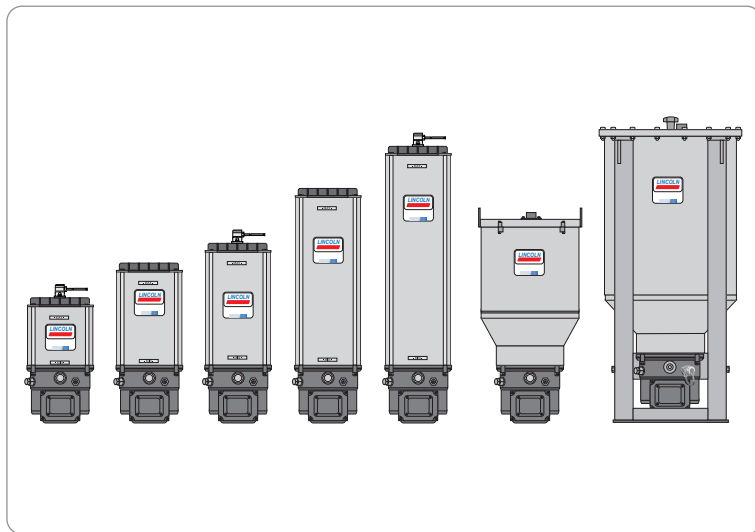


# Lubrication pump P653M for multi-line lubrication systems

Assembly instructions  
following machinery directive 2006/42/EC

EN



951-171-063-EN

Version 02

18/07/2024



## EC Declaration of incorporation following machinery directive 2006/42/EG, annex II, part 1 B

The manufacturer SKF Lubrication Systems Germany GmbH, Walldorf Facilities, Heinrich-Hertz-Str. 2-8, DE - 69190 Walldorf hereby declares under its sole responsibility the conformity of the partly completed machinery with the essential health and safety requirements of Machinery Directive 2006/42/EC Annex I marked as applicable and fulfilled in the appendix to the Declaration of Incorporation at the time of placing the machinery on the market.

The technical documents were prepared following Annex VII part B of this directive. Upon justifiable request, these special technical documents can be forwarded electronically to the respective national authorities. The manufacturer is authorized for the technical documentation.

Designation: Electrically driven pump to supply lubricant during intermittent operation within a centralized lubrication system  
Types: P653M  
Part number: 645-xxxx-x / 6450-xxxxxxx

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 |

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

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 machinery directive 2006/42/EC and any other applicable directives.

Walldorf, 14/04/2020

Jürgen Kreutzkämper  
Manager R&D Germany  
SKF Lubrication Business Unit



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



**UK Declaration of Incorporation acc. Supply of Machinery (Safety) Regulations 2008 No. 1597 Annex I**

The manufacturer SKF Lubrication Systems Germany GmbH, Heinrich-Hertz-Str. 2-8, DE -69190 Walldorf hereby declares under sole responsibility that the partly completed machinery complies with the essential health and safety requirements of UK legislation Supply of Machinery (Safety) Regulations 2008 No. 1597 Annex I, marked in the Annex to the Declaration of Incorporation as applicable and fulfilled at the time of placing on the market. The technical documentation has been compiled. We undertake to transmit the technical documentation in electronic form, in response to a reasoned request by the national authorities. The person authorised to compile the technical documentation on behalf of the manufacturer is SKF (U.K.) Limited, 2 Canada Close, Banbury, Oxfordshire, OX16 2RT, GBR

Designation: Electrically driven pump to supply lubricant during intermittent operation within a centralized lubrication system  
Type: P653M  
Part number: 645-xxxxx-x / 6450-xxxxxxx

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

- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 No. 3032
- Electromagnetic Compatibility Regulations 2016 No. 1091

**Standards**

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

The partly completed machinery must not be put into service until it has been established that the machinery into which it is to be incorporated is in compliance with the provisions of UK legislation Supply of Machinery (Safety) Regulations 2008 No. 1597 and all other applicable Directives.

Walldorf, 14/04/2020

Jürgen Kreutzkämper  
Manager R&D Germany  
SKF Lubrication Business Unit



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



Description of the essential health and safety requirements according to 2006/42/EC, Annex I, which have been applied and complied with. Any basic health and safety requirements not listed are not relevant to this product.

| Number                                                                                                                                                                                                                                                  | Basic safety and health requirements           | Applicable | Complied with |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------|---------------|
| 1.1.1                                                                                                                                                                                                                                                   | Definitions                                    | YES        | YES           |
| 1.1.2                                                                                                                                                                                                                                                   | Principles of safety integration               | YES        | YES           |
| 1.1.3                                                                                                                                                                                                                                                   | Materials and products                         | YES        | YES           |
| As to 1.1.3: Not fully complied with. The operator has to evaluate the hazards caused by the lubricant on the basis of the safety data sheet (SDS) and take protective measures, if necessary.                                                          |                                                |            |               |
| 1.1.5                                                                                                                                                                                                                                                   | Machine design with regard to the handling     | YES        | YES           |
| 1.1.6                                                                                                                                                                                                                                                   | Ergonomics                                     | YES        | YES           |
| As to 1.1.6: Not fully complied with. The operator has to ensure that the pump is integrated into the superior machine in such a manner that operation and filling of the pump are ergonomically possible.                                              |                                                |            |               |
| 1.2                                                                                                                                                                                                                                                     | Control units and commanding devices           | YES        | YES           |
| 1.2.1                                                                                                                                                                                                                                                   | Safety and reliability of control units        | YES        | YES           |
| 1.2.3                                                                                                                                                                                                                                                   | Commissioning                                  | YES        | YES           |
| 1.2.6                                                                                                                                                                                                                                                   | Power supply failure                           | YES        | YES           |
| 1.3                                                                                                                                                                                                                                                     | Protective measures against mechanical hazards | YES        | YES           |
| 1.3.1                                                                                                                                                                                                                                                   | Risk of the loss of stability                  | YES        | YES           |
| 1.3.2                                                                                                                                                                                                                                                   | Risk of breakage during operation              | YES        | YES           |
| As to 1.3.2: Not fully complied with. The operator has to secure the lubrication system against excessive pressure. For this purpose a pressure relief valve with max. 350 bar opening pressure must be provided on each pump element.                  |                                                |            |               |
| 1.3.4                                                                                                                                                                                                                                                   | Risks due to surfaces, edges or angles         | YES        | YES           |
| 1.3.7                                                                                                                                                                                                                                                   | Risks due to moving parts                      | YES        | YES           |
| 1.3.9                                                                                                                                                                                                                                                   | Risk of uncontrolled movements                 | YES        | YES           |
| 1.5                                                                                                                                                                                                                                                     | Risks from other hazards                       | YES        | YES           |
| 1.5.1                                                                                                                                                                                                                                                   | Electricity supply                             | YES        | YES           |
| 1.5.6                                                                                                                                                                                                                                                   | Fire                                           | YES        | YES           |
| As to 1.5.6: Not fully complied with. For pumps without control unit, the operator has to take suitable measures to ensure that the relative duty cycle (see Technical Data) is complied with. Otherwise the motor may generate unacceptably high heat. |                                                |            |               |

Description of the essential health and safety requirements according to 2006/42/EC, Annex I, which have been applied and complied with. Any basic health and safety requirements not listed are not relevant to this product.

| Number                                                                                                                                                                                       | Basic safety and health requirements                                                         | Applicable | Complied with |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------|---------------|
| 1.5.8                                                                                                                                                                                        | Noise                                                                                        | YES        | YES           |
| 1.5.11                                                                                                                                                                                       | Radiation from the outside                                                                   | YES        | YES           |
| 1.5.13                                                                                                                                                                                       | Emission of hazardous materials and substances                                               | YES        | YES           |
| 1.4                                                                                                                                                                                          | Risk of slipping, tripping and falling                                                       | YES        | YES           |
| 1.6                                                                                                                                                                                          | Upkeep works                                                                                 | YES        | YES           |
| 1.6.1                                                                                                                                                                                        | Machinery maintenance                                                                        | YES        | YES           |
| 1.6.2                                                                                                                                                                                        | Access to operating stands and points of intervention for maintenance                        | YES        | YES           |
| As to 1.6.2: Not fully complied with. The operator has to ensure that the pump is integrated into the superior machine in such a manner that operation of the pump is possible without risk. |                                                                                              |            |               |
| 1.6.4                                                                                                                                                                                        | Interventions by the operating personnel                                                     | YES        | YES           |
| 1.7                                                                                                                                                                                          | Information                                                                                  | YES        | YES           |
| 1.7.1                                                                                                                                                                                        | Information and warning labels on the machine                                                | YES        | YES           |
| 1.7.1.1                                                                                                                                                                                      | Information and information devices                                                          | YES        | YES           |
| 1.7.2                                                                                                                                                                                        | Warning of residual risks                                                                    | YES        | YES           |
| 1.7.3                                                                                                                                                                                        | Marking of the machines                                                                      | YES        | YES           |
| 1.7.4                                                                                                                                                                                        | Operating instructions / Assembly instructions                                               | YES        | YES           |
| 1.7.4.1                                                                                                                                                                                      | General principles for the preparation of the Operating instructions / Assembly instructions | YES        | YES           |
| 1.7.4.2                                                                                                                                                                                      | Contents of the Operating instructions / Assembly instructions                               | YES        | YES           |
| 1.7.4.3                                                                                                                                                                                      | Sales brochures                                                                              | YES        | YES           |

# Legal notice

## Manufacturer

SKF Lubrication Systems Germany GmbH  
e-mail: [Lubrication-germany@skf.com](mailto:Lubrication-germany@skf.com)  
[www.skf.com/lubrication](http://www.skf.com/lubrication)

## Manufacturer's addresses

### Walldorf Facilities

Heinrich-Hertz-Straße 2-8  
69190 Walldorf  
Germany  
Phone: +49 (0) 6227 33-0  
Fax: +49 (0) 6227 33-259

### Berlin Facilities

Motzener Straße 35/37  
12277 Berlin  
Germany  
Phone +49 (0)30 72002-0  
Fax +49 (0)30 72002-111  
[www.skf.com/lubrication](http://www.skf.com/lubrication)

## Training courses

In order to provide a maximum of safety and economic viability, SKF carries out detailed training courses. It is recommended that the training courses are attended. For more information please contact the respective SKF Service address.

## Copyright

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## Warranty

The instructions do not contain any information on the warranty. This can be found in our general terms and conditions.

## Service address North America

SKF Lubrication Business Unit  
Lincoln Industrial  
5148 North Hanley Road, St. Louis,  
MO. 63134 USA

## Disclaimer

The manufacturer shall not be held responsible for damages caused by:

- Non appropriate use  
faulty assembly, operation, setting, maintenance, repair or accidents
- Use of inappropriate lubricants
- Improper or late response to malfunctions
- Unauthorized modifications of the product
- Intent or negligence
- use of non-original SKF spare parts
- Faulty planning or layout of the centralized lubrication system

Liability for loss or damage resulting from the use of our products is limited to the maximum purchase price. Liability for consequential damages of whatever kind is excluded.

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## Explanation of symbols, signs and abbreviations

The following abbreviations may be used within these instructions. Symbols within safety notes mark the kind and source of the hazard.

|                                                                                   |                                                   |                                                                                   |                                                                    |                                                                                   |                                                        |                                                                                     |                                                         |
|-----------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------|
|  | General warning                                   |  | Dangerous electrical voltage                                       |  | Risk of falling                                        |  | Hot surfaces                                            |
|  | Unintentional intake                              |  | Crushing hazard                                                    |  | Pressure injection                                     |  | Suspended load                                          |
|  | Electrostatically sensitive components            |  | Potentially explosive atmosphere                                   |  | Keep unauthorized persons away                         |                                                                                     |                                                         |
|  | Wear personal protective equipment (goggles)      |  | Wear personal protective equipment (face shield)                   |  | Wear personal protective equipment (gloves)            |  | Wear personal protective equipment (protective clothes) |
|  | Wear personal protective equipment (safety shoes) |  | Disconnect product from mains                                      |  | General obligation                                     |                                                                                     |                                                         |
|  | Protective conductor (protection class I)         |  | Protection y double or reinforced insulation (protection class II) |  | Protection by extra low voltage (protection class III) |  | Safe galvanic isolation (protection class III)          |
|  | CE marking                                        |  | Disposal, recycling                                                |  | Disposal of waste electrical and electronic equipment  |                                                                                     |                                                         |

|                                                                                   | Warning level  | Consequence           | Probability | Symbol | Meaning                                        |
|-----------------------------------------------------------------------------------|----------------|-----------------------|-------------|--------|------------------------------------------------|
|  | <b>DANGER</b>  | Death, serious injury | imminent    | ●      | Chronological guidelines                       |
|  | <b>WARNING</b> | Death, serious injury | possible    | ○      | Lists                                          |
|  | <b>CAUTION</b> | Minor injury          | possible    | ☞      | Refers to other facts, causes, or consequences |
|                                                                                   | <b>NOTICE</b>  | Property damage       | possible    |        |                                                |

Fig. 1 Abbreviations and conversion factors

|          |                         |                 |                        |                    |                                                 |
|----------|-------------------------|-----------------|------------------------|--------------------|-------------------------------------------------|
| re.      | regarding               | °C              | degrees Celsius        | °F                 | degrees Fahrenheit                              |
| approx.  | approximately           | K               | Kelvin                 | Oz.                | ounce                                           |
| i.e.     | that is                 | N               | Newton                 | fl. oz.            | fluid ounce                                     |
| poss.    | possibly                | h               | hour                   | in.                | inch                                            |
| if appl. | if applicable           | s               | second                 | psi                | pounds per square inch                          |
| incl.    | including               | d               | day                    | sq. in.            | square inch                                     |
| min.     | minimum                 | Nm              | Newtonmeter            | cu. in.            | cubic inch                                      |
| max.     | maximum                 | ml              | millilitre             | mph                | miles per hour                                  |
| min.     | minute                  | ml/d            | millilitre per day     | rpm                | revolutions per minute                          |
| etc.     | et cetera               | cc              | cubic centimetre       | gal.               | gallon                                          |
| e.g.     | for example             | mm              | millimetre             | lb.                | pound                                           |
| kW       | kilowatt                | l               | litre                  | hp                 | horse power                                     |
| U        | Voltage                 | dB (A)          | sound pressure level   | kp                 | kilopond                                        |
| R        | resistance              | >               | greater than           | fpsec              | feet per second                                 |
| I        | current                 | <               | less than              | conversion factors |                                                 |
| V        | volt                    | ±               | plus/minus             | Length             | 1 mm = 0.03937 in.                              |
| W        | watt                    | ∅               | diameter               | Area               | 1 cm <sup>2</sup> = 0.155 sq.in                 |
| AC       | alternating current     | kg              | kilogram               | Volume             | 1 ml = 0.0352 fl.oz.                            |
| DC       | direct current          | rh              | relative humidity      |                    | 1 l = 2.11416 pints (US)                        |
| A        | ampere                  | ≈               | approximately          | Mass               | 1 kg = 2.205 lbs                                |
| Ah       | ampere hour             | =               | equal to               |                    | 1 g = 0.03527 oz.                               |
| Hz       | frequency [Hertz]       | %               | per cent               | Density            | 1 kg/cc = 8.3454 lb./gal.(US)                   |
| nc       | normally closed contact | ‰               | per mille              |                    | 1 kg/cc = 0.03613 lb./cu.in.                    |
| no       | normally open contact   | ≥               | greater than           | Force              | 1 N = 0.10197 kp                                |
| N/A      | not applicable          | ≤               | less than              | Pressure           | 1 bar = 14.5 psi                                |
| ft.      | feet                    | mm <sup>2</sup> | square millimetre      | Temperature        | °C = (°F-32) x 5/9                              |
|          |                         | rpm             | revolutions per minute | Output             | 1 kW = 1.34109 hp                               |
|          |                         | ↑               | Increases a value      | Acceleration       | 1 m/s <sup>2</sup> = 3.28084 ft./s <sup>2</sup> |
|          |                         | ↓               | Reduces a value        | Speed              | 1 m/s = 3.28084 fpsec.                          |
|          |                         |                 |                        |                    | 1 m/s = 2.23694 mph                             |

# 1. Safety instructions

## 1.1 General safety instructions

- The owner must ensure that safety information has been read by any persons entrusted with works on the product or by those persons who supervise or instruct the before-mentioned group of persons. In addition, the owner must also ensure that the relevant personnel are fully familiar with and have understood the contents of the Instructions. It is prohibited to commission or operate the products prior to reading the instructions
- These instructions must be kept for further use
- The described products were manufactured according to the state of the art. Risks may, however, arise from a usage not according to the intended purpose and may result in harm to persons or damage to material assets
- Any malfunctions which may affect safety must be remedied immediately. In addition to these Instructions, general statutory regulations for accident prevention and environmental protection must be observed

## 1.2 General behaviour when handling the product

- The product may be used only in awareness of the potential dangers, in proper technical condition, and according to the information in these instructions
- Familiarize yourself with the functions and operation of the product. The specified assembly and operating steps and their sequences must be observed
- Any unclear points regarding proper condition or correct assembly/ operation must be clarified. Operation is prohibited until issues have been clarified
- Keep unauthorized persons away
- Wear personal protective equipment always
- Precautionary operational measures and instructions for the respective work must be observed
- Responsibilities for different activities must be clearly defined and observed. Uncertainty seriously endangers safety
- Safety-related protective and safety equipment must not be removed, modified or affected otherwise in its function and is to be checked at regular intervals for completeness and function
- If protective and safety equipment has to be dismantled, it must be reassembled immediately after finishing the work, and then checked for correct function
- Remedy occurring faults in the frame of responsibilities. Immediately inform your superior in the case of faults beyond your competence
- Never use parts of the centralized lubrication system or of the machine as standing or climbing aids

### 1.3 Intended use

Supply of lubricants within a centralized lubrication system following the specifications, technical data and limits stated in these Instructions:

Usage is allowed exclusively for professional users in the frame of commercial and economic activities.

