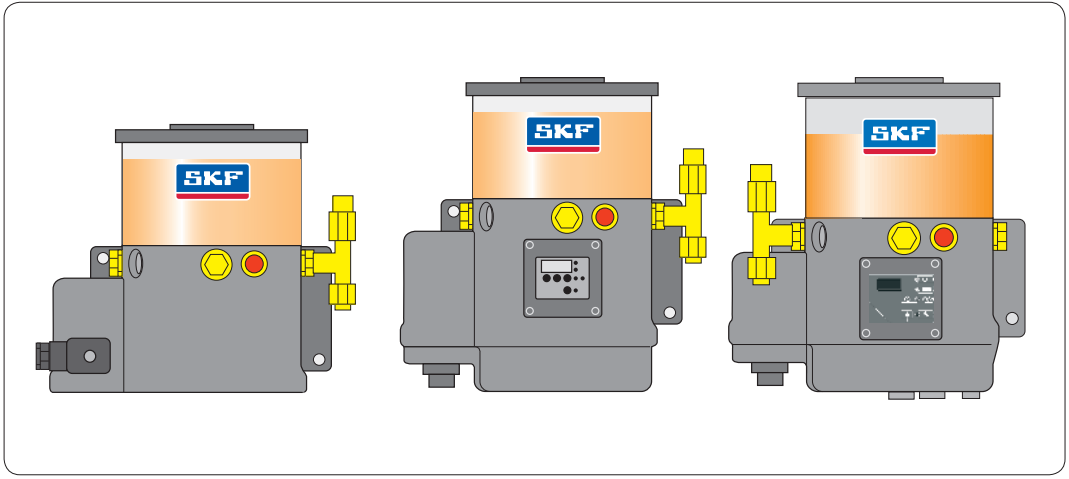
KFG; KFGS; KFGC (CAN bus) for vehicle lubrication

Assembly instructions acc. to EC Dir. 2006/42/EC
for partly completed machinery with associated operating instructions

EN



Version 03

Masthead

These original assembly instructions with associated operating instructions pursuant to EC Machinery Directive 2006/42/EC are an integral part of the described product and must be kept for future use.
These original assembly instructions with associated operating instructions have been prepared in accordance with the established standards and rules for technical documentation, VDI 4500 and EN 292.

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Subject to changes in contents and technical information.

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EC Declaration of Incorporation according to Machinery Directive 2006/42/EC, Annex II Part 1 B

The manufacturer SKF Lubrication Systems Germany GmbH ,Plant Hockenheim, 2. Industriestraße 4, DE - 68766 Hockenheim hereby declares that the partly completed machinery:

Designation: **Piston pump aggregate for vehicle lubrication**

Type: KFG, KFGS, KFGC

Part no.: KFG*; KFG*M*; KFG*R*; 772-*

Year of construction: See type identification plate

complies with the following basic requirements of the EC Machinery Directive 2006/42/EC at the time when first being launched in the market.

1.1.2 · 1.1.3 · 1.3.2 · 1.3.4 · 1.5.1 · 1.5.6· 1.5.8 · 1.5.9 · 1.6.1 · 1.7.1 · 1.7.3 · 1.7.4

The special technical documents were prepared following annex II part B of this directive. Upon justifiable request, these special technical documents can be forwarded electronically to the respective national authorities. The person empowered to assemble the technical documentation on behalf of the manufacturer is the head of standardization; see manufacturer's address.
Furthermore, the following directives and harmonized standards were applied in the respective applicable areas:

2011/65/EU RoHS II
2014/30/EU Electromagnetic compatibility | Industry

Standard	Edition	Standard	Edition	Standard	Edition	Standard	Edition
DIN EN ISO 12100	2011	DIN EN 60947-5-1	2010	DIN EN 61000-6-2	2006	DIN EN 61000-6-4	2011
DIN EN 809	2012	DIN EN 61131-2	2008	Amendment	2011	DIN EN 60947-5-1	2010
DIN EN 60204-1	2007	Amendment	2009	DIN EN 61000-6-3	2011		
Amendment	2010	DIN EN 60034-1	2015	Amendment	2012		
DIN EN 50581	2013	DIN EN 61000-6-1	2007				

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the EC Machinery Directive 2006/42/EC and any other applicable directives.

Hockenheim, 2016/05/31

Jürgen Kreutzkämper
Manager R&D Germany
SKF Lubrication Business Unit

Stefan Schürmann
Manager R&D Hockenheim/Walldorf
SKF Lubrication Business Unit

Explanation of symbols and signs

You will find these symbols, which warn of specific dangers to persons, material assets, or the environment, next to all safety instructions in these operating instructions.
Please heed these instructions and proceed with special care in such cases. Please forward all safety instructions to other users.

Instructions placed directly on the machines/ grease lubrication pump units, such as:

- Arrow indicators
- Labels for fluid connections must be followed and kept in fully legible condition.



You are responsible!

Please read the assembly and operating instructions thoroughly and follow the safety instructions.

Hazard symbols

General hazard
DIN 4844-2-W000

Electrical voltage/current
DIN 4844-2-W008

Hot surface
DIN 4844-2-W026

Danger of being drawn into machinery
BGV 8A

Slipping hazard
DIN 4844-2-W028

Warning of potentially explosive atmosphere
DIN 4844-2-W021

Indicators used with safety instructions and their meaning

Indicator	Use
Danger!	danger of bodily injury
Warning!	danger of damage to property and the environment
Note!	provides additional information

Informational symbols

Note

- Prompts an action

○ Used for itemizing

➔ Points out other facts, causes, or consequences

☞ Provides additional information

Assembly instructions in accordance with Machinery Directive 2006/42/EC, Annex VI

The assembly instructions fulfill the Machinery Directive indicated above with regard to partly completed machinery. Partly completed machinery, which includes the product described herein, is only intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment, thereby forming machinery to which the abovementioned Directive applies.

1. Safety instructions

The operator of the described product must ensure that the assembly instructions are read and understood by all persons tasked with the assembly, operation, maintenance, and repair of the product. The assembly instructions must be kept readily available.

Note that the assembly instructions form part of the product and must accompany the product if sold to a new owner.

The described product is manufactured in accordance with the generally accepted rules and standards of industry practice and with occupational safety and accident prevention regulations. Risks may, however, arise from its usage and may result in physical harm to persons or damage to other material assets. Therefore the product may only be used in proper technical condition and in observance of the assembly instructions. In particular, any malfunctions which may affect safety must be remedied immediately.

In addition to the assembly instructions, general statutory regulations and other regulations for accident prevention and environmental protection must be observed and applied.

1.1 Intended use

Pump units of SKF's KFG, KFGS and KFGC series are used to supply centralized lubrication systems in vehicles, systems and machines. They deliver oils and greases up to NLGI Grade 2.
The use of synthetic oils requires prior approval from SKF Lubrication Systems.
Any other usage is deemed non-compliant with the intended use.
In particular, the product is neither designed nor approved for use in conjunction with materials classified as hazardous by CLP Regulation EC 1272/2008.
The product described here is neither designed nor approved for use in conjunction with gases, liquefied gases, pressurized gases in solution, vapors and such fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible temperature.
Unless specially indicated otherwise, products from SKF Lubrication Systems are not approved for use in potentially explosive areas as defined in the ATEX Directive 2014/34/EU.

1.2 Authorized personnel

Only qualified technical personnel may install, operate, maintain, and repair the products described in the assembly instructions. Qualified technical personnel are persons who have been trained, assigned and instructed by the operator of the final product into which the described product is incorporated. Such persons are familiar with the relevant standards, rules, accident prevention regulations, and assembly conditions as a result of their training, experience, and instruction. They are authorized to identify and perform necessary actions while avoiding any risks which may arise.

The definition of qualified personnel and the prohibition against employing non-qualified personnel are laid down in DIN VDE 0105 and IEC 364

1.3 Electric shock hazard

Electrical connections for the described product may only be established by qualified and trained personnel authorized to do so by the operator, and in observance of the local conditions for connections and local regulations (e.g., DIN, VDE). Significant bodily injury and property damage may result from improperly connected products.



Danger!
Work on products that have not been de-energized may result in bodily injury.

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

1.4 System pressure hazard



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

1.5 Compressed air hazard



The described product is pressurized during operation. The product must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

Depending on the model design, the product may be able to be operated with compressed air.

1.6 Hydraulic pressure hazard



The described product is pressurized during operation. The product must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

Depending on the model design, the product may be able to be operated hydraulically.

1.7 Explosion protection information



Danger!
Only the pump models tested and approved by SKF Lubrication Systems Germany GmbH in accordance with ATEX Directive 2014/34/EU are permitted to be used in areas with explosion protection. The relevant class of protection is engraved on the pump's rating plate.

- When filling lubricant into the pump, make sure the lubricant is clean. The reservoir must be filled in good time (pay attention to fill level monitoring). Lubricant must be filled only via the filler socket G 3/8“ (FF) or G 1/2“ (FB) on the pump flange. Lubricant may only be filled via the "reservoir cover" if absolutely certain that no potentially explosive atmosphere exists.

- In case of overfilling, the excessive amount of lubricant must be removed. Make sure there is no potentially explosive atmosphere when doing this.

- The switching circuits of the fill level monitor must be supplied by an intrinsically safe circuit, e.g., through the installation of an ATEX-compliant isolating switch by thecustomer.
The unit must be grounded via a ground connection. The customer must install adequate overload protection for the power consumption of the motor.

- To avoid electrostatic discharge, lay hydraulic connecting lines in corrosion-resistant metal tubing, e.g., stainless steel pipe.

- When setting up the pump, make sure the setup location is level and not subject to vibrations or jolts.

- During maintenance work, use only tools intended for use in potentially explosive spaces or else make certain that there is no potentially explosive atmosphere present.

- The service life of the oil lubrication pump is limited. It must therefore undergo a function and leak test at regular intervals. Perform appropriate repairs in the event of malfunctions, leaks, or rust. Replace the pump if necessary.

- The user must make sure through the choice of the lubricant to be delivered that no chemical reactions capable of serving as ignition sources will occur in conjunction with the explosive atmospheres expected.
The lubricant's ignition temperature must be at least 50 kelvin above the pump's maximum surface temperature (temperature class).

Depending on the model design, the product may be available in an explosion-proof design.

2. Lubricants

2.1 General information

All products from SKF Lubrication Systems may be used only for their intended purpose and in accordance with the information in the product's assembly instructions.

Intended use is the use of the products for the purpose of providing centralized lubrication/lubrication of bearings and friction points using lubricants within the physical usage limits which can be found in the documentation for the devices, e.g., assembly instructions/operating instructions and the product descriptions, e.g., technical drawings and catalogs.
Particular attention is called to the fact that hazardous materials of any kind, especially the materials classified as hazardous by CLP Regulation EC 1272/2008 may only be used to fill SKF centralized lubrication systems and components and delivered and/or distributed with the same after consulting with and receiving written approval from SKF.

No products manufactured by SKF Lubrication Systems are approved for use in conjunction with gases, liquefied gases, pressurized gases in solution, vapors, or such fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible temperature.
Other media which are neither lubricant nor hazardous substance may only be fed after consultation with and written approval from SKF Lubrication Systems.
SKF Lubrication Systems considers lubricants to be an element of system design which must always be factored into the selection of components and the design of centralized lubrication systems. The lubricating properties of the lubricants are critically important in these considerations.

2.2 Selection of lubricants

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

Warning!
The amount of lubricant required at a lubrication point is specified by the bearing or machine manufacturer. It must be ensured that the required quantity of lubricant is provided to the lubrication point. The lubrication point may otherwise not receive adequate lubrication, which can lead to damage and failure of the bearing.

Selection of a lubricant suitable for the lubrication task is made by the machine/system manufacturer and/or the operator of the machine/system in cooperation with the lubricant supplier.
The bearings/friction points that require lubrication, their expected load during operation, and the expected ambient conditions are taken into account during selection, with consideration of economic and environmental aspects.

SKF Lubrication Systems supports customers in the selection of suitable components for feeding the selected lubricant and in the planning and design of a centralized lubrication system.

Please contact SKF Lubrication Systems if you have further questions regarding lubricants. Lubricants can be tested in the company's laboratory for their suitability for pumping in centralized lubrication systems (e.g., "bleeding").

You can request an overview of the lubricant tests offered by SKF Lubrication Systems from the company's Service department.

2.3 Approved lubricants

Warning!
Only lubricants approved for the product may be used. Unsuitable lubricants can lead to failure of the product and to property damage.

Warning!
Different lubricants cannot be mixed, as mixing may result in damage and necessitate costly and complicated cleaning of the product/lubrication system. It is recommended that an indication of the lubricant in use be attached to the lubricant reservoir in order to prevent accidental mixing of lubricants.

The product described here can be operated using lubricants that meet the specifications in the technical data.

Note that in rare cases, there may be lubricants whose properties are within permissible limit values but whose other characteristics render them unsuitable for use in centralized lubrication systems. For example, synthetic lubricants may be incompatible with elastomers.

2.4 Lubricants and the environment



Warning!
Lubricants can contaminate soil and bodies of water. Lubricants must be properly used and disposed of. Observe the local regulations and laws regarding the disposal of lubricants.

It is important to note that lubricants are environmentally hazardous, flammable substances which require special precautionary measures during transport, storage, and processing.
Consult the safety data sheet from the lubricant manufacturer for information regarding transport, storage, processing, and environmental hazards of the lubricant that will be used.
The safety data sheet for a lubricant can be requested from the lubricant manufacturer.

2.5 Lubricant hazards



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

Lubricant leaking from centralized lubrication systems is a serious hazard. Leaking lubricant can create risks that may result in physical harm to persons or damage to other material assets.



Follow the safety instructions on the lubricant's safety data sheet.

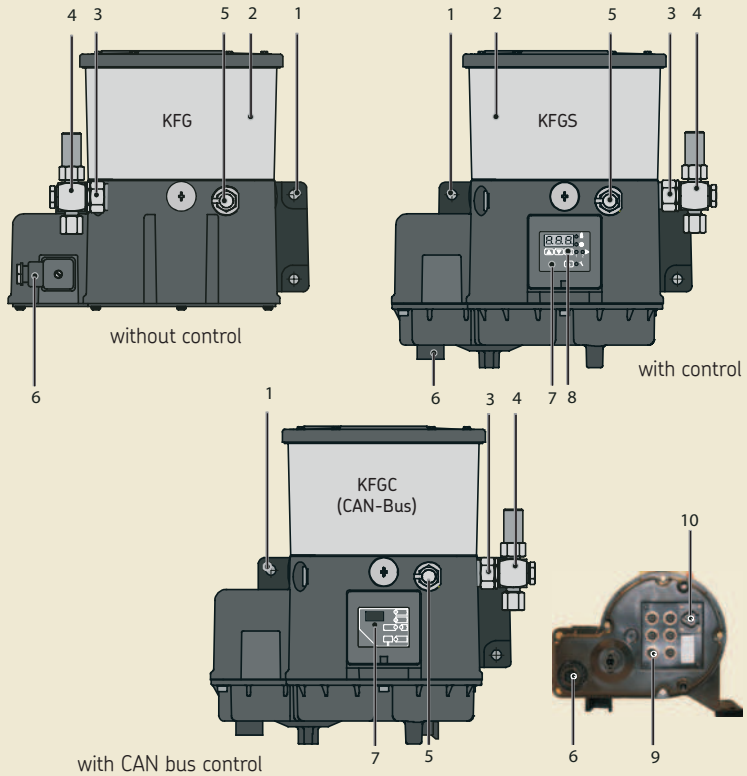
Lubricants are a hazardous substance. The safety instructions on the lubricant's safety data sheet must be followed. The safety data sheet for a lubricant can be requested from the lubricant manufacturer.

