Lubrication System QLS 301 / QLS 401

Assembly instructions following machinery directive 2006/42/EC

951-171-003-EN
Version 09
28/03/2018
EC Declaration of incorporation following machinery directive 2006/42/EC, annex II, part 1 B

The manufacturer, SKF Lubrication Systems Germany GmbH, Walldorf Facilities, Heinrich-Hertz-Str. 2-8, DE - 69190 Walldorf, hereby declares that the partly completed machinery complies with the following basic safety and health requirements of the EC machinery directive 2006/42/EC at the time when first being launched in the market.

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

The special technical documents were prepared following Annex VII part B of this directive. Upon justifiable request, these special technical documents can be forwarded electronically to the respective national authorities. The person empowered to assemble the technical documentation on behalf of the manufacturer is the head of standardization, See manufacturer’s address.

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

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<tr>
<td>ISO 12100</td>
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<td>EN 50581</td>
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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 previsions of machinery directive 2006/42/EC and any other applicable directives.

Walldorf, 28/03/2018
Jürgen Kreutzkämper
Manager R&D Germany

Stefan Schürmann
Manager R&D Hockenheim/Walldorf

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Legal disclosure

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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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All rights reserved.

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.

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<th>Dangerous electrical voltage</th>
<th>Risk of falling</th>
<th>Hot surfaces</th>
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<td>Unintentional intake</td>
<td>Crushing hazard</td>
<td>Pressure injection</td>
<td>Suspended load</td>
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<tr>
<td>Electrostatically sensitive components</td>
<td>Potentially explosive atmosphere</td>
<td>Keep unauthorized persons away.</td>
<td>Wear personal protective equipment (protective clothes)</td>
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<tr>
<td>Wear personal protective equipment (goggles)</td>
<td>Wear personal protective equipment (face shield)</td>
<td>Wear personal protective equipment (gloves)</td>
<td></td>
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<tr>
<td>Wear personal protective equipment (safety shoes)</td>
<td>Disconnect product from mains</td>
<td>General obligation</td>
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<tr>
<td>Protection by extra low voltage (protection class III)</td>
<td>Protection y double or reinforced insulation (protection class II)</td>
<td>Safe galvanic isolation (protection class III)</td>
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<th>Consequence</th>
<th>Probability</th>
<th>Symbol</th>
<th>Meaning</th>
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<td>DANGER</td>
<td>Death, serious injury</td>
<td>imminent</td>
<td>●</td>
<td>Chronological guidelines</td>
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<td>WARNING</td>
<td>Death, serious injury</td>
<td>possible</td>
<td>○</td>
<td>Lists</td>
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<td>CAUTION</td>
<td>Minor injury</td>
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<td>❄️</td>
<td>Refers to other facts, causes, or consequences</td>
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<td>NOTICE</td>
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### Abbreviations and conversion factors

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<tr>
<td>rpm</td>
<td>revolutions per minute</td>
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<tr>
<td>l</td>
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<tr>
<td>dB (A)</td>
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<td>kW</td>
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<td>cc</td>
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<td>mm</td>
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<td>l</td>
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</tr>
<tr>
<td>%</td>
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<td>kg</td>
<td>kilogram</td>
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<td>rh</td>
<td>relative humidity</td>
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<td>approximately</td>
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<td>Å</td>
<td>decreases a value</td>
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<tr>
<td>mm²</td>
<td>square millimetre</td>
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<td>rpm</td>
<td>revolutions per minute</td>
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<tr>
<td>Å</td>
<td>increases a value</td>
</tr>
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<td>in.</td>
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<tr>
<td>fl. oz.</td>
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<td>psi</td>
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</tbody>
</table>

**Conversion factors**

- 1 mm = 0.03937 in.
- 1 cm² = 0.155 sq.in
- 1 ml = 0.0352 fl.oz.
- 1 l = 2.11416 pints (US)
- 1 kg = 2.205 lbs
- 1 g = 0.03527 oz.
- 1 kg/cc = 8.3454 lb./gal(US)
- 1 kg/cc = 0.03613 lb./cu.in.
- 1 N = 0.10197 kp
- 1 bar = 14.5 psi
- °C = (°F−32) x 5/9
- 1 kW = 1.34109 hp
- 1 m/s² = 3.28084 ft./s²
- 1 m/s = 3.28084 fps
- 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 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) or HCS 29 CFR 1910.1200 marked with GHS01-GHS06 and GHS08 hazard pictograms
- to feed, forward, or store gases, liquefied gases, dissolved gases, vapours, or fluids whose vapour pressure exceeds normal atmospheric pressure of 1013 mbar by more than 0.5 bar [7.25 psi] at the maximum permissible operating temperature.
- in an explosion protection zone

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

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 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 ADR test certificate
Provided the use of ADR connecting material as stated in the type identification code and correctly performed electrical installation, the lubricant pumps comply with ADR requirements for use outside potentially explosive zones 0, 1 or 2 in vehicle types EX/II, EX/III, FL and AT.

Test institute: TÜV-SÜD Auto Service GmbH
Component approval marking: TU.E66.054-01
1.12 Markings on the product

- Hand injury warning
- Rotational direction of the pump

![ADR TÜ.EGG.047-01](image)

Pumps with ADR approval

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 GHS), where appropriate.

1.13 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)

1.13.1 UL approval mark

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

1.13.2 ECE approval mark

The ECE approval mark (E1) confirms that an ECE design certification (ECE R10) was issued for the product.
1. Safety instructions

1.14 Persons authorized to operate the pump

1.14.1 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.

1.14.2 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.

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

1.15 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.

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

1.17 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.

1.18 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
1.19 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

- Carrying 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 products 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.
1. Safety instructions

1.20 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

1.21 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.

○ 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.
### 1.22 Residual risks

<table>
<thead>
<tr>
<th>Residual risk</th>
<th>Possible in life cycle</th>
<th>Prevention/ remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal injury/ material damage due to falling of raised parts</td>
<td>A B C G H K</td>
<td>Keep unauthorized persons away. No people may remain under suspended loads. Lift parts with adequate lifting devices.</td>
</tr>
<tr>
<td>Personal injury/ material damage due to tilting or falling of the product because of non-observance of the stated tightening torques</td>
<td>B C G</td>
<td>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.</td>
</tr>
<tr>
<td>Personal injury/ material damage due to electric shock in case of damage to the connection cable</td>
<td>B C D E F G H</td>
<td>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.</td>
</tr>
<tr>
<td>Personal injury/ damage to material due to spilled or leaked lubricant</td>
<td>B C D F G H K</td>
<td>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.</td>
</tr>
<tr>
<td>Loss of electrical protective function due to faulty installation of electrical components after repair</td>
<td>G</td>
<td>After replacement of electrical components carry out an electrical safety test according to ISO/EN 60204-1</td>
</tr>
<tr>
<td>Reservoir with follower plate is subjected to spring load</td>
<td>G</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Life phases:**
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 Described variants of the QLS system

QLS 301 with controller
- with follower plate
- with or without controller
- with 12 V DC or 24 V DC
- with 120 V AC or 230 V AC
- with SSV metering device attached to the rear or bottom
- with external SSV metering device

QLS 301 without controller

QLS 401 with controller
- with or without controller
- with 12 V DC or 24 V DC
- with 120 V AC or 230 V AC
- with SSV metering device attached to the rear or bottom
- with external SSV metering device
- with SSVDV metering device attached to the rear
1 Reservoir
The lubricant is stored in the reservoir. Depending on the pump version there are different types of reservoirs and reservoir sizes.

2 Filler fitting
Serves to fill the reservoir with suitable clean lubricant.

3 Membrane keypad
The membrane keypad serves to display operation and fault messages and to change parameters (programming) in the case of pumps with control unit.

4 Pump housing
Comprises the motor and, corresponding to the pump version, different control PCBs and different connection options (square or bayonet plug).
3. Overview, functional description

5 Power supply
Serves to connect the pump to an external power supply.

6 Signal line
Serves to connect the pump to an external control or signal device.

7 Metering devices
Serve to meter and distribute lubricant as well as to switch off the pump by means of an indicator pin and proximity switch after reaching the preset number of operating cycles. Different SSV and SSVDV metering devices are available for different kinds of applications.

8 Reservoir venting device
Serves to vent the reservoir when filling it with lubricant or to vent the reservoir during operation.

