 65535 can be set for hours.
	Operator key for editing numerical values (arrow key right) Pressing the key moves the cursor one position to the right. If the cursor is on the right edge, the edit window closes and the changes are discarded.

9.2.2 Display and control menu

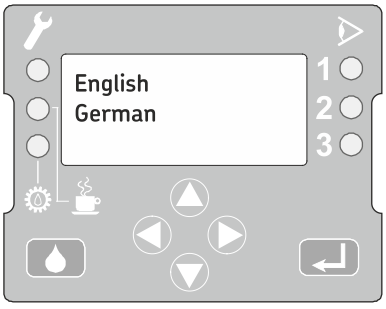
The control unit's LCD display has three rows of eight characters each.
In menus containing more than three available choices, only three options are visible. Press the <up/down> arrow keys to access further options.

Configuring a setting on the device involves consecutively opening multiple menu windows. The current device setting is then shown on a black background.

Not all possible options are displayed in the settings. Only settings that are available and permitted for the selected device type (ProFlex or MonoFlex) and the current device settings are shown.

9.2.2.1 Language selection

Fig. 44



Language selection

The first menu level shows language selection. The language that is currently selected flashes.

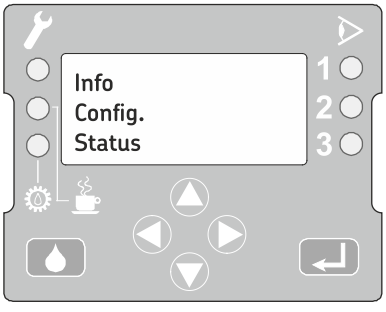
1. Use the keys ▲ ▼ to select the desired language.

2. Confirm your selection with the key ↵.

Upon confirmation, the main menu will be displayed in the selected language.

9.2.2.2 Main menu

Fig. 45



Main menu

Table 48

Main menu

Menu	Description
Info	Display of device-specific data such as the serial number or firmware version of the control unit
Config.	Parameter settings
Status	Display current status of control unit
Service	Service menu Password-protected menu level enabled only for SKF service personnel

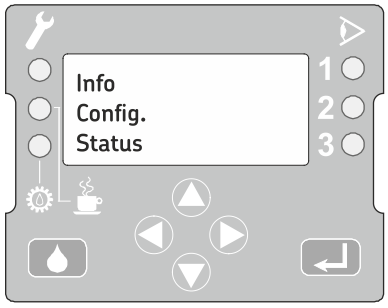
1. Use the keys ▲ ▼ to select the desired menu.

2. Confirm your selection with the key ↵.

Upon confirmation, the selected submenu will be displayed.

9.2.2.3 "Info" menu

Fig. 46



"Info" menu

The "Info" menu is used to query the hardware identification code and the runtimes stored thus far for the system, motor, and error time (system runtime, motor runtime, error time).

NOTE
No values can be entered or modified in the "Info" menu.

Table 49

Info menu

Parameter	Description
Serial number	This displays the serial number of the control unit.
Firmware	This displays the software version number of the control unit.
Sys time	This displays the total running time (on-time) of the control unit in hours, minutes, and seconds.
Mot time	This displays the total runtime of the pump motor in hours, minutes, and seconds.
Err time	This displays the total time of the current error (if present). If there is currently no error state, the display shows the sum time of all errors detected thus far.

1. Use the keys ▲ ▼ to select the desired parameter.
2. Confirm your selection with the key ↵.
- The key ◀ takes you back to the main menu.

Upon confirmation, the selected parameter will be displayed.

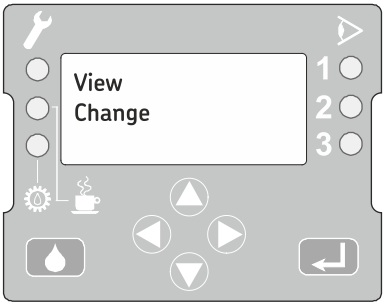
9.2.2.4 "Config." menu

In the "Config." menu, you can choose whether you want to view the menu only, or edit the configuration data. To edit the configuration data, you need to enter the password.

