

Gear, Gerotor, Vane and Multi-Circuit Pump Units

For use in centralized lubrication systems

Product line:

M..-../ME..-../MF..-../MFE..-..

M202-../M205-..

ZM..-..

143-012-..

FLM..-../FLMF..-..



Owner's Manual - Containing Installation, Operation and Maintenance Instructions

(Original installation instructions in accordance with EC-Machinery Directive 2006/42/EC)

Version 01

WARNING:

Read this owner's manual before installing, operating or maintaining the product. Failure to follow the instructions and safety precautions in this owner's manual could result in serious injury, death, or property damage. Keep for future reference.



Masthead

This owner's manual - containing installation, operation and maintenance instructions complies with EC-Machinery Directive 2006/42/EC and is an integral part of the described product. It must be kept for future use.

This owner's manual - containing installation, operation and maintenance instructions was created in accordance with the valid standards and regulations on documentation, VDI 4500 and EN 292.

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Information concerning the EC Declaration of Conformity and the EC Declaration of Incorporation

For the product(s) designated below:

Gear, Gerotor, Vane and Multi-Circuit Pump Unit

Product line:

M...-/ME...-/MF...-/MFE...-..
M202.../M205-..
ZM...-..
143-012-..
FLM...-/FLMF...-..

SKF herewith certifies that it conforms to the pertinent safety requirements set forth in the following Council Directive(s) for the harmonisation of the laws of the Member States...

- Machinery Directive 2006/42/EC
- Low-voltage Directive 2006/95/EC

Notes:

- (a) This declaration certifies conformity with the aforementioned directive(s), but does not contain any assurance of properties.
- (b) The safety instructions in the owner's manual must be observed.

- (c) The certified product must not be started up until it is confirmed that the equipment, machinery, vehicle or the like in which the product was installed meets the provisions and requirements of the national directives to be applied. This is in particular important for the implementation of the Use of Work Directive.
- (d) Operation of the products on non-standard main voltage as well as nonobservance of installation instructions can affect the EMC properties and electrical safety.

SKF further declares that the above mentioned product:

- is meant for integration into a machinery / for connection to other machinery according to the **EC-Machinery Directive 2006/42/EC, Appendix II Part B**. Starting up the product is not permissible until it is assured that the machinery, vehicle or the like in which the product was installed meets the provisions and requirements of the regulations set forth in the EC Directive 2006/42/EC.
- with reference to the **EC Directive 97/23/EC concerning apparatus subjected to pressure**, this product must only be used as intended and according to the Owner's manual. Especially observe the following:

Products of SKF Lubrication Systems Germany AG must not be used in conjunction with fluids, group I (hazardous fluids), according to the definition of article 2 paragraph 2 of the Directive 67/548/EC dtd. 27th June, 1967; and are not approved for application with such fluids.

None of the products manufactured by SKF Lubrication Systems Germany AG can be used with gases, liquefied gases, gases dissolved under pressure, steams or fluids that will reach a steam pressure of more than 0.5 bar above the normal atmospheric pressure (1013 mbar) in the permissible application temperature range.

When used as intended, the products supplied by SKF Lubrication Systems Germany AG do not reach the limit values listed in the Article 3 par. 1, sections 1.1 to 1.3 and par. 2 of the Directive 97/23/EC. Therefore, they do not come under the requirements set forth in annex I of that Directive. They are not labelled with the CE mark with reference to the Directive 97/23/EC. They are classified by SKF Lubrication Systems Germany AG to come under Article 3 par. 3 of the Directive.

The EC Declaration of Conformity and EC-Declaration of Incorporation is part of the product documentation. These documents are delivered with the product.





Safety information in owner's manual

Meaning of symbols and corresponding information

In this owner's manual, the symbols and words shown on this page are meant to communicate a particular risk to persons, material assets, or the environment.

Be sure all persons exposed to these risks read this manual. Keep it near the equipment for future reference.

Hazard symbols

Symbole	Standard	Use
	DIN 4844-2 W000	General risk of injury or damage
	DIN 4844-2 W008	Voltage
	DIN 4844-2 W026	Hot surface
	DIN 4844-2 W028	Slip hazard

Instructions attached directly to the equipment, such as rotational direction arrows and fluid connection labels, must be followed. Replace such signs if they become illegible.

- Rotational direction arrow
- Fluid connection label



Keywords in safety informations and their meanings

Keyword	Use
Danger!	Indicates a danger of injury to persons
Caution!	Indicates a danger of damage to property or the environment
Notice!	Indicates additional

Read this Owner's Manual before installing, operating or maintaining the product. Failure to follow the instructions and safety precautions in this owner's manual could result in serious injury, death, or property damage. Keep for future reference.

Note: Not every symbol and corresponding information described in the Safety Information is used in this owner's manual.

Information symbols

Symbol	Use
	Prompts you to take action
•	Indicates other issues, causes or circumstances
○	Used for bulleted lists
➔	Provides additional information
	Prompts you to take action

1. Safety information



These instructions must be read and understood by all persons who are involved with the installation, operation, maintenance, and repair of the product. These instructions must be kept close to the equipment for future reference.



Note that these installation instructions is an integral part of the product. It must be handed over to the new operator of the product if the product is sold.

The described product was manufactured in accordance with all generally acknowledged regulations pertaining to technology, occupational safety, and accident prevention. However, dangers that can cause physical injury to persons or damage to other material assets might still occur during the use of the product. This product should only be operated if it has been installed in accordance with these instructions and is safe to operate. In particular, malfunctions that might affect the safety of the product must be rectified immediately.



In addition to the information provided in the installation instructions, all generally applicable regulations on accident prevention and the environment must be observed.