9 Emergency lubrication fitting
Serves to provide the connected lubrication points with lubricant, e.g. in case of a defect of the pump.
3. Overview, functional description

### 3.2 Mounting positions of the metering devices

<table>
<thead>
<tr>
<th>Mounting Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear-mounted metering device</td>
</tr>
<tr>
<td>Bottom-mounted metering device</td>
</tr>
<tr>
<td>Pump for external metering device</td>
</tr>
</tbody>
</table>

- with internal return of lubricant via outlet "2" of the metering device
- connection of the feed lines with pressure plastic tubes (Ø 6x1.5 mm)
- vertical metering device outlets (V)
- with external return of lubricant via return line connection "R" of the connection block
- connection of the feed lines with pressure plastic tube or steel tube lines (Ø 6x1.5 mm)
- horizontal metering device outlets (H)
- The port (10) for the proximity switch of the external SSV metering device is located on the pump housing. External SSV metering devices are supplied with a corresponding plug and 2 m connection cable.
3.3 Changing the output volume of the SSV metering devices

About 0.2 cc of lubricant are supplied per stroke and outlet. Closing unneeded outlets with closure screws (11) increases the output of the next lower open outlet on the same side by the lubricant volume of the upper closed outlets. Maximum number of outlets that can be crossported internally:

SSV 6 = 3  SSV 12 = 6  SSV 18 = 9
SSV 8 = 4  SSV 14 = 7
SSV 10 = 5  SSV 16 = 8

Further cross-porting of the output volume is possible externally only by means of a tee piece.
3.4 Changing the output volume of an SSVDV metering device

Adjust the output volume by screwing the required metering screw into the corresponding outlet of the metering piston level (A). Additionally, the output can be adapted by closing unneeded outlets. (see SSV metering device)

Maximum number of outlets that can be crossported internally:

SSVDV  6 = 3  SSVDV 12 = 6
SSVDV 10 = 4  SSVDV 16 = 7

Metering screws SSVDV
1.8  1.4  1.0  0.8  0.6  0.08 cc
3.5 Return of unneeded lubricant

3.5.1 Rear-mounted metering device
Return is realized internally:
for even numbers of outlets
  - by closing outlet 2
for odd numbers of outlets
  - by closing outlets 2 and 1
Lubrication lines are connected to the outlets with the highest numbers. The outlets with the lowest numbers are used for returning the lubricant.

3.5.2 Bottom-mounted metering device and external metering device
Return is realized externally via return line “R of the connection block. Outlets 1 and 2 must never be closed as otherwise there may occur a blockade in the metering device.
3.6 Membrane keypad

In case of pumps with controller the membrane keypad with display serves to:

- display operation states, error codes
- trigger an additional lubrication
- display and change parameters (programming)

All functions – except from the display of error codes – are available during the pump’s pause time only.

Pump adjustments are made via the green adjustment key (3.3) and the red switch key (3.2) and are shown on the display (3.1).
3. Overview, functional description

3.7 Displays in the display mode S4 control PCB

- **Ready for operation**
  The pump is in the pause mode. There are no fault indications pending.

- **Pump is on**
  The pump is in the operating mode. There are no fault indications pending.

- **Pre-low-level signal**
  The pump is in the operating mode. There is little lubricant available. The display alternates with “pump is on”.

- **Low level indication**
  Lubricant lacks. The pump terminates the current lubrication cycle. It can be restarted only after refilling the reservoir.

- **Fault signal Er**
  Too high back pressure
  Control PCB defective
  An unspecified error occurred during the monitoring time.

- **Fault signal EP**
  A fault of the membrane keypad is pending.

3.8 Displays in the programming mode S4 control PCB

- **Programming step P1**
  In this programming step the hourly value of the pause time is set.

- **Programming step P2**
  In this step the minute value of the pause time is set.

- **Programming step P3**
  In this step the number of metering device cycles per operating cycle is set.

- **Programming step P4**
  In this step the type of output signal is set.
  nc = normally closed contact
  no = normally open contact

- **Programming step P5**
  In this step it is determined whether a differentiation is made between a fault signal or a low-level signal.

- **Programming step P6**
  In this step it is set how the pump will start when being switched on.
  SP = Start with pause time
  SO = Start with lubrication time
3.9 Displays in the display mode S4 control PCB

- **End of programming**
  Programming has been completed. To adopt the values set the programming has to be confirmed with the green key 3.3 (see Fig. 13) within 30 seconds.

- **Normally closed contact**
  Output signal is preset as normally closed contact. Programming step P4

- **Normally open contact**
  Output signal is preset as normally closed contact. Programming step P4

- **Fault - low-level signal**
  No differentiation between fault and low-level signal. Programming step P5

- **Output signal programmed as normally open contact**
  Intermittent low-level signal, functional faults as permanent signal (ON). Programming step P5

- **Output signal programmed as normally closed contact**
  Intermittent low-level signal, functional faults as permanent signal (OFF). Programming step P5

3.10 Displays in the programming mode S4 control PCB

- **Start phase SP**
  When being switched on the pump starts with a pause time. Programming step P6

- **Start stage SO**
  When being switched on the pump starts with the lubrication time. Programming step P6

- **Remaining pause time**
  Consists of 3 consecutive displays that change in a two second interval.
  - Display 1
  - Display 2
    Shows the remaining pause time in hours.
  - Display 3
    Shows the remaining pause time in minutes.

Example: 0110. Remaining pause time 1 hour and 10 minutes.
3. Overview, functional description

3.11 Displays in the display mode S4 control PCB

AC (Display 1)
Shows the number of automatically triggered operating cycles. Counter value 0-9999 (continuous). The display consists of 3 subsequent displays alternating in a two second interval.

Display 2
Shows the values in thousands and hundreds.

Display 3
Shows the values in tens and units.

Example: 0625 = 625 automatically triggered operating cycles.

3.12 Displays in the programming mode S4 control PCB

UC (Display 1)
Shows the number of manually triggered additional lubrication cycles. Counter value 0-9999 (continuous). The display consists of 3 subsequent displays alternating in a two second interval.

Display 2
Shows the values in thousands and hundreds.

Display 3
Shows the values in tens and units.

Example: 0110 = 110 manually triggered additional lubrication cycles.
3.13 Displays in the display mode S5/S6 control PCB

- **Ready for operation**
  - The pump is in the pause mode. There are no fault indications pending.

- **Pump is on**
  - The pump is in the operating mode. There are no fault indications pending.

- **Fault signal Er**
  - Too high back pressure
  - Control PCB defective
  - An unspecified error occurred during the monitoring time.

- **Fault signal EP**
  - A fault of the membrane keypad is pending.

3.14 Displays in the programming mode S5/S6 control PCB

- **Programming step P1**
  - In this programming step the hourly value of the pause time is set.

- **Programming step P2**
  - In this step the minute value of the pause time is set.

- **Programming step P3**
  - In this step the number of metering device cycles per operating cycle is set.

- **End of programming**
  - Programming has been completed. To adopt the values set the programming has to be confirmed with the green key 3.3 (see Fig. 13) within 30 seconds.

- **Remaining pause time**
  - Consists of 3 consecutive displays that change in a two second interval.

  - **Display 1**
    - Shows the remaining pause time in hours (displayed value x 100).

  - **Display 2**
    - Shows the remaining pause time in hours (displayed value x 1).

  Example: 0110. Remaining pause time = 110 hours.
## 4. Technical data

### 4.1 General technical data

<table>
<thead>
<tr>
<th>Pump variant</th>
<th>12 V DC</th>
<th>24 V DC</th>
<th>120 V AC 60 Hz</th>
<th>230 V AC 50 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissible operating temperature</td>
<td>-25 °C to 70 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure</td>
<td>205 bar max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation position</td>
<td>QLS 301 any&lt;sup&gt;1&lt;/sup&gt;</td>
<td>QLS 401 vertical (max. deviation ± 5 °)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication points</td>
<td>max. 18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sound pressure level</td>
<td>&lt; 70 dB (A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reservoir size</td>
<td>QLS 301</td>
<td>QLS 401</td>
<td>1 litre</td>
<td>1 litre or 2 litres</td>
</tr>
<tr>
<td>Filling</td>
<td>via hydraulic lubrication fitting R 1/4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of empty pump with SSV 12 metering device</td>
<td>approx. 6 kg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricants&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Lubricating greases NLGI II and NLGI III&lt;sup&gt;2&lt;/sup&gt;/ fluid greases NLGI 00, 000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output&lt;sup&gt;2&lt;/sup&gt;</td>
<td>approx. 0.12 ccm (per stroke)</td>
<td>approx. 1.0 ccm (per minute)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum pump run time</td>
<td>25 minutes (V AC)</td>
<td>15 minutes (V DC)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) also rotating installation, like e.g. in wind turbine generators. Maximum speed and maximum distance to the hub on request.

2) NLGI III lubricants may be supplied under certain operating conditions only. Therefore the lubricant’s supply characteristics have to be clarified with SKF in advance.