Requesting the editing mode / entering the password

NOTE
When the correct password is entered, all currently running lubrication procedures are stopped and the editing mode starts.

Fig. 47

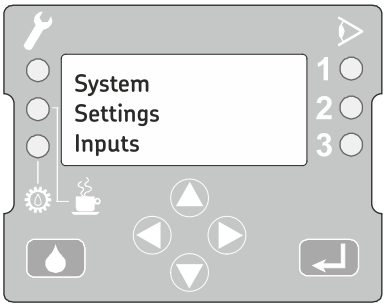


Requesting the editing mode

1. Use the keys ▲ ▼ to select the desired mode.
- *Display:* This displays the contents of the "Config." menu. The active configuration or selection will flash. Data cannot be entered or changed in display mode.
- *Change:* This activates the editing mode for the "Config." menu. The prompt to enter the password will then appear.

2. Confirm your selection with the key ↵.
3. Entering the password (if *Change* is selected):
Use the keys ▲ ▼ ▶ to enter the password and then confirm your entry using the key ↵.
- You can use the key ◀ to cancel your entry and go back to the main menu.

Fig. 48



"Config." menu

Table 50

"Config." menu

Menu/parameter	Description
System Settings Inlets Outlets Default Reset New Pwd	Submenus in the "Config." menu For detailed information, see the separate operating instructions for the control unit.

1. Use the keys ▲ ▼ to select the desired menu.

2. Confirm your selection with the key ↵.

Upon confirmation, the selected submenu will be displayed.

9.2.3 Programming a KFGL pump unit

Detailed, separate operating instructions for the LC502 control unit are supplied together with these assembly instructions. Chapter 5 of the separate operating instructions for the control unit describes the user-configurable setting options.

Document No. 951-180-004-EN
For the programming of a KFGL pump unit in MonoFlex design (single-line centralized lubrication system)

Document No. 951-180-005-EN
For the programming of a KFGL pump unit in ProFlex design (progressive centralized lubrication system)

10. Maintenance and repair

⚠ 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

⚠ WARNING

System pressure

The centralized lubrication system is pressurized during operation. Depressurize the centralized lubrication system before starting maintenance work

NOTE

Only original spare parts from SKF Lubrication Systems Germany GmbH may be used.

10.1 General

The following maintenance schedule contains an overview of the inspections and maintenance work that must be performed on a regular basis.
The maintenance intervals depend on customer-specific settings and operating conditions. The customer is therefore responsible for determining and observing the maintenance intervals on its own.

NOTE

All work beyond this scope must be performed by authorized SKF Service personnel only.

- The purity of the lubricants used is the decisive factor in the service life of the pump elements.

10.2 Service

If you encounter problems or have any questions, please contact our sales and service centers or our representatives abroad. A list with current addresses is available on the Internet at:
www.skf.com/lubrication

10.3 Maintenance schedule

Careful and regular maintenance is required in order to detect and remedy possible faults in time. The operator must always determine the specific intervals according to the operating conditions, review them regularly, and adjust them where necessary. If necessary, copy the table for regular maintenance activities.

Table 51

Checklist: Maintenance activities

Activity to be performed	YES	NO
Mechanical and electrical system connections established correctly	☐	☐
The performance characteristics for the aforementioned connections match the specifications in the "Technical data"	☐	☐
All components such as lubrication lines and metering devices are correctly installed	☐	☐
Product is protected by a suitable pressure limiting valve	☐	☐
No apparent damage, contamination, or corrosion	☐	☐
Any dismantled protective and monitoring equipment is fully reinstalled and functional	☐	☐
All warning labels on the product are present and in proper condition	☐	☐
No unusual noises, vibrations, moisture accumulation, or odors present	☐	☐
No undesired discharge of lubricant (leakages) at connections	☐	☐
Lubricant is fed without bubbles	☐	☐
The bearings and friction points requiring lubrication receive the planned lubricant volume	☐	☐

11. 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.