1.1 Intended use



All SKF Lubrication Systems Germany AG products must only be used for their intended purpose and in accordance with the specifications of the installation instructions for the product in question.

The described product is for supplying centralized lubrication systems with lubricant and is intended for use in centralized lubrication systems. Any other use of this product constitutes improper use.

Products of SKF Lubrication Systems Germany AG must not be used in conjunction with fluids, group I (hazardous fluids), according to the definition of article 2 paragraph 2 of the Directive 67/548/EC dtd. 27th June, 1967; and are not approved for application with such fluids.

None of the products manufactured by SKF Lubrication Systems Germany AG can be used with gases, liquefied gases, gases dissolved under pressure, steams or fluids that will reach a steam pressure of more than 0.5 bar above the normal atmospheric pressure (1013 mbar) in the permissible application temperature range.

Unless otherwise noted, products of SKF Lubrication Systems Germany AG must not be used in conjunction with explosive atmospheres according to the ATEX-Directive 94/9/EC.

1.2 Authorized personnel

The products described in the installation instructions may only be installed, operated, maintained, and repaired by qualified experts. Qualified experts are persons who have been trained, instructed, and familiarized with the end product into which the described product is installed. These persons are considered capable of such tasks due to their education, training, and experience with valid standards, conditions, accident prevention regulations, and installation measures. They should be able to carry out the required tasks and to recognize - and thus avoid - any dangers that might otherwise occur.

A definition of what constitutes a qualified person and who are unqualified persons are stipulated in DIN VDE 0105 and IEC 364.

1.3 Danger relating to electric current

The electrical connection for the described product may only be established by qualified, instructed persons who have been authorized by the operator or owner to carry out this task. All local electrical operating conditions and regulations such as DIN and VDE must be observed. Improperly connected products can result in considerable damage to property and serious injury to persons.

**Danger!**

Working on products that have not been disconnected from the power supply can cause serious injury or death to persons. Installation, maintenance, and repair work may only be carried out by qualified experts on products that have been disconnected from the power supply. The supply voltage must be turned off before any product components are opened.

1.4 Danger relating to system pressure

**Danger!**

Centralized lubrication systems are under pressure when they are being operated. Such systems must therefore be depressurized before starting installation, maintenance, or repair work and before making any changes to the system.

1.5 Warranty and liability

SKF Lubrication Systems Germany AG assumes no warranty and liability if one of the following circumstance should occur:

- Not intended use
- Improper installation/disassembly or improper operation of the product
- Use of contaminated lubricants or lubricants which are not approved
- Improper maintenance or repairing of the product
- Using of unoriginal SKF Lubrication Systems Germany AG spare parts
- Making alterations or modifications to the product, which are not approved and signed by SKF Lubrication Systems Germany AG
- Non-observance of the advices about transport and storage

2. Lubricants

2.1 General information



All SKF Lubrication Systems Germany AG products must only be used for their intended purpose and in accordance with the specifications of the installation instructions for the product in question.

The intended use of this product is for the centralized lubrication/lubrication of bearings and wear points with lubricants. All physical limitations of use stipulated in the documentation of the product such as the owner's manual, technical drawings and catalogues must be observed.

Note that hazardous substances of any kind and - in particular - the substances that are classed as hazardous in accordance with EC-Directive 67/548/EC Article 2, Paragraph 2 may only be inserted into and conveyed/distributed by centralized lubrication systems and components following consultation with SKF Lubrication Systems Germany AG and with the express written permission of the company.

Products manufactured by SKF Lubrication Systems Germany AG are not approved for use in conjunction with gases, liquefied gases, gases dissolved under pressure, vapours, and fluids with a vapour pressure of more than 0.5 bar above normal atmospheric pressure (1013 mbar) at the maximum permitted temperature.

Should there be a need to use the product to convey media other than lubricants or hazardous substances, this must be discussed with SKF Lubrication Systems Germany AG first and the company must give express written permission.

In the opinion of SKF Lubrication Systems Germany AG, lubricants constitute a design element that must be considered when selecting components and designing centralized lubrication systems. The lubrication properties of the lubricants in question must be considered.

2.2 Selection of lubricants



You must observe the machinery manufacturer's information on the lubricants to be used in the machinery.



Caution!

The manufacturer of the bearing or machinery to be lubricated will specify the lubricant requirements for each point to be lubricated. You must make sure that the required quantity of lubricant is provided to the relevant lubricating point. If a lubricating point is insufficiently lubricated, the bearing may become damaged or jammed.

While the machinery/bearing manufacturer usually specifies lubricants, it is the owner/operator (or maintenance person) who must finally select the appropriate lubricant, with the help of the lubricant supplier. When selecting a lubricant, the type of bearing/wear point, the stresses and strains to be expected during operation, and anticipated ambient conditions must be taken into account. All financial/economic aspects must also be considered.



If required, SKF Lubrication Systems Germany AG can help customers to select suitable components for the conveyance of the selected lubricant and to plan and design their centralized lubrication system.

If you have further questions, you can contact SKF Lubrication Systems Germany AG. We can test lubricants in our own laboratory to establish their suitability for conveyance (e.g. 'oil separation' behaviour) in centralized lubrication systems. You can request an overview of lubricant tests offered by SKF Lubrication Systems Germany AG from our Service department.

2.3 Approved lubricants



Caution!

Only lubricants that have been approved by SKF for use with the product may be used. Unsuitable lubricants can cause product malfunctions and damage to property.



Caution!

Different lubricants must not be mixed together. Doing so can cause damage and require extensive cleaning of the products/centralized lubrication system. To prevent confusion, we recommend that you attach information indicating the lubricant to be used on the lubricant reservoir.

The described product can be operated with lubricants that comply with the specifications in the technical data.