<table>
<thead>
<tr>
<th>Temperature [°C]:</th>
<th>-25 °C</th>
<th>-20 °C</th>
<th>+25 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>012 V DC Speed [rpm]</td>
<td>5.0</td>
<td>6.0 - 7.5</td>
<td>7.1 - 8.4</td>
</tr>
<tr>
<td>024 V DC Speed [rpm]</td>
<td>5.3 - 6.0</td>
<td>6.2 - 7.3</td>
<td>7.3 - 8.3</td>
</tr>
<tr>
<td>120 V AC Speed [rpm]</td>
<td>5.9 - 6.9</td>
<td>8.3</td>
<td>8.5 - 9.0</td>
</tr>
<tr>
<td>230 V AC Speed [rpm]</td>
<td>2.5 - 5.6</td>
<td>6.5 - 6.8</td>
<td>6.9 - 7.1</td>
</tr>
</tbody>
</table>

The stated speed depends on the back pressure and the temperature. Basically the following applies: the higher the back pressure and the lower the temperature, the lower is the speed.
## 4.2 Electrics:

<table>
<thead>
<tr>
<th></th>
<th>12 V DC</th>
<th>24 V DC</th>
<th>120 V AC (60 Hz)</th>
<th>230 V AC (50 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pump variant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IP protection class of bayonet plug</strong></td>
<td>6K9K</td>
<td>6K9K</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td><strong>Power supply with square plug (left side)</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Tolerance of input voltage</strong></td>
<td>-20 / + 30 %</td>
<td>-20 / + 30 %</td>
<td>±10 %</td>
<td>±10 %</td>
</tr>
<tr>
<td><strong>Current input (maximum)</strong></td>
<td>≤ 2 A</td>
<td>≤ 1 A</td>
<td>≤ 1 A</td>
<td>≤ 0.5 A</td>
</tr>
<tr>
<td><strong>Types of protection</strong></td>
<td>PELV</td>
<td>PELV</td>
<td>PELV</td>
<td>PELV</td>
</tr>
<tr>
<td><strong>Inputs</strong></td>
<td>protected against reverse polarity, short circuit proof, non-isolated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power supply with bayonet plug (left side)</strong></td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>Power supply and fault signal with bayonet plug (left side)</strong></td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>Fault signals with square plug (right side)</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Protective and disconnecting device required for isolation</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Switching voltage</strong></td>
<td>48 V AC / DC</td>
<td>48 V AC / DC</td>
<td>48 V AC / DC</td>
<td>48 V AC / DC</td>
</tr>
<tr>
<td><strong>IP protection class of bayonet plug</strong></td>
<td>65 / 67#</td>
<td>65 / 67#</td>
<td>65 / 67#</td>
<td>65/67#</td>
</tr>
<tr>
<td><strong>AC fault relay for low level signal and fault signals</strong></td>
<td>230 V AC</td>
<td>230 V AC</td>
<td>230 V AC</td>
<td>230 V AC</td>
</tr>
<tr>
<td><strong>maximum switched current</strong></td>
<td>5 A</td>
<td>5 A</td>
<td>5 A</td>
<td>5 A</td>
</tr>
<tr>
<td><strong>DC fault relay for low level signal and fault signals</strong></td>
<td>24 V DC</td>
<td>24 V DC</td>
<td>24 V DC</td>
<td>24 V DC</td>
</tr>
<tr>
<td><strong>maximum switched current</strong></td>
<td>5 A</td>
<td>5 A</td>
<td>5 A</td>
<td>5 A</td>
</tr>
<tr>
<td><strong>Residual ripple (DIN 41755)</strong></td>
<td>±5 %</td>
<td>±5 %</td>
<td>±5 %</td>
<td>±5 %</td>
</tr>
</tbody>
</table>

# IP 67 only for square plugs with prefabricated cable
4.3 Factory settings of pumps with S4 control PCB

<table>
<thead>
<tr>
<th>Programming step/ value</th>
<th>Factory setting</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Pause time in hours</td>
<td>6 hours</td>
<td>0-59 hours</td>
</tr>
<tr>
<td>P2 Pause time in minutes</td>
<td>0 minutes</td>
<td>0-59 minutes</td>
</tr>
</tbody>
</table>
| P3 Metering device cycles per operating cycle | 1 cycle | V DC pumps 1-5 cycles  
                           |             | V AC pumps 1-3 cycles  |
| P4 Signal output fault relay | no | NO contact / NC contact |
| P5 Differentiation of low-level signal and fault signal | -- | - (no differentiation) 
                           |             | -U (output signal as nc contact) 
                           |             | -Π (output signal as no contact) |
| P6 Start stage | SP | [SP] Pump starts with pause time 
                           |             | [SO] Pump starts with lubrication time |

Maximum runtime  
see chapter 4.1. not modifiable

Maximum adjustable pause time = 59 hours 59 minutes  
Minimum adjustable pause time V DC pump = 4 minutes  
Minimum adjustable pause time V AC pump = 20 minutes  
# For the V AC versions adhere to the following values in order to avoid pump failure due to exceeding the max. runtime:  
- in case of SSV 6 + 8 max. 3 cycles  
- in case of SSV 10 to SSV 18 max. 1 cycle
### 4.4 Factory settings of pumps with S5/ S6 control PCB

<table>
<thead>
<tr>
<th>Programming step/ value</th>
<th>Factory setting</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1/ P2 Pause time in hours</td>
<td>1600 h (P1=16; P=00)</td>
<td>2-9998 h</td>
</tr>
<tr>
<td>P3 Metering device cycles per lubrication cycle*</td>
<td>60 cycles (P3 = 60)</td>
<td>1-99 cycles</td>
</tr>
</tbody>
</table>

**Signal output**
- S5 NC normally closed contact
- S6 NO normally open contact
- not modifiable

**Differentiation of low-level signal and fault signal**
- no differentiation
- not modifiable

**Start stage**
- The pump starts with a pause time.
- not modifiable

**Maximum runtime**
- 15 minutes
- not modifiable

Maximum adjustable pause time between the lubrication cycles = 9998 hours; minimum adjustable pause time V DC and V AC pumps = 2 hours
Increment of pause time setting: P1 = 100 hours (example: 100 h, 200 h, 300 h); P2 = 2 hours (example: 2 h, 4 h, 6 h, 8 h)

*A lubrication cycle is completed as soon as the preset number of metering device cycles (P3) has been completed successfully. Between the individual metering device cycles there is a fixed interval pause of 4 minutes. During the interval pause the display shows the metering device cycles of the current lubrication cycle still to be carried out. During the interval pause no additional lubrication can be triggered, nor can parameters be changed or displayed.
If during the interval pause the power supply to the pump is interrupted, the interval pause will start from the beginning. In case of frequent interruptions during the interval pause this can result in the fact that no metering device cycle will be started anymore and thus the lubrication cycle cannot be completed. Reset the S5/S6 printed circuit board to the factory settings.
Switch off the power supply. Press the green and red keys simultaneously. Switch on power supply again. In the display there appears the fault low-level signal (see page 27) Release the green and red keys, Switch the power supply off and on again.
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 lubricants of NLGI class ≤ 0.

![Graph showing the limits of use for different NLGI classes and temperature ranges in °C and °F.](image-url)
4.7 Processing of the low-level signals in case of external controller and monitoring of the pump

The statements apply for pumps without control pcb with external control and monitoring by the operator.
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 ≥ 32 seconds:
- Each operating cycle requires at least 6 signals by the magnetic switch.

Operating cycle ≥ 24 seconds ≤ 32 seconds:
- Each operating cycle requires at least 4 signals by the magnetic switch.

Operating cycle ≤ 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

Adhere to the following tightening torques when installing or repairing the pump.

<table>
<thead>
<tr>
<th>Component</th>
<th>Torque (Nm ± Allows)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump with base plate, machine, or vehicle</td>
<td>18 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Metering device with QLS pump</td>
<td>9 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Pump element with pump housing</td>
<td>25 Nm ± 2 Nm</td>
</tr>
<tr>
<td>Outlet fitting on metering device</td>
<td></td>
</tr>
<tr>
<td>screw-in type</td>
<td>17 Nm ± 1 Nm</td>
</tr>
<tr>
<td>plug-in type</td>
<td>12 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Indicator pin fitting</td>
<td>18 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Closure screw (outlet)</td>
<td>15 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Closure screw (piston)</td>
<td>18 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Coupling nut on outlet fitting</td>
<td></td>
</tr>
<tr>
<td>Plastic tube</td>
<td>10 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Steel tube</td>
<td>11 Nm ± 1 Nm</td>
</tr>
<tr>
<td>Cover of pump housing</td>
<td>1.6 Nm ± 0.8 Nm</td>
</tr>
<tr>
<td>Reservoir with pump housing</td>
<td>1.6 Nm ± 0.1 Nm</td>
</tr>
</tbody>
</table>
4.9 Useable reservoir volume

The useable reservoir volume mainly depends on the NGLI consistency class and the operating temperature of the lubricant to be used. In case of high consistency and low operating temperature normally more lubricant sticks to the inner surfaces of the reservoir/pump and is thus no more available for being dispensed.

<table>
<thead>
<tr>
<th>Lubricants with relatively high consistency 4)</th>
<th>Useable reservoir volume</th>
<th>Lubricants with relatively low consistency 5)</th>
<th>Useable reservoir volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-litre reservoir without low level indication (XN)</td>
<td>approx. 0.5 litres</td>
<td>approx. 1.0 litres</td>
<td>approx. 0.6 to 0.9 litres</td>
</tr>
<tr>
<td>2-litre reservoir without low level indication (XN)</td>
<td>approx. 1.6 litres</td>
<td>approx. 2.0 litres</td>
<td>approx. 1.7 to 2.0 litres</td>
</tr>
</tbody>
</table>

4) Lubricant consistencies of NLGI 2 lubricants at +20 °C up to the maximum admissible lubricant consistency.
5) Lubricant consistencies of NLGI-000 lubricants at +70 °C up to lubricant consistencies of NLGI-1.5 lubricants at +20 °C.