3. Overview

Components

Item	Description	Chapter
1	Assembly holes	4.2.1
2	Lubricant reservoir	4.2.2
3	Pump elements	4.3.
4	Pressure regulating valve	4.3.5
5	Conical head nipple	4.3.5
6	Electrical connection	4.5
7	General control unit/ CAN bus display	Operating-instructions
8	Pushbutton	Operating instructions
9	Inputs and outputs (CAN bus version)	Operating instructions
10	CAN bus plug	Operating instructions

Components



4. Assembly

4.1 General information

Pump units of the KFG, KFGS and KFGC (CAN bus) series are an integral component of centralized lubrication systems used in machines and systems.
They deliver greases up to NLGI Grade 2. The pump units differ in terms of the size of lubricant reservoir, the lubricant filling and their control and function monitoring. The installation of volume-specific pump elements permits a single unit of the KFG or KFGS series to operate up to three independent zones.
The KFGC series is capable of operating up to four independent zones, depending on the task. The system can be equipped with or without functionality to monitor pressure build-up and reduction.

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

4.2 Setup and attachment

The pump unit should be installed in a place protected from contamination, water splashes and vibrations. It should, however, be easily accessible so that all other installations can be performed without difficulty and the device can be filled easily.
The fill level of the reservoir must be easily visible.

The unit is mounted in a vertical position.

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.

A drilling jig can be ordered
(order number 951-130-115).

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

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

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.

Warning!
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.

Warning!
Do not tilt or drop the KFG (S) (C) grease lubrication pump unit!

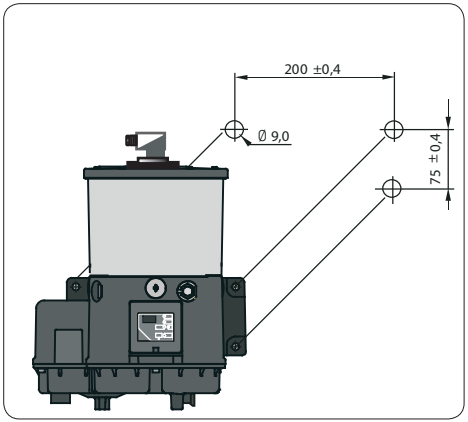
Install the pump units on the machine using three M8 screws with a minimum length of 20 mm.

Fastening material to be provided by the customer:

- Hexagon head screws (3x) acc. to DIN933-M8x....-8.8
- Washers (3x) acc. to DIN 125-B8.4-St

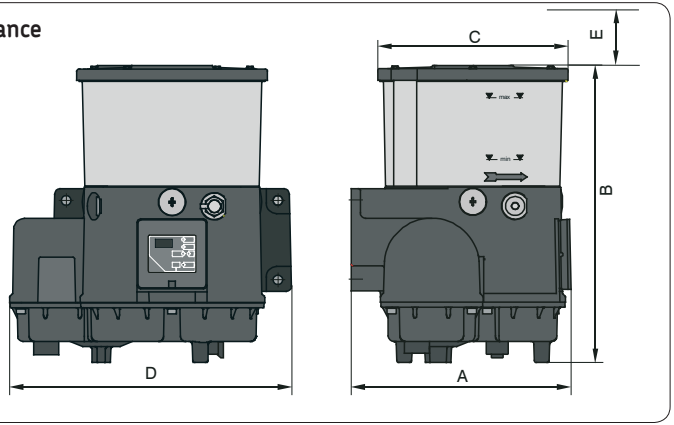
Warning!
The torque of the fastening screws depends on the customer's installation. Make sure that torque is adequate when installing the pump unit!

4.2.1 Assembly holes



4.2.2 Mounting dimensions

Minimum mounting clearance
E = 20 mm



1) *KFGS-_5.. . . . .- 12VDC oder 24 V DC = pump unit with control unit and supply voltage of 12 or 24 VDC*

KFGS-_5.. . . . .- 230 VAC
= pump unit with control unit and supply voltage of 90 to 264 VAC

The minimum clearance height for installation depends on the reservoir design. Add another 20 mm to allow for the total pump height.

Mounting dimensions

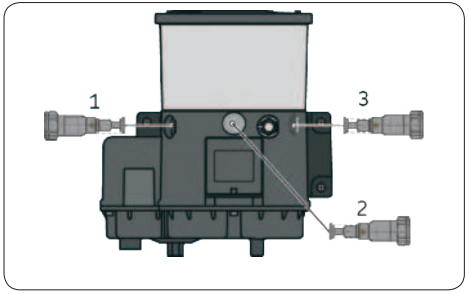
Description	Reservoir capacity [kg]	A [mm]	B [mm]	C [Ø mm]	D [mm]	Weight [kg] with full lubricant reservoir
KFG1-5...	2	210	230	180	226	7
KFG3-5...	6	210	412	226	226	11
KFG5-5...	10	210	585	205	226	15
KFGS1-5... [1])	2	210	282	180	226	7
KFGS3-5... [1])	6	210	464	226	226	11
KFGS5-5... [1])	10	210	637	205	226	15

4.3 Pump elements

4.3.1 KFG/KFGS pump elements

KFG and KFGS pump units can be equipped with up to three pump elements. Each pump element has a connector for, e.g., connecting an independent progressive feeder. A grease return can be attached in place of a pump element.
Close any outlets which are not required using a DIN 910-M20x1.5-5.8 screw plug with a DIN 7603-A20x24-Al washer.

The pump elements must be ordered according to the required delivery rate.



Possible layout of the three pump elements

4.3.2 KFGC (CAN bus) pump elements

3/2 directional solenoid valves can be employed so that lubricant connections can also return the lubricant into the reservoir from lubricant outlets which are not required at the moment.
Close any outlets which are not required using a DIN 910-M20x1.5-5.8 screw plug with a DIN 7603-A20x24-Al washer.

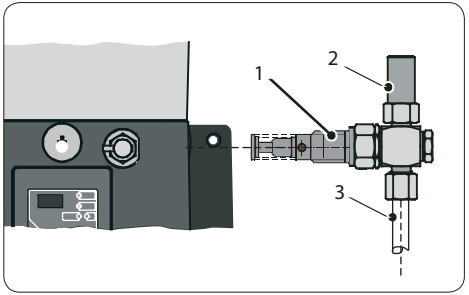
4.3.3 Installing a pump element

Pump units of the KFG, KFGS und KFGC (CAN bus) series are generally delivered with pump elements installed.
Perform the following to later add or replace a pump element:

- Turn off pump unit.
- Loosen up and remove the screw plug.

Then perform the following:

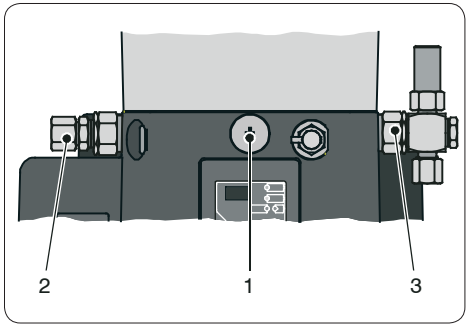
- Loosen and remove pressure regulating valve (**2**) (or lubrication line (**3**)) on an already mounted pump element (**1**).
- Loosen and remove mounted pump element (**1**).
- Insert new pump element (**1**) into housing hole and twist in by hand.
- Tighten pump element (**1**) at a torque of 35 Nm.
- Switch on pump and leave running until grease without bubbles discharges from the pump element outlet.
- Reconnect pressure regulating valve (**2**) (or lubrication line (**3**)) to the pump element (**1**) and tighten at a torque of 25 Nm.



Pump element replacement

4.3.4 Deliverable pump elements

The pump element must be ordered according to the required delivery rate (see Pump elements table).



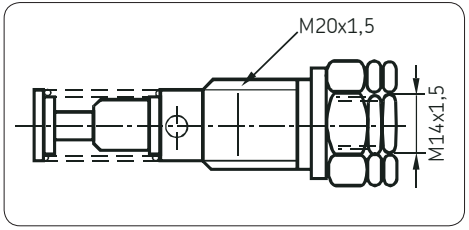
Connection for pump elements

Connection for pump elements	
1	Screw plug
2	Pipe connector
3	Pump element with pressure regulating valve

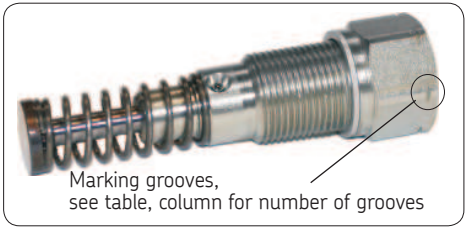
Pump elements

Delivery rate [1] [cm³/min]	Number of grooves	Max. permis. operating pressure [bar]	Order No.
2.5	1	300	**KFG1.U1**
1.8	2	300	**KFG1.U2**
1.3	3	300	**KFG1.U3**
0.8	4	300	**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. The 5.0 cm³/min pump element is preferred for use in single-line centralized lubrication systems.



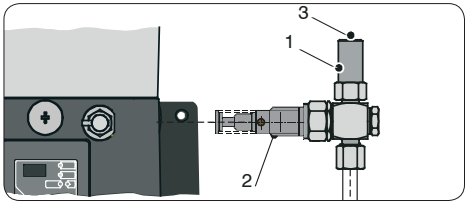
KFG pump element with constant delivery rate, without pressure regulating valve



KFG pump element with constant delivery rate, without pressure regulating valve

4.3.5 Pressure regulating valve

A pressure regulating valve (**1**) protects the entire lubrication system against excessive system pressure. It is mounted directly on the pump element (**2**). The cracking pressure set for this valve is 300 bar or 200 bar, depending on the valve design. If a blocked feeder or a lubrication point causes operating pressure to rise above 300 (200) bar, the valve opens, followed by a noticeable discharge of grease (**3**). This also serves as a form of visual system monitoring.
This protects the pump unit against damage. A further option are pressure regulating valves with an emergency lubricant nipple. These can be used with manual grease presses to provide the lubrication system with adequate lubricant in case of power failure or a defective pump.



Connection for pressure regulating valve

Spare parts

Pressure regulating valve without lubricant nipple

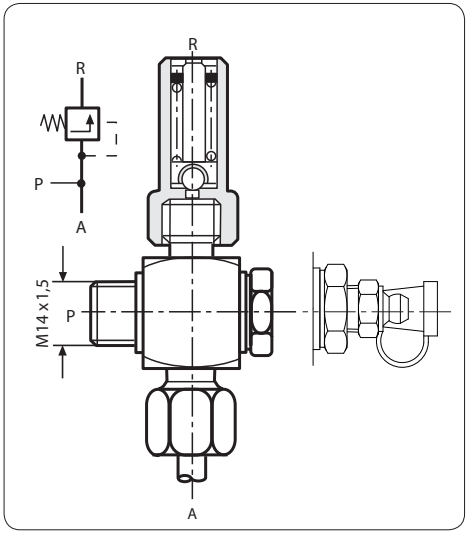
Tube Ø [mm]	Cracking pressure [bar]	Order number
6	300	**161-210-012**
6	200	**161-210-032**
8	300	**161-210-018**
8	200	**161-210-031**
10	300	**161-210-016**
10	200	**161-210-030**

Pressure regulating valve with lubricant nipple

6	300	**161-210-014**
8	300	**161-210-025**

Pressure regulating valve with pressure gauge

6	300	**161-210-046**
8	300	**161-210-047**
10	300	**161-210-048**

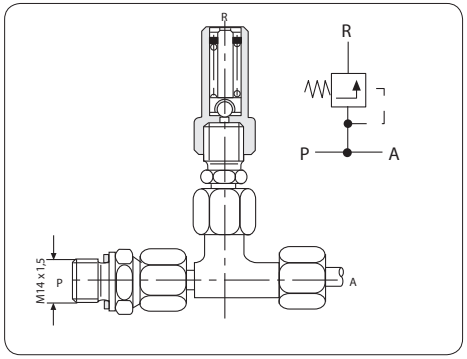


pressure regulating valve

Connections for pressure regulating valves

A Connection for pipe Ø
P Pipe thread for pump element
R Grease emitted at overpressure

Note
The pressure regulating valve is available with an optional lubricant nipple.



Pressure regulating valve with T connector

4.4 Information on lubricant filling

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

The lubricant reservoir is filled in different ways based on the design.

4.4.1 Lubricant filling

Lubricant filling is performed using a DIN 71412-AM10x1 conical head nipple (**1**) and a conventional grease press.
The conical head nipple can be twisted onto the position (**2**), for example to gain better access. As an alternative, the connection (**2**) can be used to mount a lubricant return or filler coupling (see following page).

Pressure regulating valve

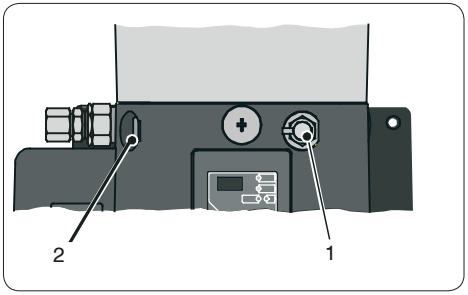
Pressure regulating valve with T connector output

Tube Ø [mm]	Cracking pressure [bar]	Order 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**

Connections for pressure regulating valve with T connector

A Connection for pipe Ø
P Pipe thread for pump element
R Grease emitted at overpressure

Cracking pressure..... 300 ± 20 bar
Nominal tube sizes Ø . 6, 8, 10 mm



Filler sockets/lubricant return

4.4.2 Filler coupling

As an alternative or addition to a conical head nipple (**1**), the unit can also be equipped with a filler socket (part No. 995-000-705) (**2**) to fill using a filling pump. A corresponding coupling socket (part No. 995-001-500) (**3**) must be mounted on the filling pump. The cap on the filler socket must be removed before filling.