Note that some lubricants may have properties that lie within the permitted limit values and yet not be suitable for use in centralized lubrication systems for other reasons. For example, some synthetic lubricants are not compatible with elastomers.

2.4 Lubricants and the environment



Caution!

Lubricants can contaminate the ground and watercourses. Lubricants must be used and disposed of properly. Country specific regulations and laws on the use and disposal of lubricants must be observed.

Note that lubricants are harmful to the environment and flammable; their transportation, storage, and processing are subject to special precautionary measures. For specifications on transportation, storage, processing, and dangers to the use and the environment for the lubricant, refer to the material safety data sheet provided by or available from the lubricant manufacturer. You can ask the manufacturer of the lubricant for the material safety data sheet.

2.5 Danger relating to lubricants



Danger!

Centralized lubrication systems must be leak-tight. Leaking centralized lubrication systems can cause a slip hazard. When performing installation, maintenance, and repairs test the centralized lubrication system for leaks. Leaky parts of the centralized lubrication system or components of the lubrication equipment have to be sealed immediately.

Leaking centralized lubrication systems or components of the lubrication equipment are a source of danger in relation to slip hazard and the risk of injury.

These dangers can cause physical injury to persons or damage to other material assets.



Lubricants are hazardous substance. Refer to safety precautions in the lubricant manufacturer's material safety data sheet.

You can ask the manufacturer of the lubricant for the material safety data sheet.

3. Design and function

3.1 General information

SKF feed pump units in gear, gerotor, vane and multi-circuit gear pump designs, also called rotary positive-displacement pumps, deliver lubricant from a reservoir into the tubing system of the centralized lubrication system. They increase the energy (increase the pressure) of the lubricant in order to overcome flow resistance (pressure losses) in the tubing, components (filters, valves, distributors) and friction points. SKF feed pump units are used in a broad flow rate range for total-loss and circulating-oil lubrication systems in various designs and at various performance levels, depending on the type and size of the centralized lubrication system and the lubricant.

The following model designs are used:

- Single-circuit gear pumps
- Multi-circuit gear pumps (2 to 20 delivery circuits)
- Gerotor pumps
- Vane pumps

3.2 Single-circuit gear pumps of series M, ME, MF and MFE

Single-circuit gear pumps are used in a large flow rate range in total-loss and circulating-oil lubrication systems. They are almost always used as a single-circuit gear pump unit consisting of an electric motor, adapter flange, coupling, and gear pump.

In many total-loss lubrication systems, single-circuit gear pump units are therefore used with electric motors. Single-circuit gear pumps are chiefly used with externally clogged gears. Gerotor pumps are used when high flow rates and low noise levels are required. The flow rate for total-loss lubrication systems with piston distributors ranges from 0.1 l/min. to 2.5 l/min. at pressures up to 50 bar. Single-circuit gear pump units with higher flow rates are used in circulating-oil lubrication systems. In single-circuit gear pump units for total-loss lubrication systems, the valves required for the piston distributor function, pressure change and pressure relief are usually integrated in the adapter flange. In single-circuit gear pump units for circulating-oil lubrication systems, the pressure-regulating valve and the return connection are integrated in the adapter flange.

3.3 Two-circuit gear pumps of series M202 and M205

Two-circuit gear pump units are used for circulating-oil lubrication systems with two separate delivery circuits. A third gear in the gear pump provides two-circuit gear pump units with a second delivery circuit. The adapter flange design does not have valves or a return connection. Pressure-regulating valves required to safeguard the circulating-oil lubrication system must be placed separately in the circulating-oil lubrication system.

3.4 Multi-circuit gear pumps of series ZM

Multiple-circuit gear pump units with 2 to 20 separate delivery circuits are often used for hydrostatic bearings. The flow rates of the individual delivery circuits are usually between 0.015 l/min. and 0.5 l/min. The pressure difference between the suction port and the pressure port should not be greater than 5 bar, as higher differences lead to significant fluctuations in delivery rates between the individual delivery circuits. In order to nevertheless achieve high outlet pressures, priming pumps are used which set the general pressure level, while the multi-circuit gear pump units divide the flow.

Priming pump units can be operated separately or as a priming pump integrated into the multi-circuit gear pump unit. Corresponding model designs are available on request.

3.5 Gerotor pumps of series 143-012

Gerotor pump units are used in total-loss and circulating-oil lubrication systems in a flow rate range between 0.85 l/min. and approx. 20 l/min. at pressures up to 50 bar. The gerotor pumps have trochoidal gearing and are thus also called trochoidal pumps. Gerotor pump units are characterized by very smooth running, low noise generation and good suction capability.

3.6 Vane pumps of series FLM and FLMF

Vane pump units are often used in circulating-oil lubrication systems to pump oil back into the lubricant reservoir in cases where the natural gradient of the return line is not sufficient to allow the accumulated oil to flow back. Vane pumps differ from gear pumps in that they can also feed oil/air mixtures. Vane pump units also have better suction capability than gear pumps. The maximum length of the suction line on vane pump units is up to 3000 mm, depending on the model design. The maximum permissible back pressure in model designs used for centralized lubrication is limited to 6 bar.

3.7 Model designs

SKF feed pump units in gear, gerotor, vane and multi-circuit gear pump designs are offered in a wide range of model designs. Special designs are available on request. The basic designs and the most important technical data are listed in Table 1.

The technical data as well as information about the electrical and hydraulic connection and the operation of the feed pump units can be found in the documentation for the respective feed pump unit.



If no documentation is available, you can request the documentation directly from SKF Lubrication Systems Germany AG.