### 1.4 Foreseeable misuse

Any usage differing from the one stated in these Instructions is strictly prohibited, particularly a usage:

- outside the indicated ambient temperature range
- with non-specified means of operation
- without adequate pressure control valve
- in continuous operation
- of C3 versions in areas with aggressive and corrosive materials (e.g. with high salt concentration)
- of plastic parts in areas with high ozone levels or in areas with harmful radiation (e.g. ionising radiation)

- to supply, transport, or store hazardous substances and mixtures in accordance with annex I part 2-5 of the CLP regulation (EG 1272/2008) respectively GHS with acute oral, dermal, inhalative toxicity, and of substances or substance mixtures marked with GHS01-GHS06 and GHS08 hazard pictograms.
- to supply, transport or store fluids of group 1 classified as hazardous fluids as defined in the Pressure Equipment Directive (2014/68/EU) Article 13 (1) a).
- to feed, forward, or store gases, liquefied gases, dissolved gases, vapours, or fluids whose vapour pressure exceeds the normal atmospheric pressure of 1013 mbar by more than 0.5 bar at the maximum permissible operating temperature.
- in an explosion protection zone.
- without adequate protection against too high pressures in case of pressurized products.
- outside the technical data and limits specified in these instructions.

### 1.5 Modifications of the product

Unauthorized conversions or modifications may result in unforeseeable impacts on safety. Therefore, any unauthorized conversions or modifications are expressly prohibited.

### 1.6 Prohibition of certain activities

Due to potential sources of faults that may not be visible or due to legal regulations the following activities may be carried out by manufacturer specialists or authorized persons only:

- Repairs or changes to the drive
- Replacement of or changes on the pistons of the pump elements
- Changes on the power supply board exceeding the replacement in case of defects

### 1.7 Painting of plastic parts

Painting of any plastic parts or seals of the described products is expressly prohibited. Remove or tape plastic parts completely before painting the superior machine

### 1.8 Notes related to the CE marking

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

- 2014/30/EU  
Electromagnetic compatibility
- 2011/65/EU  
(RoHS II) Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

#### Reference on Low Voltage Directive 2014/35/EU

The protective regulations of Low Voltage Directive 2014/35/EU are fulfilled according to annex I (1.5.1) of Machinery Directive 2006/42/EC.

#### Reference on Pressure Equipment Directive 2014/68/EU

Because of its performance data the product does not achieve the limit values defined in Article 4 (1) (a) (i) and is therefore excluded from the scope of application of Pressure Equipment Directive 2014/68/EU following Article 4 (3).

### 1.9 Inspections prior to delivery

The following inspections were carried out prior to delivery:

- Safety and functional tests
- Electrical inspections following ISO EN 60204-1

### 1.10 Other applicable documents

In addition to these instructions, the following documents must be observed by the respective target group:

- Operational instructions and approval rules
- Safety data sheet of the lubricant used

Where appropriate:

- Project planning documents
- Additional information on special versions of the pump. You will find these in the special system documentation
- Any documents of other components required to set up the centralized lubrication system

## 1.11 Markings on the product



Warning of dangerous electrical voltage (VAC versions only)



Warning of unintended intake by the stirring paddle with the reservoir lid being open



Warning of spring tension in case of pumps with follower plate



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

## 1.12 Notes related to the type identification plate

The type identification plate states important characteristics such as type designation, order number, and regulatory characteristics.

To ensure that the loss of data due to an illegible type identification plate is avoided, the characteristics should be entered in the Instructions.

Model: \_\_\_\_\_

P. No. \_\_\_\_\_

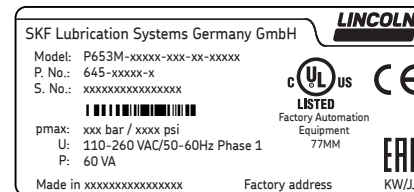
S. No. \_\_\_\_\_

(CW/YY) \_\_\_\_\_

Calendar week/year of construction

## 1.12.1 UL approval mark

The UL approval mark confirms conformity of the product with applicable safety regulations of the USA and Canada.



## 1.12.2 EAC conformity marking

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

### 1.13 Persons authorized to operate the pump

#### 1.13.1 Operator

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

#### 1.13.2 Specialist in mechanics

Person with appropriate professional education, knowledge and experience to detect and avoid the hazards that may arise during transport, installation, start-up, operation, maintenance, repair and disassembly.

#### 1.13.3 Specialist in electrics

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

### 1.14 Briefing of external technicians

Prior to commencing the activities, external technicians must be informed by the operator of the company safety provisions, the applicable accident prevention regulations to be maintained, and the functions of the superordinate machine and its protective devices.

### 1.15 Provision of personal protective equipment

The operator must provide suitable personal protective equipment for the respective location of operation and the purpose of operation.

### 1.16 Operation

The following must be observed during commissioning and operation:

- Any information within this manual and the information within the referenced documents
- All laws and regulations to be complied with by the user

### 1.17 Emergency stopping

In case of an emergency stop the pump station by:

- Interrupting the power supply to the pump
- Where appropriate, using measures determined by the operator, such as actuating the emergency stop switch of the superior machine

**1.18 Transport, installation, maintenance, malfunctions, repair, shutdown, disposal**

- All relevant persons must be informed of the activity prior to starting any work. Observe the precautionary operational measures and work instructions
- Carry out transport using suitable transport and hoisting equipment on suitable ways only
- Maintenance and repair work can be subject to restrictions at low or high temperatures (e.g. changed flow properties of the lubricant). Therefore, where possible, try to carry out maintenance and repair work at room temperature.
- Prior to performing work, the product and the machine, into which the product will be integrated, must be depressurized and secured against unauthorized activation
- Ensure through suitable measures that movable or detached parts are immobilized during the work and that no limbs can be caught in between by inadvertent movements
- Assemble the product only outside of the operating range of moving parts, at an adequate distance from sources of heat or cold. Other units of the machine or vehicle must not be damaged or impaired in their function by the installation
- Dry or cover wet, slippery surfaces accordingly
- Cover hot or cold surfaces accordingly
- Work on electrical components must be carried out by electrical specialists only. Observe any waiting periods for discharging, if necessary
- Carry out works on electrical components only while the system is depressurized and use voltage isolated tools suitable for electrical works only
- Carry out electrical connections only according to the information in the valid wiring diagram and taking the relevant regulations and the local connection conditions into account
- Do not touch cables or electrical components with wet or damp hands
- Fuses must not be bypassed Replace defective fuses always by fuses of the same type
- Ensure proper connection of the protective conductor in case of protection class I
- Observe the stated type of protection
- Undertake drilling at non-critical, non-load bearing parts only. Use any available boreholes. Do not damage lines and cables when drilling.
- Observe possible abrasion points. Protect the parts accordingly

- All components used must be designed according to the maximum operating pressure and the maximum respectively minimum ambient temperature
- No parts of the centralized lubrication system may be subjected to torsion, shear, or bending
- Check all parts prior to their usage for contamination and clean, if necessary
- Lubricant lines must be primed with lubricant prior to installation. This makes the subsequent ventilation of the system easier
- Observe the specified tightening torques. When tightening, use a calibrated torque wrench,
- When working with heavy parts use suitable lifting tools
- Avoid mixing up or wrong assembly of dismantled parts. Mark these parts accordingly

### 1.19 Initial commissioning / daily start-up

Ensure that:

- All safety devices are completely available and functional
- All connections are correctly connected
- All parts are correctly installed
- All warning labels on the product are present completely, highly visible and undamaged
- Illegible or missing warning labels are to be replaced without delay

### 1.20 Cleaning

- Risk of fire and explosion when using inflammable cleaning agents Only use non-flammable cleaning agents suitable for the purpose
- Do not use aggressive cleaning agents
- Thoroughly remove residues of cleaning agents from the product
- Do not use steam jet and high pressure cleaners. Electrical components may be damaged. Observe the type of protection of the pump
- Cleaning work may not be carried out on energized components
- Mark damp areas accordingly

## 1.21 Residual risks

1

| Residual risk                                                                                                                                                      | Possible in life cycle |   |   |   |   |   |   |   |   |  | Prevention/ remedy                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---|---|---|---|---|---|---|---|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Personal injury/ material damage due to falling of raised parts                                                                                                    | A                      | B | C |   |   |   | G | H | K |  | Keep unauthorized persons away. No people may remain under suspended loads. Lift parts with adequate lifting devices.                                                                                                                                                                                                                             |
| Personal injury/ material damage due to tilting or falling of the product because of non-observance of the stated tightening torques                               |                        | B | C |   |   |   | G |   |   |  | Observe the specified tightening torques. Fix the product to components with adequate load-bearing capacities only. If no tightening torques are stated, apply tightening torques according to the screw size characteristics for 8.8 screws.                                                                                                     |
| Personal injury/ material damage due to electric shock in case of damage to the connection cable                                                                   |                        | B | C | D | E | F | G | H |   |  | Check the connection cable with regard to damages before the first usage and then at regular intervals. Do not mount cable to moving parts or friction points. If this cannot be avoided, use spring coils respectively protective conduits.                                                                                                      |
| Personal injury/ damage to material due to spilled or leaked lubricant                                                                                             |                        | B | C | D |   | F | G | H | K |  | Be careful when filling the reservoir and when connecting or disconnecting lubricant feed lines. Always use suitable hydraulic screw connections and lubrication lines for the stated pressures. Do not mount lubrication lines to moving parts or friction points. If this cannot be avoided, use spring coils respectively protective conduits. |
| Loss of electrical protective function due to faulty installation of electrical components after repair                                                            |                        |   |   |   |   |   | G |   |   |  | After replacement of electrical components carry out an electrical safety test according to ISO 60204-1.                                                                                                                                                                                                                                          |
| Reservoir with follower plate is subjected to spring load                                                                                                          |                        |   |   |   |   |   | G |   |   |  | Remove reservoir with follower plate only when the spring is quite released (i.e. the reservoir is empty). Provide adequate protective measure, e.g. fastening straps, when loosening the reservoir. Do not work with your head directly above the reservoir.                                                                                     |
| Life phases:<br>A = transport, B = installation, C = initial start-up, D = operation, E = cleaning, F = maintenance, G = fault, repair, H = shutdown, K = disposal |                        |   |   |   |   |   |   |   |   |  |                                                                                                                                                                                                                                                                                                                                                   |

## 2. Lubricants

### 2.1 General information

Lubricants are used specifically for certain application purposes. In order to fulfil their tasks, lubricants must fulfil various requirements.

The most important requirements for lubricants are:

- Reduction of abrasion and wear
- Corrosion protection
- Noise minimisation
- protection against contamination or penetration of foreign objects
- Cooling (primarily with oils)
- longevity (physical/ chemical stability)
- economic and ecological aspects

### 2.2 Selection of lubricants

SKF considers lubricants to be an element of system design. A suitable lubricant is selected already when designing the machine and forms the basis for the planning of a centralized lubrication system.

The selection is made by the manufacturer or operator of the machine, preferably together with the lubricant supplier based on the requirement profile defined.

Should you have little or no experience with the selection of lubricants for centralized lubrication systems, please contact SKF.

If required we will be glad to support customers to select suitable components for feeding the selected lubricant and to plan and design their centralized lubrication system.

You will avoid possible downtimes through damage to your machine or system or damage to the centralized lubrication system.

### 2.3 Material compatibility

Lubricants must generally be compatible with the following materials:

- steel, grey iron, brass, copper, aluminium
- NBR, FPM, ABS, PA, PUR

### 2.4 Temperature characteristics

The lubricant used must be suitable for the specific ambient temperature of the product. The viscosity required for proper operation of the product must be adhered to and must not be exceeded in case of low temperatures nor fall below specification in case of high temperatures. Specified viscosities, see chapter Technical data.

### 2.5 Ageing of lubricants

After a prolonged downtime of the machine, the lubricant must be inspected prior to re-commissioning as to whether it is still suitable for use due to chemical or physical ageing. We recommend that you undertake this inspection already after a machine downtime of 1 week.

If doubts arise as to a further suitability of the lubricant, please replace it prior to re-commissioning and, if necessary, undertake initial lubrication by hand.

It is possible for lubricants to be tested in the company's laboratory for their suitability for being pumped in centralized lubrication systems (e.g. "bleeding").

Please contact SKF, if you have further questions regarding lubricants.

You may request an overview of the lubricants tested by SKF.



Only lubricants specified for the product (see chapter Technical data) may be used. Unsuitable lubricants may lead to a failure of the product.



Do not mix lubricants. This may have unforeseeable effects on the usability and therefore on the function of the centralized lubrication system.



When handling lubricants the relevant safety data sheets and hazard designations, if any, on the packaging have to be observed.



Due to the multitude of possible additives, individual lubricants, which according to the manufacturer's data sheets fulfil the necessary specification, may not, in fact, be suitable for use in centralized lubrication systems (e. g. incompatibility between synthetic lubricants and materials). In order to avoid this, always use lubricants tested by SKF.

### 3. Overview, functional description

#### 3.1 Pumps with plastic reservoir

##### 1 Reservoir

The lubricant is stored in the reservoir. Depending on the pump version there are different types of reservoirs and reservoir sizes.

##### 1.1 Reservoir lid

Serves as a protection against contamination of the lubricant. After removing the reservoir lid the reservoir of pumps without follower plates can be filled from the top with suitable clean lubricant.

##### 1.2 Reservoir venting device

It provides air for the reservoir while the pump is operating and lubricant is supplied. It vents the reservoir while the pump is filled.

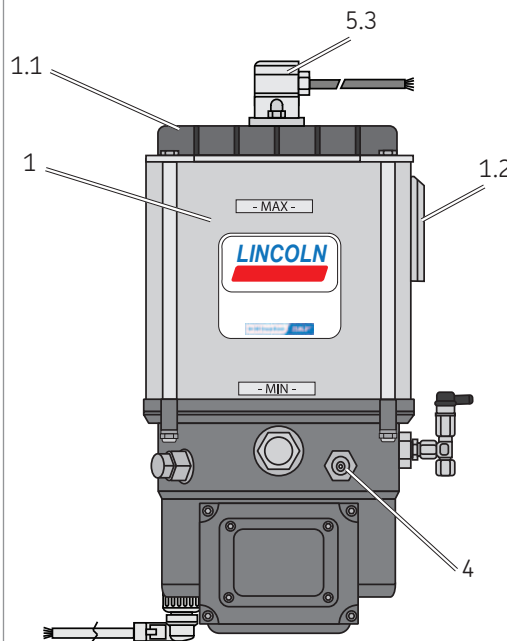
##### 4 Filler fitting

Serves to fill the pump. If the filler fitting is removed, this port can be used to connect the external grease return from the pressure control valves to the pump elements with corresponding accessories.