4.10 Lubricant requirement for priming of an empty pump

To prime an empty pump up to the MAX marking of the reservoir, the following lubricant quantities are required.

<table>
<thead>
<tr>
<th>Reservoir size</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 litre</td>
<td>1.75 litres ± 0.15</td>
</tr>
<tr>
<td>2 litres</td>
<td>3.0 litres ± 0.10</td>
</tr>
</tbody>
</table>

When using lubricants of a relatively low consistency in pumps subjected to strong vibrations or tilting motions (e.g. construction and agricultural machinery), make sure to maintain a level that is about 25 mm below the MAX marking of the reservoir. This prevents lubricant from entering the reservoir vent. In case of very strong vibrations this value must be increased, for low vibrations it can be reduced. Changing the filling level by 10 mm corresponds to a volume change of about 0.2 litres.
4. Technical data

4.11 Type identification code QLS 301

<table>
<thead>
<tr>
<th>Identification code</th>
<th>Control PCBs</th>
</tr>
</thead>
<tbody>
<tr>
<td>P301 3 1 4 1 2 1 5 4</td>
<td>0</td>
</tr>
</tbody>
</table>

- **Basic type of pump**: P301
- **Metering devices**:
  - 0 = external metering device SSV 6-KNQLS, SSV 8-KNQLS
  - 1 = external metering device SSV 12-KNQLS, SSV 18-KNQLS
  - 3 = SSV 6 (rear-mounted)
  - 4 = SSV 8 (rear-mounted)
  - 6 = SSV 12 (rear- or bottom-mounted)
  - 9 = SSV 18 (rear- or bottom-mounted)
- **Assignment of metering device outlets**:
  - 0 = no metering device
  - 1 = vertical metering device outlets (V)
  - 2 = horizontal metering device outlets (H)
- **Supply voltage**:
  - 2 = 12 V DC (available with or without control PCB)
  - 4 = 24 V DC (available with or without control PCB)
  - 6 = 120 V AC (available with control PCB only)
  - 8 = 230 V AC (available with control PCB only)
- **Reservoir version**:
  - 1 = 1XL,3, (1-l reservoir with low-level indication)

* Connection types 1, 5, 6 can be combined with square plug version (1) only.
** Connection types 7, 8 can be combined with bayonet plug version (5) only.

Types of electrical connection:
- *with connection socket, without cable = 1
- *with connection socket and 10 m cable = 5
- *with connection socket and 10 m ADR cable = 6
- **with connection socket (bayonet) and 10 m cable = 7
- **with connection socket (bayonet) and 10 m ADR cable = 8

Connection socket design:
- *Square plug design A (industry) = 1
- **Bayonet plug 4-pole design (vehicles) = 5

Number of possible connections:
- 1 connection left side, power supply (V DC/V AC) 1A = 0
- 1 x right side for external low-level or fault indication square plug, industrial applications

951-171-003
Version 09
4. Technical data

4.12 Type identification code QLS 401

<table>
<thead>
<tr>
<th>Identification code</th>
<th>Control PCBs</th>
</tr>
</thead>
<tbody>
<tr>
<td>P401 3 1 4 0 1 1 5 4</td>
<td>Control PCB S4 for 12/24 V DC = 4</td>
</tr>
<tr>
<td></td>
<td>NC and NO contacts programmable 1-5 cycles</td>
</tr>
<tr>
<td></td>
<td>Control PCB S4 for 120/230 VAC = 4</td>
</tr>
<tr>
<td></td>
<td>NC and NO contacts programmable</td>
</tr>
<tr>
<td></td>
<td>1-3 cycles (SSV 6/SSV 8) 1 cycle (SSV 12/SSV 18)</td>
</tr>
<tr>
<td></td>
<td>Control PCB S5 for 12/24 V DC NC contact signal = 5*</td>
</tr>
<tr>
<td></td>
<td>Control PCB S5 for 120/230 VAC NC contact signal = 5*</td>
</tr>
<tr>
<td></td>
<td>1-3 cycles (SSV 6/SSV 8) 1 cycle (SSV 12/SSV 18)</td>
</tr>
<tr>
<td></td>
<td>Control PCB S6 for 12/24 V DC NO contact signal = 6**</td>
</tr>
<tr>
<td></td>
<td>Control PCB S6 for 120/230 VAC NO contact signal = 6**</td>
</tr>
<tr>
<td></td>
<td>1-3 cycles (SSV 6/SSV 8) 1 cycle (SSV 12/SSV 18)</td>
</tr>
</tbody>
</table>

Supply voltage

2 = 12 V DC (available with or without control PCB)
4 = 24 V DC (available with or without control PCB)
6 = 120 V AC (available with control PCB only)
8 = 230 V AC (available with control PCB only)

Reservoir version

0 = 1XN (1-l reservoir without low-level indication)
1 = 1XL, 3, (1-l reservoir with low-level indication)
2 = 2XN (2-l reservoir without low-level indication)
3 = 2XL, 3, (2-l reservoir with low-level indication)

* Connection types 1, 5, 6 can be combined with square plug version (1) only.
** Connection types 7, 8 can be combined with bayonet plug version (5) only.
# Control PCBs can be combined with XN reservoir versions only.

Types of electrical connection

* with connection socket, without cable = 1
* with connection socket and 10 m cable = 5
** with connection socket and 10 m ADR cable = 6
** with connection socket (bayonet) and 10 m ADR cable = 8

Connection socket design

* Square plug design A (industry) = 1
** Bayonet plug 4-pole design (vehicles) = 5

Number of possible connections

1 connection left side, power supply (V DC/ V AC) 1A = 0
Square plug, industrial applications
1 connection left side, power supply (V DC) 1A = 2
Low-level or fault indication, bayonet plug, vehicles only
2 connections, 1 x left side for power supply (V DC/ V AC) 2A = 1
1 x right side for external low-level or fault indication
Square plug, industrial applications
4.13 Type identification code QLS 401 SSVDV

Identification code

<table>
<thead>
<tr>
<th>P401</th>
<th>SSVDV16</th>
<th>AAAABBBB</th>
<th>24DC</th>
<th>1XN</th>
<th>2A</th>
<th>1</th>
<th>5</th>
<th>S4</th>
</tr>
</thead>
</table>

**Basic type of pump**
P401

**Metering devices**
- SSVDV 6 (rear-mounted, vertical outlets (V))
- SSVDV 12 (rear-mounted, vertical outlets (V))
- SSVDV 16 (rear-mounted, vertical outlets (V))

**Metering screws per pair of outlets**
- A = 0.08 cc
- B = 0.14 cc
- C = 0.20 cc
- D = 0.30 cc
- E = 0.40 cc
- F = 0.60 cc
- G = 0.80 cc
- H = 1.00 cc
- I = 1.40 cc
- J = 1.80 cc

Marks the mounted metering screws per pair of outlets, starting with the highest pair of outlets. The number of metering screws in the identification code corresponds to half of the metering device's outlets.

**Supply voltage**
- 12 V DC (available with or without control PCB)
- 24 V DC (available with or without control PCB)

**Reservoir version**
- 1XN (1L reservoir without low-level indication)
- 1XL (1L reservoir with low-level indication)
- 2XN (2L reservoir without low-level indication)
- 2XL (2L reservoir with low-level indication)

* Connection types 1, 5, 6 can be combined with square plug version (1) only.
** Connection types 7, 8 can be combined with bayonet plug version (5) only.

**Types of electrical connection**
- *with connection socket, without cable = 1
- *with connection socket and 10 m ADR cable = 6
- **with connection socket (bayonet) and 10 m ADR cable = 8

**Connection socket design**
- *Square plug design A (industry) = 1
- **Bayonet plug 4-pole design (vehicles) = 5

**Number of possible connections**
- 1 connection left side, power supply = 1A
- 2 connections, 1 x left side for power supply = 2A
- 1 x right side for external low-level or fault indication square plug

This pump type allows for V DC variants only.
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, 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 devices**
- 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.
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 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.
6.3 Minimum assembly dimensions

Ensure sufficient space for maintenance work or for a possible disassembly of the product by leaving a free space of at least 50 mm into each direction in addition to the stated dimensions.

Minimum assembly dimensions Fig. 9

A = height 230 mm (1-l reservoir)
A = height 313 mm (2-l reservoir)
B = width 237 mm
C = depth 215 mm

7) in case of bottom-mounted metering device + 40 mm
8) in case of rear-mounted SSVDV metering device + 20 mm
6.4 Connection dimensions

The pump is fastened on the two mounting bores. Fastening is done by means of the fastening material included in the scope of delivery.
2 x M8 screw
2 x M8 nut (self-locking)
2 x washer

Tightening torque = 18 Nm ± 1 Nm

Connection dimensions
E = hole distance 146 mm
F = height 110 mm
6.5 Electrical connection

Electrical connections must be done in such way that no forces are transferred to the product (tension-free connection). For electrical connection proceed as follows:

Square plug
- Use adequate cable to configure square plug without cable. For connection of the cable, see wiring diagram on square plug or corresponding wiring diagram in these Instructions (see chapter 12).
- Remove protective caps from the electrical connections of the pump.
- Place plugs with sealing onto connections and fasten them by means of a screw.