Table 1: Basic design, technical data

Product line	Pump design	Relief valve	Reservoir separately	Possible to be installed at a reservoir	Number of supply circuits	Suction height, max.	Flow rate in l/min ^{1.)}	Permitted range of oil viscosity in cSt (mm ² /s) ^{2.)}
M 1, M 2, M 5	gear	–	yes	–	1	500	0,1 / 0,2 / 0,5	20 – 1000
MF 1, MF 2, MF 5	gear	–	–	yes	1	500	0,1 / 0,2 / 0,5	20 – 1000
ME 1, ME 2, ME 5	gear	yes	yes	–	1	500	0,1 / 0,2 / 0,5	20 – 1000
MFE 1, MFE 2, MFE 5	gear	yes	–	yes	1	500	0,1 / 0,2 / 0,5	20 – 1000
FLMF 12, FLMF 24	vane	–	–	yes	1	3000 / 1000	1,2 / 2,4	20 – 850 / 500
FLM 12, FLM 24	vane	–	yes	–	1	3000 / 1000	1,2 / 2,4	20 – 850 / 500
M 201	gear	–	yes	–	2	500	2 x 0,1	20 – 1000
M 202	gear	–	yes	–	2	500	2 x 0,2	20 – 1500
M 205	gear	–	yes	–	2	500	2 x 0,5	20 – 500
ZM 12, ZM 25	gear	–	yes	–	1	500 / 1000	1,2 / 2,5	20 – 2000
143 012 1..	gerotor	–	yes	–	1	1000	0,85 – 19,0	20 – 1000
143 012 2..	gerotor	–	–	yes	1	1000	0,85 – 19,0	20 – 1000
ZM 212-21	gear	–	yes	–	2	500	2 x 1,2	20 – 2000
ZM 212-31	gear	–	–	yes	2	500	2 x 1,2	20 – 2000
ZM 502	gear	–	yes	–	5	500	5 x 0,2	20 – 1000
ZM 502-3	gear	–	–	yes	5	500	5 x 0,2	20 – 1000
ZM 505	gear	–	yes	–	5	500	5 x 0,45	20 – 500
ZM 505-3	gear	–	–	yes	5	500	5 x 0,45	20 – 500
ZM 1002	gear	–	yes	–	10	500	10 x 0,2	20 – 1000
ZM 1002-3	gear	–	–	yes	10	500	10 x 0,2	20 – 1000

1.) Flow rate based on an oil viscosity of 140 cSt (mm²/s) at a back pressure of p = 5 bar

2.) Permitted range of oil viscosity depends on back pressure and flow rate

Table 1 (cont.): Basic design, technical data

Product line	Pump design	Relief valve	Reservoir separately	Possible to be installed at a reservoir	Number of supply circuits	Suction height, max.	Flow rate in l/min ^{1.)}	Permitted range of oil viscosity in cSt (mm ² /s) ^{2.)}
ZM 1005	gear	-	yes	-	10	500	10 x 0,45	20 – 250
ZM 1005-3	gear	-	-	yes	10	500	10 x 0,45	20 – 250
ZM 1025	gear	-	yes	-	10	500	5 x 0,2 + 5 x 0,45	20 – 500
ZM 1025-3	gear	-	-	yes	10	500	5 x 0,2 + 5 x 0,45	20 – 500
ZM 2101-1 ZM 2102-1 ZM 2103-1 ZM 2104-1	gear	-	yes	-	20	-	20 x 0,015 20 x 0,03 20 x 0,05 20 x 0,1	20 – 1000
ZM 1035	gear	-	yes	-	10	500	10 x 0,45	20 – 500
ZM 2201 ZM 2202 ZM 2203	gear	-	yes	-	20	500	20 x 0,025 20 x 0,035 20 x 0,05	20 – 500

1.) Flow rate based on an oil viscosity of 140 cSt (mm²/s) at a back pressure of p = 5 bar

2.) Permitted range of oil viscosity depends on back pressure and flow rate

3.8 Lubrication system design

The feed pump unit (gear, gerotor or vane pump, depending on the design) conveys the lubricant from a lubricant reservoir via a pressure-regulating valve and through the lubrication line to the consuming points of the lubrication system. Depending on the design of the lubrication system, pressure filters, directional control valves, and flow control valves may be connected between the feed pump unit and the consuming points.

Total-loss lubrication systems with piston distributors have a pressure relief valve in the feed pump unit or separately in the lubricant reservoir. This pressure relief valve is required for the operation of the piston distributors. The lubricant is conveyed to the piston distributors via the pressure relief valve and pressure-regulating valve. Using the built-up system pressure, the lubricant for each lubrication point is metered separately via the piston distributor and conveyed to the consuming point; in prelubrication distributors, this occurs simultaneously with the pressure build-up in the lubrication line; in relubrication distributors, this occurs following the relief procedure.

Due to their design, total-loss lubrication systems with progressive feeders do not need a pressure relief valve. A pressure-regulating valve suitable for the maximum permissible system pressure is required to protect the lubrication system against excessively high pressure.

In circulating-oil lubrication systems, the feed pump unit conveys the lubricant into the lubrication line to the consuming points. During this process, the oil flow can be divided and metered using progressive feeders or transported directly to the lubrication point. The lubricant is returned to the lubricant reservoir through a return line and the return connection.

4. Installation instructions

Feed pump units described in the installation instructions may only be installed by qualified experts. Qualified experts are persons who have been trained, instructed, and familiarized with the end product into which the described feed pump unit is to be installed. These persons are considered capable of such tasks due to their education, training, and experience with valid standards, conditions, accident prevention regulations, and operating measures. They are entitled to carry out the required tasks and to recognize - and thus avoid - any dangers that might otherwise occur.

A definition of what constitutes a qualified person and who are unqualified persons are stipulated in DIN VDE 0105 and IEC 364.

Before installing/positioning the feed pump unit, remove the packaging material and any transportation safety devices such as sealing plugs. Keep the packaging material until you are sure that there are no delivery discrepancies that need to be clarified.