##### 5.3 Electrical connection of the low-level indication

in case of pumps with follower plate

Fig. 2 Overview, functional description of pumps with plastic reservoir and follower plate

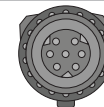


#### Types of connections

##### Square plug



##### Bayonet plug 7/7 poles



### 3. Overview, functional description

#### 2 Pump housing

The pump housing accommodates the motor, the electrical connections, the filler fitting and the pump elements.

#### 3 Pump elements

The pump can be equipped with up to 3 pump elements.

#### 3.3 Cap screw

The cap screw serves to close outlets that are not used.

#### 15 Blind plug

The blind plug serves for the manufacturer's purposes exclusively and must not be unscrewed by the operator.

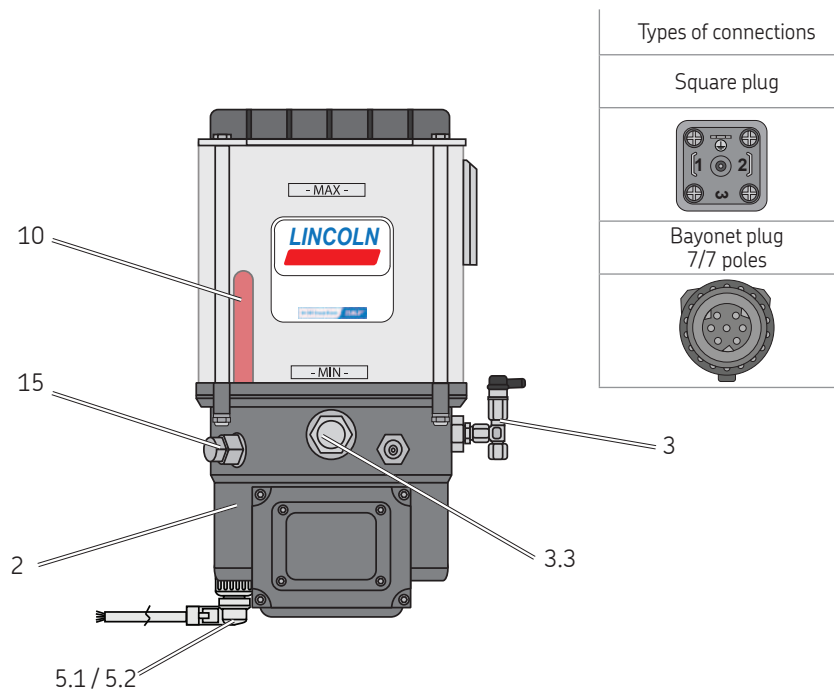
#### 5 Electrical connections

They are used for (5.1) power supply (input) and for (5.2) signal connection (concealed) of the pump.

#### 10 Stirring paddle

While the pump operates, the stirring paddle homogenises and smoothens the lubricant. The stirring paddle's lower vertical part pushes the lubricant towards the pump elements thus improving the suction behaviour of the pump.

Fig. 3 Overview, functional description of pumps with plastic reservoir without follower plate



### 3.2 Pumps with sheet steel reservoir

#### 1 Reservoir

The lubricant is stored in the reservoir. Depending on the pump version there are different types of reservoirs.

#### 1.2 Reservoir venting device

It provides air for the reservoir while the pump is operating and lubricant is supplied. It vents the reservoir while the pump is filled.

#### 1.3 Inspection glass

Serves to verify the filling level in the reservoir.

#### 2 Pump housing

The pump housing accommodates the motor, the electrical connections, the filler fitting and the pump elements.

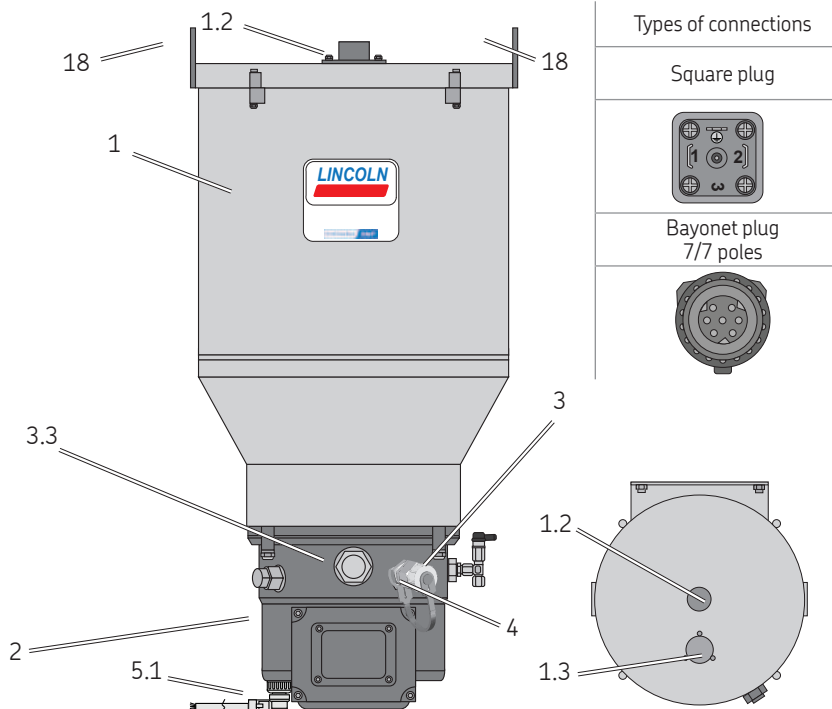
#### 3 Pump elements

The pump can be equipped with up to 3 pump elements. The cap screw (3.3) serves to close outlets that are not used.

#### 18 Lifting lugs

The lifting lugs serve to lift the pump.

Fig. 4 Overview, functional description of pumps with 30 L sheet steel reservoir



**15 Blind plug**

The blind plug serves for the manufacturer's purposes exclusively and must not be unscrewed by the operator.

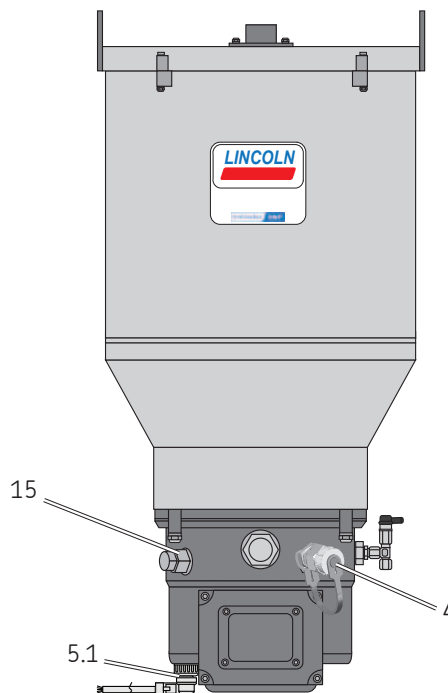
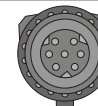
**4 Filling connection**

Serves to fill the pump.

**5 Electrical connection**

Is used to connect the (5.1) power supply.

Fig. 5 Overview, functional description of pumps with 30 L sheet steel reservoir

**Types of connections****Square plug****Bayonet plug  
7/7 poles**

### 1 Reservoir

The lubricant is stored in the reservoir. Depending on the pump version there are different types of reservoirs.

### 1.2 Reservoir venting device

It provides air for the reservoir while the pump is operating and lubricant is supplied. It vents the reservoir while the pump is filled.

### 2 Pump housing

The pump housing accommodates the motor, the electrical connections, the filler fitting and the pump elements.

### 3 Pump elements

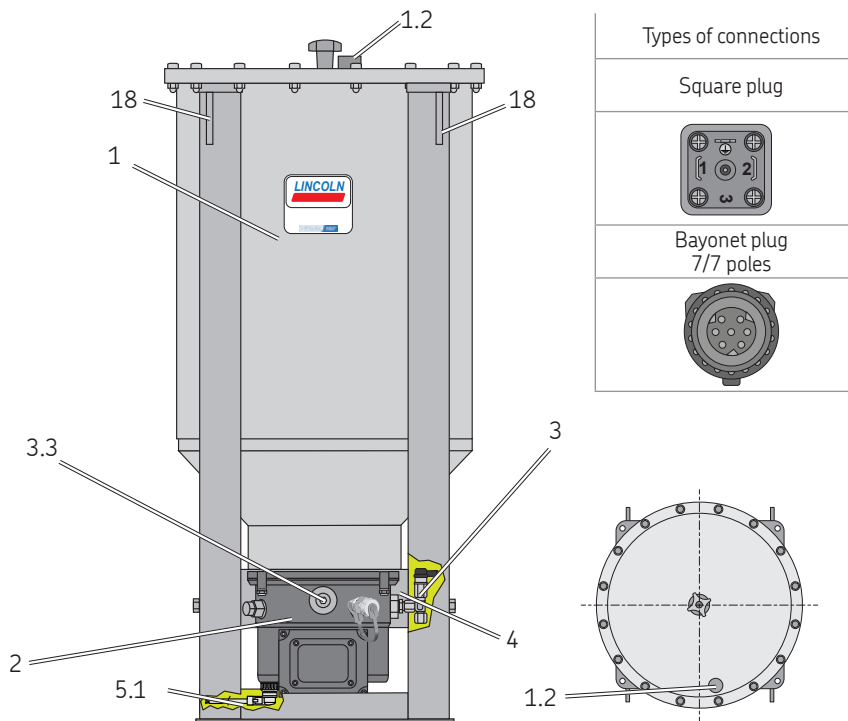
The pump can be equipped with up to 3 pump elements. The different cap screws (3.3) serve:

- to close unneeded ports.
- in case of Z7 / ZT7 pump elements to cross-port the outputs to one outlet.

### 18 Lifting lugs

The lifting lugs serve to lift the pump.

Fig. 6 Overview, functional description of pumps with 100 L sheet steel reservoir



**15 Blind plug**

The blind plug serves for the manufacturer's purposes exclusively and must not be unscrewed by the operator.

**4 Filling connection**

Serves to fill the pump.

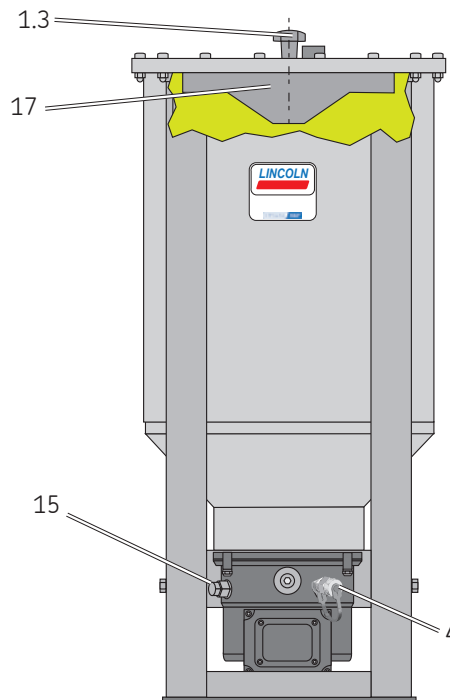
**5 Electrical connection**

Is used to connect the (5.1) power supply.

**1.3 Rotary knob for wiper bar**

Using the rotary knob (1.3), the wiper bar (17) on the inside of the transparent plastic lid (PMMA) can be turned to remove any grease deposits.

Fig. 7 Overview, functional description of pumps with 100 L sheet steel reservoir



## 4. Technical data

### 4.1 General technical data

|                                     |                                      |                           |                                  |
|-------------------------------------|--------------------------------------|---------------------------|----------------------------------|
| Operating pressure                  | max. 350 bar [5076 psi]              | Weight of the empty pump  |                                  |
| Number of pump elements             | max. 3                               | 4 litres approx. 9 kg     | [1.05 gal. approx. 19.8 lbs.]    |
| Direction of rotation               | clockwise                            | 8 litres approx. 10 kg    | [2.11 gal. approx. 22.0 lbs.]    |
| sound pressure level                | < 70 dB (A)                          | 10 litres, approx. 11 kg  | [2.64 gal. approx. 24.3 lbs.]    |
| Nominal speed                       | 32 rpm                               | 15 litres, approx. 13 kg  | [3.96 gal. approx. 28.7 lbs.]    |
| Relative duty cycle                 | 30 % ED S3 120 minutes               | 20 litres, approx. 15 kg  | [5.28 gal. approx. 33.1 lbs.]    |
| Ambient temperature <sup>1)</sup>   | -40 °C to +70 °C [-40 °F to +158 °F] | 30 litres, approx. 20 kg  | [7.95 gal. approx. 44.1 lbs.]    |
| Installation position <sup>2)</sup> | vertical, i.e. reservoir at top.     | 100 litres, approx. 56 kg | [26.42 gal. approx. 123.48 lbs.] |

|                           |               |
|---------------------------|---------------|
| Protection type and class | see next page |
|---------------------------|---------------|

|                                  |                                                                          |
|----------------------------------|--------------------------------------------------------------------------|
| Approved lubricant consistencies | Lubrication greases up to and including NLGI 2<br>Rail head conditioner# |
|----------------------------------|--------------------------------------------------------------------------|

|          |                                                                                                                                                                                                                                |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Filling* | <ul style="list-style-type: none"> <li>- Filler fitting</li> <li>- Reservoir lid (reservoirs without follower plate only)</li> <li>- Filling connection (standard for 30-litre and 100 litre sheet steel reservoir)</li> </ul> |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

\* The existing filling options depend on the actual pump configuration.

# Suitable track conditioners have to be agreed upon SKF prior to using them.

<sup>1)</sup> The minimum admissible ambient temperature assumes that the lubricant used can be pumped. The maximum admissible ambient temperature depends on the load and is mainly determined by the runtime and the operating pressure. In case of temperatures  $\geq 60^\circ\text{C}$  [140° F] and heavy load (high pressure) the maximum duty cycle should be reduced. Depending on the pump configuration there must be considered possible limitations regarding the ambient temperature due to electrical components (e.g. ultrasonic sensors).

<sup>2)</sup> Pumps with follower plate allow for a rotating installation as well, e. g. in wind turbine generators. Maximum speed and maximum distance to the rotation axis on request. The following applies for pumps without follower plate: The maximum filling must be reduced according to the expected inclination (e.g. in case of construction or agricultural machinery). The minimum filling must be increased as of an expected inclination of  $> 30^\circ$ , as otherwise a reduced lubricant volume in the suction area of the pump could result in a functional impairment.

## 4.2 Electrical data

|                              | V DC pump          | V AC pump                                               |
|------------------------------|--------------------|---------------------------------------------------------|
| Rated voltage                | 24 V DC $\pm$ 10 % | 110 - 240 V AC ( $\pm$ 10 %)                            |
| Frequency                    |                    | 50-60 Hz ( $\pm$ 5 %)   1-phase                         |
| Recommended back-up fuse     | 3.0 A (slow-blow)  | 6.0 A (slow-blow)   110 - 260 V                         |
| Switch-on current limitation |                    | type 80 A peak (cold start @ 25 °C / 77 °F)             |
| Operating voltage of motor   | 24 V DC            | 24 V DC                                                 |
| Output (signal)              | non-isolated       | non-isolated                                            |
| Max. switching capacity      | 60 VA              | 60 VA                                                   |
| Max. switching voltage       | 30 V DC            | 30 V DC                                                 |
| Max. switching current       | 700 mA             | 700 mA                                                  |
| Current consumption          | 2.4 A              | typically 1.6 A at 110 V AC<br>up to 0.82 A at 260 V AC |

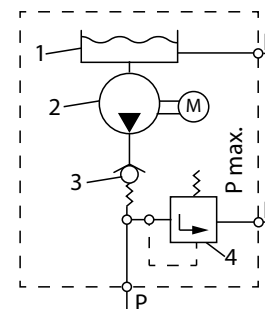
### 4.2.1 Protection types and classes

|                                  | VDC                | VAC                                                                                                  |
|----------------------------------|--------------------|------------------------------------------------------------------------------------------------------|
| Degree of protection (ISO 20653) | IP6K9K             | IP6K9K                                                                                               |
| Types of protection              |                    |                                                                                                      |
| - Square plug                    | SELV / PELV / FELV | Protection class 1  |
| - Bayonet plug                   | SELV / PELV        | not allowed                                                                                          |



The specified degree of protection of the pump assumes that IP6K9K-capable connection sockets and corresponding cables are used. When using connection sockets and cables with a lower degree of protection, classification is made according to the lowest degree of protection. For the achievable degrees of protection when using the connection sockets and cables supplied by us, see chapter Spare parts.

