Lubrication Monitor Controller of series LMC 301

for control of up to three pumps, each with an SKF dual-line centralized lubrication system containing one to three channels.

Operating instructions
according to Low-Voltage Directive 2014/35/EU

EN

951-180-069-EN
Version 04
2023/08/31

EU Declaration of Conformity in accordance with Directive 2014/35/EU Annex IV on the use of electrical equipment within certain voltage limits

The manufacturer Lincoln Industrial Corporation, 5148 North Hanley Road, St. Louis MO, U.S.A. hereby declares under its sole responsibility conformity of the following electrical device/equipment

Designation: **Lubrication Monitor Controller**
Type: **LMC 301**
Item number: **086500 / 086501 / 086502 / 086503**
Year of manufacture: see type plate

with all relevant harmonization legislation of the European Union at the time of placing on the market. The following Directives and standards were applied in the applicable areas.

2014/35/EU	LVD	Low-Voltage Directive
2014/30/EU	EMC	Electromagnetic Compatibility
2011/65/EU	RoHS II	Directive on the restriction of certain hazardous substances in electrical and electronic equipment

Standards

EN 61010-1:2010, EN 61010-1:2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019
EN 61000-6-2:2005/AC:2005
EN 61000-6-3:2007/A1:2011/AC:2012
EN IEC 63000:2018

St. Louis, MO U.S.A. 2022/04/05

Robert Collins
Technical Compliance Manager

UK Declaration of Conformity pursuant to the Electrical Equipment (Safety) Regulations 2016 (No. 1101)

The manufacturer Lincoln Industrial Corporation, 5148 North Hanley Road, St. Louis MO, U.S.A. hereby declares under its sole responsibility conformity of the electrical device/equipment conforms with all relevant United Kingdom legislation at the time of placing on the market. The authorized representative for the compilation of the technical documentation is SKF (U.K.) Limited, 2 Canada Close, Banbury, Oxfordshire, OX16 2RT, GBR.

Designation: **Lubrication Monitor Controller**
Type: **LMC 301**
Item number: **086500 / 086501 / 086502 / 086503**
Year of manufacture: see type plate

The following Directives and standards were applied in the applicable areas.

- Electrical Equipment (Safety) Regulations 2016 No. 1101 (S.I. 2016:1101)
- Electromagnetic Compatibility Regulations 2016 No. 1091 (S.I.2012:303)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 No. 3032 (S.I.2012:3032)

Standards

EN 61010-1:2010, EN 61010-1:2010/A1:2019/AC:2019-04, EN 61010-1:2010/A1:2019

EN 61000-6-2:2005/AC:2005

EN 61000-6-3:2007/A1:2011/AC:2012

EN IEC 63000:2018

St. Louis, MO U.S.A. 2022/04/05

Robert Collins
Technical Compliance Manager

Masthead

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Authorized party placing the product on the market locally
European Union
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United Kingdom
SKF (U.K.) Limited,
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OX16 2RT, GBR.

South America
SKF Argentina Pte. Roca 4145,
CP 2001 Rosario, Santa Fe

Training
SKF conducts detailed training in order to enable the maximum safety and efficiency. SKF recommends taking advantage of this training. For information, contact the relevant SKF service address.

Warranty
The instructions do not contain any information on the warranty. This can be found in our General Terms and Conditions.

Disclaimer of liability
The manufacturer shall not be held liable for damage resulting from:

- Improper usage, assembly, operation, configuration, maintenance, repair, or accidents
- Use of unsuitable lubricants
- Improper reaction to malfunctions.
- Unauthorized modifications to the product.
- Intentional or gross negligence
- Use of non-original SKF spare parts
- Faulty planning or design of the centralized lubrication system

The maximum liability for loss or damage resulting from the use of our products is limited to the purchase price. Liability for indirect damage of any kind is excluded.

Table of contents

Explanation of symbols and signs

Activities that present specific hazards to persons or material assets are indicated with warnings.

Read the instructions completely and follow all operating instructions and the warning and safety instructions.