Caution!

Feed pump units must not be tipped up or dropped.

Country specific accident prevention regulations and the operating and maintenance instructions of the operator must be observed when carrying out all installation work on machineries.

4.1 Positioning and mounting

Feed pump units should be mounted in a way that protects it from humidity and vibrations. It should also be easily accessible so that all other installation work can be carried out without problems. Make sure that there is a sufficient amount of circulating air to prevent the excessive heating of the feed pump unit. For information on the maximum permitted ambient temperature, see the technical data at the end of this owner's manual.



For the product-specific technical data on a specific feed pump unit, see the relevant documentation. If no documentation is available, you can directly request the documentation from SKF Lubrication Systems Germany AG.

Consult the specifications in the documentation regarding the possible mounting position of the feed pump unit.

Installation holes for the attachment of the feed pump unit on a base or at the flange must be made in accordance with the stipulations of the section 'Mounting dimensions'.

**Caution!**

During installation work - and particularly when drilling - the following points must be observed:

- Existing supply lines must not be damaged by the installation work.
- Other units must not be damaged by the installation work.
- The feed pump unit must not be mounted within the radius of activity of moving parts so it will not interfere with or be stuck by moving parts.
- The feed pump unit must be installed a sufficient distance away from sources of heat, so that the maximum ambient temperature of 40°C is not exceeded.
- Country specific installation and accident prevention regulations must be observed.

4.2 Mounting dimensions

SKF feed pump units in gear, gerotor, vane and multi-circuit pump designs can be mounted separately from the lubricant reservoir or flanged to a lubricant reservoir, depending on the model design.

Feed pump units for flange mounting to a lubricant reservoir can be mounted above or below the lubricant level, depending on the model design. In this case, the suction line runs entirely inside the lubricant reservoir. The suction line is not required if the pump unit is mounted below the lubricant level. The maximum permissible suction height of the specific feed pump unit must be observed. Feed pump units must be attached directly to the intended mounting location on the lubricant reservoir using appropriate fastening materials (e.g., bolts, washers, and nuts). When mounted below the lubricant level, sufficient sealing for the mounting flange must be provided in order to prevent lubricant from discharging from the lubricant reservoir.

For the dimensions and location of the fixing holes, see the documentation of the feed pump unit. If no documentation is available, the dimensions and location of the fixing holes for mounting the pump unit can be determined by taking measurements.



If no documentation is available, you can request the documentation directly from SKF Lubrication Systems Germany AG.

For installation on a base, feed pump units can be mounted separately from the lubricant reservoir. They must be attached to the intended mounting location using appropriate fastening materials (e.g., bolts, washers, and nuts).

For the dimensions and location of the fixing holes, see the documentation of the feed pump unit. If no documentation is available, the dimensions and location of the fixing holes for mounting the pump unit can be determined by taking measurements.



If no documentation is available, you can request the documentation directly from SKF Lubrication Systems Germany AG.

4.3 Electrical connection

4.3.1 Electrical connection motor

SKF feed pump units in gear, gerotor, vane and multi-circuit pump designs are driven by electric motors.



Danger!

Only qualified, instructed specialists who are authorized by the operator may install the electrical connections for the feed pump unit. Country specific connection regulations and guidelines (for example, DIN and VDE) must be strictly observed. Incorrectly connected feed pump units can cause considerable damage to property and result in serious injury or death.

For details on the electrical characteristics of the motor - such as the nominal voltage, rated frequency, and rated current - see the rating plate of the motor. The information in EN 60034-1 (VDE 0530-1) on operating at the limits of zone A ($\pm 5\%$ voltage and $\pm 2\%$ frequency deviation) and zone B ($\pm 10\%$ voltage and $+3/-5\%$ frequency deviation) - in particular with regard to heating and operating data that deviates from the rated values on the rating plate - must be observed. These limits must never be exceeded.



Danger!

The available main power supply must comply with the specifications on the rating plate of the motor or the electrical components. The fuse protection of the electric circuit must be checked. Only use fuses with the prescribed amperage. Otherwise, property damage or serious injury can occur.

The motor must be connected in a way that ensures a permanently safe electrical connection (no protruding wire ends); the corresponding cable end pieces (for example, cable shoes and cable end sleeves) must be used. Use connector lines as per DIN VDE 0100 and observe the rated current and the system-dependent requirements (for example, ambient temperature etc. as per DIN VDE 0298 or IEC/EN 60204-1). For details on the electrical connection of the motor to the main power supply - and in particular the terminal and plug connections - see the documentation of the feed pump unit.



If no documentation is available, you can directly request the documentation from SKF Lubrication Systems Germany AG.

When connecting up the electrical supply for the pump motor, make sure that the rotational direction of the motor is correct.



If the rotational direction of the motor is indicated by an arrow on the feed pump unit, the direction of the arrow must be observed.

4.4 Lubrication line connection

The lubrication line must be connected to the lubrication unit so that no forces can be transmitted to the lubrication unit once it is mounted (strainless connection).



Caution!

The fittings used for the lubrication line should be designed for use at the maximum operating pressure of the lubrication unit. Otherwise, the lubrication system must be protected against excessively high pressure by means of a pressure relief valve.

For operating pressures up to 45 bar - as are common on single-line piston distributor systems - SKF fittings for solderless tube connection (double or single tapered sleeves) can be used. For higher operating pressures of up to 250 bar - as are common on progressive centralized lubrication systems - SKF cutting sleeve screw unions as per DIN 2353 should be used. If using fittings produced by other manufacturers, the installation instructions and technical data of the manufacturer in question must be observed.