Bayonet plug
- Remove protective caps from the electrical connections of the pump.
- Place plugs onto connections and fasten them by turning them.
- In case of the bayonet plugs prefabricated by the operator, pin assignment is done in accordance with the wiring diagram in these Instructions (see chapter 12).

NOTE
Observe the electrical characteristics (see chapter 4).
6.6 Priming of pumps without follower plate

To prime the pump proceed as follows:

- Position bin below the pump to collect leaking lubricant.
- Screw out the yellow transport locks (12) from the metering device outlets.
- Close unneeded outlets of the metering device with closure screws.
- Place filling connection of grease gun or transfer pump onto filler fitting (2).
- Fill reservoir with lubricant until the MAX marking (Fig. 20). To do so, observe the notes contained in chapter 4.8.
- Press key (3.1) to let the pump run until lubricant leaks from the open outlets of the metering device.
- Switch the pump off.
- Remove lubricant collecting bin and dispose of leaked lubricant in an ecologically sound manner.

The pump is now ready for operation with the factory settings or can be adapted accordingly by changing the relevant parameters (programming).
6.7 Priming of the QLS 301 with follower plate

**NOTICE**

Risk of damage to the superior machine due to wrong priming. Avoid air pockets in the lubricant and under the follower plate. This may affect the pump’s suction behaviour and result in a poor or lacking output performance.

**NOTICE**

Damage to the pump

Make sure that no dirt enters the reservoir during the filling procedure. Do not overfill the reservoir. Consider lubricant expansion by increased temperature (important, e.g. for storage or transport of the pump) or by pressure relief after the filling procedure (reservoir vent clogged by lubricant).

To prime an empty QLS 301 proceed as follows:

- Unscrew Allen key M5 (1.2) out of the reservoir axis and keep it for further usage together with the below sealing ring.
- Remove reservoir (1) upwards. If necessary, slightly loosen reservoir on the side close to the reservoir centering device (1.1) by means of a blunt tool.
- Remove the spring (1.3).
6. Installation

- Position grease gun on filler fitting (2).
- Press follower plate (13) downward onto the pump housing.
- Fill pump until follower plate (1.1) starts lifting and some lubricant leaks out from the side (see Fig. 25).
- Slightly grease sealing lip (13.1) of follower plate with the leaking lubricant.
- Position spring (1.3) on reservoir axis again.
- Manually press reservoir over the O-ring completely downwards. Ensure that the reservoir centering device (see Fig. 22) is firmly seated in the corresponding recess of the pump housing.
- Use Allen key M5 (1.4) to screw reservoir together with washer onto the reservoir axis again.

**Tightening torque = 1.6 Nm ± 0.1 Nm**

- Fill reservoir until shortly below the MAX marking.
- Remove possible contaminations from the reservoir outside.
6.8 Programming of control PCB S4

To program QLS pumps with control pcb S4 proceed according to the following programming scheme.

Simultaneously press key 3.2 and key 3.3 for about 4 seconds to access the first programming step P1. After releasing the keys the adjusted value will be displayed. Change the value of the programming step by pressing key 3.3.

Confirm adjusted value within 30 seconds by pressing key 3.2. Otherwise the value will be lost.

Programming is continued with programming step P2. After confirming the last step P6 the programming is completed.

Programming steps
P1/ P2 Setting of the pause time in hours
P1/ P2 Setting of the pause time in minutes
P3 Setting of the metering device cycles
P4 Setting of the output signal on the monitoring relay
P5 Setting of the differentiation between fault and low-level signal
P6 Setting of the start stage

A = Programming step
B = Possible value
C = Change value by pressing the key
D = Possible new value
E = Confirm adjusted value within 30 seconds by pressing key 3.2 and continue with the next programming step. Confirm and finish the programming by pressing key 3.3 after the last programming step.

Notes related to the programming
Settings can be done in one direction only (+)
Fast forward by holding down key 3.3.

Programming scheme of control printed circuit board S4 Fig. 20

---

---
6.9 Programming of control PCBs S5 and S6

To program QLS pumps with control PCB S5/S6 proceed according to the following programming scheme.

- Simultaneously press key 3.2 and key 3.3 to access the first programming step P1. After releasing the keys the adjusted value will be displayed.
- Change the value of the programming step by pressing key 3.3.
- Confirm the changed value.

Programming is continued with programming step P2.

- Change the value of the programming step by pressing key 3.3.
- Confirm the changed value.

Programming is continued with programming step P3.

- Change the value of the programming step by pressing key 3.3.
- Confirm the changed value.

After confirming this step the programming is completed.

**Programming steps**

P1 Setting of the pause time in steps of 100 hours (display x 100)

P2 Setting of the pause time in steps of 2 hours (display x 2)

P3 Setting of the metering device cycles per operating cycle

A = Programming step  
B = Possible value  
C = Change value by pressing the key  
D = Possible new value  
E = Confirm adjusted value within 30 seconds by pressing key 3.2 and continue with the next programming step. Confirm and finish the programming by pressing key 3.3 after the last programming step.

**Notes related to the programming**

Settings can be done in one direction only (+)  
Fast forward by holding down key 3.3.
6.10 Feed lines

**CAUTION**
Risk of falling
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. Installation

6.11 Connection of the lubrication lines

To connect the lubrication lines the following lubrication lines and push-in type fittings should be used.
○ Check valve with knurled standard collet
○ Pressure plastic tube

As an option also the following parts can be used for the high-pressure range.
○ Check valve with reinforced smooth collet
○ High-pressure hose

The inlet and outlet fittings of the main metering device belong to the high-pressure range. All other lubrication lines and fittings on secondary metering devices belong to the low-pressure range.

In construction and agricultural machinery all lubrication lines and fittings belong to the high-pressure range.

6.12 Maximum length of lubrication lines

The maximum lengths of the lubrication lines depends on the back pressure in the system and is restricted by the nominal pressure of the pressure control valve in the pump.

The back pressure is influenced mainly by the following factors:
○ NLGI class of the lubrication grease used
○ Suitability of the lubrication grease used for the actual operating temperature (e.g. low-temperature grease).
○ Lubrication line diameter
○ Pressure in the bearing / at the lubrication point
6.13 Mounting of screw sleeves and hose studs

Check valves with reinforced collet may be connected only to high-pressure hoses with screw sleeves and hose studs.

To carry out the assembly proceed as follows:

- Turn screw sleeve (14) clockwise onto the high-pressure hose until measure 11 mm is reached.
- Oil screw sleeve and inside of high-pressure hose.
- Screw hose stud (16) into screw sleeve (12).
7. Start-up

7.1 General information
Start-up of the fully and correctly mounted QLS pump is effected via the machine contact or the driving switch. If “EP”, “Er” is displayed after switching the pump on, a fault is pending.

NOTE
S4 control printed circuit board:
If the power supply is interrupted within 1 minute from switching the pump on, after switching the pump on again the pause time starts from the beginning.

If the power supply is interrupted after 1 minute from switching the pump on, after switching the pump on again the pause time will continue from where it had been interrupted.

S5/S6 control printed circuit board:
In case of an interruption of the power supply only the full hour values will be stored as pause time.

The minutes values will be lost (max. loss = 59 minutes per interruption of the power supply). In case of frequent interruptions of the power supply, the actual pause time may differ significantly from the preset pause time.

7.2 Triggering an additional lubrication cycle
To trigger an additional lubrication cycle proceed as follows:
• Press the reset key (3.3) for > 2 seconds.
• The pump starts a lubrication cycle. At the same time the pause time already lapsed is reset.
• In the display there appears the symbol "Pump on".

NOTE
S4 control PCB: The duration of the additional lubrication corresponds to the preset number of metering device cycles per lubrication cycle.

S5/S6 control PCB:
The duration of the additional lubrication corresponds to one metering device cycle.
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.

### Start-up check list

#### 7.3 Inspections prior to initial start-up

<table>
<thead>
<tr>
<th>Description</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical connection carried out correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical connections carried out correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The performance data of the previously indicated connections correspond to the specifications stated in the Technical data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All components, such as lubrication lines and metering devices, have been correctly installed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product protected with adequate pressure control valve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No visible damage, contamination and corrosion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any dismantled protection and monitoring equipment has been reassembled and checked for correct function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All warning labels on the product are available and in proper condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The lubrication and pause times adjusted on the control PCB correspond to the planned lubrication and pause times</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 7.4 Inspections during initial start-up

<table>
<thead>
<tr>
<th>Description</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>No unusual noises, vibrations, accumulation of moisture, or odours present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No unwanted escape of lubricant (leakages) from connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricant is supplied free from bubbles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bearings and friction points are provided with the planned amount of lubricant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

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 timelines 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.