## 4.3 Hydraulic connection diagram



1 = Reservoir

2 = Pump

3 = Check valve

4 = Pressure control valve

R = Return line

P = Pressure line

## 4.4 Nominal output volumes



The stated nominal outputs per stroke and pump element refer to NLGI 2 lubrication greases at an ambient temperature of + 20 °C [68 °F] and a back pressure of 100 bar [1450 psi] on the pump element. Deviating operating conditions or deviating pump configuration result in a changed motor speed and thus in a change of the output per time unit. If as a consequence of the changed motor speed the output per time unit needs to be adapted, this will be done by adapting the lubrication and pause time settings of the pump.

| Pump element              | Z7     | ZT7 <sup>3)</sup> | K5      | K7     | Unit      |
|---------------------------|--------|-------------------|---------|--------|-----------|
| Nominal output per stroke | 0.25   | 0.25              | 0.125   | 0.25   | cc        |
|                           | [0.015 | [0.015            | [0.0075 | [0.015 | [cu. in.] |

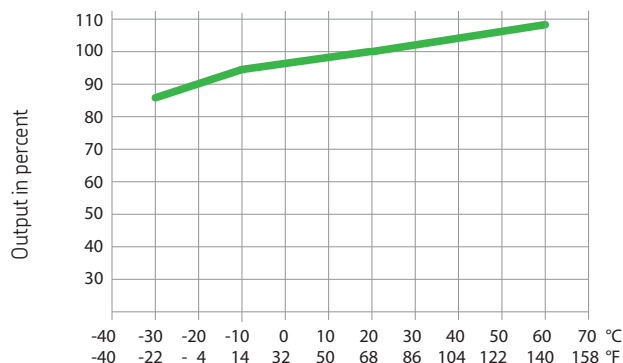
<sup>3)</sup> Suitable for use with track conditioner only

### 4.4.1 Influencing variables on the output volume

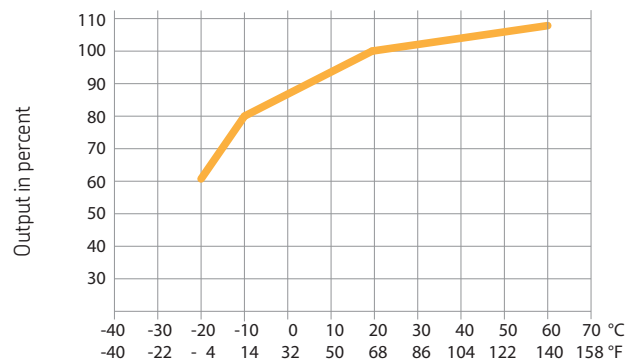
| Influencing variables                       | Increasing the output | Reducing the output  |
|---------------------------------------------|-----------------------|----------------------|
| Ambient temperature                         | > + 20 °C [68 °F]     | < + 20 °C [68 °F]    |
| Consistency class of the lubrication grease | < NLGI 2              | N/A                  |
| Number of pump elements                     | N/A                   | > 1                  |
| Back pressure at the pump element           | < 100 bar [1450 psi]  | > 100 bar [1450 psi] |

## 4.4.2 Output diagrams of typical NLGI 2 lubricants

Low temperature lubrication grease



High temperature lubrication grease



The output diagrams represent the average value of the different high- respectively low-temperature lubrication greases.

Calculation of the output using the example of a high-temperature lubrication grease

Nominal speed of the pump motor per minute x nominal output of pump element 7 per stroke x efficiency in percent at an assumed ambient temperature of -10 °C [14 °F] = 20 rpm x 0.22 cc (0.0134) x 80 % = 3.5 cc/min [0.214 cu.in./min.].

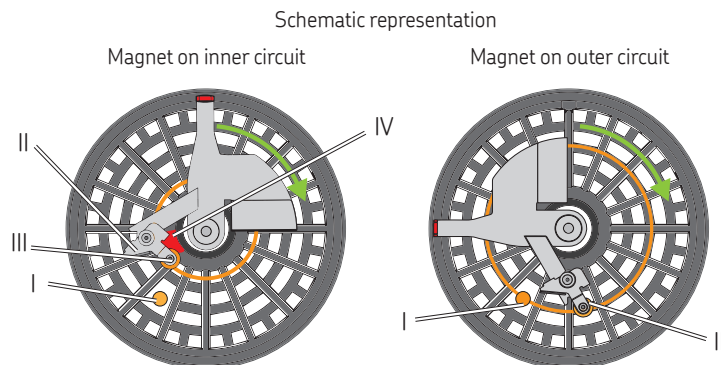
#### 4.5 Functioning principle of the intermittent low-level indication

The intermittent low-level indication operates free of contact. Its main components are the following:

- firmly positioned magnetic switch (I) inside of the reservoir bottom
- flexible guide plate (II) connected to the stirring paddle with a magnet (III) and a control cam (IV)

If the reservoir is filled with a lubrication grease suitable for the intermittent low-level indication and the pump is operating, then the guide plate (II) is deflected by the resistance of the lubrication grease. As a consequence the magnet (III) connected to the guide plate (II) is moved on its inner circuit and cannot trigger a pulse at the magnetic switch (I) with its magnetic field. A control cam (IV) positively guides the magnet together with the pivoted guide plate towards the outside during each revolution. As soon as the guide plate leaves the control cam, the lubricant's resistance pushes the guide plate together with the magnet to the inside again.

As soon as the lubricant inside the reservoir has fallen to that level that the lubricant's resistance is no more sufficient to further deflect the guide plate (II), the magnet (III) remains on the outer circuit and triggers a pulse each time it slides across the magnetic switch (I). If during an operating cycle the magnet (III) slides across the magnetic switch (I) six times, a low-level signal is sent by the control printed circuit board of the pump. For programming of the external control of the pump, see corresponding chapter in these instructions.

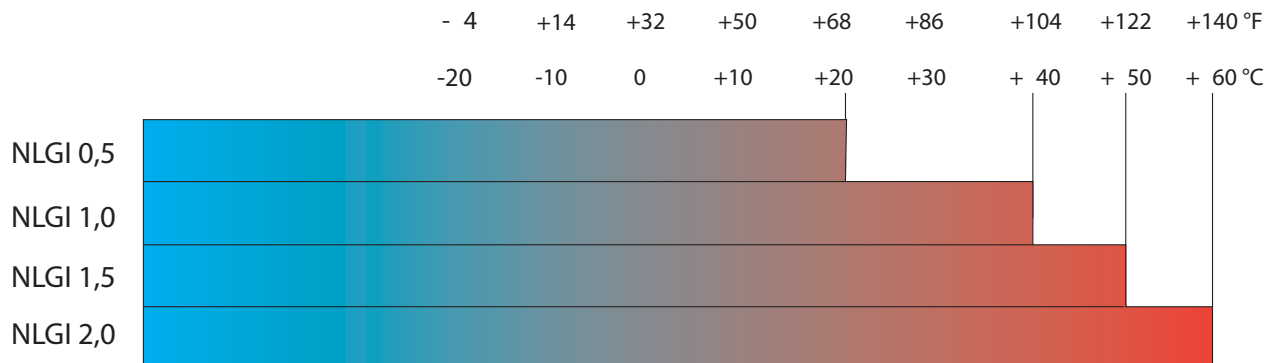


#### 4.6 Limits of use of the intermittent low-level indication

The following lubricant consistencies have to be complied with in order to ensure the correct functioning of the intermittent low-level indication. Above the stated range of temperature a correct functioning of the intermittent low-level indication cannot be ensured. The inferior temperature ranges require the suitability of the lubricant for the respective temperature range. Otherwise the too high consistency of the lubricant may result in malfunctions, e.g. interruption of the lubricant supply, or in damages to the pump (e. g. bending of the stirring paddle).



The intermittent low-level indication is not appropriate for lubrication grease of NLGI class  $\leq 0$ .



#### 4.7 Processing of the low-level signals in case of external controller and monitoring of the pump

To avoid early low-level indication (e.g. caused by air inclusions or wave formation in the lubricant) in case of external controller or monitoring the following conditions have to be fulfilled by programming the external controller accordingly.

- After each operating cycle the pulses of the intermittent low-level indications have to be deleted.



Pulses must never be added up over several operating cycles. This will result in an early low-level indication.

##### Operating cycle $\geq 32$ seconds:

- Each operating cycle requires at least 6 signals by the magnetic switch .

##### Operating cycle $\geq 24$ seconds $\leq 32$ seconds:

- Each operating cycle requires at least 4 signals by the magnetic switch .

##### Operating cycle $\leq 24$ seconds:

- The number of required magnetic switch signals has to be adapted to the operating conditions to be expected.  
To do so, contact our Customer Service.

#### 4.7.1 Visualization of a low-level indication

The low-level signal is visualized via an external control light as shown in the connection diagram.

#### 4.7.2 Remaining run time of pump in case of a low-level indication

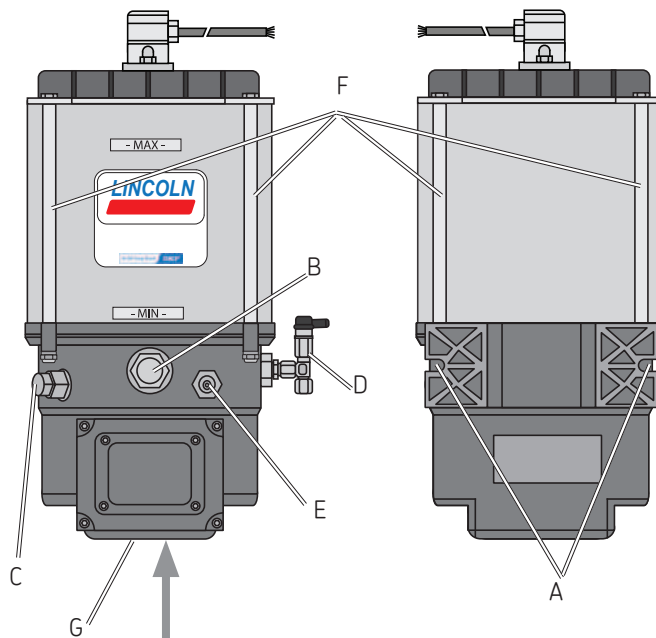
##### Pump with external controller

The owner has to ensure that the pump is stopped by the external control unit latest 4 minutes after the low-level signal.

## 4.8 Tightening torques

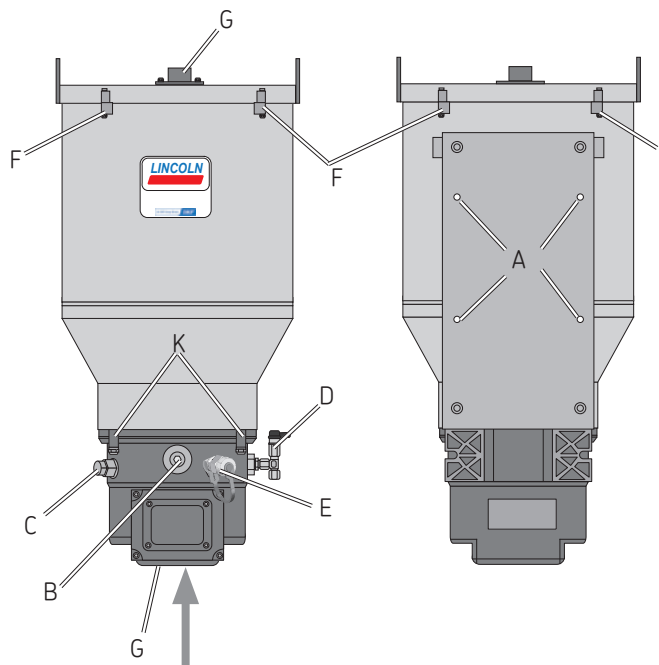
### 4.8.1 Pumps with plastic reservoir

|                                                                          | Nm             | [ft.lb.]        |
|--------------------------------------------------------------------------|----------------|-----------------|
| A Install the pump                                                       | $18 \pm 1.0$   | $13.3 \pm 0.74$ |
| B Pump element in pump housing                                           | $40 \pm 2.0$   | $29.5 \pm 1.5$  |
| C Cap screw in valve body                                                | $35 \pm 2.0$   | $25.8 \pm 1.5$  |
| D Pressure control valve in pump element                                 | 6 / 0.5        | $4.4 \pm 0.37$  |
| E Cap screw / adapter with hydraulic lubrication fitting in pump housing | $10 \pm 1.0$   | $7.4 \pm 0.74$  |
| F Tie rods of the reservoir                                              | $10 \pm 1.0$   | $7.4 \pm 0.74$  |
| G Housing cover (bottom side)                                            | $0.75 \pm 0.1$ | $0.55 \pm 0.07$ |
| Options (without figure)                                                 |                |                 |
| Filling connection                                                       | $20 \pm 2.0$   | $14.8 \pm 1.5$  |
| Return line connection                                                   | $12 \pm 1.2$   | $8.9 \pm 0.89$  |



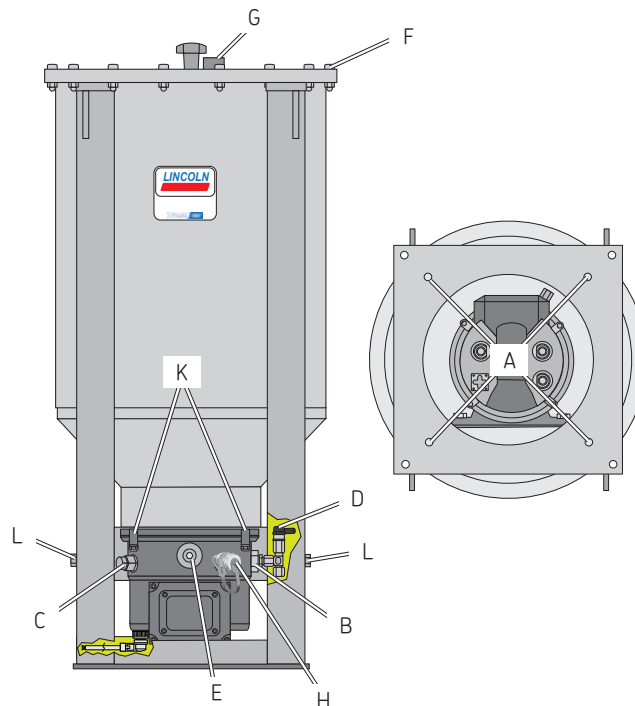
## 4.8.2 Pumps with 30 L sheet steel reservoir

|                                                                                               | Nm             | ft.lb.          |
|-----------------------------------------------------------------------------------------------|----------------|-----------------|
| A Install the pump                                                                            | $20 \pm 2.0$   | $14.8 \pm 1.5$  |
| B Pump element in pump housing                                                                | $40 \pm 2.0$   | $29.5 \pm 1.5$  |
| C Cap screw in valve body                                                                     | $35 \pm 2.0$   | $25.8 \pm 1.5$  |
| D Pressure control valve in pump element                                                      | 6 / 0.5        | $4.4 \pm 0.37$  |
| E Cap screw / adapter with hydraulic lubrication fitting / filling connection in pump housing | $10 \pm 1.0$   | $7.4 \pm 0.74$  |
| F 4 x screws on the reservoir lid                                                             | $5 \pm 0.5$    | $3.7 \pm 0.37$  |
| G Reservoir venting device                                                                    | $0.75 \pm 0.1$ | $0.55 \pm 0.07$ |
| H Filling connection                                                                          | $20 \pm 2.0$   | $14.8 \pm 1.5$  |
| K 4 x screws on reservoir bottom                                                              | $10 \pm 1.0$   | $7.4 \pm 0.74$  |
| Options (without figure):                                                                     |                |                 |
| F Return line connection                                                                      | $12 \pm 1.2$   | $8.9 \pm 0.89$  |



## 4.8.3 Pumps with 100 L sheet steel reservoir

|                                                                                               | Nm           | ft.lb.          |
|-----------------------------------------------------------------------------------------------|--------------|-----------------|
| A Install the pump                                                                            | $40 \pm 5.0$ | $29.50 \pm 3.7$ |
| B Pump element in pump housing                                                                | $40 \pm 2.0$ | $29.50 \pm 1.5$ |
| C Cap screw in valve body                                                                     | $35 \pm 2.0$ | $25.8 \pm 1.5$  |
| D Pressure control valve in pump element                                                      | $6 / 0.5$    | $4.4 \pm 0.37$  |
| E Cap screw / adapter with hydraulic lubrication fitting / filling connection in pump housing | $10 \pm 1.0$ | $7.4 \pm 0.74$  |
| F 16 x screws on the reservoir lid                                                            | $2 \pm 0.5$  | $1.5 \pm 0.37$  |
| G Reservoir venting device                                                                    | $1 \pm 0.1$  | $0.74 \pm 0.07$ |
| H Piston detector to adapter                                                                  | $20 \pm 2.0$ | $14.8 \pm 1.5$  |
| K 4 x screws on reservoir bottom                                                              | $10 \pm 1.0$ | $7.4 \pm 0.74$  |
| L Retaining plate at the pump housing                                                         | $40 \pm 5.0$ | $29.50 \pm 3.7$ |
| Options (without figure):                                                                     |              |                 |
| F Return line connection                                                                      | $2 \pm 0.5$  | $1.5 \pm 0.37$  |



#### 4.9 Type identification code

The type identification code facilitates selection/ identification of important features of the product. For the type identification code of the respective product, see the type identification plate on the pump.