4.4.1 Series M and ME

SKF feed pump units of series M and ME are single-circuit gear pump units which are intended for mounting separately from the lubricant reservoir. The maximum permissible suction height of the specific single-circuit gear pump unit must be observed.

A total of three lubrication lines must be connected to the feed pump unit:

- Suction line from the lubricant reservoir to connection S (located directly on the gear pump)
- Delivery line from flange connection P to the consuming point
- Return line R from flange connection to lubricant reservoir.

4.4.2 Series MF and MFE

SKF feed pump units of series MF and MFE are single-circuit gear pump units which are intended for mounting on the side or top of a lubricant reservoir above the lubricant level. Feed pump units are available in special designs with sealed single-circuit gear pumps for side (horizontal) mounting on the lubricant reservoir below the lubricant level. The maximum permissible suction height of the specific single-circuit gear pump unit must be observed.

A total of two lubrication lines must be connected to the feed pump unit:

- Suction line from the lubricant reservoir to connection S (located directly on the gear pump)
- Delivery line from flange connection P to the consuming point

4.4.3 Series M202 and M205

SKF feed pump units of series M202 and M205 are two-circuit gear pump units which can be mounted separately or flanged to a lubricant reservoir, depending on the model design. They can be flanged to the top or side (horizontally) of a lubricant reservoir. When installed on the side (horizontally), ensure that the unit is mounted above the maximum lubricant level. Special designs with a sealed flange for mounting below the lubricant level are available on request. The maximum permissible suction height of the specific two-circuit gear pump unit must be observed.

A total of three lubrication lines must be connected to the feed pump unit:

- Suction line from the lubricant reservoir to connection S (located directly on the gear pump)
- Delivery line 1 from flange connection P to lubrication point
- Delivery line 2 from flange connection P2 to the consuming point

4.4.4 Series ZM

SKF feed pump units of series ZM are multi-circuit gear pump units which can be mounted separately or flanged to a lubricant reservoir, depending on the model design. They can be flanged to the top or side (horizontally) of a lubricant reservoir. When installed on the side (horizontally), ensure that the unit is mounted above the maximum lubricant level. Special designs with a sealed flange for mounting below the lubricant level are available on request. The maximum permissible suction height of the specific multi-circuit gear pump unit must be observed.

At a minimum, a total of three lubrication lines must be connected to the feed pump unit:

- Suction line from the lubricant reservoir to the suction port (located directly on the gerotor pump)
- Delivery lines from the pressure ports (located directly on the gerotor pump) to the consuming points (minimum of two)

In multi-circuit gear pump units of series ZM, pressure ports on the multi-circuit gear pump which may not be needed must not be closed. The lubricant from unneeded pressure ports of the multi-circuit gear pump units must be returned to a lubricant reservoir via a lubrication line.

4.4.5 Series 143-012

SKF feed pump units of series 143-012 are gerotor pump units which can be mounted separately or flanged to a lubricant reservoir, depending on the model design. They can be flanged to the top or side (horizontally) of a lubricant reservoir. When installed on the side (horizontally), ensure that the unit is mounted above the maximum lubricant level. Special designs with a sealed flange for mounting below the lubricant level are available on request. The maximum permissible suction height of the specific gerotor pump unit must be observed.

A total of two lubrication lines must be connected to the feed pump unit:

- Suction line from the lubricant reservoir to the suction port (located directly on the gerotor pump)
- Delivery line from the pressure port (located directly on the gerotor pump) to the consuming point

4.4.6 Series FLM and FLMF

SKF feed pump units of series FLM and FLMF are vane pump units which can be mounted separately or flanged to a lubricant reservoir, depending on the model design. They can be flanged to the top or side (horizontally) of a lubricant reservoir. When installed on the side (horizontally), ensure that the unit is mounted above the maximum lubricant level. Special designs with a sealed flange for mounting below the lubricant level are available on request. The maximum permissible suction height of the specific vane pump unit must be observed.

A total of two lubrication lines must be connected to the feed pump unit:

- Suction line from the lubricant reservoir to connection S (located directly on the gear pump)
- Delivery line to flange connection P

4.5 Laying of lubrication line

The following information should be observed for the laying of the main lubrication lines and lubricating point lines in order to ensure that the entire centralized lubrication system works smoothly.

The main lubrication line should be dimensioned in accordance with the maximum pressure and conveyance volume to which the lubrication unit is exposed. Where possible, the main lubrication line should climb from the lubrication unit and enable deaeration at the highest point of the lubrication line system.

Lubricant distributors at the end of the main lubricant line should be mounted so that the distributor outlets point upwards. If lubricant distributors have to be positioned below the main lubricant line for system design reasons, they should not be so placed at the end of the main lubrication line.

The pipes, hoses, cut-off valves, control valves, fittings, and so on must be suitable for the maximum operating pressure of the lubrication unit, the permitted temperatures, and the lubricants to be conveyed. In addition, the lubrication system must be protected against excessively high pressure by means of a pressure relief valve.

All components of the lubrication line system - including pipes, hoses, cut-off valves, control valves, fittings, and so on - must be carefully

cleaned before installation. No seals on lubrication line systems should protrude inwards in a way that disrupts the flow of the lubricant and could allow contaminants to enter the lubrication line system.

Lubrication lines must be laid in a way that prevents air pockets from forming anywhere on the system. Cross section changes to the lubrication line from a small to a large cross section in the direction of flow of the lubricant are to be avoided. Transitions from one cross section to another should be smooth.

The flow of the lubricant in the lubrication lines should not be impeded through the incorporation of sharp bends, corner valves, or check valves. Unavoidable cross section changes in lubrication lines must have smooth transitions. Wherever possible, sudden changes of direction are to be avoided.



Caution!