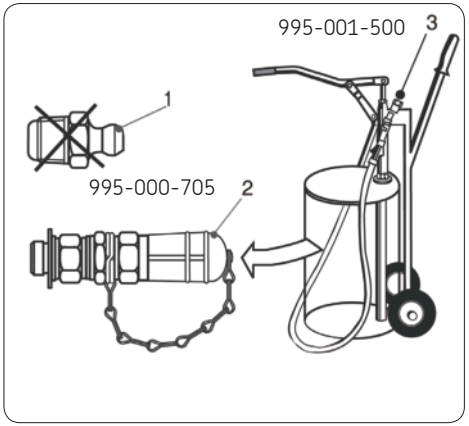
4.4.3 Filling cylinder

The pump unit can also be filled through one of the lubricant outlets using a filling cylinder (**1**). To do this, remove the M20x1.5 screw plug (**2**) in the lubricant outlet and replace it with a filler socket (part No. 169-000-174) (**3**). The caps (**4**) on the socket and filling cylinder must be removed before filling.

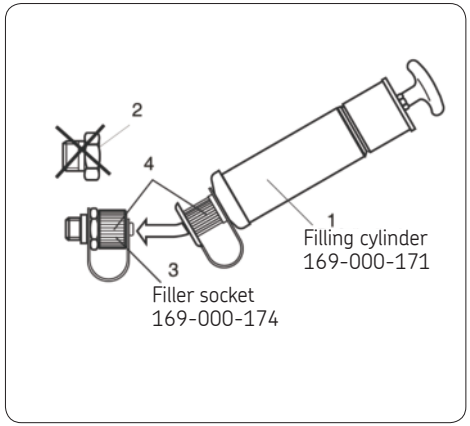
4.4.4 Filling cover

A special design for the pump units is filled with lubricant through a special hinged lid or a screw cap.

Only fill using clean lubricant and an appropriate filling device. Not suitable in case of highly contaminated pumps and surrounding areas.



Filling via filler coupling



Filling via filling cylinder



KFG3-5; KFGS3-5

KFG5-5; KFGS5-5

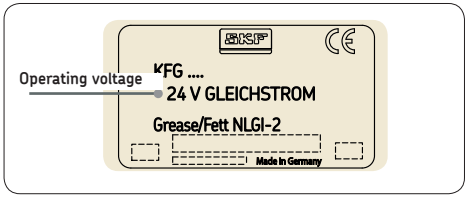
KFG1-5W2; KFGS1-5W2 (for NLGI Grade 1 greases)

KFGS1-5

Filling cover versions

4.5 Electrical connection

Warning!
Compare the operating voltage with the specifications on the rating plate.



Operating voltage specification on rating plate

4.5.1 General conditions for electrical connections

KFG; KFGS; KFGC, general conditions for electrical connections

Nominal voltage	Power consumption (load-dependent)	Power consumption (max.)	Pump starting current (approx. 20 ms)	Max. pre-connected fuse
24 VDC [1])	1.25 A [2])	< 2.5 A	4.5 A	4 A [3]) [4])
12 VDC [1])	2.4 A [2])	< 5 A	9 A	6 A [3]) [4])

KFGC (CAN-Bus)

Switching outputs:	Type: Solid-state output, short-circuit-proof and overload-proof
Max. current-carrying capacity:	- with simultaneous operation of 4 outputs 1.0 A - with simultaneous operation of 2 outputs 1.25 A - with operation of 1 output 1.5 A
Modes of operation:	- Single operation - Parallel connection of multiple outputs while simultaneously increasing output current
Signal inputs:	Type: digital solid-state input, short-circuit-proof
Connectivity:	- Switching contact, no detection of wire breakage - Dual wire sensors (e.g., piston detector), detection of wire breakage

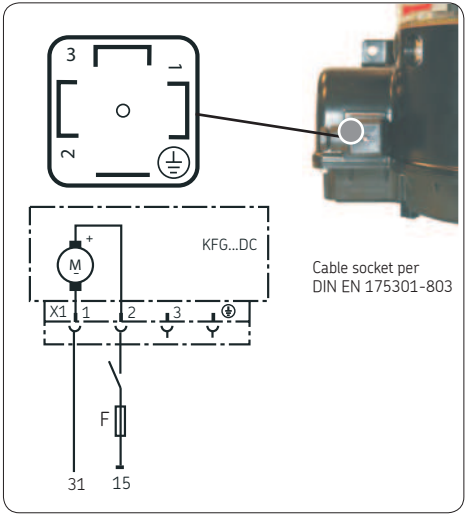
*1) Protective measures that must be applied for designated usage: **"Functional Extra Low Voltage", "Protective Extra Low Voltage" (PELV)** Standards: EN 60204 Part 1: IEC 60204-1: DIN VDE 0100 Part 410 / IEC 364-4-41: HD384.4.41*
2) Typical value at ambient temperature = 25 °C and operating pressure = 150 bar
3) Fuse per DIN 72581 T.3
4) Conductor: cross-section 1.5 mm^2, length ≤ 12 m

4.5.2 KFG series

The KFG pump unit is available in the voltage designs 12 V DC and 24 V DC. The electrical voltage connection is established through a 4-pin cable socket according to DIN EN 175301-803.
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 (special designs may differ).

4.5.2.1 Power supply 12-/24 VDC



Connector pin assignment for 12/24 VDC

PIN	Description
Pos. 1	- (Mass) = **31**
Pos. 2	+ (current) = **15** Supply voltage potential (ignition ON)

4.5.2.2 External control

The following control unit is designed to control the lubrication and interval times, as well as to monitor the lubrication process:

Order No. **IG502-2-E**
The operating instructions/functional description of the control unit must be observed.

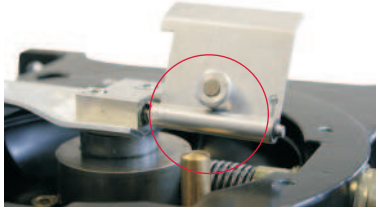
You can find additional information about the control unit in brochure No. 1-9430, "Progressive Systems for Commercial Vehicles."

KFG

4.5.2.3 Fill level monitoring
Type: W1 (max. 24 VDC)
for NLGI Grade 2 greases



Contact W1 closed, go position



Contact W1 open

Functional description

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 agitator is turned downward by the grease resistance when the reservoir is full. A pulse is created at each revolution of the agitator. When the minimum fill level is reached, the resistance the grease exerts on the rocker subsides. The rocker turns back and the pulses are interrupted.

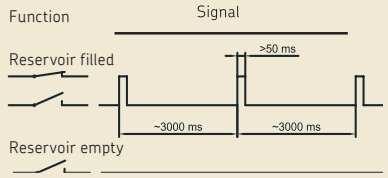
Technical data

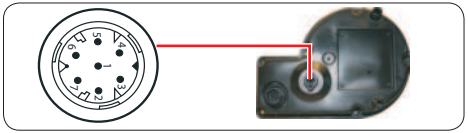
Fill level monitoring W1
Function . . . . . mechanical, via floating reed contact
Form of contact . . . . . NO-contact
Switching capacity, max. . . . 0.6 W
Switching voltage, max. . . . 24 VDC
Switched current, max. . . . 25 mA; only ohm load [1])

Plug-in connection DIN EN 60947/IEC 947
Connection diagram . . . . . 7-pin round plug [2])

1) No inductive load, no lamp load (signal lamp)
2) Socket-see AccessoriesPage 28

W1 block diagram





W1 connector pin assignment (pump unit)

PIN		Description
1	=	**31** - Supply voltage potential (0V, GND)
2	=	**15** + Supply voltage potential
3	=	not assigned
4	=	not assigned
5	=	+ Potential
6	=	Signal (pulses)
7	=	not assigned

Type: W1G with signal smoothing (max. 24 VDC) for NLGI Grade 2 greases

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

- Ability to isolate supply voltage potentials between fill level monitoring and pump voltage.
- Fill level information can also be queried during the interval time.
- Reverse voltage protection in pump feed line planned.
- Optional time-out periods.

The individual functions are implemented using internal jumpers according to the customer's specific pump design.

The connection is established via a 4-pin circular connector on the bottom of the pump.

The W1G with signal smoothing is standard in the design:

- W1-smooth with output signal: reservoir full (filled)/reservoir empty (floating contact)

Technical data

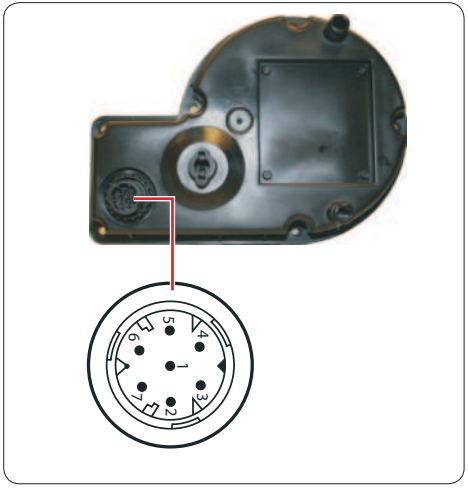
Fill level monitoring
Function . . . . . floating contact
Form of contact . . . . . .
Changeover
Switching capacity. . . . . max. 60 W
Switching voltage . . . . . max. 30 VDC

Plug-in connection DIN EN 60947/IEC 947
Connection diagram . . . . 7-pin round plug [1])

1) Socket-see AccessoriesPage 28

KFG

Type: W1 smooth (max. 24 VDC) for NLGI Grade 2 greases



Connection diagram for floating W1 control with signal smoothing for NLGI Grade 2 greases (W1G = standard design)

W1G connector pin assignment (pump unit)

PIN		Description
1	=	**31** - Supply voltage potential (0V, GND)
2	=	**15** + Supply voltage potential
3	=	**NC** (pin 5 and pin 3 closed, reservoir empty)
4	=	**NO** (pin 5 and pin 3 closed, reservoir filled)
5	=	**COM (**+ potential)
6/7	=	not assigned

4.5.3 KFGS series

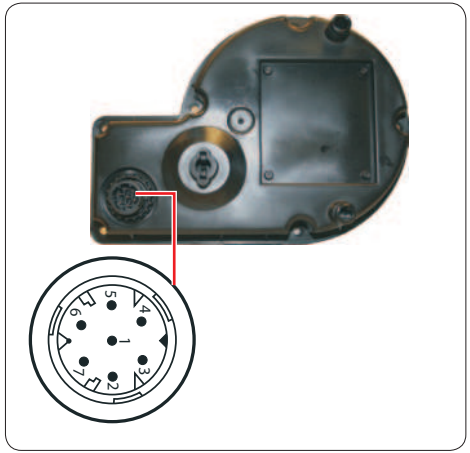
with integrated control
The KFGS pump unit is available in the voltage designs 12V und 24VDC.

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

The pump control unit can run in the following control modes:

- Counter operation without system monitoring
- Counter operation with system monitoring
- Timer operation without system monitoring
- Timer operation with system monitoring

4.5.3.1 Power supply 12-/24 VDC



Power supply through 7-pin round plug

Accessories

Description	Order No.
Wiring harness, in corrugated pipe, with socket-outlet on pump side	
12 m length	**997-000-630**
16 m length	**997-000-650**

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

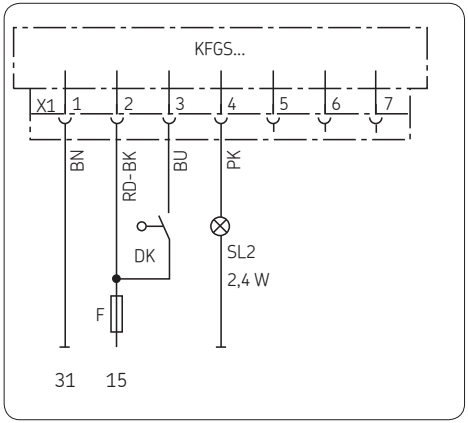
Note
The connector pin assignment depends on the specific operating mode. The pins and therefore assigned according to the following examples, listed in Chapter 4.5.3.2.
Unneeded conductor ends on the cable set must be individually insulated and secured so that no short to ground can occur.

Settings for progressive lubrication

4.5.3.2 Connectivity for counter operation without system monitoring

Interval depends on number of pulses
Pump cycle time depends on time

Programming:
cPA, tCO, COP = OFF - see Chapter 6 in the operating instructions



Accessories

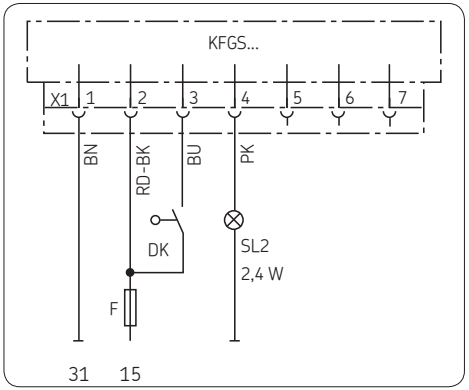
Description	Order No.
Cable harness, in corrugated pipe, with pump-side socket	
8 m long	**997-000-760**
12 m long	**997-000-630**
16 m long	**997-000-650**

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 = 1st interim lubrication, 2- Delete fault notification
4	SL2	Indicator light "fault"

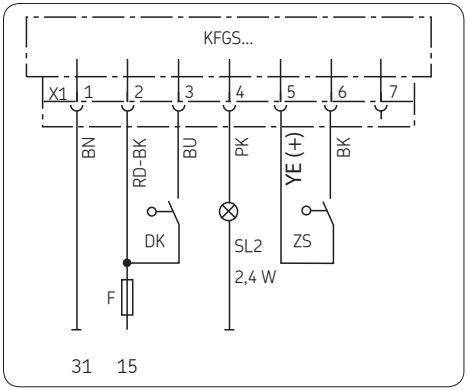
4.5.3.3 Connectivity for counter operation without system monitoring

Programming: cPA, tCO, COP = OFF



4.5.3.4 Connectivity for counter operation with system monitoring

Programming: cPA, tCO, COP = CS



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 = 1st interim lubrication, 2. Delete fault notification
4	SL2	Indicator light "fault"
5	ZS	Piston detector "+"
6	ZS	Piston detector "signal"
7	SL1	Indicator light "pump ON"

Control using machine pulses (Counter mode = load-dependent lubrication)**)**

The duration of the interval 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 interval time and the pump cycle time can be configured.

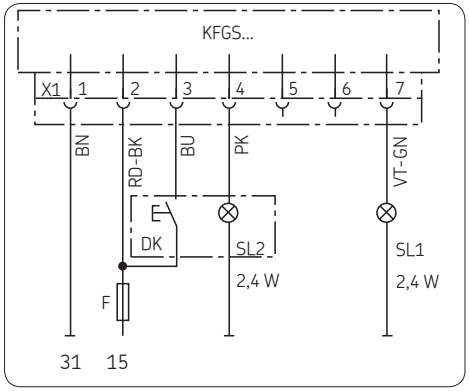
The fill level monitoring unit is internally connected to the integrated pump control unit.

A fault notification can be sent to the process control level via indicator light SL2.