**Maintenance check list**

<table>
<thead>
<tr>
<th>Activity to be done</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical connection carried out correctly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical connections carried out correctly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The performance data of the previously indicated connections correspond to the specifications stated in the Technical data</td>
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<td></td>
</tr>
<tr>
<td>All components, such as lubrication lines and metering devices, have been correctly installed</td>
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<td></td>
</tr>
<tr>
<td>No unusual noises, vibrations, accumulation of moisture, or odours present</td>
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<tr>
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</tr>
<tr>
<td>Lubricant is supplied free from bubbles</td>
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<td></td>
</tr>
<tr>
<td>Bearings and friction points are provided with the planned amount of lubricant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 11. Troubleshooting

### Fault messages in case of pumps with controller

<table>
<thead>
<tr>
<th>Fault message on the display</th>
<th>Meaning</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Fault signal LI            | ○ Pre-warning empty  
                               ○ There is little lubricant available. The display alternates with "pump is on". | ○ Fill reservoir |
| Fault signal LL            | ○ Low-level indication  
                               ○ No lubricant available any more. The pump still completes the current lubrication cycle. A restart can take place only after refilling the reservoir. | ○ Fill reservoir |
| Fault signal EP            | ○ Fault of the membrane keypad or  
                               ○ fault of the display | ○ Replace membrane keypad  
                               ○ Replace control printed circuit board |
| Fault signal Er            | ○ Too high back pressure  
                               ○ Control PCB defective  
                               ○ An unspecified error occurred during the monitoring time. | ○ If possible, use a more suitable lubrication grease and reduce line length  
                               ○ Replace control PCB  
                               ○ Let an electrician check the pump and replace pump, if necessary |

If the fault cannot be determined and remedied, please contact our Service department.
## Mechanical faults on pumps with and without controller

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause/ recognizability of fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pockets in the lubricant or lubrication system</td>
<td>○ Visual check for bubbles in the lubricant</td>
<td>○ Vent lubricant (if required, trigger several additional lubrication cycles)</td>
</tr>
<tr>
<td>Reservoir vent is clogged</td>
<td>○ Visually check whether there is lubricant in the reservoir vent.</td>
<td>○ Remove lubricant from the reservoir venting device</td>
</tr>
<tr>
<td>Suction bore of pump element is clogged.</td>
<td>○ After disassembling the pump element</td>
<td>○ Disassemble and clean the pump elements.</td>
</tr>
<tr>
<td>Piston of pump element is worn</td>
<td>○ Too low pressurization</td>
<td>○ Replace the pump element</td>
</tr>
<tr>
<td>Defective check valve in the pump element</td>
<td>○ Lubricant leaking from the pressure reducing valve</td>
<td>○ Replace pressure relief valve. Check the lubrication point and the SSV metering device and remedy fault, if necessary.</td>
</tr>
<tr>
<td>Defective pressure relief valve</td>
<td>○ Lubricant leaking from the pressure reducing valve</td>
<td>○ Replace pressure relief valve. Check the lubrication point and the SSV metering device and remedy fault, if necessary.</td>
</tr>
<tr>
<td>Blockade on a lubrication point or in the SSV metering device</td>
<td>○ Lubricant leaking from the pressure reducing valve</td>
<td>○ Replace pressure relief valve. Check the lubrication point and the SSV metering device and remedy fault, if necessary.</td>
</tr>
</tbody>
</table>

If the fault cannot be determined and remedied, please contact our Service department.
### Mechanical faults on pumps with and without controller

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause/ recognizability of fault</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Lubricant volume on one or more lubrication points deviates from projected values | ○ Wrong setting of pause time or number of metering device cycles  
○ Wrong cross-porting of outlets on the SSV metering device  
○ Wrongly adjusted SSVDV metering device | ○ Check and, if necessary, correct pause time settings and metering device cycles  
○ Check and, if necessary, correct cross-porting of outlets  
○ Check metering screws and replace them, if necessary |
| Pump is permanently on/ Pump does not switch off | ○ Indicator pin on metering device does not move within switching distance of proximity switch or indicator pin is not positioned centrically in front of proximity switch | ○ Check position and distance of indicator pin (distance < 0.5 mm) and correct, if necessary |

If the fault cannot be determined and remedied, please contact our Service department.
### Electrical faults in case of pumps with controller

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause/ recognizability of fault</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| Power supply to pump interrupted   | ○ Recognizable - pump display is off. Fault in the superior machine/vehicle.  
○ External fuse defective  
○ Plug (A1) of power supply not mounted to pump correctly | ○ See documentation of the superior machine or vehicle  
○ Check the external fuse and replace, if necessary.  
○ Check correct fastening of plug (A1) and correct, if necessary. |
| Power supply interrupted from control PCB to motor | ○ Pump display is off | ○ Check power supply from the control PCB to the motor and correct, if necessary. |
| Motor does not run despite circulating segmented display | ○ Defective motor connection | ○ Check motor connection following the corresponding circuit diagram. |
| Motor defective                    | ○ After triggering an additional lubrication pump does not run despite external power supply and control PCB | ○ Replace pump |

If the fault cannot be determined and remedied, please contact our Service department.
## Electrical faults in case of pumps without controller

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause/ recognizability of fault</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply to pump interrupted</td>
<td>○ After triggering an additional lubrication via an external controller pump does not run&lt;br&gt;○ Fault of the superior machine or vehicle.&lt;br&gt;○ External fuse defective&lt;br&gt;○ Plug (A1) of power supply not mounted to pump correctly</td>
<td>○ See documentation of the superior machine or vehicle&lt;br&gt;○ Check the external fuse and replace, if necessary.&lt;br&gt;○ Check correct fastening of plug (A1) and correct, if necessary.</td>
</tr>
<tr>
<td>Pump runs, but does not supply lubricant</td>
<td>○ Fault in one or several downstream lubrication circuits or bearing points&lt;br&gt;&lt;br&gt;○ Metering device blocked</td>
<td>○ Loosen lubrication feed lines on the metering device one after the other to determine the location of the blockade. The blockade is located behind the outlet from which lubricant leaks.&lt;br&gt;○ Replace metering device by a new one.</td>
</tr>
<tr>
<td>Deviating amount of lubricant at the lubrication point</td>
<td>○ Wrong cross-porting of outlets of the metering device&lt;br&gt;&lt;br&gt;○ Use of wrong metering screws with the SSVDV metering devices</td>
<td>○ Check metering device and correct, if necessary.&lt;br&gt;&lt;br&gt;○ Check metering device and correct, if necessary.</td>
</tr>
<tr>
<td>Motor defective</td>
<td>○ After triggering an additional lubrication pump does not run despite existing power supply</td>
<td>○ Replace pump, if necessary.</td>
</tr>
</tbody>
</table>

If the fault cannot be determined and remedied, please contact our Service department.
12. Repairs

12.1 Replacement of the membrane keypad

To replace the membrane keypad proceed as follows:

- Switch the pump off and disconnect it from the electrical grid. Loosen fitting (5.1) on plug (A1) and remove plug.
- Unscrew the cover of the pump housing on the four screws (11) and carefully remove the cover downwards.
- Carefully lift the control printed circuit board (10) from bottom to top out of the bracket in the cover until the blue plug (10.1) of the control printed circuit board is easily accessible.
- Remove blue plug from the control printed circuit board.
- Carefully loosen the adhesive membrane keypad from the housing and remove it together with the connection cable.

**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.

Replacement of membrane keypad Fig. 26
12. Repairs

Replacement of membrane keypad Fig. 27

- Guide the connection cable of the new membrane keypad from the front through the opening for the membrane keypad in the housing and plug it onto the corresponding port of the control printed circuit board. Ensure that the plug is oriented correctly.
- Carefully insert control printed circuit board in the bracket.
- Stick new membrane keypad onto housing.
- Mount cover of pump housing with four new microencapsulated screws (11).

**Tightening torque = 1.6 Nm + 0.8 Nm**

- Remount plug A1 to connect the pump to the power grid.

12.2 Tests after replacement of the control PCB

After replacement of the control PCB carry out an electrical safety test according to ISO 60204-1.

**Filing**

After the replacement of the control PCB the scope and findings of the test have to be recorded in writing and handed over for filing to the person responsible for machine operation.
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 of the QLS system may be used exclusively for replacement of identical defective parts. Modifications (except from metering screws) with spare parts on existing products are not allowed.