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |    |   |   |    |   |   |  |  |  |          |         |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|---|---|----|---|---|--|--|--|----------|---------|--|
| P | 6 | 5 | 3 | M |   | X | - | 8 | X | L | F | - | 3 | Z | 7 | - | 2 | 4 | - | 1 | A | 7. | 1 | 6 |    |   |   |  |  |  |          | Example |  |
| P | 6 | 5 | 3 | M |   | - | U | - | 2 | 0 | X | L | B | 0 | - | 3 | Z | 7 | - | 2 | 4 | -  | 1 | A | 7. | 1 | 6 |  |  |  |          |         |  |
| P | 6 | 5 | 3 | M |   |   |   | - | 2 | 0 | X | L | B | 0 | - | 1 | K | 7 | - | A | C | -  | 2 | A | 1. | 0 | 1 |  |  |  |          |         |  |
| A |   |   |   |   | B | C |   | D | E | F |   |   | G |   |   | H |   |   | K | L | M |    |   |   |    |   |   |  |  |  | Category |         |  |

|                                                         |                       |
|---------------------------------------------------------|-----------------------|
| A   Product designation <sup>9)</sup>                   |                       |
| P653M                                                   |                       |
| B   Corrosion protection classes <sup>9)</sup>          |                       |
| X = C5-M-H Term of protection ≥ 15 years <sup>10)</sup> |                       |
| C   Approvals <sup>9)</sup>                             |                       |
| U = UL                                                  |                       |
| D   Reservoir sizes <sup>9)</sup>                       |                       |
| 4 = 4 l [1.06 gal.]                                     | Plastic reservoir     |
| 8 = 8 l [2.11 gal.]                                     | Plastic reservoir     |
| 10 = 10 l [2.64 gal.]                                   | Plastic reservoir     |
| 15 = 15 l [3.96 gal.]                                   | Plastic reservoir     |
| 20 = 20 l [5.28 gal.]                                   | Plastic reservoir     |
| 30 = 30 l [7.92 gal.]                                   | Sheet steel reservoir |
| 100 = 100 l [26.42 gal.]                                | Sheet steel reservoir |
| E   Lubricant <sup>9)</sup>                             |                       |
| X = Lubrication grease                                  |                       |

9) From these categories only one feature can be selected at a time.

10) The duration of the corrosion protection does not stand for the warranty period.

Connection options of the low-level indication for pumps with follower plate: A) Bayonet plug; B) Square plug

| F   Reservoir versions <sup>9)</sup>                                                                  |   |                                                                         |                                                 |
|-------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------|-------------------------------------------------|
| XN                                                                                                    | = | Lubrication grease without low-level indication                         |                                                 |
| XL                                                                                                    | = | Lubrication grease with low-level indication                            |                                                 |
| XNBO                                                                                                  | = | Lubrication grease without low-level indication, filling from top       |                                                 |
| XLBO                                                                                                  | = | Lubrication grease with low-level indication, filling from top          |                                                 |
| XLF                                                                                                   | = | Lubrication grease with follower plate and 1 switch point <sup>B)</sup> |                                                 |
|                                                                                                       |   |                                                                         |                                                 |
| XNBO                                                                                                  | = | Lubrication grease without low-level indication                         |                                                 |
| LBO                                                                                                   | = | Lubrication grease with intermittent low-level indication               |                                                 |
| G   Pump elements                                                                                     |   |                                                                         |                                                 |
| 1-3                                                                                                   | = | Number of pump elements                                                 |                                                 |
| K5                                                                                                    | = | Piston Ø 5                                                              | [0.20 in] Output volume per outlet              |
| K7                                                                                                    | = | Piston Ø 7                                                              | [0.28 in] Output volume per outlet              |
| Z7                                                                                                    | = | Piston Ø 7                                                              | [0.28 in] Internally cross-ported output volume |
| ZT7 <sup>E)</sup>                                                                                     | = | Piston Ø 7                                                              | [0.28 in] Internally cross-ported output volume |
| <sup>E)</sup> gas-nitro carburized; connection thread M22x1.5; outlet G1/4 for track conditioner only |   |                                                                         |                                                 |
| Output volume of pump elements, see chapter Nominal output volume                                     |   |                                                                         |                                                 |

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4

## 5. Delivery, returns, and storage

### 5.1 Delivery

After receipt of the shipment, check the shipment for damage and completeness according to the shipping documents. Immediately report any transport damages to the forwarding agent.

Keep the packaging material until any discrepancies are resolved. During in-house transport ensure safe handling.

### 5.2 Returns

Clean all parts and pack them properly (i.e. following the regulations of the recipient country) before returning them.

Protect the product against mechanical influences such as impacts. There are no restrictions for land, sea or air transport.

Mark returns on the packaging as follows.



### 5.3 Storage

SKF products are subject to the following storage conditions:

- dry, dust- and vibration-free in closed premises
- no corrosive, aggressive materials at the place of storage (e. g. UV rays, ozone)
- protected against pests and animals (insects, rodents, etc.)
- possibly in the original product packaging
- shielded from nearby sources of heat and coldness
- in case of high temperature fluctuations or high humidity take adequate measures (e. g. heater) to prevent the formation of condensation water



Before application inspect the products with regard to possible damages occurred during their storage. This particularly applies for parts made out of plastic (embrittlement).

### 5.4 Storage temperature range

- In case of parts not filled with lubricant the admissible storage temperature corresponds to that of the admissible ambient temperature of the pump (see Technical data)
- In case of parts filled with lubricant the admissible storage temperature range is:

min. + 5 °C [+41 °F]

max. + 35 °C [+95 °F]



If the storage temperature range is not adhered to, the following work steps for replacing the lubricant may not in all cases lead to the desired result.

### 5.5 Storage conditions for parts filled with lubricant

The conditions mentioned in the following will have to be adhered to when storing products filled with lubricant,

#### 5.5.1 Storage period of up to 6 months

The filled products can be used without having to take further measures.

#### 5.5.2 Storage period from 6 to 18 months

##### Pump

- Connect the pump electrically
- Switch the pump on and let it run, e.g. by triggering an additional lubrication cycle, until about 4 cc of lubricant will leak from each pump element
- Switch the pump off and disconnect it from the electrical grid
- Remove and dispose of leaked lubricant

##### Metering device

- Remove all connection lines and closure screws, if any
- Connect the pump primed with new lubrication grease suitable for the application purpose to the divider bar in such way that the opposite port of the divider bar remains open
- Let the pump run until new lubricant leaks from the divider bar
- Remove leaked lubricant
- Reinstall closure screws and connection lines

##### Lines

- Dismantle preassembled lines
- Ensure that both line ends remain open
- Prime lines with new lubricant

#### 5.5.3 Storage period exceeding 18 months

To avoid dysfunctions consult the manufacturer before commissioning. The general procedure to remove the old grease filling corresponds to that of a storage period from 6 to 18 months.

#### 5.6 Corrosion protection

The corrosion protection (e. g. on the inside of the reservoir) should be verified and renewed every 6 - 12 months corresponding to the conditions at the place of storage.

## 6. Installation

### 6.1 General information

Only qualified technical personnel may install the products described in these Instructions.

During assembly pay attention to the following:

- Other units must not be damaged by the assembly
- The product must not be installed within the range of moving parts
- The product must be installed at an adequate distance from sources of heat and coldness
- Observe the product's IP degree of protection
- Adhere to safety distances and legal prescriptions on assembly and prevention of accidents
- Possibly existing visual monitoring devices, e.g. pressure gauges, MIN/MAX markings or piston detectors, must be clearly visible
- Observe prescriptions in chapter Technical data regarding the installation position

### 6.2 Transport of the pumps

In filled condition, the pumps stated in these instructions may be transported vertically only, as otherwise lubricant might leak from the reservoir.

### 6.3 Place of installation

Protect the product against humidity, dust and vibrations and install it in an easily accessible position to facilitate other installation and maintenance works.

## 6.4 Mechanical connection

### 6.4.1 Installation bores

#### NOTICE

##### Risk of damage to the superior machine and to the pump

Drill the mounting bores on non-load-bearing parts of the superior machine only. Fastening must not be done on two parts moving against one another (e. g. machine bed and machine assembly).

Fastening is done as shown on the following pages by means of:

Pumps with 4- or 8-litre reservoir  
 2 hexagon screws M8 (8.8)  
 2 hexagon nuts M8 (8.8)  
 4 washers 8

Tightening torque = 18 Nm ± 1.0 Nm  
 [13.27 ft.lb. ± 0.74 ft.lb.]

Pumps with 10-, 15- or 20-litre plastic reservoir

4 hexagon screws M8 (8.8)  
 4 hexagon nuts M8 (8.8)  
 8 washers 8

Tightening torque = 18 Nm ± 1.0 Nm  
 [13.27 ft.lb. ± 0.74 ft.lb.]

Pumps with 30-litre sheet steel reservoir

4 hexagon screws M8 (8.8)  
 4 hexagon nuts M8 (8.8)  
 8 washers 8

Tightening torque = 20 Nm ± 2.0 Nm  
 [14.8 ft.lb. ± 1.5 ft.lb.]

Pumps with 100-litre sheet steel reservoir

4 screws M8 (8.8)  
 4 hexagon nuts M8 (8.8)  
 8 washers 10

Tightening torque = 40 Nm ± 5.0 Nm  
 [29.50 ft.lb. ± 3.7 ft.lb.]

### 6.5 Minimum assembly dimensions

Ensure sufficient space for maintenance work or for attachment of further components to build a centralized lubrication system to the pump by leaving a free space of at least 100 mm [3.94 in.] into each direction in addition to the stated dimensions.

Fig. 8 Minimum installation dimensions 4 L [1.06 gal.] and 8 L [2.11 gal.] Litres plastic reservoir

|    | Pumps with follower plate |                 |                         |                 | Pumps with stirring paddle |                 |                         |                 |
|----|---------------------------|-----------------|-------------------------|-----------------|----------------------------|-----------------|-------------------------|-----------------|
|    | 4 Litres<br>[1.06 gal.]   |                 | 8 Litres<br>[2.11 gal.] |                 | 4 Litres<br>[1.06 gal.]    |                 | 8 Litres<br>[2.11 gal.] |                 |
|    | V DC                      | V AC            | V DC                    | V AC            | V DC                       | V AC            | V DC                    | V AC            |
| H  |                           |                 |                         |                 | 415<br>[16.34]             | 435<br>[17.13]  | 515<br>[20.28]          | 535<br>[21.06]  |
| H1 | 471<br>[18.54]            | 491<br>[19.33]  | 571<br>[22.48]          | 591<br>[23.27]  |                            |                 |                         |                 |
| H2 | 154.5<br>[6.08]           | 174.5<br>[6.87] | 154.5<br>[6.08]         | 174.5<br>[6.87] | 154.5<br>[6.08]            | 174.5<br>[6.87] | 154.5<br>[6.08]         | 174.5<br>[6.87] |
| B  | 240<br>[9.45]             | 240<br>[9.45]   | 240<br>[9.45]           | 240<br>[9.45]   | 240<br>[9.45]              | 240<br>[9.45]   | 240<br>[9.45]           | 240<br>[9.45]   |
| T  | 235<br>[9.25]             | 235<br>[9.25]   | 235<br>[9.25]           | 235<br>[9.25]   | 235<br>[9.25]              | 235<br>[9.25]   | 235<br>[9.25]           | 235<br>[9.25]   |

[ = indication in inches]

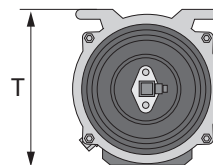
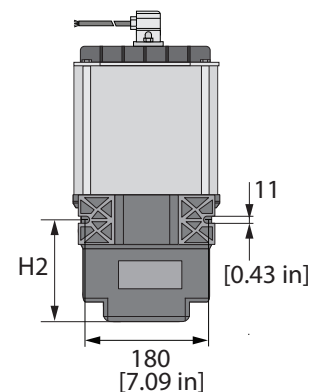
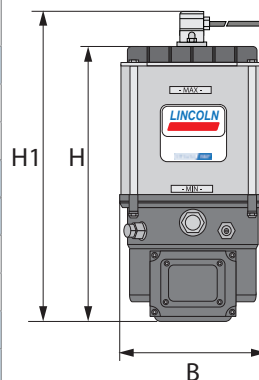


Fig. 9 Minimum installation dimensions 10, 15 and 20 Litres plastic reservoirs

|                           | Pumps with follower plate |         |                          |         |                          |         | Pumps with stirring paddle |         |                          |         |                          |         |
|---------------------------|---------------------------|---------|--------------------------|---------|--------------------------|---------|----------------------------|---------|--------------------------|---------|--------------------------|---------|
|                           | 10 Litres<br>[2.64 gal.]  |         | 15 Litres<br>[3.96 gal.] |         | 20 Litres<br>[5.28 gal.] |         | 10 Litres<br>[2.64 gal.]   |         | 15 Litres<br>[3.96 gal.] |         | 20 Litres<br>[5.28 gal.] |         |
|                           | V DC                      | V AC    | V DC                     | V AC    | V DC                     | V AC    | V DC                       | V AC    | V DC                     | V AC    | V DC                     | V AC    |
| H                         |                           |         |                          |         |                          |         | 577                        | 597     | 758                      | 778     | 893                      | 913     |
|                           |                           |         |                          |         |                          |         | [22.72]                    | [23.50] | [29.84]                  | [30.63] | [35.16]                  | [35.94] |
| H1                        | 633                       | 814     | 949                      | 653     | 834                      | 969     |                            |         |                          |         |                          |         |
|                           | [24.92]                   | [32.05] | [37.36]                  | [25.71] | [32.83]                  | [38.15] |                            |         |                          |         |                          |         |
| H2                        | 154.5                     | 174.5   | 154.5                    | 174.5   | 154.5                    | 174.5   | 154.5                      | 174.5   | 154.5                    | 174.5   | 154.5                    | 174.5   |
|                           | [6.08]                    | [6.87]  | [6.08]                   | [6.87]  | [6.08]                   | [6.87]  | [6.08]                     | [6.87]  | [6.08]                   | [6.87]  | [6.08]                   | [6.87]  |
| H3                        | 367.5                     |         | 550.5                    |         | 685.5                    |         | 367.5                      |         | 550.5                    |         | 685.5                    |         |
|                           | [14.47]                   |         | [21.67]                  |         | [26.99]                  |         | [14.47]                    |         | [21.67]                  |         | [26.99]                  |         |
| B                         | 240                       | 240     | 240                      | 240     | 240                      | 240     | 240                        | 240     | 240                      | 240     | 240                      | 240     |
|                           | [9.45]                    | [9.45]  | [9.45]                   | [9.45]  | [9.45]                   | [9.45]  | [9.45]                     | [9.45]  | [9.45]                   | [9.45]  | [9.45]                   | [9.45]  |
| T                         | 235                       | 235     | 235                      | 235     | 235                      | 235     | 235                        | 235     | 235                      | 235     | 235                      | 235     |
|                           | [9.25]                    | [9.25]  | [9.25]                   | [9.25]  | [9.25]                   | [9.25]  | [9.25]                     | [9.25]  | [9.25]                   | [9.25]  | [9.25]                   | [9.25]  |
| [ = indication in inches] |                           |         |                          |         |                          |         |                            |         |                          |         |                          |         |