11.1 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.

11.2 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.

11.3 Exterior cleaning

Do not allow any cleaning fluid to enter the interior of the product during cleaning.
If products have ultrasonic sensors, the active sensor surface must be cleaned with a cloth when it becomes contaminated.

12. Faults, causes, and remedies

The operator/operating personnel must perform visual fill level control of the lubricant reservoir at regular intervals.

The control intervals depend on the amount of lubricant required and the pump's runtime. The operator/operating personnel must therefore determine the intervals on their own based on the specific conditions of usage.

12.1 Malfunctions on pump units

Table 52

Pump malfunctions

Fault	Possible cause	Remedy
Stirring paddle in the lubricant reservoir does not rotate during the activated pump run time.	• Mechanical damage, e.g., motor defective.	• Replace pump. • Carry out start-up and functional test. • Be sure the pause and contact times are correct.
	• Undervoltage • Electrical connection interrupted.	• Check the power supply. • Check or replace fuse. • Check electrical connections. • Check cable set for damage.
Pump does not function when the key is pressed, although all electrical connections are ok.	• Electrical control has failed. • Pump drive/motor is defective. • Lubricant level in reservoir is below minimum.	• Check the fuse. • Replace pump. • Fill lubricant reservoir to "max." • If the reservoir has been emptied, the entire system must be bled after refilling (see section First start-up, Page 52).
	• Stirring paddle cannot be rotated.	• Replace the pump element, making sure the marking on the pump element is correct.
Pump does not deliver any lubricant, although stirring paddle is rotating.	• Suction problems due to air pockets in grease.	• Dismantle pump element and operate pump using the key until grease discharges from outlet on housing.
	• Positively driven pump element not correctly installed.	• Check the installation of the positively driven pump elements (see section Assembly of a pump element with positively driven pistons, Page 38).
	• Pump element does not build up pressure, pump element is worn out.	• Replace the pump element, making sure the marking on the pump element is correct.
	• Lubricant too stiff.	• If necessary, adjust lubricant to work properly at lowest working temperature.
Pressure limiting valve on pump opens and lubricant leaks out.	• System pressure is over 200/300 bar, e.g., due to metering device blockage or blocked lubrication point	• system and repair/rework the system so the maximum system pressure at 20 °C is 200 bar.
	• Valve is damaged or contaminated, so it does not close properly.	• Replace pressure limiting valve.

12.2 Malfunctions on KFGS pump unit

NOTICE

Damage to components

The lubrication points may not be supplied with adequate lubrication because a malfunction has affected the proper functioning of the lubrication system.
Malfunctions must always be remedied immediately.

Fig. 49

Fault LED

All fault notifications are displayed by the Fault LED as a centralized fault notification.
When a fault notification occurs, the control unit stops the normal operational sequence and the fault that has occurred is saved and displayed. The cause of the fault can be read on the control screen. This greatly simplifies failure diagnostics, though it requires system monitoring.

12.2.1 Displaying fault notifications

Table 53

Fault notifications

Display	Description
FCS	**Fault Cycle Switch:** No signal from piston detector during pump cycle. (See Block operation on page 75)
FPS	**Fault Pressure Switch:** No signal from the pressure switch during pump cycle.
FLL	**Fault Low Level:** The minimum fill level in the lubricant reservoir has been reached. The further operational sequence has been stopped.

1. Briefly press the key ▲ or ▼ to start the display mode.
2. Press the key ▲ repeatedly until the fault notifications (see Table 53) are displayed.

12.2.2 Deleting fault notifications

NOTICE

Damage to components

Determine and remedy the cause of faults before deleting fault notifications.
The user is liable for damages resulting from operating the machine without lubrication.