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

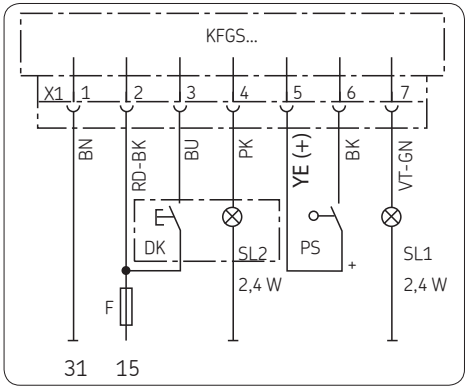
4.5.3.5 Connectivity for timer operation without system monitoring

Programming: tPA, tCO, COP = OFF



4.5.3.6 Connectivity for timer operation with system monitoring

Programming: tPA, tCO, COP = CS



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 "1st interim lubrication" "2. Delete fault notification"
4	SL2	Indicator light "fault"
5	PS	Pressure switch "+"
6	PS	Pressure switch "signal"
7	SL1	Indicator light "pump ON"

Timer mode

In timer mode, the interval 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.

4.5.4 KFGC series

The KFGC (CAN bus) pump unit is available in the voltage designs 12 VDC and 24 VDC.
In this version, the electrical connection is established via a 7-pin plug-in connection on the underside of the pump unit. There is also a 3-pin Deutsch connector on the underside for the CAN bus connection. Up to six circular connectors can also be attached to control the reversing valves and sensors.

4.5.4.1 Power supply 12-/24 VDC



Power supply through 7-pin round plug

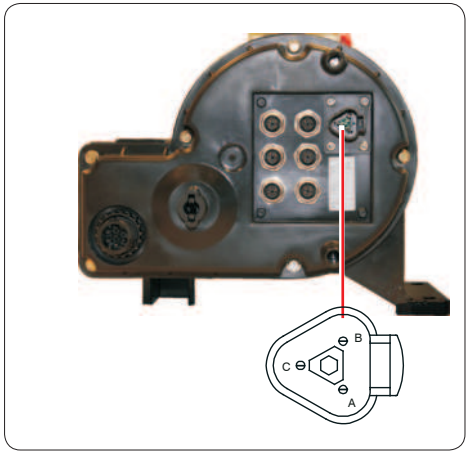
Power supply connector pin assignment

PIN	Color code		Function
1	BN	brown	31 M
2	RD-BK	Red-black	15 +
3	BU	Blue	MC+/CS4+
4	PK	pink	MC-/CS4-
5	BK	Black	VT4 +
6	BK	Black	Vt4 -
7	VT-GN	Purple-green	NC

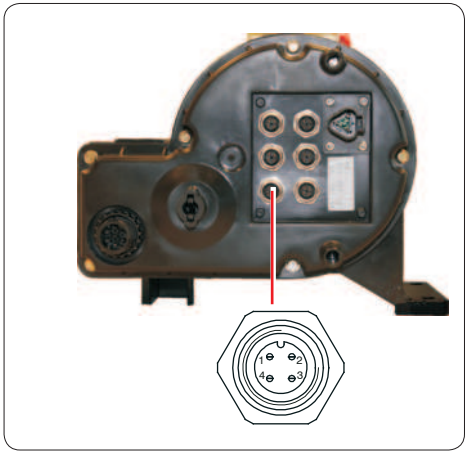
Accessories

Description	Order No.
Cable harness, in corrugated pipe, with pump-side socket	
12 m long	**997-000-630**
16 m long	**997-000-650**

Unneeded conductor ends on the cable set must be individually insulated and secured so that no short to ground can occur.



CAN bus connection, plug type DEUTSCH DT04-3P-L012



Connection for reversing valve/piston detector (max. 6 connections)

Accessories for reversing valve/piston detector

Description	Order No.
Cable harness with socket approx. 2 m	997-000-734

CAN bus connector pin assignment

PIN	Color code		Function
A	YE	yellow	CAN_H
B	GN	green	CAN-B
C	BK	black	CAN-SHLD

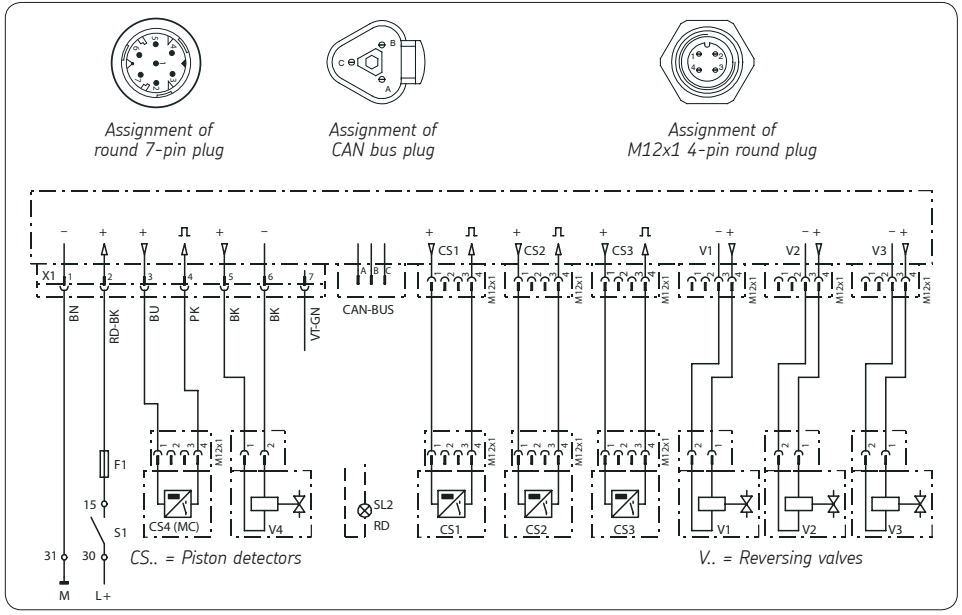
Connector pin assignment for reversing valve/piston detector

PIN	Color code		Input Cs2/Cs3	Output VT1 to VT3
1	BN	brown	+	NC
2	WH	white	NC	NC
3	Bu	blue	NC	-
4	BK	black	-	+

4.5.4.2 Connectivity

Example of connecting four reversing valves and four piston detectors on devices with the maximum equipment level (6x M12x1 round plug-in connections) for operating a progressive feeder system, distributed in four lubrication zones

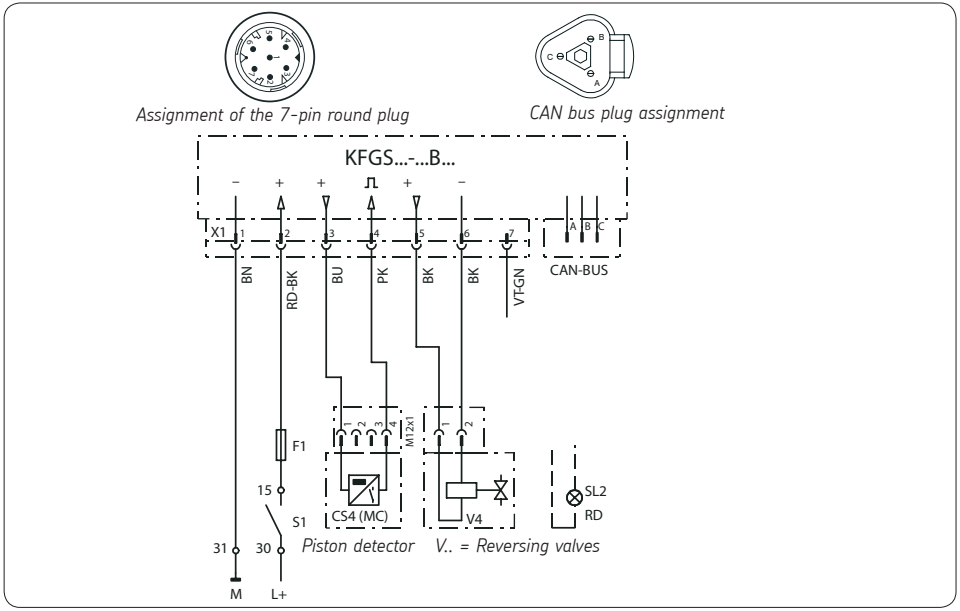
Customer-specific deviations are possible.



Legend for connection illustration with maximum equipment level

CS1 – CS4	Piston detectors 1 - 4	**V1 - V4**	Valves 1 – 4
MC	Machine contact	**SL2**	Indicator light "fault" (can alternately be operated in place of valve 4)
L+	+ Supply voltage potential		
S1	Ignition switch	**F1**	Fuse

Example of connecting a piston detector or machine contact and a reversing valve to a device with minimum equipment level (without M12x1 circular connectors) for operating a progressive feeder system, multiple zones not used.

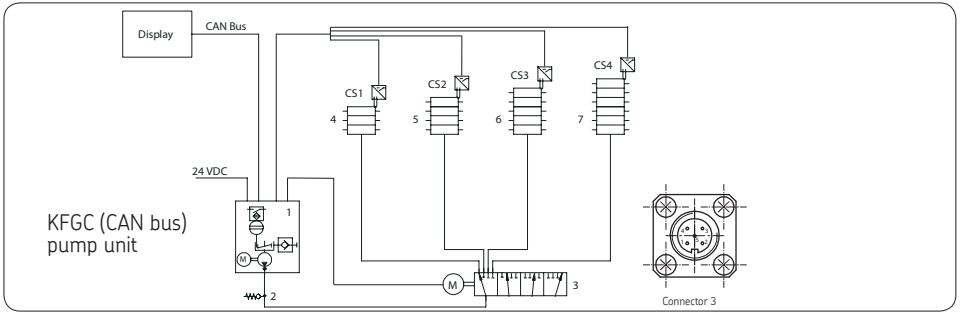


Legend for connection illustration with minimum equipment level

CS4	Piston detector 4	**V4**	Valve 4
MC	Machine contact	**SL2**	"Fault" indicator light can alternately be operated in place of valve 4)
L+	+ Supply voltage potential		
S1	Switch	**F1**	Fuse

4.5.4.3 Example of CAN bus control with 5/4 directional solenoid valve

The 5/4 directional control valve is intended for use in progressive feeder lubrication systems and in the industrial sector. It possesses an input which can be switched to one of the four outputs at a time. Using this valve, especially in combination with the KFG CAN bus pump unit, up to four independent zones can be supplied with lubricant, controlled and monitored. The 5/4 directional control valve thus replaces up to four 2/2 directional control valves. During the switching process, there may be a brief connection (approx. 0.1 s) between the main line and non-actuated lubrication lines. The DCV5-4+924 5/4 directional control valve is electrically actuated with 24 VDC.



Legend for connection illustration with a 5/4 directional solenoid valve

1	KFG CAN-Bus pump unit	**2**	Pressure regulating valve,
3	5/4 directional control valve DCV5-4+924,	**4 - 7**	Piston distributors
CS1 – CS4	Piston detector of the lubrication zones 1 - 4		

4.5.4.4 CAN bus system configuration

Systems with connection to CAN bus system.

These systems are configured via the CAN bus connection. Please see the "LC-CAN 5000 Configuration and Control Interface Protocol" manual for details on configuring and communicating with the control unit over the CAN network using the SAE J1939 communication protocol.

4.5.4.5 CAN bus system configuration

Systems without connection to
CAN bus system

Systems without a connection to a CAN bus system are configured using a PC with an IrDA interface.
A configuration program needs to be installed on the PC to do this. You can obtain this program from the SKF Service Center.

4.6 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.

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 display.

4.7 Lubrication line connection

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

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

For higher operating pressures up to 250 bar as can occur especially in progressive centralized lubrication systems, SKF cutting-sleeve screw unions conforming to DIN 2353 can be used. If using fittings from other manufacturers, pay careful attention to the assembly instructions and technical specifications provided by the manufacturer.

4.8 Lubrication line arrangement

The pipes, tubes, shutoff valves and directional control valves, fittings, etc. that will be used must be designed for the maximum operating pressure of the lubrication unit, the permissible temperatures and the lubricants that will be delivered. The lubrication line system also needs to be protected from excessive pressure by means of a pressure-limiting valve.
All components of the lubrication line system such as pipes, tubes, shutoff valves, directional control valves, fittings, etc. must be carefully cleaned before assembly. No seals should point inward in the lubrication line system, as this could hinder lubricant flow and introduce contaminants into the lubrication line system. Lubrication lines should always be arranged so that air pockets cannot form anywhere. Avoid changes in the cross-section of the lubrication line from small to large cross-sections in the direction of flow of the lubricant. When the cross-section does change, the transition should be gentle.

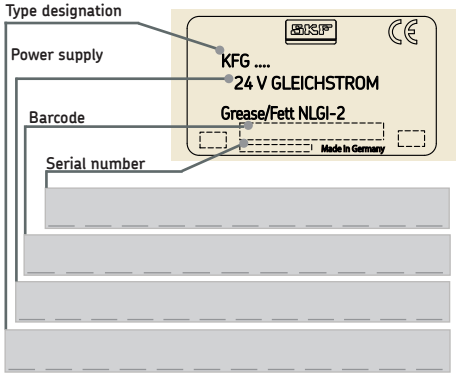
4.9 Progressive system ventilation

- Fill pump with lubricant.
- Remove main lines on unit.
- Allow pump to run until lubricant without bubbles is discharged at the straight connector on the pump element.
- Mount main lines.
- Allow pump to run until grease can be seen discharging at all lubrication points.

4.10 Note on the rating plate

Rating plates on KFG and KFGS pump units provide important key data such as designation and material description (or customer number).
To avoid loss of this data in case the rating plate becomes illegible, these characteristics should be entered in the following table.

- Enter key data from rating plate in the following table:



KFG; KFGS; KFGC (CAN bus)

for vehicle lubrication

Operating instructions associated with assembly instructions

according to EC Dir. 2006/42/EC for partly completed machinery

1. Safety instructions

General

Warning!
These operating instructions must be read and properly understood by the assembler and the responsible technical personnel/operator before assembly and commissioning.

The safety instructions listed in Chapter 1, "Safety instructions," of the assembly instructions also apply without restrictions to these operating instructions.

In addition to the operating instructions, general statutory regulations and other binding regulations for accident prevention and for environmental protection (recycling/disposal) must be observed and applied.

Disclaimer of liability

SKF Lubrication Systems shall not be held liable for damages:

- Caused by contaminated or unsuitable lubricants
- Caused by the installation of non-original SKF components or SKF spare parts
- Caused by inappropriate usage
- Resulting from improper assembly, configuration or filling
- Resulting from improper response to malfunctions
- Caused by independent modification of system components
- Only media approved for these types of pump units may be used. Unsuitable media may result in pump unit failure and potentially severe bodily injury and property damage.

2. Lubricants

Warning!
The information on lubricants listed in Chapter 2, "Lubricants," of the assembly instructions also applies without restrictions to these operating instructions.

3. Transport, delivery, and storage

SKF Lubrication Systems products are packaged in accordance with standard commercial practice according to the regulations of the recipient's country and DIN ISO 9001. During transport, safe handling must be ensured and the product must be protected from mechanical effects such as impacts. The transport packaging must be marked "Do not drop!".