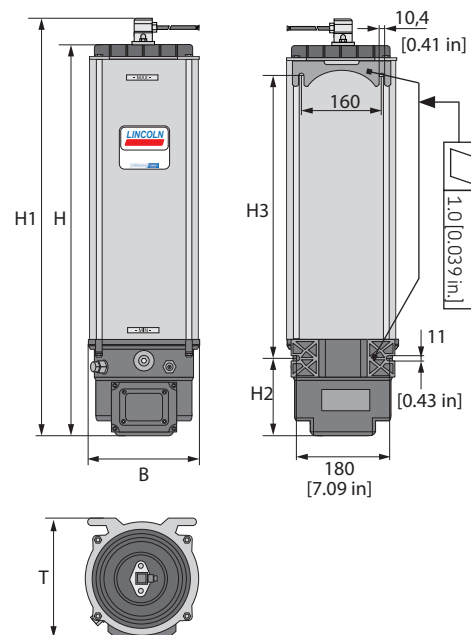


Fig. 10 Minimum installation dimensions 30 Litres sheet steel reservoir

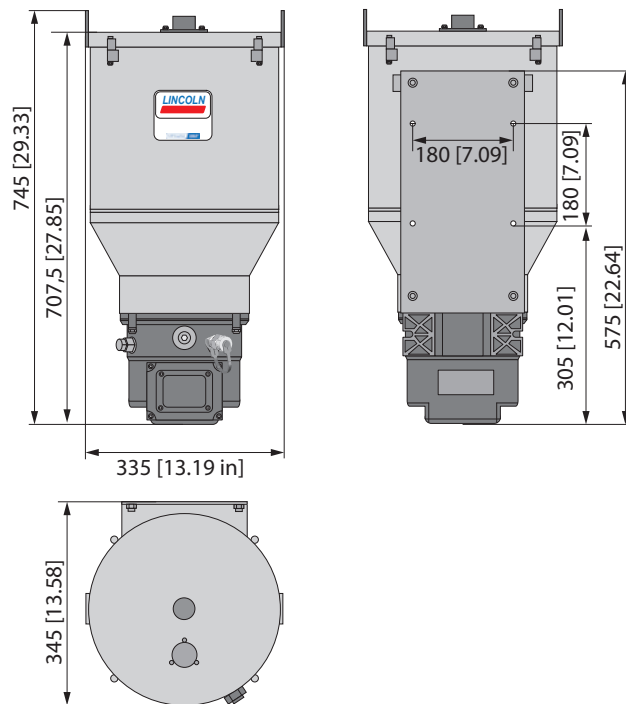
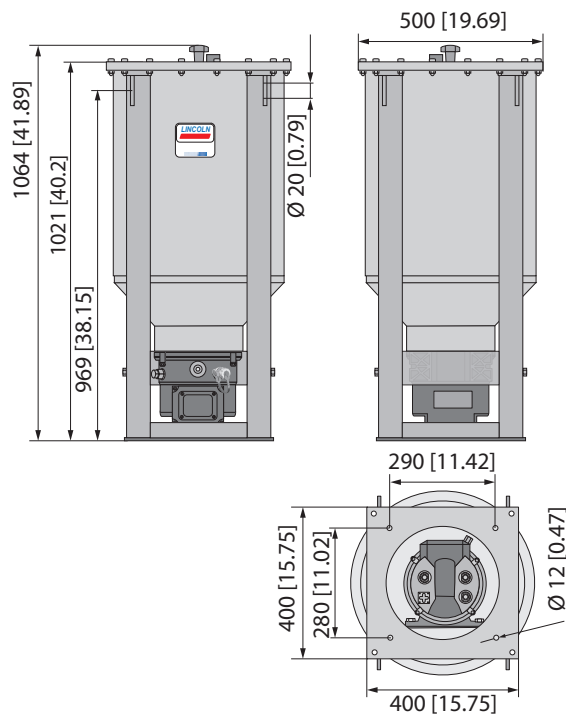


Fig. 11 Minimum installation dimensions 100 Litres sheet steel reservoir



## 6.6 Electrical connection



### WARNING



#### Electric shock

Make sure to disconnect the product from the power supply before carrying out any works on electrical components.

Carry out the electrical connection according to the connection type of the pump,

- Tailor the plug for the power supply (5.1) and the control line (5.2) according to the respective connection diagram in these instructions
- Insert plug into corresponding socket and mount correctly. Only be doing so the degree of protection can be complied with



Connect the plugs in such way that no mechanical forces are transferred to the product.

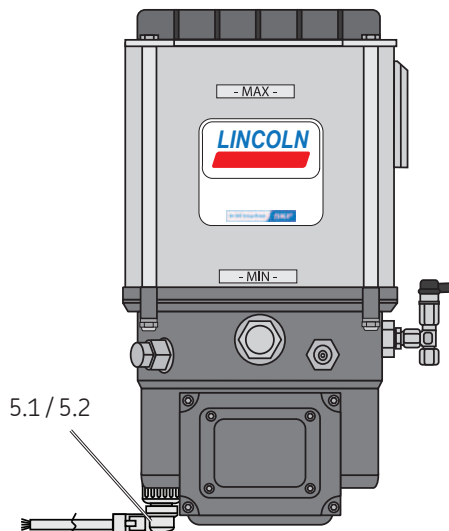


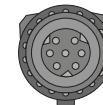
Fig. 12 Electrical connection

#### Types of connections

##### Square plug



##### Bayonet plug 7/7 poles

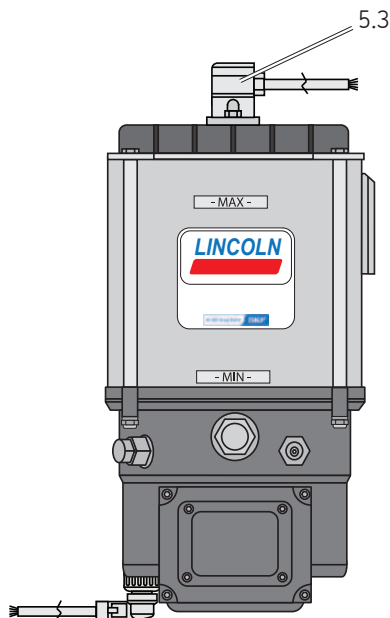


The electrical connection of the low-level indication (5.3) of pumps with follower plate is made according to the pump's connection type. See chapter Connection of the signal line to the reservoir lid.



In case of connection type 1A5. xx the low-level signal is routed from connection 5.3 downward into the pump housing and internally switched to the cable of connection 5.1.

Fig. 13 Electrical connection of the low-level indication for pumps with follower plate



### 6.7 Installing the pump elements

To carry out the assembly proceed as follows:



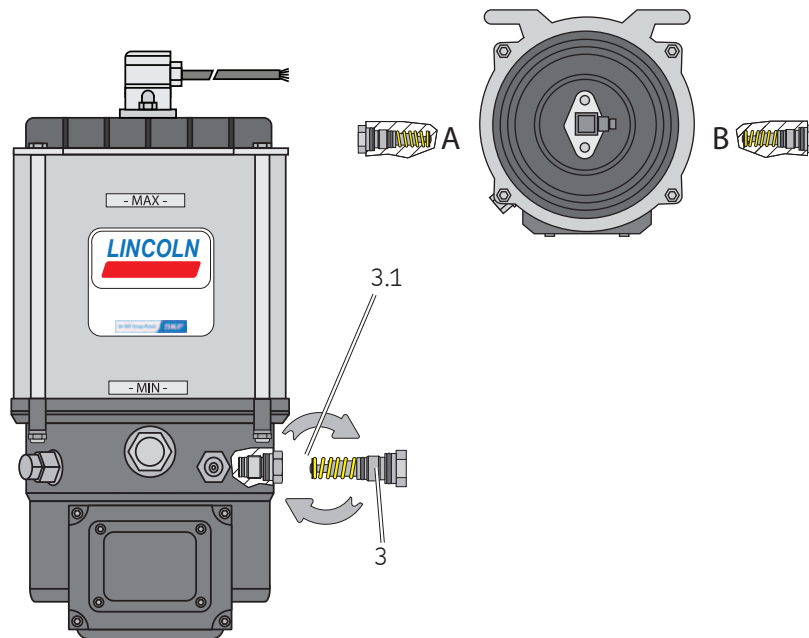
If the pump is operated with 2 pump elements only, these have to be installed at positions A and B. When using one pump element only, any installation position is possible.

- Unscrew blind plug (3.1) from pump housing (3)
- Screw pump element (3) into pump housing

Tightening torque = 40 Nm  $\pm$  0.5 Nm  
[29.50 ft.lb.  $\pm$  0.37 ft.lb.]

- Repeat procedure for each pump element

Fig. 14 Installing the pump element



### 6.8 Mount pressure control valve

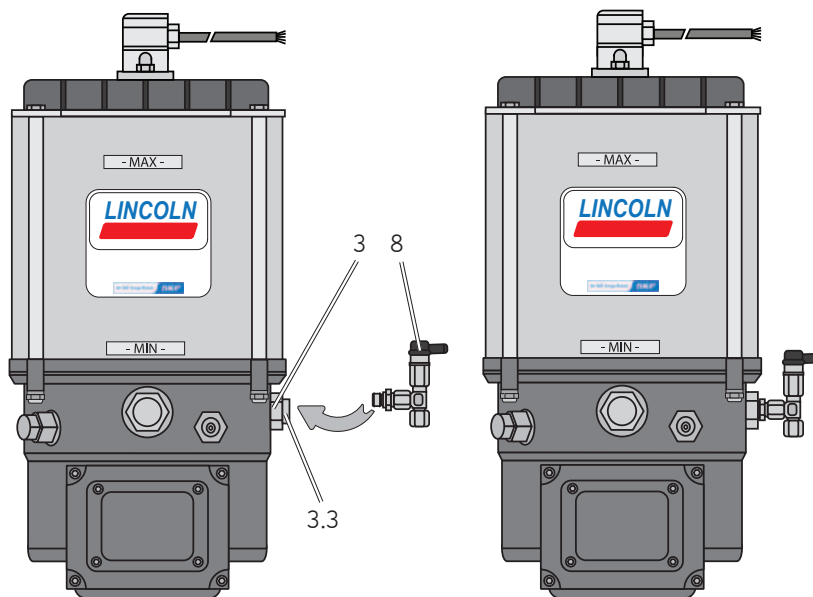
Protect each pump element by means of a pressure control valve suitable for the planned maximum admissible operating pressure of the centralized lubrication system.

To carry out the assembly proceed as follows:

- Remove the cap screw (3.3) from the pump element (3)
- Screw pressure control valve (8) into pump element (3)
- Repeat procedure for each pump element

Tightening torque = 6 Nm -0.5 Nm  
[4.43 ft.lb. - 0.07 ft.lb.]

Fig. 15 Mount pressure control valve



## 6.9 Lubrication line connection

|                                                                                   |                                                                                                                                 |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   |  <b>CAUTION</b>                                |
|  | <b>Risk of falling</b><br>Exercise care when dealing with lubricants. Bind and remove spilled or leaked lubricants immediately. |



Connect lubrication lines in such way that no forces are transferred to the product (tension-free connection).

All components of the centralized lubrication system must be laid out for:

- the maximum arising operating pressure
- the admissible ambient temperature
- the output volume and the lubricant to be supplied

Observe the following installation instructions for safe and smooth operation.

- Use clean components and filled lubrication lines only
- The main lubrication line should be laid preferably rising with a possibility to vent it at its highest point. Lubrication lines shall generally be laid in such way that there can never be created air pockets at any point
- Possibly mount the lubricant metering devices at the end of the main lubrication line in such way that the outlets of the lubricant metering devices show upwards
- If lubricant metering devices have to be mounted below the main lubrication line, then this should not be done at the end of the main lubrication line
- The lubricant flow should not be impeded by the installation of sharp elbows, angle valves, gaskets protruding to the inside, or cross-section changes (big to small). Provide unavoidable changes of the cross sections in the lubrication lines with as smooth transitions as possible

### 6.10 Filling with lubricant



Only adequate lubricant without contaminations may be filled into the pump. Avoid air bubbles when filling the pump.

#### 6.10.1 Filling via the reservoir lid



#### WARNING

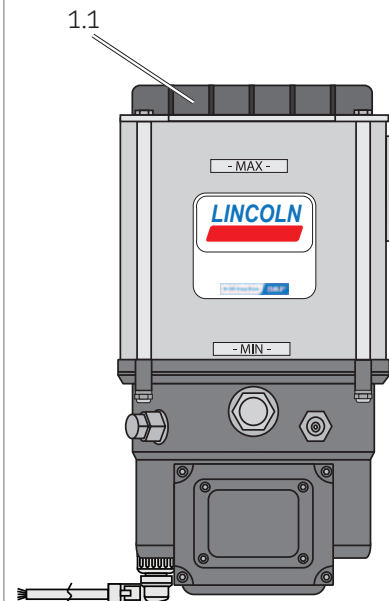


**Crushing hazard** on the rotating stirring paddle. Filling via the reservoir lid is allowed only after disconnecting the pump from the power supply by removing it from the connection (5.1).

- Unscrew the reservoir lid (1.1) anti-clockwise from the reservoir. Deposit the reservoir lid at a clean place. The inside of the reservoir lid must not be contaminated. Remove possible contaminations

- Fill the reservoir from the top up to the MAX marking. Make sure to fill in the lubricant without air inclusions, if possible
- Reinstall the reservoir lid (1.1) clockwise

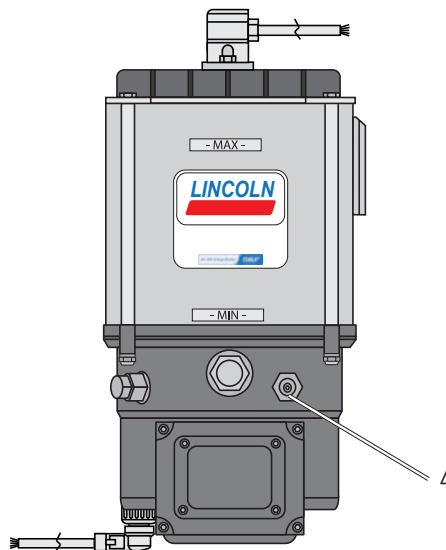
Fig. 16 Filling via the reservoir lid



### 6.10.2 Filling via filler fitting

- Connect filling connection of filler pump with filler fitting (4)
- Switch on filler pump and fill reservoir until shortly below the MAX marking
- Switch filler pump off and remove it from filler fitting (4) of pump

Fig. 17 Filling via filler fitting



### 6.10.3 Priming of pumps with follower plate



In case of pumps without grease filling, before commissioning the space below the follower plate must be filled with grease. Any further fillings take place only via the filler fitting (4) or the optional filling connection on the pump



#### CAUTION

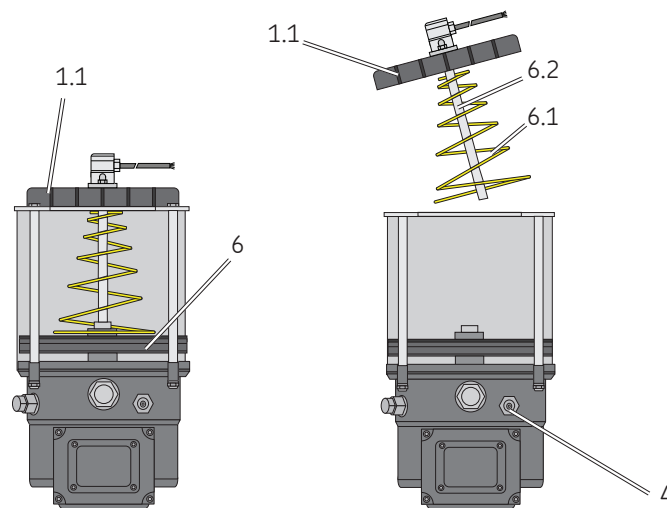


#### Spring force

Slowly loosen the reservoir lid holding it well. Wear safety goggles.