Lubrication lines must be leak-tight. Lubricants can contaminate the ground and watercourses. Lubricants must be used and disposed of properly. Country specific regulations and laws on the use and disposal of lubricants must be observed.



Danger!

Centralized lubrication systems must be leak-tight. Leaking centralized lubrication systems are a source of danger in relation to slip hazard and the risk of injury. When making installation, maintenance, and repair work test the centralized lubrication system for leaks. Leaky parts of the centralized lubrication system or components of the lubrication equipment have to be sealed immediately.

Leaking centralized lubrication systems or components of the lubrication equipment are a source of danger in relation to slip hazard and the risk of injury. These dangers can cause physical injury to persons or damage to other material assets.



Lubricants are hazardous substance. Refer to safety precautions in the lubricant manufacturer's material safety data sheet.

You can ask the manufacturer of the lubricant for the material safety data sheet.

5. Transport, delivery and storage

5.1 Transport

SKF Lubrication Systems Germany AG products are packaged in accordance with the regulations of the recipient country and in accordance with DIN ISO 9001. Our products must be transported with care. Products must be protected against mechanical influences such as impacts. Transport packaging must be labelled with the information 'Do not drop!'.



Caution!

The product must not be tipped up or dropped.

There are no restrictions relating to land, air, or sea transportation.

5.2 Delivery

Following receipt of the shipment, the product or products must be checked for damage and the shipping documents should be used to make sure that the delivery is complete. Keep the packaging material until you are sure that there are no delivery discrepancies that need to be clarified.

5.3 Storage

The following conditions apply to the storage of SKF Lubrication Systems Germany AG products.

5.3.1 Storage of lubrication units

- Ambient conditions: Dry, dust-free environment; storage in well-ventilated, dry area
- Storage time: 24 months max.
- Permitted air humidity: < 65%
- Warehouse temperature: 10 - 40°C
- Light: Direct sunlight/UV radiation must be avoided; nearby sources of heat must be screened

5.3.2 Storage of electronic and electrical devices

- Ambient conditions: Dry, dust-free environment; storage in well-ventilated, dry area
- Storage time: 24 months max.
- Permitted air humidity: < 65%
- Warehouse temperature: 10 - 40°C
- Light: Direct sunlight/UV radiation must be avoided; nearby sources of heat must be screened

5.3.3 Storage - general information

- Ensure that no dust gets into stored products by wrapping them in plastic film
- Store products on racks or pallets to protect them from damp floors
- Before placing products into storage, protect uncoated metal surfaces - and drive parts and mount surfaces in particular - from corrosion using long-term corrosion protection
- At 6-monthly intervals: Check products for corrosion. If signs of corrosion are found, remove the corrosion that has already resulted and improve the corrosion protection measures.
- Drives must be protected against mechanical damage

6. Operation

6.1 General information

The described feed pump units are operated automatically or manually depending on the design. The transport of lubricants through the lubrication lines should be subjected to regular visual checks.

The lubricant fill level in the lubricant reservoir – if used – should be subjected to regular visual checks. If the lubricant fill level is low, lubricant should be added up to the MAX mark.



You must observe the lubricant manufacturer's instructions and precautions on the lubricant to be used.



Caution!

Only clean lubricant may be added. Use the filler neck of the reservoir and fill in the lubricant with a suitable device. Contaminated lubricants can result in serious system malfunctions. The lubricant reservoir must be filled in a way that keeps it free from bubbles.



Caution!

Different lubricants must not be mixed together. Doing so can cause damage and require extensive cleaning of the feed pump unit /centralized lubrication system. To prevent confusion, we recommend that you fit an adhesive label on the reservoir with the information indicating the lubricant to be used on the lubricant reservoir.

6.2 Startup

Before starting up the feed pump unit, check all electrical and hydraulic connections.

The lubricant may only be conveyed if it is free from bubbles. Fill the lubricant reservoir – if used – with clean lubricant without allowing any bubbles to form. For deaerating the feed pump unit /centralized lubrication system, start running the feed pump unit until bubble-free lubricant escapes all lubricating points.

The process of deaerating the centralized lubrication system is facilitated by:

- Opening the ends of the main pipe until bubble-free lubricant escapes
- Filling longer pipe sections before connecting the system to the lubricating point

7. Shutdown

7.1 Temporary shutdown

You can temporarily shut down the described product by disconnecting the electrical, pneumatic, and/or hydraulic supply connections. For more information, see the section 'General information' in this installation instructions.

If you wish to shut down the product temporarily, refer also to the instructions in the section 'Transport, delivery, and storage' of this owner's manual.

When placing the product back into operation, refer to the information in the sections 'Installation' and 'Startup' of this owner's manual.

7.2 Permanent shutdown

All country specific legal guidelines and legislation on the disposal of contaminated equipment must be observed when shutting down the product for the final time.



Caution!

Lubricants can contaminate the ground and watercourses. Lubricants must be used and disposed of properly. Country specific regulations and laws on the use and disposal of lubricants must be observed.

SKF Lubrication Systems Germany AG will take back the product and arrange for its legal disposal. Costs to the customer will be limited to SKF's incurred costs.

8. Maintenance



Danger!

To prevent chance of serious injury or death, disconnect the product from main power supply before working on it. Installation, maintenance, and repair work may only be carried out by qualified experts on a product that is not connected to a power supply.



Danger!

Centralized lubrication systems are under pressure when they are being operated. Centralized lubrication systems must therefore be depressurized before starting installation, maintenance, or repair work and before making any changes to the system.



Danger!

The described product may be under pressure when it is being operated. The product must therefore be depressurized before starting installation, maintenance, or repair work and before making any changes to the system.

SKF Lubrication Systems Germany AG products are low-maintenance. However, to ensure that they function properly and to avoid risks right from the startup, all joints and connections should be checked to make sure that they are properly fitted.