NOTE

The time during which the control unit and pump unit have been operated without lubrication is stored as fault hours **Fh** in the EPROM and cannot be deleted.

12.2.3 Fault types

Depending on the severity of the fault, the control unit issues either a warning or a malfunction notification (see following table).

Table 54

Example of a fault

Display	Description
Fault LED flashes	**Example of fault** Insufficient number of piston detector signals from a lubrication segment during the pump cycle. **Response by control unit** Block operation up to configured number of repetitions • If the piston detector signal has still not been received, the valve is closed and a fault notification is generated.

12.2.4 Recording fault times

Fault-state counter
The amount of time that passes from issuance of a failure notification to its acknowledgment is added up in hours. After acknowledgment, this value is automatically transferred to the fault-hours counter.

Fault-hours counter
The fault-hours counter adds up all fault-state times occurring during the total running time of the unit. The current counter reading can be read in display mode in two blocks of three digits each by calling up the parameter **Fh** (see Chapter KFGS display mode, Page 57).

- The maximum reading that can be displayed is 99 999.9 hours.
- The smallest recordable interval is 0.1 hours = 6 minutes. The memory cannot be deleted.

12.2.5 Faults in a progressive system

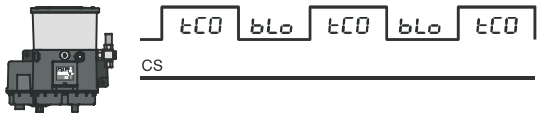
Block operation
Block operation is the reaction of the control unit to the absence of signals from the piston detector.

Possible causes:

- Defective lubrication lines
- Blocked progressive metering device
- Defective piston detector
- Insufficient lubricant

NOTE
A total of three lubrication cycles are performed with query to the piston detector.

Fig. 50



No signal from the piston detector

No signal from piston detector during pump run time:
- Normal operation is interrupted
- Block pause begins with query to piston detector

No signal from piston detector during block pause:
- Second lubrication cycle begins in block operation

As soon as a signal is received from the piston detector, block operation is aborted and the normal lubrication cycle starts with a pause.

After three pump run times and two block pauses without a signal from the piston detector, the block mode is terminated and the fault notification **FCS** is issued.
The cause of the fault must be determined and rectified.

Table 55

Duration of block pause

tPA block pause	Normal operation blo
0.1 h (6 min)	6 min
0.2 h (12 min)	12 min
0.3 h and longer	15 min

12.3 Malfunctions on KFGL pump unit

NOTICE

Damage to components

The lubrication points may not be supplied with adequate lubrication because a malfunction has affected the proper functioning of the lubrication system.
Malfunctions must always be remedied immediately.

Fig. 51

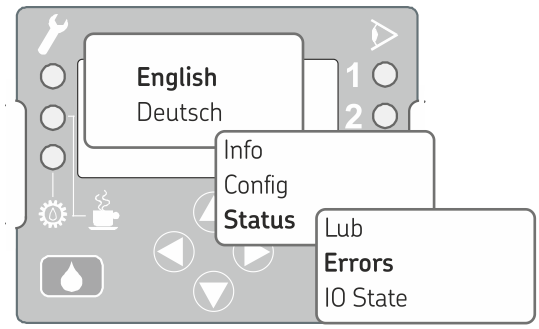
"Fault" LED

All fault notifications are displayed by the Fault LED as a centralized fault notification:
- LED flashes red: fault detected
- LED shows a steady red light = fault on a signal input, no fault detected on the pump control unit (the fault lies outside the pump)

The LC502 control unit is able to detect a range of different system faults. The "Fault" LED flashes red as soon as a fault is detected. Depending on the type of fault, the control unit switches off the lubrication zone affected or all the lubrication zones.
The fault notification can be viewed on the control screen in the "*Status*" menu.