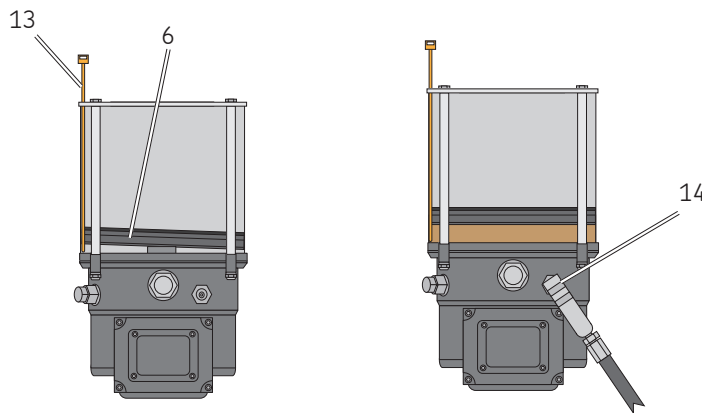
- Unscrew the reservoir lid (1.1) anti-clockwise from the reservoir
- Carefully loosen (6.1) the spring from the fixation at the follower plate (6)
- Carefully pull the contact rod (6.2) out of the follower plate (6)
- Remove the reservoir lid together with the spring and the contact rod

Fig. 18 Filling via filler fitting



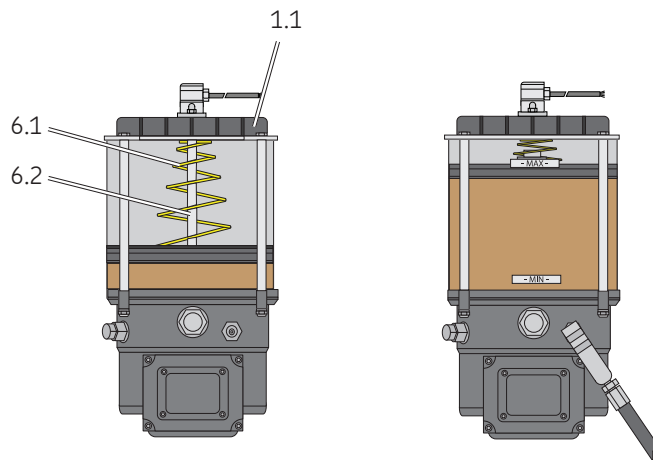
- Lightly oil the reservoir inside and the sealing lip of the follower plate
- Slightly tilt the follower plate (6) in the reservoir so that the side opposite of the filler fitting (4) is at the highest point.
- At this point pass a cable tie (13) into the area below the follower plate as shown
- Position the follower plate (6) horizontally again. Ensure that the cable tie (13) creates an air gap.
- Position the filling connection (14) of the filler pump onto the filler fitting and fill the space below the follower plate with lubricant. Ensure that no air pockets remain below the follower plate and that no lubricant reaches the upper side of the follower plate.

Fig. 19 Filling via filler fitting



- Reinstall the spring (6.1) and the contact rod (6.2).
- Close the reservoir lid (1.1) clockwise
- Fill the pump via the filler fitting up to the MAX marking.

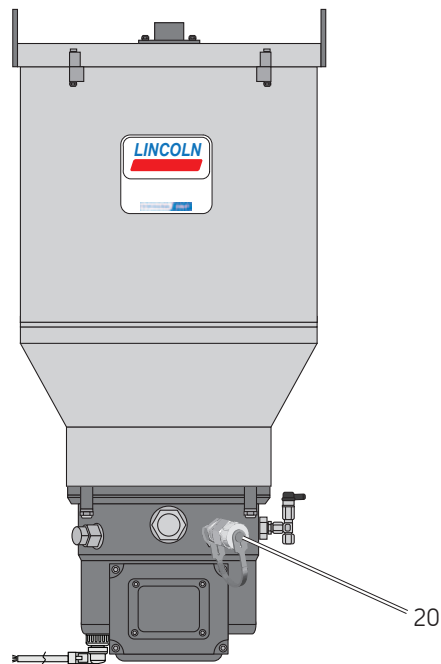
Fig. 20 Filling via filler fitting



#### 6.10.4 Filling of the pumps with 30-litre sheet steel reservoir

- Unscrew protective cap from filling connection (20) anticlockwise.
- Connect filling connection of filler pump with filler fitting (20).
- Switch on filler pump and fill reservoir.
- Check the filling level through the inspection glass and fill the reservoir up to a maximum of 50 mm below the reservoir lid.
- Switch off filler pump and remove it from filler fitting (20) of pump.
- Screw protective cap (20.1) clockwise onto filling connection (20) of pump again.

Fig. 21 Filling via filling connection



### 6.10.5 Installation of the reservoir venting device



The loosely enclosed reservoir venting device must not be installed until the pump has reached its final installation position and is vertical.

#### NOTICE

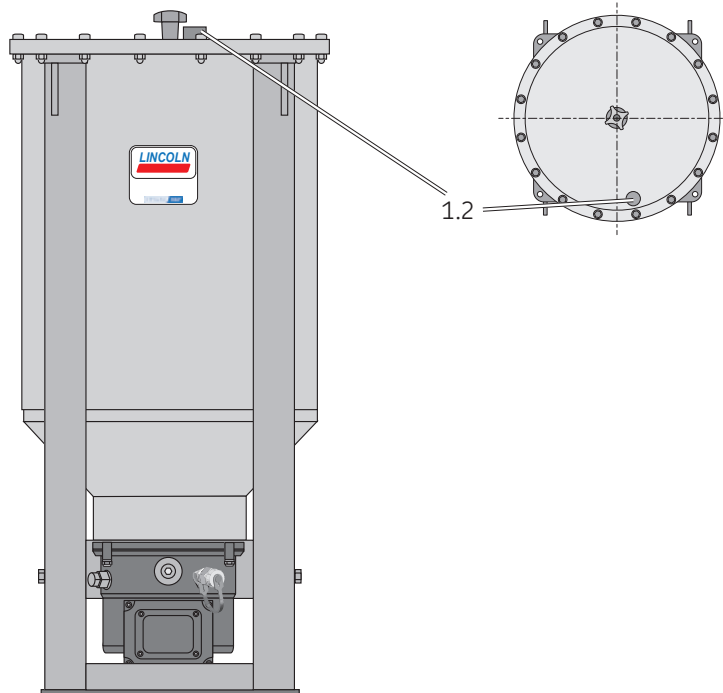
##### Possible damage to the pump

The pump may be filled only after the reservoir venting device has been installed. Otherwise when filling the reservoir lid may be damaged.

- Remove any contamination in the area of the cap screw. Unscrew the cap screw from the position for the reservoir venting device (1.2).
- Secure the thread of the reservoir venting device e.g. with Loctite 403 against loosening and screw the reservoir venting device (1.2) in.

Tightening torque = 1 Nm  $\pm$  0.1 Nm  
[0.74 ft.lb.  $\pm$  0.07 ft.lb.]

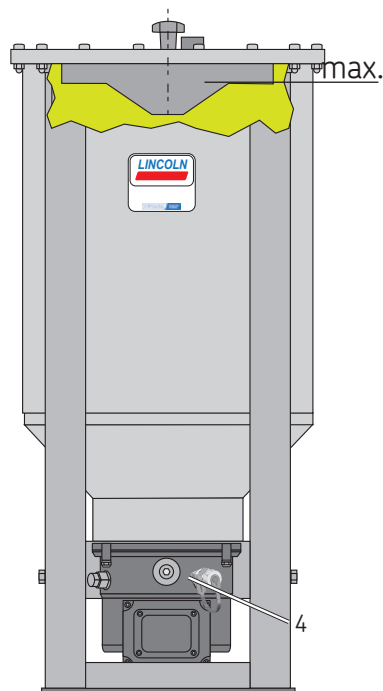
Fig. 22 Installation of the reservoir venting device



#### 6.10.6 Filling of pump with 100-litre sheet steel reservoir

- Unscrew protective cap from filling connection (4) anticlockwise.
- Connect filling connection of filler pump with filler fitting (4).
- Switch on filler pump and fill reservoir.
- Check the filling level through the transparent reservoir lid and fill up to the outer lower rim (about 60 mm below the reservoir lid) of the wiper bar (17).
- Switch off filler pump and remove it from filling connection (4) of pump.
- Screw protective cap clockwise onto filling connection (4) of pump again.

Fig. 23 Filling via filling connection



## 7. Initial start-up

In order to warrant safety and function, a person assigned by the operator must carry out the following inspections. Immediately eliminate detected deficiencies. Deficiencies may be remedied by an authorized and qualified specialist only.

Fig. 24 Start-up check list

| 7.1 Inspections prior to initial start-up                                                                                  | YES                      | NO                       |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| Electrical connection carried out correctly                                                                                | <input type="checkbox"/> | <input type="checkbox"/> |
| Mechanical connection carried out correctly                                                                                | <input type="checkbox"/> | <input type="checkbox"/> |
| The performance data of the previously indicated connections correspond to the specifications stated in the Technical data | <input type="checkbox"/> | <input type="checkbox"/> |
| All components, such as lubrication lines and metering devices, have been correctly installed                              | <input type="checkbox"/> | <input type="checkbox"/> |
| Product protected with adequate pressure control valve                                                                     | <input type="checkbox"/> | <input type="checkbox"/> |
| No visible damage, contamination and corrosion                                                                             | <input type="checkbox"/> | <input type="checkbox"/> |
| Any dismantled protection and monitoring equipment has been reassembled and checked for correct function                   | <input type="checkbox"/> | <input type="checkbox"/> |
| All warning labels on the product are available and in proper condition                                                    | <input type="checkbox"/> | <input type="checkbox"/> |
| 7.2 Inspections during initial start-up                                                                                    |                          |                          |
| No unusual noises, vibrations, accumulation of moisture, or odours present                                                 | <input type="checkbox"/> | <input type="checkbox"/> |
| No unwanted escape of lubricant (leakages) from connections                                                                | <input type="checkbox"/> | <input type="checkbox"/> |
| Lubricant is supplied free from bubbles                                                                                    | <input type="checkbox"/> | <input type="checkbox"/> |
| Bearings and friction points are provided with the planned amount of lubricant                                             | <input type="checkbox"/> | <input type="checkbox"/> |

## 8. Operation

SKF products operate automatically to the greatest possible extent.

Basically, activities during standard operation are limited to the control of the filling level of pumps without low-level indication and the timely refilling of lubricant.

### 8.1 Refill lubricant

See chapter Filling with lubricant

## 9. Cleaning

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   |  <b>WARNING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|  | <p><b>Electric shock</b></p> <p>Carry out cleaning works only on depressurized products that have been disconnected from the power supply. Do not touch cables or electrical components with wet or damp hands.</p> <p>Use steam-jet cleaners or high-pressure cleaners only in accordance with the degree of protection of the pump. Otherwise electrical components may be damaged.</p> <p>Performance of cleaning, required personal protective equipment, cleaning agents and devices following the valid operational regulations of the operator.</p> |

### 9.1 Cleaning agents

Cleaning agents compatible with the material may be used only. (Materials, see chapter 2.3).



Thoroughly remove residues of cleaning agents from the product and rinse off with clear water.

### 9.2 Exterior cleaning

- Mark and secure wet areas
- Keep unauthorized persons away
- Thorough cleaning of all outer surfaces with a damp cloth



Make sure to keep the reservoir closed during the cleaning procedure.

### 9.3 Interior cleaning

Normally, interior cleaning is not required. Should incorrect or contaminated lubricant have been filled, inside cleaning of the product will be required. To do so, contact the SKF Customer Service.

## 10. Maintenance

Regular and appropriate maintenance is a prerequisite to detect and clear faults in time. The specific time lines have to be determined, verified at regular intervals and adapted, if necessary, by the operator based on the operating conditions. If needed, copy the table for regular maintenance activities.

Fig. 25 Maintenance check list

| Activity to be done                                                                                                        | YES                      | NO                       |
|----------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|
| Electrical connection carried out correctly                                                                                | <input type="checkbox"/> | <input type="checkbox"/> |
| Mechanical connection carried out correctly                                                                                | <input type="checkbox"/> | <input type="checkbox"/> |
| The performance data of the previously indicated connections correspond to the specifications stated in the Technical data | <input type="checkbox"/> | <input type="checkbox"/> |
| All components, such as lubrication lines and metering devices, have been correctly installed                              | <input type="checkbox"/> | <input type="checkbox"/> |
| Product protected with adequate pressure control valve                                                                     | <input type="checkbox"/> | <input type="checkbox"/> |
| No visible damage, contamination and corrosion                                                                             | <input type="checkbox"/> | <input type="checkbox"/> |
| Any dismantled protection and monitoring equipment has been reassembled and checked for correct function                   | <input type="checkbox"/> | <input type="checkbox"/> |
| All warning labels on the product are available and in proper condition                                                    | <input type="checkbox"/> | <input type="checkbox"/> |
| No unusual noises, vibrations, accumulation of moisture, or odours present                                                 | <input type="checkbox"/> | <input type="checkbox"/> |
| No unwanted escape of lubricant (leakages) from connections                                                                | <input type="checkbox"/> | <input type="checkbox"/> |
| Lubricant is supplied free from bubbles                                                                                    | <input type="checkbox"/> | <input type="checkbox"/> |
| Bearings and friction points are provided with the planned amount of lubricant                                             | <input type="checkbox"/> | <input type="checkbox"/> |

## 11. Troubleshooting

Fig. 26 Fault table 1

| Fault             | Possible cause                                                                                                                                                                                                                                                                                                                                                            | Remedy                                                                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pump does not run | Power supply to pump interrupted <ul style="list-style-type: none"> <li>- Superior machine is switched off</li> <li>- Connection cable of pump is loose or defective</li> <li>- External fuse is defective</li> </ul> Pump is in the pause time mode<br>Pump motor is defective<br>Power supply board of pump is defective (in case of VAC pumps)<br>Internal cable break | Check whether one of the indicated faults is present and remedy it in the frame of responsibilities.<br><br>Faults outside of your own responsibility have to be reported to your superior to initiate further measures.<br><br>If the fault cannot be determined and remedied, please contact our Customer Service. |

Fig. 27 Fault table 2

| Fault                                              | Possible cause                                                                                                                                                                                                                                                                                                                                                   | Remedy                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pump runs but supplies no or only little lubricant | Blockade, fault within the centralized lubrication system<br>Defective check valve<br>Defective pressure relief valve<br>Suction bore of pump element is clogged<br>Close pump element<br>Air pockets in the lubricant/ under the follower plate<br>Too high lubricant consistency (at low temperatures)<br>Too low lubricant consistency (at high temperatures) | Check whether one of the indicated faults is present and remedy it in the frame of responsibilities.<br><br>Faults outside of your own responsibility have to be reported to your superior to initiate further measures.<br><br>If the fault cannot be determined and remedied, please contact our Customer Service. |
|                                                    | Wrong configuration of metering device within the centralized lubrication system                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                      |

## 12. Repairs



### WARNING



#### Risk of injury

Before carrying out any repair work, take at least the following safety measures:



- Keep unauthorized persons away

- Mark and secure work area

- De-pressurize the product



- Disconnect the product from the power supply and secure it against being switched on

- Verify that no power is being applied

- Earth and short-circuit the product

- Where needed, cover neighbouring units that are live

### 12.1 Replace pump element and pressure control valve



The characteristics of the new pump element must correspond to the characteristics of the pump element to be replaced.

To replace the pump element, proceed as follows:

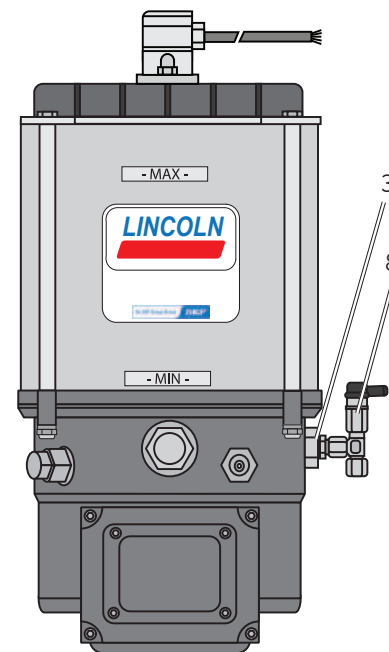
- Unscrew defective pump element (3) at its hexagon out of pump housing together with pressure control valve
- Screw the new pump element (3) into the pump housing together with a new gasket

Tightening torque = 20 Nm  $\pm$  2.0 Nm  
[14.75 ft.lb.  $\pm$  1.4 ft.lb.]