Warning level		Consequence	Probability
⚠	DANGER	Death / serious injury	Immediate
⚠	WARNING	Serious injury	Possible
⚠	CAUTION	Minor injury	Possible
	NOTICE	Property damage	Possible

Information symbols within the text	
w	Meaning
●	Prompts an action
○	Used for itemizing
☞	Refers to other facts, causes, or consequences
→	Provides additional information within procedures

Possible symbols	
Symbol	Meaning
	Note
	Electric shock hazard
	Slipping hazard
	Hazard from hot surfaces
	Risk of being drawn into machinery
	Crushing hazard
	Danger from suspended load
	Pressure injection hazard
	Explosion-proof component
	Electrostatic sensitive components
	Wear personal protective gear (goggles)
	Secure (lock) the machine against accidental starting
	Environmentally sound disposal

Instructions placed on a unit, machine, or equipment, such as:

- Rotation arrow
- Fluid connection labels
- Warnings

must be followed and kept in fully legible condition.

Abbreviations and conversion factors

Abbreviations

re:	regarding
approx.	approximately
°C	degrees Celsius
s	second
dB (A)	Sound pressure level
i.e.	that is
etc.	et cetera
poss.	possibly
<	less than
±	plus or minus
>	greater than
e.g.	for example
etc.	et cetera
usually	usually
Ø	diameter
incl.	including
K	Kelvin
kg	kilogram
RH	relative humidity
kW	kilowatt
l	liter
Min.	minute
max.	maximum
min.	minimum
mm	millimeter
ml	milliliter
N	Newton
Nm	Newton meter
oz.	ounce
psi	pound per square inch
hp	horsepower
lb.	pound
sq.in.	square inch
kp	kilopond
cu.in.	cubic inch
mph	miles per hour
fpsec	feet per second
°F	degrees Fahrenheit
fl.oz.	fluid ounce
in.	inch
gal.	gallon

Conversion factors

Length	1 mm = 0.03937 in.
Area	1 cm^2 = 0.155 sq.in.
Volume	1 ml = 0.0352 fl.oz.
	1 l = 2.11416 pints (US)
Ground	1 kg = 2.205 lbs
	1 g = 0.03527 oz.
Density	1 kg/cm^3 = 8.3454 lb./gal. (US)
	1 kg/cm^3 = 0.03613 lb./cu.in.
Force	1 N = 0.10197 kp
Speed	1 m/s = 3.28084 fpsec.
	1 m/s = 2.23694 mph
Acceleration	1 m/s^2 = 3.28084 $ft./s^2$
Pressure	1 bar = 14.5 psi
Temperature	°C = (°F-32) x 5/9
Power	1 kW = 1.34109 hp

1. Safety instructions

1.1 General safety instructions

The operator must ensure that the instructions are read and fully understood by all persons tasked with working on the product or who supervise or instruct such persons.
The operator must also ensure that the staff fully understands the content of the instructions.
The instructions must be kept readily available together with the product.
The manual forms part of the product and must accompany the product if sold to a new owner.
The product described here was manufactured according to the state of the art.
Risks may, however, arise from its usage and may result in personal injury
or damage to property.
Any malfunctions affecting safety must be remedied immediately.
In addition to the assembly instructions/operating instructions, all statutory regulations and other regulations for accident prevention and environmental protection must be observed.

1.2 General behavior when handling the product

- The product may only be used in awareness of the potential dangers, in proper technical condition, and according to the information in this manual.
- Personnel must familiarize themselves 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.
- Unauthorized persons must be kept away.
- All safety instructions and in-house instructions relevant to the particular activity must be observed.
- Responsibilities for different activities must be clearly defined and observed. Uncertainty seriously endangers safety.
- Protective and safety mechanisms cannot be removed, modified, nor disabled during operation and must be checked for proper function and completeness at regular intervals. If protective and safety mechanisms must be removed, they must be installed immediately following conclusion of work and checked for proper function.
- Any faults that occur must be resolved according to responsibility. The supervisor must be notified immediately in case of malfunctions outside one's individual scope of responsibility.
- Wear personal protective equipment.
- Observe the relevant safety data sheets when handling lubricants/equipment.

1.3 Qualified technical personnel

Only qualified technical personnel may install, operate, maintain, and repair the products described here. Such persons are familiar with the relevant standards, rules, accident prevention regulations, and assembly conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid any potential hazards. The definition of qualified personnel and the prohibition against employing non-qualified personnel are laid down in DIN VDE 0105 and IEC 364. Relevant country-specific definitions of qualified technical personnel apply for countries outside the scope of DIN VDE 0105 or IEC 364.
The core principles of these country-specific qualification requirements for technical personnel cannot be below those of the two standards mentioned above.