Warning!
The product must not be tilted or dropped.

There are no restrictions for land, air or sea transport.
After receipt of the shipment, the product(s) must be inspected for damage and for completeness according to the shipping documents. The packaging material must be preserved until any discrepancies are resolved.
SKF Lubrication Systems products are subject to the following storage conditions:

3.1 Lubrication units

- Ambient conditions: dry and dust-free surroundings, storage in well ventilated dry area
- Storage time: max. 24 months
- Permissible humidity: < 65%
- Storage temperature: 10 - 40°C
- Light: avoid direct sun or UV exposure and shield nearby sources of heat

3.2 Electronic and electrical devices

- Ambient conditions: dry and dust-free surroundings, storage in well ventilated dry area
- Storage time: max. 24 months
- Permissible humidity: < 65%
- Storage temperature: 10 - 40°C
- Light: avoid direct sun or UV exposure and shield nearby sources of heat

3.3 General notes

- The product(s) can be enveloped in plastic film to provide low-dust storage.
- Protect against ground moisture by storing on a shelf or wooden pallet.
- Bright-finished metallic surfaces, especially wearing parts and assembly surfaces, must be protected using long-term anti-corrosive agents before storage.
- At approx. 6-month intervals: Check for corrosion. If there are signs of corrosion, reapply anti-corrosive agents.
- Drives must be protected from mechanical damage.

4. Assembly

4.1 Information on assembly

The assembly procedure for KFG grease lubrication pump units is described in detail in the assembly instructions associated with these operating instructions. Information/instructions about assembling the KFG (S) (C) grease lubrication pump units beyond the scope of the assembly instructions are contained later in this chapter.

4.2 Assembly procedure for KFG (S) (C) pump units

- Assembly must be performed in accordance with the included assembly instructions and the additional information/instructions contained in this chapter.

4.3 Dismantling and disposal



Warning!
The applicable national environmental regulations and statutes are to be adhered to when dismantling and disposing of the multiline pump unit.
The product can also be returned to SKF Lubrication Systems for disposal, in which case the customer is responsible for reimbursing the costs incurred.

5. Design

5.1 General information

Pump units of the KFG, KFGS and KFGC (CAN bus) series are electrically driven reservoir pump units available with and without an integrated control unit. The pump provides on-demand lubricant supply to centralized lubrication systems with progressive feeders or single-line distributors on machines, systems and vehicles.
The pump units differ in terms of the size and type of lubricant reservoir, the lubricant filling and their control and function monitoring.
Powerful CAN bus versions allow one unit and a special valve to supply up to four independent zones according to demand.
Note
The exact pump designation of the CAN bus version consists of the particular order code and begins with the KFGC designation. This pump design is listed below under the KFGC designation for the sake of simplifying the descriptions.

5.2 Design

Pump units of the KFG, KFGS and KFGC 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.

5.2.1 Pump housing

The pump housing contains, among other things, the pump drive, control unit (KFGS) and three lubricant outlets for installing a maximum of three pump elements. A conical head nipple is attached to the pump housing to fill the pump. A filler socket or grease return can also be attached.
A display and control screen is mounted on the front side of the KFGS design, while the KFGC design has a display attached. An IrDA interface is integrated into this screen, which can optionally be used to program the pump.

Depending on the pump version and voltage design, the electrical connections are located on the left front and/or the underside of the pump housing.

5.2.2 Lubricant reservoir

The lubricant reservoir is available in 2 kg, 6 kg and 10 kg sizes.
The reservoirs are made of transparent plastic and 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 or, optionally, a capacitive level switch attached to the cover.

5.2.3 KFGS control unit

Pump units of the KFGS series are equipped with an IG502-2-I integrated control unit with a control display. Operating parameters for interval times (timer), interval pulses (counter) and pump cycle times (contact) can be entered through the control unit.

5.3 KFG-pump units

Pump units of the KFGS series are reservoir pump units without an integrated control unit. Pumps in the KFG series have different reservoir designs and reservoir capacities (2 kg, 6 kg and 10 kg) depending on their field of application.

The pump is available in the 12/24 V DC voltage designs.
Fill level switches W1 and W1G can be attached with one switching point each to monitor the pump fill level.
Both fill level switches are integrated in the pump housing. The output signal only communicates the following:

- Reservoir full (filled)
- Reservoir empty.

The W1G version features signal smoothing.

5.4 KFGS-pump units

Pump units of the KFGS series are reservoir pump units with an integrated control unit. Parameters for interval times (timer), interval pulses (counter) and pump cycle times (contact) can be entered through the control panel. Feeding operation can be monitored via a piston detector.
The KFGS pump is available in the same reservoir designs, reservoir capacities and voltage designs as the KFG series.
The fill level of pump units of the KFG/KFGS/KFGC series is monitored using the fill level switches mentioned in the assembly instructions (Chapter 4). The selection of fill level switches is based on the lubricant used, which then determines whether the switches are installed in the pump housing or reservoir cover.

5.5 KFGC (CAN bus)

Pump units of the KFGC (CAN bus) series are pump units from the KFGS series with an integrated CAN bus control unit.
The LC-CAN 5000 control units offer the following special features:

- CAN bus interface (SAE J1939), which allows units to be seamlessly integrated into the CAN bus networks.
- The lubrication system can be monitored, operated and configured through the CAN bus.
- There is also the option of configuring and operating the pump unit using the existing IrDA interface.

Moreover, the control unit is able to control and monitor up to four independent zones and to supply them from a single pump unit.
To achieve this capability, electric switch valves which are controlled based on the parameters set for each individual lubrication zone are placed in the main line. The control unit has up to four solid-state switching outputs for this purpose.

Aside from valve control, the outputs can also be configured as digital outputs for other purposes.

In addition to the above-mentioned outputs, up to four digital inputs are available, e.g., for connecting piston detectors, pressure switches or other switching contacts. A detailed description of the electrical connections can be found in Chapter 5.

The control unit's comprehensive monitoring functions allow potential faults to be detected early. This includes, among other things, monitoring the fill level in the lubricant reservoir, monitoring the signal lines on attached components for line breakage, and monitoring the switching outputs for short circuits.
Chapter 6 contains a complete description of the monitoring functions for use in progressive feeder systems.

Important system events such as a low fill level in the lubricant reservoir are saved by the control unit and given a time stamp. This allows the causes of operational faults to be determined more easily. A description of the functions for operational malfunctions can be found in Chapter 14.
The flexible parameters and configuration options allow custom lubrication concepts to be implemented for each individual lubrication zone in the system. The control unit can store up to 16 sets of parameters. Each set of parameters contains all the information required to control and monitor the lubrication process. This means that different lubrication scenarios can be prepared and saved then called on when needed.
Chapter 4 contains instructions on configuring the system.

5.6 Images of pump units



KFG pump unit without integrated control unit, with 2 kg lubricant reservoir



KFGS pump unit with integrated control unit and 2 kg lubricant reservoir



KFGC (CAN bus) pump unit with 2 kg lubricant reservoir

6. Functional description in progressive systems

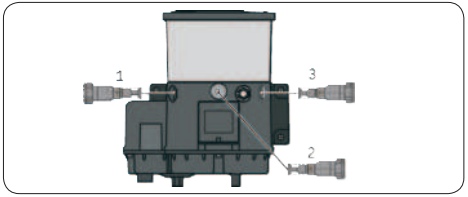
6.1 Functional description of progressive systems with KFG pump unit

A general progressive feeder system consists of the following components: Pump unit with pump element and pressure regulating valve, progressive feeders, and lubrication lines.

When the pump motor is turned on, the piston pump delivers 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 feeder. There, the lubricant is distributed according to the volume required by the lubrication point being supplied. In progressive systems with a master feeder and secondary feeder, the lubricant coming from the pump unit is delivered to the master feeder. The master feeder distributes the lubricant to the secondary feeders according to their individual volume requirements.
From there, the lubricant flows to the lubrication points.

6.1.1 Pump element

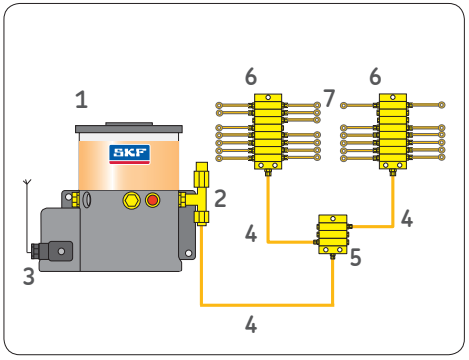
The pump element meters the lubricant then passes it to the downstream lubrication points or feeders. Four different pump elements with a delivery volume ranging from 0.8 to 2.5 cm^3/min. are available to provide the required quantity of lubricant (see Chapter 4.3.4 in the assembly instructions).



Layout of pump elements

6.1.2 Pressure regulating valve

A pressure regulating valve must be installed on the pump element on progressive systems to prevent excessive operating pressure in the lubrication system. The pressure regulating valve (see Chapter 4.3.5 in the assembly instructions) opens when operating pressure exceeds its cracking pressure.



Example of progressive system with KFG pump unit

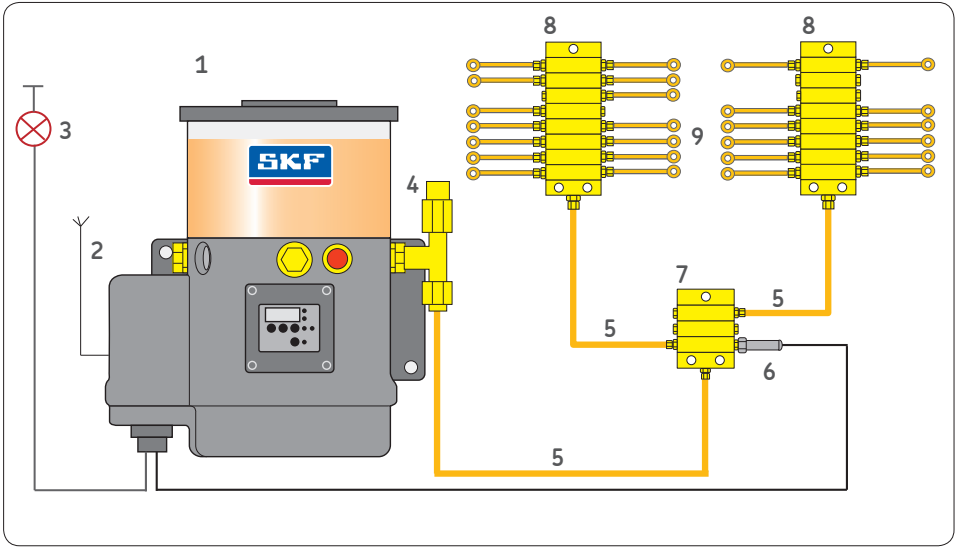
Progressive system with KFG pump unit

1 KFG unit
2 Pump element with pressure regulating valve
3 Electrical pump connection
4 Lubrication lines
5 Master feeder
6 Secondary feeder
7 Lubrication points

6.2 Functional description of progressive system with a KFGS pump unit

The general functional description for progressive systems with a KFG pump unit also applies for the design with KFGS pump control.
The control unit integrated into the pump housing allows the following additional configuration, monitoring and connectivity options:

- Interval time and pump cycle 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
- Connectivity for inductive piston detector to monitor the feeder function
- Connectivity for external pushbutton
- Internal fill level monitoring (W1 control); lubrication cycle is halted and a fault signal is displayed if the fill level falls below minimum
- Fault memory



Example of progressive system with KFGS pump unit

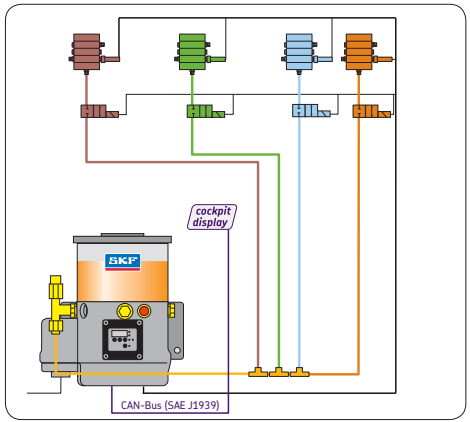
	Progressive system with piston detector		
1	KFGS unit	6	Piston detector
2	Power supply	7	Master feeder
3	Fault indicator light	8	Secondary feeder
4	Pump element with pressure regulating valve	9	Lubrication points
5	Lubrication lines		

6.3 Functional description of progressive system with KFGC (CAN bus) pump unit

The general functional description for progressive systems with a KFGS pump unit also applies for the design with CAN bus pump control

The integrated LC-CAN5000 control unit permits the lubrication zone of a progressive feeder system to be distributed into individual lubrication zones for which individual parameters (e.g., contact and interval times) can be set. Up to four lubrication zones can be installed in total.
To distribute the lubricant, a corresponding number of electric switch valves is installed in the lubrication line leading from the pump element. A valve is opened as soon as the control unit starts a pump cycle period for the corresponding lubrication zone.
The pump can only provide one lubrication zone with adequate lubrication, so it must be ensured that only one valve is opened during operation. This is handled by the control unit in automatic and semiautomatic operation.

When CAN commands are used for control, valve opening must be ensured by selecting the appropriate contact and interval times or by using appropriately programmed processes in the external lubrication program to switch the valves in a carefully coordinated sequence so that only one valve is activated at a time.



Progressive system with KFGC (CAN bus) pump unit

6.3.1 Explanations of the lubrication process and lubrication cycle

The lubrication cycle/process is divided into a pump cycle time and an interval time because the lubrication points only require lubrication at certain intervals. A lubrication cycle always begins with a pump cycle.

Pump cycle time
The pump cycle time is the time during which the pump delivers lubricant. When multiple lubrication zones are used, one of the zone valves is opened and then closed once the pump cycle ends.

The duration of the pump cycle time is a time value configurable in hours, minutes and seconds.
The pump cycle time for units with W1 fill level control can also be set in pulses, i.e., the number of agitator revolutions. The quantity of lubricant to be delivered is thus largely independent of ambient conditions.
It is also possible to limit the pump cycle time based on the pulses (strokes) received from the piston detector.
The pump unit switches off after the defined number of pulses (strokes) is reached. The pulses must be received within a defined period of time, otherwise the pump unit switches to block operation.

Interval time
During an interval time, also called interval for short, the pump is idle or, if multiple lubrication zones are used, the valve for the lubrication zone in question is closed.

The duration of the interval time can be configured.
In automatic mode, the interval time can be determined in two different ways: by specifying either a time value (interval timer) or a number of pulses (interval counter) sent to the control unit by the machine depending on how long it has been running. This provides two different means of control, the timer mode and counter mode.
In semi-automatic mode, the user sets the interval between two lubrications.
When configuring the lubrication scenario, the interval time is a delay for consecutively opening the valves of the individual lubrication zones after a lubrication cycle has been started. This prevents all valves from opening at the same time.