12.3.1 Displaying fault notifications

Fig. 52



Opening the Status menu

1. Use the keys ▲ ▼ to select the desired language.
2. Confirm your selection with the key ↵.
3. Use the keys ▲ ▼ to select the *"Status"* menu.
4. Confirm your selection with the key ↵.
5. Use the keys ▲ ▼ to select the *"Fault"* menu.
6. Confirm your selection with the key ↵.
– The active fault notification is now displayed

NOTE

The operating instructions for the LC502 control unit are supplied together with these assembly instructions.

- Document No. 951-180-004-EN: Pump units in MonoFlex design (single-line centralized lubrication system)
- Document No. 951-180-005-EN: Pump units in ProFlex design (progressive centralized lubrication system)

Refer to the operating instructions of the control unit to remedy faults on a KFGL pump unit.

12.3.2 Deleting fault notifications

NOTICE

Damage to components

Determine and remedy the cause of faults before deleting fault notifications.

All fault notifications can be acknowledged and deleted using the 💧 key; the lubrication process is then restarted in all lines. In some cases this may be able to be done with an external pressure switch (DK).

13. 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

14. Shutdown, disposal

14.1 Temporary shutdown

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

14.2 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.

14.3 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.

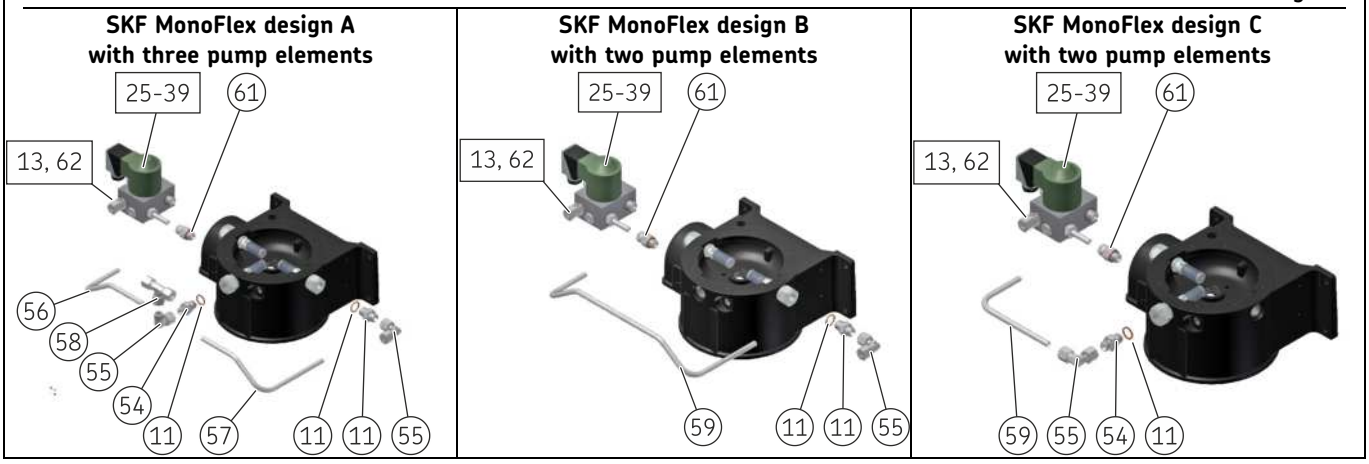
15. Spare parts

Spare parts may be used exclusively for replacement of identical defective parts. Modifications with spare parts on existing products are not allowed.