14.1 SSV metering devices

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of QLS 301/QLS 401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSV metering device 8 K bottom-mounted*</td>
<td>1</td>
<td>619-37586-1</td>
</tr>
<tr>
<td>SSV metering device 10 K bottom-mounted*</td>
<td>1</td>
<td>619-37776-6</td>
</tr>
<tr>
<td>SSV metering device 12 K bottom-mounted*</td>
<td>1</td>
<td>619-37587-1</td>
</tr>
<tr>
<td>SSV metering device 14 K bottom-mounted*</td>
<td>1</td>
<td>619-37776-7</td>
</tr>
<tr>
<td>SSV metering device 16 K bottom-mounted*</td>
<td>1</td>
<td>619-37776-8</td>
</tr>
<tr>
<td>SSV metering device 18 K bottom-mounted*</td>
<td>1</td>
<td>619-37588-1</td>
</tr>
<tr>
<td>SSV metering device 6 K rear-mounted*</td>
<td>1</td>
<td>619-37589-1</td>
</tr>
<tr>
<td>SSV metering device 08 K rear-mounted*</td>
<td>1</td>
<td>619-37782-1</td>
</tr>
<tr>
<td>SSV metering device 12 K rear-mounted*</td>
<td>1</td>
<td>619-37590-1</td>
</tr>
<tr>
<td>SSV metering device 18 K rear-mounted*</td>
<td>1</td>
<td>619-37591-1</td>
</tr>
<tr>
<td>SSV 06 KN QLS external connection#</td>
<td>1</td>
<td>619-28945-1</td>
</tr>
<tr>
<td>SSV 08 KN QLS external connection#</td>
<td>1</td>
<td>619-28946-1</td>
</tr>
<tr>
<td>SSV 10 KN QLS external connection#</td>
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<td>619-28949-1</td>
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<tr>
<td>SSV 12 KN QLS external connection#</td>
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<td>619-28950-1</td>
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<tr>
<td>SSV 14 KN QLS external connection#</td>
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<td>619-28951-1</td>
</tr>
<tr>
<td>SSV 16 KN QLS external connection#</td>
<td>1</td>
<td>619-28952-1</td>
</tr>
<tr>
<td>SSV 18 KN QLS external connection#</td>
<td>1</td>
<td>619-28953-1</td>
</tr>
<tr>
<td>SSV 22 KN QLS external connection#</td>
<td>1</td>
<td>619-77131-1</td>
</tr>
</tbody>
</table>

* including indicator pin
# including indicator pin and sensor

14.2 SSVDV metering device

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of QLS 401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSVDV metering device 6 rear-mounted*</td>
<td>1</td>
<td>649-77599-1</td>
</tr>
<tr>
<td>SSVDV metering device 10 rear-mounted*</td>
<td>1</td>
<td>649-77600-1</td>
</tr>
<tr>
<td>SSVDV metering device 12 rear-mounted*</td>
<td>1</td>
<td>649-77601-1</td>
</tr>
<tr>
<td>SSVDV metering device 16 rear-mounted*</td>
<td>1</td>
<td>649-77602-1</td>
</tr>
</tbody>
</table>
### 14.3 Metering screws for SSVDV metering devices

<table>
<thead>
<tr>
<th>Code</th>
<th>Length</th>
<th>Metered volume</th>
<th>Qty</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>008 / A</td>
<td>46.7 mm</td>
<td>0.08 cc/ stroke</td>
<td>12</td>
<td>549-34254-1</td>
</tr>
<tr>
<td>014 / B</td>
<td>45.9 mm</td>
<td>0.14 cc/ stroke</td>
<td>12</td>
<td>549-34254-2</td>
</tr>
<tr>
<td>020 / C</td>
<td>44.7 mm</td>
<td>0.20 cc/ stroke</td>
<td>12</td>
<td>549-34254-3</td>
</tr>
<tr>
<td>030 / D</td>
<td>42.7 mm</td>
<td>0.30 cc/ stroke</td>
<td>12</td>
<td>549-34254-4</td>
</tr>
<tr>
<td>040 / E</td>
<td>40.7 mm</td>
<td>0.40 cc/ stroke</td>
<td>12</td>
<td>549-34254-5</td>
</tr>
<tr>
<td>060 / F</td>
<td>36.7 mm</td>
<td>0.60 cc/ stroke</td>
<td>12</td>
<td>549-34254-6</td>
</tr>
<tr>
<td>080 / G</td>
<td>32.7 mm</td>
<td>0.80 cc/ stroke</td>
<td>12</td>
<td>549-34254-7</td>
</tr>
<tr>
<td>100 / H</td>
<td>28.7 mm</td>
<td>1.00 cc/ stroke</td>
<td>12</td>
<td>549-34254-8</td>
</tr>
<tr>
<td>140 / I</td>
<td>20.8 mm</td>
<td>1.40 cc/ stroke</td>
<td>12</td>
<td>549-34254-9</td>
</tr>
<tr>
<td>180 / J</td>
<td>12.8 mm</td>
<td>1.80 cc/ stroke</td>
<td>12</td>
<td>549-34255-1</td>
</tr>
</tbody>
</table>

Set of respectively 2 metering screws of all sizes

<table>
<thead>
<tr>
<th>Qty</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>549-34255-2</td>
</tr>
</tbody>
</table>

### 14.4 Kit of seals

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasket set for QLS 301 (without figure)</td>
<td>1</td>
<td>550-36979-8</td>
</tr>
<tr>
<td>Gasket set for QLS 401 (without figure)</td>
<td>1</td>
<td>550-34178-1</td>
</tr>
</tbody>
</table>
### 14.5 Membrane keypad

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of QLS 301/QLS 401 with controller</td>
<td>1</td>
<td>236-14340-8</td>
</tr>
<tr>
<td>Adhesive membrane keypad</td>
<td>1</td>
<td>236-14340-8</td>
</tr>
</tbody>
</table>

### 14.6 Pump element

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump element D6</td>
<td>1</td>
<td>650-28856-1</td>
</tr>
</tbody>
</table>

### 14.7 Adapter M22 x 1.5

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter M22 x 1.5 with lubrication fitting</td>
<td>1</td>
<td>519-33959-1</td>
</tr>
</tbody>
</table>

### 14.8 Push-in type fittings with check valve

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push-in type fitting RVM 6510-6 M10x1-S</td>
<td>1</td>
<td>226-10337-3</td>
</tr>
<tr>
<td>Push-in type fitting RVM 6511-6 M10x1-S01</td>
<td>1</td>
<td>226-14091-4</td>
</tr>
<tr>
<td>Push-in type fitting WRVM 6521-6 M10x1-S01</td>
<td>1</td>
<td>226-14091-8</td>
</tr>
</tbody>
</table>
14.9 reservoir

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of QLS 301/QLS 401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transparent 1-l reservoir with sealing and labels (QLS 301/401)</td>
<td>1</td>
<td>550-36979-2</td>
</tr>
<tr>
<td>Use of QLS 401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transparent 2-l reservoir with sealing and labels (QLS 401)</td>
<td>1</td>
<td>550-34179-4</td>
</tr>
</tbody>
</table>

14.10 Housing cover replacement kit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of QLS 301/QLS 401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of connection 1A1 V DC/square plug/bottom-mounted metering device</td>
<td>1</td>
<td>550-34178-5</td>
</tr>
<tr>
<td>Type of connection 2A1 V DC/square plug/bottom-mounted metering device</td>
<td>1</td>
<td>550-34178-4</td>
</tr>
<tr>
<td>Type of connection 1A1 V AC/square plug/bottom-mounted metering device</td>
<td>1</td>
<td>550-34178-3</td>
</tr>
<tr>
<td>Type of connection 2A1 V AC/square plug/bottom-mounted metering device</td>
<td>1</td>
<td>550-34178-2</td>
</tr>
<tr>
<td>Use of QLS 301/QLS 401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of connection 1A1 V DC/bayonet plug/bottom-mounted metering device</td>
<td>1</td>
<td>550-34179-3</td>
</tr>
</tbody>
</table>

A replacement kit consists of: Housing cover including membrane, membrane keypad, housing sealing, plug for feed line including protective cap, corresponding number of microencapsulated housing screws and required adhesive labels.
### 14.11 V DC motors

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 V DC pump motors with motor connection cable</td>
<td>1</td>
<td>550-36982-1</td>
</tr>
<tr>
<td>24 V DC pump motors with motor connection cable</td>
<td>1</td>
<td>550-36982-2</td>
</tr>
</tbody>
</table>

### 14.12 Electrical connections

<table>
<thead>
<tr>
<th>Designation</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square plug with connection socket (black) with 10 m cable (4-wire)</td>
<td>1</td>
<td>664-36078-7</td>
</tr>
<tr>
<td>Square plug with connection socket (grey) with 10 m cable (4-wire)</td>
<td>1</td>
<td>664-36078-9</td>
</tr>
<tr>
<td>Bayonet plug with connection socket with 10 m cable (4-wire)</td>
<td>1</td>
<td>664-34045-1</td>
</tr>
</tbody>
</table>