Block operation, pump delay time and waiting time
On systems with piston detector monitoring, there may be various non-critical reasons for the set number of piston detector signals not being received during the pump cycle time. In this case, a second pump cycle time is started after a certain delay.

This process can be repeated multiple times. This process is also referred to as block operation, as the pump starts and stops quickly several times.
Block operation is interrupted as soon as the set number of piston detector signals has been received. The length of an interval time following a successful block operation is not changed. Operation then continues as normal.
If the set number of piston detector signals is not reached during block operation, the control unit switches off the affected lubrication zone or the entire lubrication system and issues a fault notification.
The number of blocks to be cycled through can be configured.

6.3.2 Modes of operation

The lubrication process can be controlled either automatically, semi-automatically or completely via CAN commands.

6.3.2.1 Automatic control unit

In this operating mode, the control unit handles all control and monitoring of the lubrication process. The pump motor and valves cannot be controlled using CAN commands. Only the CAN command START/STOP is allowed.
The control unit controls the following functions based on the set parameters:

- Starting and switching off the pump
- Opening and closing the valves of the lubrication zones

The interval time and pump cycle time are the most important parameters for controlling these processes. They can be set in different ways.

Timer mode
In timer mode, the interval time for each lubrication zone is determined by a time value. It is configured by entering a time value in minutes and/or hours.
The pump cycle time for each lubrication zone is configured using a time value in hours, minutes and seconds. The pump cycle time for units with W1 fill level control can also be set in pulses, i.e., the number of agitator revolutions.

Control using machine pulses
(**Counter mode** = load-dependent lubrication)
The duration of the interval time is determined by a pulse generator that sends pulses to the control unit based on how long the machine has been in use. The control unit counts the pulses that are received and starts the pump or opens the corresponding zone valve after the preset number of pulses. The pump cycle time is defined by a time value. Both the number of pulses that determine the interval time and the pump cycle time can be configured.

When multiple lubrication zones are used, multiple zone valves may be addressed at the same time in automatic mode (given the corresponding parameters) or in block operation. In this case, the control unit opens the valves in a carefully coordinated sequence so that only one valve is activated at a time, while still providing all feeders with lubrication. The result is that the pump cycle time for each zone is maintained.

6.3.2.2 Semi-automatic control unit

In this operating mode, every lubrication cycle must be started by a CAN START command. When the control unit receives the START command, the lubrication scenario configured in the selected parameter set is loaded and processed.
The valve for the lubrication zone configured in the parameter set as the start zone is opened. The valves for the other zones are opened after a delay, which is configured as "interval time." If interval times are the same in multiple zones, the valves are actuated according to the numerical sequence configured. This prevents the pump from having to supply multiple lubrication zones at the same time. If the pump cycle times for multiple zones still overlap, e.g., in block operation, the control unit actuates the zones as described in the preceding section.
The pump cycle time for each zone is based on time or pulses and is configured by entering the time in hours, minutes and seconds or a number of pulses (corresponding to revolutions of the pump's agitator).
The lubrication cycle can only be aborted using a CAN STOP command. If a new lubrication cycle is started by a CAN START command while another lubrication process is ongoing, the ongoing process is aborted and the new process is started.
The system stops after completion of the lubrication cycle. The next lubrication cycle must be initiated by another CAN command.

6.3.2.3 Control via CAN commands

In this operating mode, both the pump motor and the lubrication zone valves can be controlled as desired via CAN commands. Interval and pump cycle times which are configured in the parameter sets are ignored.
When multiple lubrication zones are used, care must be taken that multiple valves are not opened at the same time during a pump cycle, as this can result in undersupply of the lubrication points.

6.3.3 Monitoring functions

The following functions are available for monitoring the lubrication system:

- Fill level monitoring
- Monitoring the lubrication cycle via piston detector
- Monitoring signal cables for cable breakage and monitoring valves and piston detectors
- Monitoring switch outputs for short circuit
- Monitoring power consumption of the pump motor
- Monitoring the temperature in the pump unit
- Diagnostics memory (real-time)

6.3.3.1 System monitoring

This function includes the following monitoring functions:

- Fill level monitoring
- Monitoring the lubrication cycle via piston detector

System monitoring can be activated and deactivated. The monitoring functions mentioned above are deactivated when system monitoring is deactivated. This means that no fault notification is issued if, for example, the fill level in the lubricant reservoir falls below the "min" mark.
It only makes sense to deactivate system monitoring if the functions mentioned above cannot be used because the required sensors are not connected.

6.3.3.2 Fill level monitoring

Mechanical sensors (W1 or W1G) are used for monitoring the fill level in the lubricant reservoir. They monitor whether the lubricant has fallen below the "min" mark, and are intended for use with NLGI Grade 2 greases.
For NLGI Grade ≤ 1 greases, SKF offers an optional capacitive sensor (W2) which is integrated into the reservoir cover.

The sensor sends a signal to the control unit if the lubricant level reaches the "min" mark. The control unit then generates a fault notification (see Chapter 14.2).

Fault notifications due to insufficient fill level are only issued when system monitoring is active.

6.3.3.3 Monitoring lubrication cycle via piston detector

The progressive feeders installed on the lubrication system are supplied with lubricant several times during the pump cycle. They then deliver the lubricant to the lubrication point. The complete piston movement of a progressive feeder forward and back to the normal position is also called a cycle. The piston movement can be detected via a contact switch, a "piston detector," which sends the corresponding signals to the control unit. There, the signals are registered and evaluated.
The number of cycles which must occur before an interval time is started can be specified in order to monitor the lubrication cycle and ensure sufficient lubrication of the lubrication points.
A configuration setting also determines whether the pump cycle should be ended after the specified number of piston detector pulses has been reached or whether the pump should continue to operate until the specified time value or number of pulses (revolutions of the agitator) is reached.

If the specified number of piston detector pulses is not reached during the pump cycle, the control unit reacts by starting block operation.

In contrast with the KFGS pump unit, the KFGC (CAN bus) design can repeat the lubrication cycle as often as desired.

If the specified number of pulses (strokes) is reached during the repeat lubrication cycle, the pump unit switches back to normal operation.

If the set number of piston detector signals is not reached during block operation, the control unit switches off the affected lubrication zone or the entire lubrication system and issues a fault notification. (see also Chapter 14.2).

6.3.3.4 Monitoring signal cables for cable breakage and monitoring valves and piston detectors

Every signal input configured for connecting a piston detector to the control unit is constantly monitored for cable breakage.
On a lubrication system with multiple zones, the piston detector assigned to a zone is queried before the zone valve is opened. If the piston detector is not found, the control unit assumes a cable has been broken. In this case, the lubrication cycle is first started according to the specified pump cycle time. The lubrication zone is then deactivated until the piston detector fault is resolved.
Block operation is not initiated. On a system without multiple lubrication zones, the unit is fully deactivated after the pump cycle time is finished. A fault notification is generated in all cases (see Chapter 14.2).

The signal inputs can be linked to the outputs. This allows indirect monitoring of whether a valve attached to the output has actually opened to allow lubricant through. The inputs and outputs must be clearly assigned. A signal input used to, for example, operate a cycle switch can only monitor the valve of the lubrication zone that contains the piston detector

6.3.3.5 Monitoring switching outputs for short circuits

The control unit is capable of detecting short circuit faults on the outputs. In such cases, the output is switched off, which idles the corresponding valve, and a fault notification is generated.
Unaffected valves continue to operate.

6.3.3.5 Monitoring power consumption of the pump motor

The power consumption of the pump motor is monitored to avoid motor overload. If the limit values are exceeded (see Technical Data, Chapter 15), the system is switched off and enters fault mode (see Chapter 14.2).

6.3.3.7 Monitoring unit temperature

The printed circuit board of the LC-CAN 5000 control unit contains a temperature sensor. If the temperature in the unit exceeds the limit value (see Technical Data, Chapter 12), the system is switched off and enters fault mode (see Chapter 14.2).

6.3.4 Display and documentation functions

During system operation, current operational data (status data) is stored in the FRAM and can be read at any time.
If the control unit is switched off or loses power, the most recent status data remains in the FRAM. When the control unit is turned on again, it reads the saved data and the lubrication process continues where it left off, unless the configuration has been changed (zero voltage signal).

All faults detected by the lubrication system's monitoring functions are also given a time stamp and stored persistently in the control unit's non-volatile memory area.

6.3.5 Configurable parameters

The control unit contains 16 pre-set sets of parameter data which can be programmed as desired. A parameter set contains all the information required to control and monitor the lubrication process, e.g., the number of lubrication zones, the interval times, the pump cycle times, the number of cycles, etc.

7. Commissioning

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

The lubricant fill level in the lubricant reservoir, if present, should likewise be subjected to regular visual inspection. If the lubricant fill level is too low, lubricant needs to be added up to the maximum mark as described in Chapter 4.4.1.

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

Warning!
Only fill using clean lubricant and an appropriate device. Contaminated lubricants can result in severe system malfunction. The lubricant reservoir must be filled without introducing bubbles.

Warning!
Different lubricants cannot be mixed, as mixing may result in damage and necessitate costly and complicated cleaning of the product/centralized lubrication system.
It is recommended that an indication of the lubricant in use be attached to the lubricant reservoir in order to prevent accidental mixing of lubricants.

7.1 General commissioning

Before the product is commissioned, all electrical connections must be inspected.

The lubricant may only be fed without bubbles. The lubricant reservoir, if present, must be filled with clean lubricant without introducing bubbles. The product is then operated until lubricant without bubbles is discharged at all lubrication points.

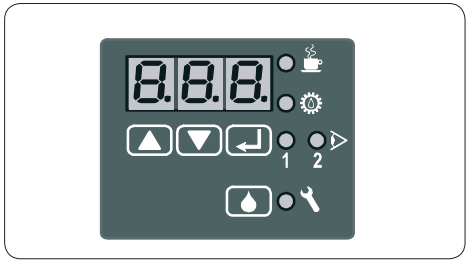
The process of venting the centralized lubrication system can be facilitated by:

- Opening the ends of the main pipes until lubricant without bubbles is discharged.
- Filling long pipe sections before connecting to the lubrication points.

8. Display and control elements of control screen

8.1 KFGS series

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.



Control screen

Display and control elements of the KFGS control screen

Representation	Description	Function
	Three-digit LED display	Values and operating status
	PAUSE LED	Interval time
	CONTACT LED	Display contact time (pump operation)
1 2	1 = CS LED	Monitors system function via an external piston detector CS = Cycle Switch, piston detector 2 = PS LED Monitors function with an external pressure switch PS = Pressure Switch
	FAULT LED	Fault notification
	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 key	○ Trigger interim lubrication ○ Delete fault notification

8.1.1 Three-digit LED display

The 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.



Device display - three-digit LED display

Three-digit LED display

Display	Meaning	Statement	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.

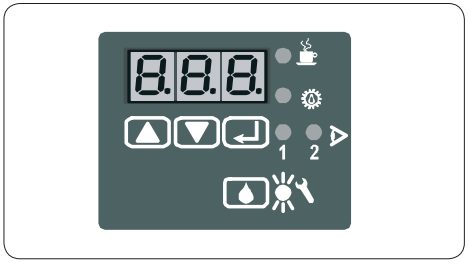


Device display - three-digit LED display

Continuation of "Three-digit LED display" table

Display	Meaning	Statement	Control function
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 has been reached in the reservoir.	
FCS	**F**ault **C**ycle **S**witch 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	**F**ault **P**ressure **S**witch Fault: Pressure switch	No signal from pressure switch during pump cycle.	The control unit is currently in FAULT mode. The operational sequence has been stopped.
0h	**O**peration **H**our Meter	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	**F**ault **H**our Meter	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	**Blo**ck mode	No signal from the piston detector. Unlike in normal mode, the control unit is still the monitoring sequence. A fault notification is issued if the fault remains for three pump cycles times.	

8.1.2 LED display



Device display - LED display

LED display

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.
CS 1	A cycle switch (CS) is used for system monitoring. On progressive feeders, 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
PS 2	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.	

KFGS

8.1.3 Pushbutton operation



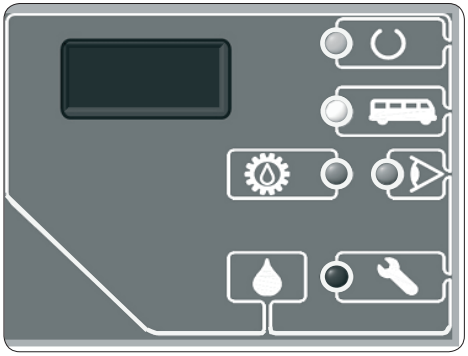
Device display - pushbuttons

Pushbutton operation

Key	Function
	Pressing during PAUSE triggers an interim lubrication. Fault notifications are acknowledged and deleted.
	Switch on the display in display mode Call up next parameter in programming mode Increase displayed value by 1
	Switch on the display 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

8.2 KFGC series (CAN bus)

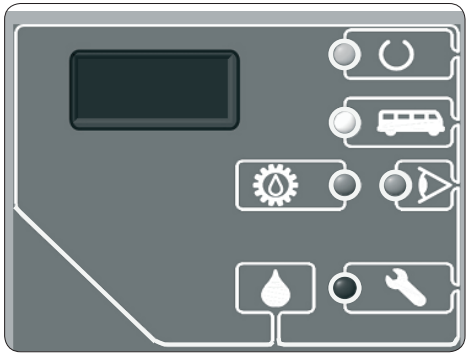
The display and control screen is protected from water splashes and mechanical damage by a transparent plastic cover. The cover must be removed to operate the unit and then remounted afterwards.



KFGC (CAN bus) display (CAN bus)

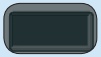
Display and control elements of the KFGC control screen

Representation	LED color	Description	Function
	Green	POWER LED	Lights up when operating voltage present.
	Blue	PUMP LED	Lights up when pump is running.
	White	BUS LED	Lights up when communication with the CAN network has been successfully established.
	Yellow	CS/MC LED	Lights up briefly when the control unit detects a signal edge at an input from a piston detector (CS), pressure switch or from the machine contact (MC).
	Red	FAULT LED	**LED lights up:** Indicates a fault that does not immediately influence the lubrication program (e.g., break in valve cable). The lubrication program continues despite the fault notification. **LED flashes:** Indicates a fault that influences the lubrication program (e.g., break in piston detector cable). The lubrication program is aborted.



KFGC (CAN bus) display (CAN bus)

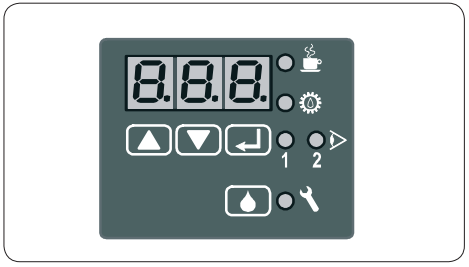
Continuation of "Display and control elements of the KFGC control screen" table

Representation	Description	Function
	IrDA interface	Infrared service interface ○ Read stored status data and fault notifications ○ Configure the control unit via PC
	DK key	○ Trigger interim lubrication ○ Halt lubrication ○ Delete fault notification

9. KFGS display mode

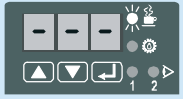
9.1 KFGS series

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 ▲ ▼.