The operator is responsible for assigning tasks and the area of responsibility.

The personnel must be trained and instructed prior to beginning work if they do not possess the requisite knowledge. Product training can also be performed by SKF in exchange for costs incurred.

1.4 Electric shock hazard

WARNING

Electric shock

Work on the Lubrication Monitor Controller may be performed only by qualified and trained personnel authorized to do so by the operator.

De-energize the product prior to beginning work.

Local electrical operating conditions and regulations (e.g., DIN, VDE) must be observed.

Serious injury or death and property damage may result from improperly connected products.

1.5 Operation

The following must be observed while working on the product.

- All information within this manual and the information within the referenced documents
- All laws and regulations that the operator must observe

1.6 Assembly/maintenance/faults/decommissioning/disposal

All relevant persons (operating personnel, supervisors) must be informed of the activity prior to beginning work. Precautionary operational measures / work instructions must be observed.

- Take appropriate measures to ensure that moving/detached parts are immobilized during the work and that no body parts can be pinched by unintended movements.
- Assemble the product only outside the operating range of moving parts, at an adequate distance from sources of heat or cold.
- Prior to performing work, the product and the machine/system in which the product will be integrated must be de-energized and depressurized and secured against unauthorized activation.
- All work on electrical components may be performed only with voltage-insulated tools.

- Fuses must not be bridged. Always replace fuses with fuses of the same type.
- Ensure proper grounding of the product.
- Drill holes required for assembly only on non-critical, non-load-bearing parts.
- Other units of the machine/the vehicle must not be damaged or their function impaired by the installation.
- No parts of the centralized lubrication system may be subjected to torsion, shear, or bending.
- Use suitable lifting gear when working with heavy parts.
- Avoid mixing up/incorrectly assembling disassembled parts. Label parts.

1.7 Foreseeable misuse

Any usage of the product differing from the aforementioned
conditions and stated purpose is strictly prohibited.
Particularly prohibited are:

- Use for other control tasks
- Use in an explosion protection zone
- Use to feed, forward, or store hazardous substances and mixtures as defined in Annex I Part 2-5 of the CLP Regulation (EC 1272/2008)
- Use to feed / forward / store gases, liquefied gases, dissolved gases, vapors, or fluids whose vapor pressure exceeds normal atmospheric pressure (1013 mbar) by more than 0.5 bar at their maximum permissible operating temperature

1.8 Intended use

The Lubrication Monitor Controller is used to control up to three pumps, each with a one-to-three-zone (one to three main lines) SKF single-line centralized lubrication system.LMC 301 designs 086501 and 086503 (IO module) are powered via 110/230 VAC mains provided by the customer. They must be connected according to DIN and VDE regulations. LMC 301 designs 086500 and 086502 (IO module) are powered via 24 V DC. The technical information contained in this manual must be observed. Any other usage is deemed non-compliant with the intended use.

1.9 Disclaimer of liability

The manufacturer shall not be held liable for damage resulting from:

- Failure to comply with these instructions
- The use of lubricants/media not approved for the unit type
- Contaminated or unsuitable lubricants
- Installation of non-original SKF components
- Non-compliant usage
- Improper assembly, configuration or filling
- as a result of improper reaction to malfunctions.
- Non-observance of maintenance intervals
- Independent modification of system components

1.10 Referenced documents

In addition to this manual, the following documents must be observed by the respective target group:

- Operational instructions/ approval rules.
- Instructions from suppliers of purchased parts
- Manual for the insulation resistance tester
- Project planning documents and other relevant documents.

The operator must supplement these documents with applicable regulations for the country of use. The documentation must be included if the product is transferred to a new operator.

1.11 Warning labels on the product

The following warning labels are affixed to the product. Before start-up, check that the labels are present and intact. Immediately replace warning labels if damaged or missing. The product must not be operated until then. see the positioning diagram for the order number and position on the product.

In accordance with the results of the workstation risk assessment, additional labels (e.g., warnings, safety alerts, prohibition signs or labels in accordance with GHS) are to be attached by the operator if necessary.