### 14.13 Control PCB replacement kit

<table>
<thead>
<tr>
<th>Version</th>
<th>voltage</th>
<th>Jumper</th>
<th>Qty.</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>S4</td>
<td>120 V AC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-1</td>
</tr>
<tr>
<td>S4</td>
<td>120 V AC</td>
<td>YES</td>
<td>1</td>
<td>550-34199-2</td>
</tr>
<tr>
<td>S4</td>
<td>230 V AC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-3</td>
</tr>
<tr>
<td>S4</td>
<td>230 V AC</td>
<td>YES</td>
<td>1</td>
<td>550-34199-4</td>
</tr>
<tr>
<td>S4</td>
<td>12/24 V DC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-5</td>
</tr>
<tr>
<td>S5</td>
<td>12/24 V DC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-6</td>
</tr>
<tr>
<td>S5</td>
<td>230 V AC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-7</td>
</tr>
<tr>
<td>S6</td>
<td>12/24 V DC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-8</td>
</tr>
<tr>
<td>S6</td>
<td>230 V AC</td>
<td>NO</td>
<td>1</td>
<td>550-34199-9</td>
</tr>
<tr>
<td>S6</td>
<td>120 V AC</td>
<td>YES</td>
<td>1</td>
<td>550-85207-1</td>
</tr>
</tbody>
</table>

A replacement kit consists of: Control PCB, housing sealing, corresponding number of microencapsulated housing screws and service instructions for replacement of control PCB.
15. Circuit diagrams

15.1 Legend

<table>
<thead>
<tr>
<th>Cable colours following IEC 60757</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abbreviation</strong></td>
</tr>
<tr>
<td>BK</td>
</tr>
<tr>
<td>BN</td>
</tr>
<tr>
<td>BU</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abbreviation</strong></td>
</tr>
<tr>
<td>X1</td>
</tr>
<tr>
<td>X2</td>
</tr>
<tr>
<td>X6</td>
</tr>
<tr>
<td>X9</td>
</tr>
<tr>
<td>CS</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>FE</td>
</tr>
<tr>
<td>PE</td>
</tr>
<tr>
<td>F1</td>
</tr>
<tr>
<td>F2</td>
</tr>
</tbody>
</table>
15.2 Core assignment of the connection plugs

<table>
<thead>
<tr>
<th>Core assignment of connection A1 / X1</th>
<th>Core assignment of connection A2 / X2</th>
<th>Core assignment of connection A1 / X1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Pin 2</td>
<td>Pin 3</td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>RD</td>
<td>BN</td>
<td>BK</td>
</tr>
</tbody>
</table>

Square plug
EN 175301-803 / DIN 43650 / A

Bayonet plug ISO 15170-1

15.3 Assignment of circuit diagrams to the pump

Assignment of the circuit diagrams to a certain pump is done via the characteristics given in the type identification code

Item 4  Power supply
Item 7  Connecting socket version
Item 9  Control pcb

If the indications of the type identification code correspond to those of the circuit diagram, then the circuit diagram applies. For type identification code see the pump’s type identification plate.
15.4 Circuit diagram 12/24 V DC, with square plug and control PCB S4

12/24 VDC with
Control circuit board

[ U ]: 12/24 VDC
[ P ]: 36 W

Valid for type identification code
PXXX-X-X-2/4-X-X-1-X-4
15.5 Circuit diagram 120 V AC, with square plug and control PCB S4

- X1.2 Female plug (BK)
- X1.1 Built-in male plug
- X3.2 Male plug
- X3.1 Built-in female plug
- X2.1 Built-in male plug
- X2.2 Female plug (GY)

Valid for type identification code PXXX-X-X-X-X-X-1-X-4

120VAC (60Hz) with Control circuit board

- U: 120VAC 60Hz
- S: 120 VA

Potential-free alarm contact NO/NC programmable

Imax: 5A
Umax: 230VAC
15.6 Circuit diagram 230 V AC, with square plug and control PCB S4

-PE

230VAC L1
8 A max.
N
PE

-X1.2
Female plug (BK)

Piston Detector

-X3.2
Male plug

-Machine contact

-X1.1
Built-in male plug

230VAC (50Hz) with Control circuit board

-X3.1
Built-in female plug

230VAC (50Hz)
[U]: 230VAC 50Hz
[S]: 120 VA

-X2.1
Built-in male plug

Potential-free alarm contact NO/NC programmable

Imax: 5A
Umax: 230VAC

-X2.2
Female plug (GY)

[PE] Y1 Y2 Y3
15.7 Circuit diagram 12/24 V DC, with square plug with control PCB

- X1.2
Female plug (BK)

- X1.1
Built-in male plug

- X2.1
Built-in male plug

- X2.2
Female plug (GY)

12/24 VDC with connection board

Valid for type identification code PXxx-XX-24 V1 X0
15. Connection diagrams

15.8 Circuit diagram 12/24 V DC, with bayonet plug and control PCB S4

- X1.2
  Female plug
  L2/24VDC L+ 6 A max.
  GND
  Machine contact
  Potential-free alarm contact
  I_max: 5 A
  U_max: 30 V

- X1.1
  Built-in male plug
  L+ GND Potential-free contact Potential-free contact
  12/24 VDC with Control circuit board
  [U]: 12/24 VDC
  [P]: 36 W

- X2.1
  Built-in male plug
  664-36968-6
  I_max: 5 A
  U_max: 30 V
  Potential-free alarm contact NO / NC

- X2.2
  Female plug (GY)

- X3.1
  Built-in female plug
  Signal

- X3.2
  Male plug

Valid for type identification code PXXX-XX-2/4-X-X-5-X-4

Piston Detector

Valid for type identification code PXXX-XX-2/4-X-X-5-X-4
15.9 Circuit diagram 230 V AC, with square plug and cycle switch without control PCB

Valid for type identification code PX**X-X-8-X-X-X-1-X-0
15.10 Circuit diagram 120 V AC, with square plug without control PCB

- **F1**
  - Motor + (L1) - 5 A max.

- **PE**
  - Female plug (BK)

- **-X1.2**
  - Built-in male plug
  - 120VAC (60Hz) without Control circuit board, without connection board
  - [U]: 120VAC 60Hz
  - [S]: 120 VA

- **-X2.1**
  - Built-in male plug
  - I<sub>max</sub>: 0.5A
  - U<sub>max</sub>: 30VAC/DC

- **-X2.2**
  - Female plug (GY)

Valid for type identification code PXXX-X-X-6-X-1-X-0
15.11 Circuit diagram 12/24 V DC, with square plug and control PCB S6 (N0)

- X2.1
  Built-in male plug
  664-36968-4
  PE
  [U]: 24 VDC
  [P]: 36 W
  Imax: 5A
  Umax: 30V

- X2.2
  Female plug (GY)
  YPE Y1 Y2 Y3

- X1.1
  Built-in male plug
  664-36968-4
  PE
  GND
  +12/24 VDC
  Max. 6A

- X1.2
  Female plug (black)
  PE
  1 2 3

GND

QLS401

Valid for type identification code
P401-SSV12-V-24DC-1XN-2A1.1-S6 (N0)
P401-SSV12-V-24DC-2XN-2A1.1-S6 (N0)

Valid for pump part number
650-41146-3
650-41146-9
15.12 Circuit diagram 12/24 V DC, with square plug and control PCB S5 (NC)

- X1.1
  - Built-in male plug
  - 664-36968-4
  - PE (30)
  - GND (15)

- X1.2
  - Female plug (black)

- X2.1
  - Built-in male plug
  - 664-36968-6
  - Imax: 5A
  - Umax: 30V

- X2.2
  - Female plug (GY)
  - 1
  - 2
  - 3

Valid for type identification code
P401-SSV12-V-24DC-2XN-2A1.1-S5 (NC)

Valid for pump part number
650-41300-6

12/24 VDC with
Control circuit board 236-10884-4

[U]: 24 VDC
[P]: 36 W
15.13 Circuit diagram 120 V AC (60 Hz), with square plug and control PCB S6 (NO)

Ext. Fuse
- F1

120VAC L1
Max. 6A

N
PE

Machine contact

-X1.2
Female plug (BK)

-X1.1
Built-in male plug
664-36968-3

120VAC (60Hz) with
Control circuit board 236-14213-9

[ U ]: 120VAC 60Hz
[ S ]: 120 VA

QLS401

-X2.1
Built-in male plug 664-36968-5
Imax: 5A
Umax: 230VAC

Potential-free alarm contact NO

-X2.2
Female plug (GY)

Valid for type identification code
P401-SSV12-V-120AC-1XN-2A1.1-S6 (NO)

Pump part number
650-41179-3
15. Connection diagrams

15.14 Circuit diagram 230 V AC, with square plug and control PCB S6 (NO)

Valid for type identification code
P401-SSV12-V-230AC-1XN-2A1.1-S6 (NO)
P401-SSV12-V-230AC-2XN-2A1.1-S6 (NO)

Valid for pump part number
650-40954-5
650-41146-2
15.15 Circuit diagram 230 V AC, with square plug and control PCB S5 (NC)

**Connection Diagram:**

- **Ext. Fuse**
  - 230VAC L1
  - Max. 6A
- **N**
- **PE**
- **Machine contact**
- **Female plug (BK)**
- **X1.2**
  - Built-in male plug 664-36968-3
  - Imax: 5A
  - Umax: 230VAC

**Valid for type identification code**

- P401-SSV12-V-230AC-2XN-2A1.1-S5 NC
- P401-SSV12-V-230AC-1XN-2A1.1-S5 NC

**Pump part number**

- 650-41300-7
- 650-41316-9