KFGS display

Display mode

Step	Key	Display	
1	▲ ▼ Press briefly		The current operating status is shown **Example:** Timer operation pause
2	▲		Display remaining interval time for current lubrication cycle. **Example:** 1 h
3	▲		Display pre-set total interval time **Example:** 2.6 h (factory setting) Display is in hours
4	▲		Display pump cycle **Example:** Timer operation
5	▲		**Example:** System is currently in operating status Pause, current tCO display (**t**imer **CO**ntact) not possible
6	▲		Display the pre-set value **Example:** 4 min (factory setting) Display is in minutes
7	▲		Display system monitoring

Continuation of "Display mode" table

Step	Key	Display	
8	▲	 or	 or 
		Monitoring switched off (factory setting)	Monitoring via **piston detector** **Not permitted for progressive systems!**
9	▲		Display operating hours
10/11	▲	 + 	
		Example: 1st part of Total value **Write 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 **Write down.**	2nd part of total value Total value: 00033.8 h Maximum value: 99999.9 h
	▲	Display clears **Oh** and **Fh** values are stored in EEPROM and cannot be deleted.	

10. KFGS programming

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

10.1 Start programming mode

Programming mode can be identified by the flashing LED displays.

10.2 Change lubrication interval times

Note on step 2

If the 000 factory setting has been changed, the current code must be selected using the ▲ ▼ keys and confirmed using the ↵ key.

Change lubrication interval times

Step	Key	Display	
1	↵ Press for more than 2 s		Display flashes (000 = factory setting)
2	↵ Press briefly (confirm code)		Automatic display of first parameter: "pause in timer operation" "PAUSE" LED flashes
3	↵ Press briefly		Interval time 1 h (factory setting) (display in hours)
4	▲ ▼		Set new value **Example:** 6.8 h = 6 h 48 min
5	↵ Press briefly (confirm new value)		Display next parameter "pump cycle time in timer operation" "CONTACT" LED flashes
6	↵ Press briefly		Pump cycle time 4.0 min (factory setting) Note the operating mode/set duration - see Technical Data, Chapter 15 (display in minutes)

Continuation of "Change lubrication interval times" table

Step	Key	Display	
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

10.3 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 on progressive systems or monitoring via pressure switch on single-line systems.

Configure system monitoring

Step	Key	Display	
1	Press for more than 2 s		Display flashes (000 = factory setting)
2	Press briefly (confirm code)		Automatic display of first parameter: "pause in timer operation" "PAUSE" LED flashes
3	Press until:		Beginning of monitoring settings is displayed
4	Press briefly		System monitoring switched off (factory setting)
5	Press either until	 Monitoring via piston detector "CS" LED flashes	or  **Not permitted for progressive systems!**
6	Press briefly		Confirm new setting
7	Press for more than 2 s		New settings are written to memory, the values are activated and **the display clears**

10.4 Change operating modes

A change of operation mode means changing to timer operation, counter operation or special applications.
Please refer to Chapter 9 for further information.

Change operating mode

Step	Key	Display	
1	Press for more than 2 s		Display flashes (000 = factory setting)
2	Press briefly (confirm code)		Automatic display of first parameter: "pause in timer operation" "PAUSE" LED flashes
3	▲		Change from interval time to counter operation (only possible with external electrical pulse generator) Values in pulses
4	Press briefly to confirm counter operation		Display pump cycle time in timer operation
5	▲		**Change from pump cycle time to counter operation, special application**
6	Press briefly		Confirm new setting
7	Press for more than 2 s		New settings are written to memory and the display clears

10.5 Change access code

This factory default code is now deleted and the new value is valid. 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.

Change code

Step	Key	Display	
1	Press for more than 2 s		Display flashes (000 = factory setting)
2	Press briefly (confirm code)		Key number is selected (321 = factory default setting)
3	Press briefly (confirm key)		Display flashes (000 = factory setting)
4	Press briefly (confirm code)		Display flashes
5	Press either until		new code is set Example: 666 Warning! Do not enter 321.
6	Press briefly		Confirm new code
7	Press for more than 2 s		New code is written to memory and **the display clears**

10.6 Programming ranges

Programming ranges

Function	Programming range [1]
Interval time	0.1 h to 99.9 h
Pump cycle time	0.1 min to 99.9 min
Pulses	1 to 999

10.7 Display ranges

Display ranges

Function	Display range
Fault hours	0.1 h to 99999.9 h
Operating hours	0.1 h to 99999.9 h

1) *For the permissible setting range for KFG(S) 90-264 VAC, see Technical Data, Chapter 15.*

11. KFGS operating modes

11.1 Timer operation

The interval and pump cycle 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

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

11.2 Counter operation

The interval depends on the number of pulses; the pump cycle time is time-dependent.
An external pulse generator must be attached as described in Chapter 6.

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.

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

11.3 No system monitoring

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

Monitoring must be switched off. **COP** = **OFF** System malfunctions are not automatically detected or displayed.

11.4 With system monitoring

In this operating mode, system functions are additionally monitored using external switches. The following can be monitored:

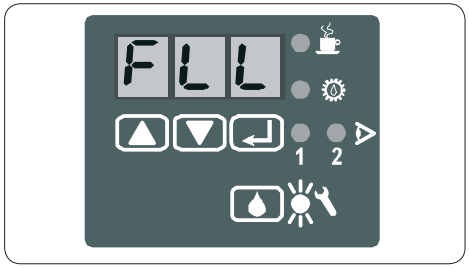
- Fill level in the lubricant reservoir
- Function of progressive feeder using a piston detector
- Function of single-line system using a pressure switch

Operational malfunctions are automatically detected and displayed.
Monitoring is switched on.
COP = **CS** (PS not permitted on progressive systems)

11.5 Fill level monitoring

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 display.



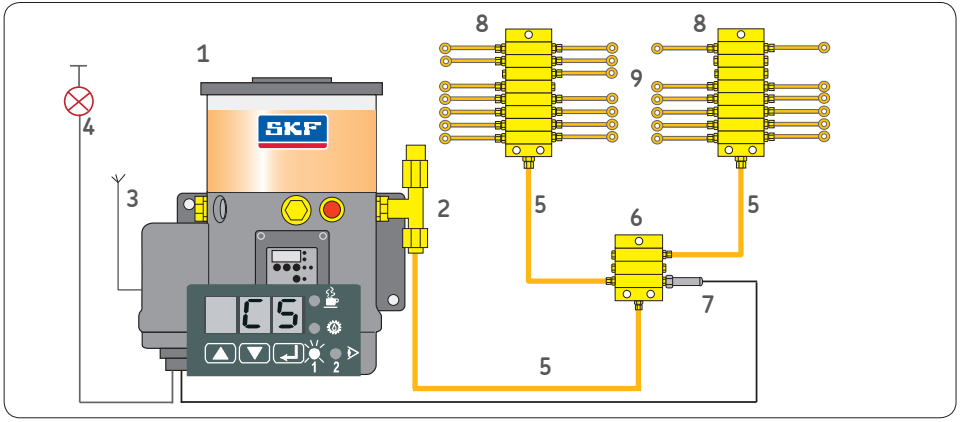
FLL: Fault Low Level (fill level too low)

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.

11.6 Monitoring via piston detector

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

The piston detector monitors the movement of pistons in the progressive feeder during CONTACT time (pump cycle time). The following monitoring setting must be activated in programming mode:
COP = CS -see Chapter 10.3



Progressive system with piston detector

1 KFGS unit
2 Pump element with Pressure regulating valve
3 Power supply
4 Fault indicator light
5 main lines
6 Master feeder
7 Piston detector
8 Secondary feeder
9 Lubrication points

12. Shutdown

12.1 Temporary shutdown

The described product can be temporarily shut down by disconnecting the electrical supply connections. The instructions in the Chapter "General information" in these assembly instructions must be observed when doing so.

If the product is to be shut down for an extended period of time, follow the instructions in the Chapter "Transport, delivery, and storage" of these operating instructions.

To recommission the product, follow the instructions in the Chapter "Assembly".

12.2 Permanent shutdown

If the product will be permanently shut down, the local regulations and laws regarding the disposal of contaminated equipment must be observed.



Warning!
Lubricants can contaminate soil and bodies of water. Lubricants must be properly used and disposed of. Observe the local regulations and laws regarding the disposal of lubricants.

The product can also be returned to SKF Lubrication Systems for disposal, in which case the customer is responsible for reimbursing the costs incurred.

13. Maintenance

Danger!
Work on products that have not been de-energized may result in bodily injury. Assembly, maintenance and repair work may only be performed on products that have been de-energized by qualified technical personnel. The supply voltage must be switched off before opening any of the product's components.

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

Danger!
The described product is pressurized during operation. The product must therefore be depressurized before starting assembly, maintenance or repair work, or any system modifications or system repairs.

Products from SKF Lubrication Systems are low-maintenance. However, all connections and fittings must be regularly inspected for proper seating to ensure proper function and to prevent hazards from arising.

If necessary, the product can be cleaned using mild cleaning agents that are compatible with the product's materials (non-alkaline, non-soap). For safety reasons, the product should be disconnected from the power supply and the hydraulic and/or compressed air supply.

It must be ensured that no cleaning agent enters the interior of the product during cleaning.

It is not necessary to clean the interior of the product if the product is operated normally and intercompatible lubricants are used.
The interior of the product must be cleaned if incorrect or contaminated lubricant is accidentally filled into the product. If this occurs, please contact the Service department of SKF Lubrication Systems for assistance.

Dismantling of the product or individual parts thereof within the statutory warranty period is not permitted and voids any claims.

Only original spare parts from SKF Lubrication Systems may be used. Arbitrary alterations to products and the use of non-original spare parts and accessories are not permitted and nullify the statutory warranty.

SKF Lubrication Systems shall not be held liable for damages resulting from improperly performed assembly, maintenance and repair work on the product.

13.1 General information

The following maintenance table 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.

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

13.2 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

Maintenance work	Action	Interval
KFG; KFGS; KFGC		
Check of fill level in lubricant reservoir	Refill if necessary.	Depends on planned lubricant consumption
Inspection of system components (lubricant lines, connection points, seals, etc.) for leaks	Parts that exhibit leaks must be replaced. Please contact an SKF service office.	After each refill of the lubricant reservoir or after long operational pauses before commissioning the machine/vehicle
Visual inspection of bearings' lubrication	In case of insufficient bearing lubrication, a fault in the lubrication system or incorrect system configuration is the probable cause. Observe the instructions contained in these operating instructions. If necessary, please contact an SKF service office.	In conjunction with lubrication reservoir filling
KFGS; KFGC (CAN bus)		
Check of basic function of control unit and system components	To inspect the basic functions, trigger an interim lubrication by pressing the key or send the corresponding CAN command.	After each lubrication reservoir filling
Inspection of electrical cables for damage	Damaged cables must be replaced. Please contact an SKF service office.	After long operational pauses before commissioning the machine/vehicle
Inspection of electrical connections and contacts for firm attachment and corrosion	Tighten loose contacts. Clean any corroded electrical contacts with a wire brush, then apply a small amount of contact grease after installation	Semi-annual

14. Operational and pump faults

14.1 KFGS operational malfunctions

14.1.1 General information

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 run time. The operator/operating personnel must therefore determine the intervals on their own based on the specific conditions of usage.
If the reservoir has been emptied, the entire system must be ventilated after refilling (see assembly instructions).

KFGS
All fault notifications are displayed by the LEDs as a centralized fault notification. When a fault notification is issued, 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 display. This greatly simplifies failure diagnostics, though it requires system monitoring.

14.1.2 Display faults

- Start the display mode with one of the two keys ▲ ▼
- Press the ▲ key until you reach the fault notification (see following table)

14.1.3 Delete fault notification

☞ All fault notifications can be acknowledged and deleted using the 💧 key. In timer operation, this can also be performed using an external pushbutton, if installed.

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

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

Fault notification

Display	Meaning
FCS	**Fault Cycle Switch**: No signal from piston detector during pump cycle (see Chapter 9, Block Operation)
FPS	**Fault Pressure Switch**: No signal from pressure switch during pump cycle.
FLL	**Fault Low Level**: The level in the reservoir has fallen below the minimum fill level. The further operational sequence has been stopped.

14.1.4 Fault types

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

Fault types

Fault type	Definition	Display	Example of fault	Response by control unit
Warning	A problem has occurred that does not affect the operational sequence but can lead to an operational malfunction if not remedied.	● 🔧 LED lights up and remains constant	The fill level in the reservoir sinks to the level of the pre-warning sensor (only on systems equipped and configured with this functionality).	○ The ● 🔧 LED flashes. ○ A fault notification is generated. ○ Operation continues as normal.
Malfunction	A fault has occurred that affects the proper functioning of the lubrication system. Note 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.	● 🔧 LED flashes	Insufficient number of piston detector signals from a lubrication zone during the pump cycle	1. Block operation up to configured number of repetitions 2. - If the piston detector signal has still not been received, the valve is closed and a fault notification is generated. - The ● 🔧 LED lights up.

14.1.5 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 8.1.1).
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.

14.1.6 Maintenance and repair

The following maintenance and repair work must be performed on a regular basis:

- Inspect fill level in lubricant reservoir.
- Regularly inspect system components for leaks.
- Visually inspect lubrication of bearings.
- Inspect electrical cables for damage.
- Inspect electrical connections and contacts.
- The basic function of the control unit and system components can be inspected by triggering an interim lubrication.
- Inspect electrical connections in case of malfunction notifications.
- Replace defective fuses with new fuses of the same performance and characteristics.

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

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

KFGS

14.1.7 Malfunctions on pump unit in 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 feeder
- Defective piston detector
- Insufficient lubricant

No signal from piston detector during pump cycle:

- 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.

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

No signal from the piston detector



Three pump cycles and two block pauses without signal from the piston detector:

Block operation is aborted

Malfunction notification is issued.



Fault notification on device display

Duration of block pause

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

- Determine and remedy cause of fault.

14.1.8 Malfunctions on KFG/KFGS pump units

KFG/KFGS pump malfunctions

Fault	Category	Possible cause	Rectification
Pump Agitator in grease reservoir does not rotate during the activated pump cycle (CONTACT mode).	Malfunction	○ Mechanical damage, e.g., motor defective ○ Undervoltage ○ Electrical connection interrupted	• Replace pump. - Loosen main line at outlet of pressure regulating valve. - Loosen electrical connection. - Loosen three fastening screws. - Remove defective pump. - Mount new pump and connect lubrication line and electrical cable. • Perform commissioning and functional inspection. • Be sure the interval and contact times are correct. • 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.	Malfunction	○ Electrical control has failed. ○ Pump drive/motor is defective. ○ Lubricant level in reservoir is below minimum. ○ Agitator does not rotate.	• Check fuse • Replace pump • Fill lubricant reservoir to "max." • Replace pump element **Note:** metering is indicated by grooves.