If necessary, you can clean the product using gentle, material-appropriate cleaning agents (no alkalis, no soap). For safety reasons, the product should be disconnected from the hydraulic and/or compressed air supplies before cleaning.

During cleaning, it is important to make sure that no cleaning agent enters the inside of the product.

If the system is operated normally with inter-compatible lubricants, the inside of the product does not need to be cleaned.

If you accidentally fill the product with an incorrect or contaminated lubricant, the inside of the product does have to be cleaned. If this occurs, contact SKF Lubrication Systems Germany AG Services for more information on cleaning procedures



You must not dismantle the product or parts of the product during the warranty period. Doing so invalidates all warranty claims.



Only original SKF Lubrication Systems Germany AG spare parts may be used. You must not carry out alterations to the product or use non-original spare parts or resources. Doing so invalidates the warranty.

SKF Lubrication Systems Germany AG is not liable for damage caused by improper installation, maintenance, or repair work.

9. Faults

Table 1 gives an overview of possible malfunctions and their causes. If you are unable to rectify the malfunction, please contact SKF Lubrication Systems Germany AG Service.



You must not dismantle the product or parts of the product during the warranty period. Doing so invalidates all warranty claims.



All other work relating to installation, maintenance, and repair must only be carried out by SKF Lubrication Systems Germany AG Service.



Only original SKF Lubrication Systems Germany AG spare parts may be used. It is prohibited for the operator to make alterations to the product or to use non-original spare parts and resources.

Table 1: Fault analysis and rectification

Problem	Possible cause	Rectification
Motor fails to start when the operating voltage is applied	No operating voltage on motor	Check mains connection. Check mains plug/cable and connect properly if necessary. Check operating voltage on motor. Check fuse protection. Check motor overload switch.
	Pump blocked	Check motor current. If current is impermissibly high: Dismantle pump, crank by hand: If resistance is high, replace the pump.
	Motor jammed	Check motor current. If current is impermissibly high: Dismantle motor, crank by hand: If resistance is high, replace the motor.
Motor runs with difficulty and at a low speed	Sluggish pump	Check motor current. If current is impermissibly high: Dismantle pump, crank by hand: If resistance is high, replace the pump.
	Sluggish motor	Check motor current. If current is impermissibly high: Dismantle motor, crank by hand: If resistance is high, replace the motor.
	Impermissible lubricant (see technical data)	Remove lubricant from entire system and dispose of lubricant in the proper manner; fill system with suitable lubricant.
	Pressure too high, pressure control valve is jammed or faulty	Check pressure control valve and replace if necessary.
	Ambient temperature too low (see technical data)	Increase ambient temperature.

**Danger!**

Working on products that have not been disconnected from the power supply can cause serious injury or death to persons. Installation, maintenance, and repair work may only be carried out by qualified experts on products that have been disconnected from the power supply. The supply voltage must be turned off before any product components are opened.

**Danger!**

Hot surfaces of an electrical motor can cause burn injuries. The surfaces of a motor should only be touched with protective gloves or when motor is no longer hot.

**Danger!**

Centralized lubrication systems are under pressure when they are being operated. Centralized lubrication systems must therefore be depressurized before starting installation, maintenance, or repair work and before making any changes to the system.

Table 1 (cont.): Fault analysis and rectification

Problem	Possible cause	Rectification
Pump does not convey lubricant; no pressure buildup	Pump blocked	Check motor current. If current is impermissibly high: Dismantle pump, crank by hand: If resistance is high, replace the pump.
	Motor jammed	Check motor current. If current is impermissibly high: Dismantle motor, crank by hand: If resistance is high, replace the motor.
	Incorrect rotational direction of motor	Check rotational direction corresponds to direction indicated by arrow, change rotational direction if necessary.
	Pressure control valve does not close	Check pressure control valve to make sure that opening pressure is correct and that there is no contamination or damage. If opening pressure is incorrect or if the pressure control valve is damaged, change the valve. Only use original SKF spare parts. If dirty, clean the pressure control valve.
No pressure buildup on main line	Air in main line	Bleed main line.
	Main line not leak-tight or break in line	Repair main line.
	Pressure control valve does not close	Check pressure control valve to make sure that opening pressure is correct and that there is no contamination or damage. If opening pressure is incorrect or if the pressure control valve is damaged, change the valve. Only use original SKF spare parts. If dirty, clean the pressure control valve.
	Relief valve does not close	Clean or replace relief valve. Only use original SKF spare parts.
	Impermissible lubricant (see technical data)	Remove lubricant from entire system and dispose of lubricant in the proper manner; fill system with suitable lubricant.
	Fill level too low	Add more lubricant.

Order No. 951-170-002

SKF reserves the right to make content and technical changes!

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Important product usage Information

All SKF Lubrication Systems Germany AG products may only be used as intended and as described in the installation instructions. If the installation instructions are delivered with your product, read them carefully and follow them.

Not all lubricants can be conveyed with centralized lubrication systems. If required, SKF Lubrication Systems Germany AG can check the lubricant selected by the user to make sure that it is suitable for conveyance in centralized lubrication systems. All lubrication systems and components that are manufactured by SKF Lubrication Systems Germany AG are not approved for use in conjunction with gases, liquefied gases, gases dissolved under pressure, vapours, and fluids with a vapour pressure of more than 0.5 bar above normal atmospheric pressure (1013 mbar) at the maximum permitted temperature.

Note that hazardous substances of any kind and - in particular - the substances that are classed as hazardous in accordance with EC Directive 67/548/EC Article 2, Paragraph 2 may only be inserted into and conveyed/distributed by centralized lubrication systems and components following consultation with SKF Lubrication Systems Germany AG and with the express written permission of the company.

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