- Then screw a new pressure control valve (8) into the pump element

Tightening torque = 6 Nm -0.5 Nm  
[4.43 ft.lb. - 0.07 ft.lb.]

Fig. 28 Replace pump element



## 13. Shutdown and disposal

### 13.1 Temporary shutdown

Temporarily shut the system down by:

- Switching off the superior machine
- Disconnecting the product from the power supply

### 13.2 Final shutdown and disassembly

The final shutdown and disassembly of the product must be planned and carried out by the operator in a professional manner and in compliance with all regulations to be observed.

### 13.3 Disposal

#### Countries within the European Union

Disposal should be avoided or minimized wherever possible. Disposal of products contaminated with lubricant must be effected via licensed waste disposal contractor in accordance with environmental requirements and waste disposal regulations as well as local authority requirements.



The specific classification of the waste is in the waste producer's responsibility, as the European Waste Catalogue provides different waste disposal codes for the same type of waste but of different origin.

#### Electrical components

have to be disposed of or recycled following WEEE directive 2012/19/EU.

#### Plastic or metal parts

can be disposed of with the commercial waste.

#### Countries outside the European Union

The disposal has to be done according to the valid national regulations and laws of the country where the product is used.

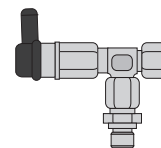
## 14. Spare parts

The spare parts assemblies may be used exclusively for replacement of identical defective parts. Modifications with spare parts on existing products are not allowed. Exceptions to this are the pump elements and the optional filling connection.

### 14.1 Pressure relief valves

| Designation                                                             | Qty. | Part number |
|-------------------------------------------------------------------------|------|-------------|
| SVTS -350-R1/4-D 6                                                      | 1    | 624-28894-1 |
| SVTS -350-R1/4-D 6 DN (C5-M-H; duration of protection $\geq$ 15 years)  | 1    | 624-29343-1 |
| SVTSV -350-R1/4-D 6 DN (C5-M-H; duration of protection $\geq$ 15 years) | 1    | 624-77908-1 |

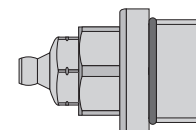
Fig. 29



### 14.2 Adapter with lubrication fitting

| Designation                                                   | Qty. | Part number |
|---------------------------------------------------------------|------|-------------|
| Adapter with lubrication fitting ST 1/4 NPTF including gasket | 1    | 519-33840-1 |
| Adapter with lubrication fitting A2 AR 1/4 including gasket   | 1    | 519-33959-1 |
| Adapter with lubrication fitting STAR 1/4 including gasket    | 1    | 519-33955-1 |

Fig. 30

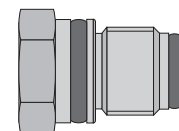


### 14.3 Blind plug

| Designation                                               | Qty. | Part number |
|-----------------------------------------------------------|------|-------------|
| Blind plug (C3-H; duration of protection $\geq$ 15 years) | 1    | 545-33240-1 |
| Blind plug (C5-M-H; term of protection $\geq$ 15 years)   | 1    | 545-60195-1 |

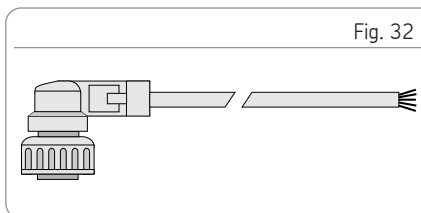
Serves to close an unneeded outlet, e.g. if a pump element is removed.

Fig. 31



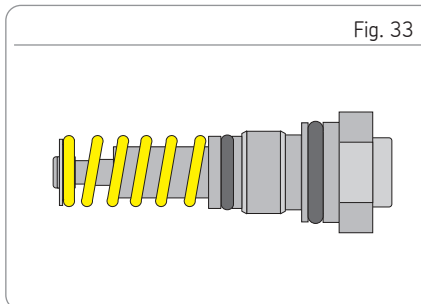
#### 14.4 Connection sockets and cable

| Designation                                                    | Qty. | Part number |
|----------------------------------------------------------------|------|-------------|
| Connection cable 10 m [33 ft.] with bayonet socket (7/7 poles) | 1    | 664-34428-3 |
| Connection cable 20 m [66 ft.] with bayonet socket (7/7 poles) | 1    | 664-34741-9 |



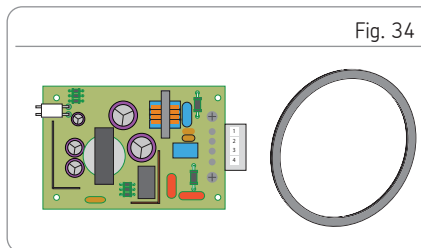
#### 14.5 Pump elements

| Designation               | Qty. | Part number<br>C3 version | Part number<br>C5-M version |
|---------------------------|------|---------------------------|-----------------------------|
| Pump element Z7           | 1    | 645-77196-1               | 645-77625-1                 |
| Pump element ZT7          | 1    | 645-77612-1               |                             |
| Pump element K5           | 1    | 645-77787-1               |                             |
| Pump element K7           | 1    | 645-29873-1               | 645-77734-1                 |
| Delivery including gasket |      |                           |                             |



#### 14.6 Replacement kit of power supply board for P653M

| Designation                                     | Qty. | Part number |
|-------------------------------------------------|------|-------------|
| Replacement kit of power supply board for P653M | 1    | 545-60737-1 |



### 14.7 Plastic reservoir

| Designation            | Qty. | Part number |
|------------------------|------|-------------|
| 4 l XLF <sup>1)</sup>  | 1    | 545-33752-1 |
| 4 l XLB <sup>2)</sup>  | 1    | 545-33758-1 |
| 8 l XLF <sup>1)</sup>  | 1    | 545-33753-1 |
| 8 l XLB <sup>2)</sup>  | 1    | 545-33759-1 |
| 15 l XLF <sup>1)</sup> | 1    | 545-33756-1 |
| 15 l XLB <sup>2)</sup> | 1    | 545-33754-1 |
| 20 l XLF <sup>1)</sup> | 1    | 545-33757-1 |
| 20 l XLB <sup>2)</sup> | 1    | 545-33760-1 |

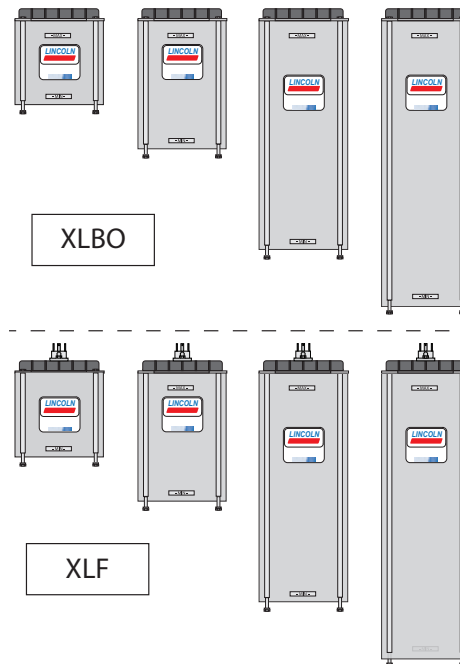
<sup>1)</sup> Delivery including: Reservoir lid with connection plug, follower plate assy., tie rods and adhesive label

<sup>2)</sup> Delivery including: Reservoir lid with fixed paddle, tie rods and adhesive label



Delivery of the plastic reservoirs without stirring paddle

Fig. 35



## 15. Electrical connections

### 15.1 Cable colours following IEC 60757

| Abbreviation | Colour | Abbreviation | Colour | Abbreviation | Colour | Abbreviation | Colour    |
|--------------|--------|--------------|--------|--------------|--------|--------------|-----------|
| BK           | black  | GN           | green  | WH           | white  | PK           | pink      |
| BN           | brown  | YE           | yellow | OG           | orange | TQ           | turquoise |
| TQ           | blue   | RD           | red    | VT           | violet | -----        | -----     |



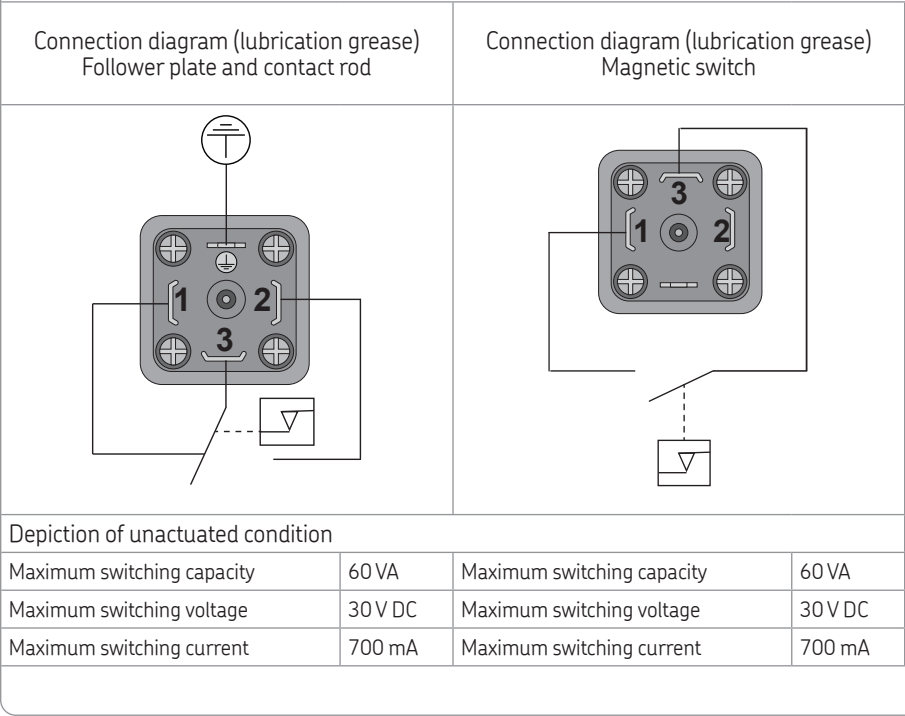
The assignment of the following electrical connection diagrams is done according to the respective referenced type identification code characteristics. For the complete type identification code of the P653 pumps, see instructions, chapter 4 Technical data.

### 15.2 Legend of the connection diagrams

|             |                                |    |                       |
|-------------|--------------------------------|----|-----------------------|
| LLC         | Low level indication           | F1 | External back-up fuse |
| X1.1 / X2.1 | Connection plugs on the pump   |    |                       |
| X1.2 / X2.2 | Connection socket on the cable |    |                       |

15.3 Connection of signal line to reservoir lid

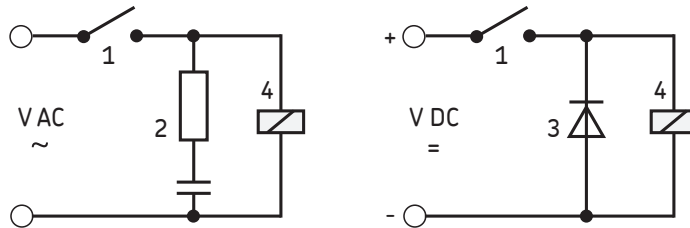
Fig. 36 Connection diagram of the signal line



#### 15.4 Recommended contact protection measure for switching inductive loads

Fig. 37 Recommended contact protection measure for switching inductive loads

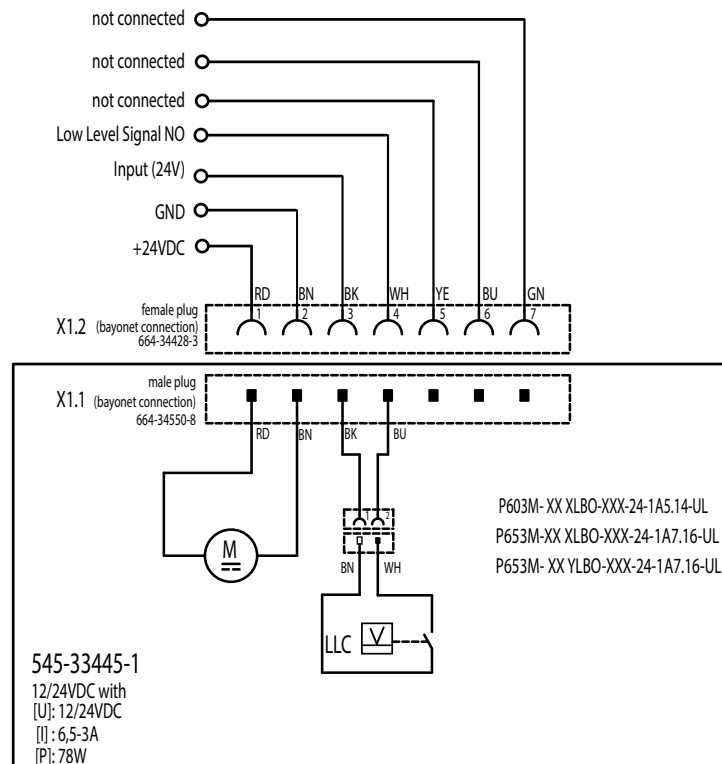
For protection of the relay contacts the following contact protection measure should be carried out by the operator.



- 1 Magnetic switch
- 2 Interference suppression diode
- 3 Diode
- 4 Load

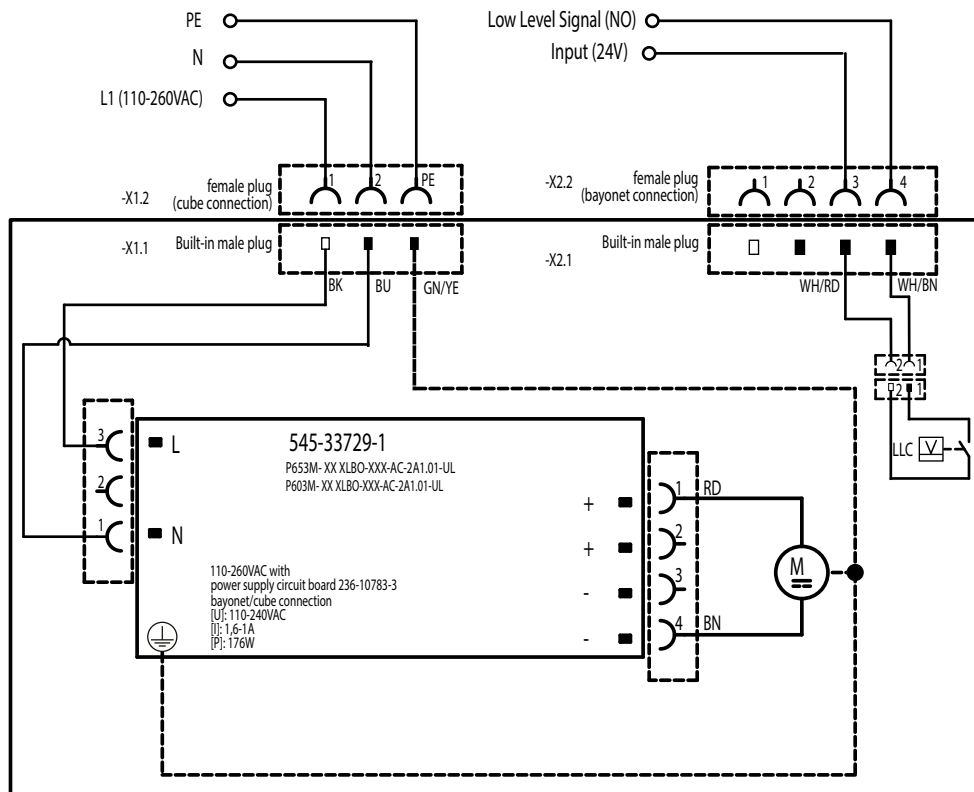
## 15.5 Connection diagram P653M VDC

Fig. 38 Connection diagram P653M VDC



## 15.6 Connection diagram P653M VAC

Fig. 39 Connection diagram P653M VAC



SKF Lubrication Systems Germany GmbH  
Walldorf Facilities  
Heinrich-Hertz-Str. 2-8  
DE - 69190 Walldorf  
Phone: +49 (0) 6227 33-0  
Fax: +49 (0) 6227 33-259  
e-mail: [Lubrication-germany@skf.com](mailto:Lubrication-germany@skf.com)  
[www.skf.com/lubrication](http://www.skf.com/lubrication)

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