Continuation of "KFG/KFGS pump malfunctions" table

Fault	Category	Possible cause	Rectification
Pump does not deliver any lubricant, although agitator is rotating.	Malfunction	○ Suction problems due to air pockets in grease ○ Pump element does not build up pressure, pump element is worn out. (This is indicated when the outlet can be closed with a finger once the main line is removed.) ○ Lubricant too stiff	• Dismantle pump element and operate pump using key until grease discharges from outlet on housing. • Replace pump element **Note:** metering is indicated by grooves. • If necessary, adjust lubricant to work properly at lowest working temperature.
Pressure regulating valve on pump opens and lubricant discharges.	Malfunction	○ System pressure is over 200/300 bar, e.g., due to feeder blockage or blocked lubrication point. ○ Valve is damaged or contaminated, so it does not close properly.	• Check system and repair/rework the system so the maximum system pressure at 20 °C is 200 bar. • Replace pressure regulating valve .

14.2 Operational malfunctions on KFGC (CAN bus)

14.2.1 Pump malfunctions

The possible causes of malfunctions listed in Chapter 14.1.8, "Malfunctions on KFG/KFGC pump units," also apply for the KFGC CAN bus version.

14.2.2 Faults detected by control unit

The comprehensive monitoring functions of the LC-CAN 5000 control unit allow faults in the operational process to be detected, registered and displayed.

Several faults, e.g., due to insufficient fill level or the absence of a signal from the piston detector, are only displayed when system monitoring is active (see Chapter 6.3.3.1).

14.2.3 Fault types

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

14.2.4 Fault notification

Warnings are indicated by a constant LED light. At the same time, the fault notification is stored in the FRAM.
Malfunctions are indicated by a flashing LED light. At the same time, the fault notification is stored in the FRAM.

14.2.5 Read faults

All fault notifications generated during operation are stored in the control unit's FRAM together with further system parameters and a timestamp. They can then be read from the FRAM. This allows each failure to be uniquely identified by its code. Refer to the "LC-CAN 5000 - Configuration and Control Interface Protocol" manual for more information.

14.2.6 Remedy faults

Always check cables first when a fault occurs. Most signal cables are monitored for breakage, so a defective cable or loose contact can cause a fault notification.

When a warning occurs, it is recommended that the system be stopped and the fault be remedied.

When a malfunction occurs, the fault must be remedied immediately in order to prevent damage to the machine and the associated risk of accidents.

After the fault has been remedied and before operation is resumed, the key must be pressed or the equivalent CAN command sent to reset the system's fault status and delete the fault notifications.

Fault types

Fault type	Definition	Display	Example of fault	Response by control unit
Warning	A problem has occurred that does not affect the operational sequence but can lead to an operational malfunction if not remedied.	- LED lights up and remains constant	The fill level in the reservoir sinks to the level of the pre-warning sensor (only on systems equipped and configured with this functionality).	○ The LED flashes. ○ A fault notification is generated. ○ Operation continues as normal.
Malfunction	A fault has occurred that affects the proper functioning of the lubrication system. Note 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.	LED flashes	Insufficient number of piston detector signals from a lubrication zone during the pump cycle	1. Block operation up to configured number of repetitions 2. - If the piston detector signal has still not been received, the valve is closed and a fault notification is generated. - The LED lights up. - The remaining lubrication zones continue to operate normally.

14.2.7 Warning and malfunction indicator on KFGC (CAN bus) pump unit

KFGC (CAN bus) fault notifications

Fault	Category	Possible cause	Rectification
Fill level warning	Warning	○ Fill level in the lubricant reservoir falls to warning sensor ○ Break in sensor cable	• Promptly refill with lubricant. (see assembly instructions, Chapter 4.4.1, page 21) • Replace cable.
Fill level fault	Malfunction	○ Fill level in lubricant reservoir reaches "min" mark ○ Break in sensor cable	• Immediately refill with lubricant (see assembly instructions, Chapter 4.4.1, page 21). • Replace the cable.
Cycle fault	Malfunction	○ Lubrication line defective ○ Progressive feeder blocked or defective ○ Piston detector defective ○ Insufficient lubricant ○ Break in sensor cable	• Replace the defective line. • Clean the feeder or replace it. • Replace the piston detector. • Immediately refill with lubricant (see Chapter 4.4.1, page 21), change pump element if necessary. • Replace the cable.
Pressure build-up fault	Malfunction	○ Lubrication line defective ○ Pressure switch defective ○ Pressure relief valve blocked or defective ○ Insufficient lubricant ○ Break in sensor cable	• Replace the defective line. • Replace the pressure switch. • Clean the valve or replace it. • Immediately refill with lubricant (see Chapter 4.4.1, page 21). Replace the pump element if necessary • Replace the cable.
Pressure reduction fault	Malfunction	○ Pressure relief valve blocked or defective ○ Pressure switch defective ○ Break in sensor cable ○ Lubricant too consistent	• Clean the valve or replace it. • Replace the pressure switch. • Replace the cable. • Fill lubricant at suitable flow pressure, clean system.

KFGC (CAN bus) fault notifications

Fault	Category	Possible cause	Rectification
Short-circuit fault	Malfunction	○ Damaged cable or plug ○ Incorrect installation	• Replace the cable. • Check the electrical installation.
Temperature fault	Malfunction	○ Ambient temperature too high ○ Output power too high	• Check system for line blockage and lubricant for feedability. • Let pump unit cool down.
Motor current fault	Malfunction	○ Partial or total blockage of motor shaft and/or agitator	• Check the agitator for freedom of movement. • Check whether objects in the grease reservoir are impeding the agitator. • Check the lubricant for feedability.
Open input/output	Warning	○ Input/output was configured but the component it was configured for is not connected	• Check the configuration. • Check whether all configured components are attached.

15. Technical data

Protective measures that must be taken for operation according to the intended use in machinery:
KFG; KFGS; KFGC (CAN bus)... 12/24 VDC:

- "Functional Extra Low Voltage", "Protective Extra Low Voltage“ (PELV)
- Disconnect the unit for insulation and voltage inspection according to EN 60204-1 1992.

Technical data

Description	Value		
	KFG(S) 1-5	**KFG(S) 3-5**	**KFG(S) 5-5**
Weight	see page 28	see page 28	see page 28
Reservoir material	PA 6I	PA 6I	PMMA
	12/24 VDC		
Permissible operating temperature range	-25 °C to +75 °C		
Electrical values	See assembly instructions, Chapter 4.5.1, "General conditions for connections," page 24		
Protection class according to DIN 40050, T9	IP56		
Operating mode/ON-time according to VDE0530/ DIN 41756	S1 continuous operation	At -25 °C to 40 °C: S1 continuous operation at 40 °C to 60 °C: Run time 0 to 10 min. minimum interval time = 4 x run time (20% ON-time) Run time 10 to 15 min. minimum interval time = 2 h	
Data universally applicable to KFG, KFGS; KFGC			
Max. back pressure	300 bar		
Max. number of outlets (if less than 3 outlets are required, close unneeded outlets with screw plugs)	3		
Delivery rates [cm^3/min]	KFG1.U1 = 2.5 KFG1.U3 = 1.3	KFG1.U2 = 1.8 KFG1.U4 = 0.8	
Lubricant	NLGI Grade 1 to 2 greases with EP additives, compatible with plastics, NBR elastomers, copper and copper alloys, and NLGI Grade 000 to 0 fluid greases		
Flow pressure	Up to max. 700 mbar		

Continuation of "Technical Data" table

Data universally applicable to KFG, KFGS; KFGC

Description	Field of application	Key data/indicator
Conditions for electrical connections	**12 VDC**	**24 VDC**
Rated voltage	12 VDC	24 VDC
Power consumption (load-dependent)	2.4 A [1])	1.25 A [1])
Power consumption (maximum) Pump	< 5 A	< 2.5 A
starting current (approx. 20 ms) Max.	9 A	4.5 A
pre-connected fuse	10 A [2]) [3])	7.5 A [2]) [3])
Fill level switch W1	NLGI 2	Fault notification via pulse
Fill level switch W1 smooth	NLGI 2	Fault notification via energized contact

1) Typical value at ambient temperature = 25 °C and operating pressure = 150 bar
2) Fuse per DIN 72581 T.3
3) Conductor: cross-section 1.5 mm², length ≤ 12 m

Continuation of "Technical Data" table

KFGC (CAN bus) data

Description	Key data
Switching outputs Type	**All types** Solid-state output, short-circuit-proof and overload-proof
Max. current-carrying capacity	• with simultaneous operation of 4 outputs: 1.0 A • with simultaneous operation of 2 outputs: 1.25 A • with operation of 1 output: 1.5 A
Modes of operation	• Single operation • Parallel connection of multiple outputs while simultaneously increasing output current
Signal inputs Type	**All types** digital solid-state input, short-circuit-proof
Connectivity	• Switching contact, no detection of wire breakage • Dual wire sensors (e.g., piston detector), detection of wire breakage
Communication connections	**All types**
CAN bus Infrared	SAE J1939 IrDA
Electrical data	**All types**
Protection class	according to DIN 40050, T9 IP5k5
Operating mode/ON-time according to VDE0530/DIN 41756	S1 continuous operation

16. Accessories

Accessories

Description	Data	Order No.
M12x1 circular connector, 4-pin, with cable for connecting to piston detector and an external fault indicator	Cable set Two-way distributor (for connecting to the M12x1 plug on the pump with 2x M12x1 outputs for piston detector and separate indicator lamp)	**179-990-719** **179-990-700**
M12x1 plug	without cable, with 4 pins, protection class IP 67 (mounted)	**179-990-371**
M12x1 angle plug	without cable, with 4 pins, protection class IP 67 (mounted)	**179-990-372**
M12x1 plug, straight	with 5 m cable, 4x 0.25 mm^2, protection class IP 68 (mounted)	**179-990-600**
M12x1 angle plug	with 5 m cable, 4x 0.25 mm^2, protection class IP 68 (mounted)	**179-990-601**
Cable socket according to DIN 43 650	Type A (ISO 4400), pivoted, without LED, 1.5 mm^2, line diameter 6 mm to 9 mm	**179-990-034**
Cable socket according to DIN 43 650	Type A (ISO 4400), pivoted, without LED, 1.5 mm^2, line diameter 4.5 mm to 7 mm	**179-990-034**
Cable socket according to DIN 43 650	Type A (ISO 4400), pivoted, with red LED, 1.5 mm^2, line diameter 6 mm to 9 mm	**179-990-121**

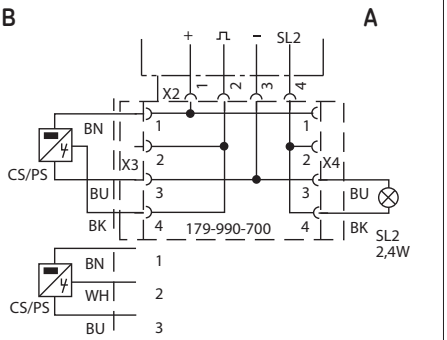
Additional data and electrical plug-in connections are available in brochure No. 1-1730, "Electric Plug-and-Socket Connectors."

KFGS

16.1 Connectivity

Timer operation with system monitoring, fill level control, piston detector and indicator light.

A double-pin plug with a special cable adapter is required for this application.



Connection for fault notification SL2

PIN	Code	Assignment	
1			
2			
3	SL2	Fault indicator light	(-)
4	SL2	Fault indicator light	(+)

Connection for piston detector CS

PIN	Code	Assignment
1		Voltage (+)
2	CS/PS	Pressure/piston detector (signal)
3		(-)
4	CS/PS	Pressure/piston detector (signal)

Accessories

Description	Data	Order No.
M12x1 circular connector with cable for connecting to piston detector and an external fault indicator	**Cable set**	**179-990-719**
	Two-way distributor (for connecting to the M12x1 plug on the pump with 2x M12x1 outputs for piston detector and separate indicator lamp)	**179-990-700**

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

External control units

Application	Type designation Order number	Features
Piston distributor for single-line systems	**EXZT2A02-E**	Pulse generator/counter with adjustable interval time, interval time extension, monitoring of pressure build-up and reduction, and fill level monitoring
Piston distributor for single-line systems	**EXZT2A03-E**	Pulse generator/counter with selectable monitoring time, monitoring of fill level and pump cycle time (stroke monitoring), adjustable delay time, and interval time extension
Progressive systems	**EXZT2A05-E**	Pulse generator/counter with adjustable interval time, interval time extension, pressure build-up monitoring, pulse monitoring, and fill level monitoring
Progressive systems	**EXZT2A06-E**	Pulse generator/counter with selectable monitoring time, monitoring of fill level and pump cycle time (stroke monitoring), adjustable delay time, interval time extension, and pulse monitoring
Piston distributor for single-line systems	**EXZT2A07-E**	Pulse generator/counter with adjustable interval time, interval time extension, pressure build-up monitoring, fill level monitoring, and fill level pre-warning
Electronic timer for centralized lubrication systems	**IG351-10-E**	Pulse generator with adjustable interval time, adjustable pump cycle time, and fill level monitoring with NO-contact
Piston distributor for single-line systems	**IGZ38-30-E**	Pulse generator/counter with adjustable interval time and pressure build-up monitoring, and fill level monitoring with NC contact (wire breakage monitoring)
Piston distributor for single-line systems	**IGZ36-20-E**	Pulse generator/counter with adjustable interval time, monitoring of pressure build-up and reduction, and adjustable delay time
Piston distributor for single-line systems	**IGZ36-20-S6-E**	Same as IGZ36-20-E, but with full level monitoring with NC contact (wire breakage monitoring)

KFG

External control units

Application	Type designation Order number	Features
Progressive systems	**IGZ51-20-E**	Pulse generator/counter with selectable intermittent or continuous pump operation, with adjustable stroke rate, selectable interval time and monitoring time, and monitoring of fill level and pump cycle time
Progressive systems	**IGZ51-20-S2-E**	Same as IGT51-20, but with non-volatile memory in case of power failure
Piston distributor for single-line systems	**IGZ51-20-S3-E**	Pulse generator/counter with adjustable interval time, interval time extension, monitoring of pressure build-up and reduction, adjustable delay time and connectable non-volatile memory in case of power failure
Progressive systems	**IGZ51-20-S7-E**	Same as IGZ51-20-S2, but with fill level switch as NC contact, pump cycle time = set monitoring time
Progressive systems	**IGZ51-20-S8-E**	Pulse generator/counter with selectable intermittent or continuous pump operation, prelubrication, selectable interval time and monitoring time, monitoring of fill level, pump cycle time and pulses, and non-volatile memory in case of power failure

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