Fig. 53

Exploded-view and spare parts drawings

Fig. 54



Exploded-view and spare parts drawings

Table 56

Wearing parts

No.	Item number	Type identification code	Description
1	KFG1.U0	E	Pump element with spring-return piston 5.0 cm^3/min
2	KFG1.U1	A	Pump element with spring-return piston 2.5 cm^3/min
3	KFG1.U2	B	Pump element with spring-return piston 1.8 cm^3/min
4	KFG1.U3	C	Pump element with spring-return piston 1.3 cm^3/min
5	KFG1.U4	D	Pump element with spring-return piston 0.8 cm^3/min
6	KFG1.U0-E	L	Pump element with positively driven-return piston 5.0 cm^3/min
7	KFG1.U1-E	G	Pump element with positively driven-return piston 2.5 cm^3/min
8	KFG1.U2-E	H	Pump element with positively driven-return piston 1.8 cm^3/min
9	KFG1.U3-E	J	Pump element with positively driven-return piston 1.3 cm^3/min

Table 57

Spare parts

No.	Item number	Type identification code	Description
10	301-034	B	Adapter M14x1.5 on G1/4 (sealing ring Item 11 must be ordered separately)
11	DIN7603-A14X18-AL	–	Sealing ring
12	406-413	C	Straight connector for tube ø 6 mm
13	408-413	D	Straight connector for tube ø 8 mm
14	410-403	E	Straight connector for tube ø 10 mm
15	161-210-063	M	DBV [1] 200 bar, straight connector ø 8 mm
16	161-210-065	N	DBV [1] 200 bar, straight connector ø 10 mm
17	161-210-062	O	DBV [1] 200 bar, straight connector ø 12 mm
18	161-210-061	P	DBV [1] 200 bar, SKF plug connector ø 8 mm
19	161-210-036	G	DBV [1] 300 bar, female thread G1/4
20	161-210-012	H	DBV [1] 300 bar, straight connector ø 6 mm
21	161-210-024	J	DBV [1] 300 bar, straight connector ø 8 mm
22	161-210-066	K	DBV [1] 300 bar, straight connector ø 10 mm
23	161-210-021	F	DBV [1] 300 bar, SKF plug connector ø 6 mm
24	161-210-034	L	DBV [1] 300 bar, SKF plug connector ø 8 mm
25	24-1254-2634	W	Relief valve with DBV [1] 200 bar, female thread G1/4, 12 V design
26	24-1254-2635	W	Relief valve with DBV [1] 200 bar, female thread G1/4, 24 V design
27	24-1254-2636	W	Relief valve with DBV [1] 200 bar, female thread G1/4, 230 V design
28	24-1254-2640	V	Relief valve with DBV [1] 200 bar, straight connector ø 8 mm, 12 V design
29	24-1254-2641	V	Relief valve with DBV [1] 200 bar, straight connector ø 8 mm, 24 V design
30	24-1254-2642	V	Relief valve with DBV [1] 200 bar, straight connector ø 8 mm, 230 V design
31	24-1254-2637	U	Relief valve with DBV [1] 200 bar, straight connector ø 10 mm, 12 V design
32	24-1254-2638	U	Relief valve with DBV [1] 200 bar, straight connector ø 10 mm, 24 V design
33	24-1254-2639	U	Relief valve with DBV [1] 200 bar, straight connector ø 10 mm, 230 V design
34	24-1254-2643	S	Relief valve with DBV [1] 200 bar, SKF plug connector ø 6 mm, 12 V design
35	24-1254-2644	S	Relief valve with DBV [1] 200 bar, SKF plug connector ø 6 mm, 24 V design
36	24-1254-2645	S	Relief valve with DBV [1] 200 bar, SKF plug connector ø 6 mm, 230 V design
37	24-1254-2646	T	Relief valve with DBV [1] 200 bar, SKF plug connector ø 8 mm, 12 V design
38	24-1254-2647	T	Relief valve with DBV [1] 200 bar, SKF plug connector ø 8 mm, 24 V design
39	24-1254-2648	T	Relief valve with DBV [1] 200 bar, SKF plug connector ø 8 mm, 230 V design
40	KFGS1.54	–	Transparent cover for the control unit
41	24-9909-0241	–	KFG filling nipple G1/4 kit
42	24-9909-0248	–	KFG DBV [1] in the housing 1.5 bar G1/4 kit (rotary application)
43	24-9909-0242	–	KFG plug screw G1/4 kit
44	24-9909-0247	–	KFG DBV [1] in the housing 1.5 bar M20x1.5 kit (rotary application)
45	169-000-174	–	KFG fill connection M20x1.5 kit (Industry, Vehicle)

[1] DBV=pressure limiting valve

Table 57 (continued)

Spare parts

No.	Item number	Type identification code	Description
46	KFG1.128	–	Plug screw, plastic, with O-ring M20x1.5 (Industry, Vehicle)
47	24-9909-0250	–	KFG plug screw, steel M20x1.5 kit (rotary application)
48	24-9909-0244	–	KFG filler coupling G1/4 kit
49	24-9909-0249	–	KFG DBV [1)] on the housing cover 30 bar G1/4 kit (rotary application)
50	24-9909-0243	–	KFG fastening kit (for reservoir capacities from 8 kg to 20 kg only)
51	24-9909-0246	–	KFG Sensor/Actuator Box kit, 230 V (+486) Industry or rotary application
52	24-9909-0254	–	KFG fill level monitoring with square connector kit (rotary application)
53	24-9909-0252	–	KFG fill level monitoring with M12x1 plug (rotary application)
54	408-313	–	Threaded connector
55	443-308-351	–	Elbow connector
56	44-1751-2953	–	pre-bent tubing
57	44-1751-2954	–	pre-bent tubing
58	445-808-351	–	Union T
59	44-1751-2956	–	pre-bent tubing
60	44-1751-2955	–	pre-bent tubing
61	24-9909-0245	–	SKF MonoFlex return line G1/4 kit
62	DIN7603-A16X20-AL	–	Sealing ring
63	995-800-138	1	2 kg reservoir with cover without fill level monitoring (industry, vehicles)
63	995-800-508	1	2 kg reservoir with cover with mechanical fill level monitoring (industry, vehicles)
63	995-800-501	1	2 kg reservoir without cover with capacitive fill level monitoring (industry, vehicles)
63	995-800-503	1	Cover for 2 kg reservoir with capacitive fill level monitoring (industry, vehicles)
63	995-800-500	3	6 kg reservoir without cover without fill level monitoring (industry, vehicles)
63	995-800-504	3	Cover for 6 kg reservoir without capacitive fill level monitoring (industry, vehicles)
63	995-800-509	3	6 kg reservoir without cover with mechanical fill level monitoring (industry, vehicles)
63	995-800-504	3	Cover for 6 kg reservoir with mechanical fill level monitoring (industry, vehicles)
63	995-800-500	3	6 kg reservoir without cover with capacitive fill level monitoring (industry, vehicles)
63	995-800-505	3	Cover for 6 kg reservoir with capacitive fill level monitoring (industry, vehicles)
63	24-0254-2791	5	10 kg reservoir with or without mechanical fill level monitoring (industry, vehicles)
63	24-0254-2790	7	15 kg reservoir with or without mechanical fill level monitoring (industry, vehicles)
63	24-0254-2789	8	20 kg reservoir with or without mechanical fill level monitoring (industry, vehicles)

16. Appendix

16.1 China RoHS Table

Table 58

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
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)
用钢和黄铜加工的零件 (Components made of machining steel and brass)	X	0	0	0	0
部件名称 (Part Name)	多溴二苯醚	邻苯二甲酸二丁酯	邻苯二甲酸丁苄酯	鄰苯二甲酸二(2-乙基己基)酯	邻苯二甲酸二异丁酯
	Polybrominated diphenyl ethers (PBDE)	Dibutyl phthalate (DBP)	Benzyl butyl phthalate (BBP)	Bis (2-ethylhexyl) phthalate (DEHP)	Diisobutyl phthalate (DIBP)
用钢和黄铜加工的零件 (Components made of machining steel and brass)	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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