Positioning of warning labels, Fig. 1

1.12 Notes on the type plate

The type plate provides important data such as the type designation, order number, and regulatory characteristics. To avoid loss of this data in case the type plate becomes illegible, these characteristics should be entered in the manual.

Model: _____

P. No. _____

S. No. _____

(CW/YY) _____
Calendar week/Year of manufacture

1.13 Note on UL mark

The UL Mark certifies that the product has UL certification of compliance with U.S. and Canadian safety regulations.

1.14 Note on UKCA marking

The UKCA marking confirms the conformity of the product with the applicable directives of the United Kingdom.

1.15 Note on China RoHS marking

The China RoHS marking confirms that there is no danger to persons or the environment from the regulated substances contained within for the product's intended period of use (number shown in the circle).

1.16 Note on CE marking

The CE marking is based on the requirements of the applied Directives:

- 2014/35/EU Low-Voltage Directive
- 2014/30/EC Electromagnetic Compatibility
- 2011/65/EU (RoHS II) Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment

1.17 Note on Pressure Equipment Directive 2014/68/EU

(If pressurized parts are present)
Due to its performance characteristics, the product does not reach the limit values defined in Article 4, Paragraph 1, Subparagraph (a) item (i) and is, pursuant to Article 4, Paragraph 3, excluded from the scope of Pressure Equipment Directive 2014/68/EU.

1.18 Residual risk

Table 1

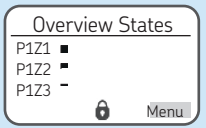
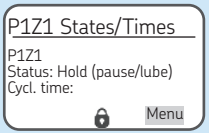
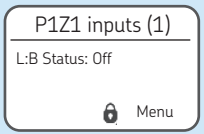
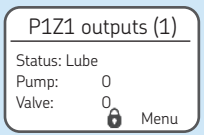
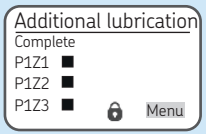
Residual risk	Remedy
Life cycle: Assembly/commissioning/operation/setup and retrofit	
Electric shock due to defective or incorrectly connected power lead on power supply or load relay	• Inspect the power lead for damage before starting the product • Correctly wire/connect the power lead
Tearing/damage to lines when installed on moving machine components	• Flexible cable lines must be used if installing on moving parts
Life cycle: Malfunction, troubleshooting, maintenance, repair/decommissioning and disposal	
Electric shock due to defective power lead on power supply	• Inspect the power lead for damage before starting the product
Electric shock from open control cabinet or active energized components	• Disconnect the customer-provided main switch or mains plug (cut power) before performing any work on electrical components • Exercise caution when operating the product

2. Overview/System description

Display, Fig. 2

The customer installs the cable glands and the cable sets provided by the customer. The customer is therefore responsible for their correct installation.
see the “Accessories” chapter, page 91, for UL-certified cable glands and protective hoses.
A rigid connecting pipe must not be used when installing the power leads (provided by customer) (see decal information (**1**) on the bottom of the controller).

Status overview and triggering an additional lubrication

Symbol	Status	Function
	▼	Pressing the **down arrow key** provides a status overview of the pumps and zones (P1Z1 = pump 1/zone 1 to max. P3Z3 pump 3/zone 3).
	+ ▼	Pressing the **down arrow key** again displays the remaining interval time or remaining runtime for the currently selected pump/zone (for example, P1Z1).
	+ ▼	Pressing the **down arrow key** again displays the activated inputs for the currently selected pump/zone.
	+ ▼	Pressing the **down arrow key** again displays the activated outputs for the currently selected pump/zone.
	⚙	Pressing the Remote Manual Lube button for five seconds causes an interim lubrication to be performed on the complete system or the activated zones (P1Z1 = pump 1/zone 1 to max. P3Z3 pump 3/zone 3).

Display and control elements of control screen

Symbol	Designation	Function
	Display	o Menu display/Display of values and parameters/Fault display o The right bar ( ) indicates that the menu extends beyond the current display
PUMP	**PUMP** Pumps A B C	Pump/main line A / B / C per pump Max. of 3 main lines possible
RUN 	**RUN**ning Active control	LED lights up = Indication of currently active pump/active control line (A/B/C)
LL 	Low Level Minimum fill level reached	LED lights up = Minimum fill level (pump A / B / C) reached
FAULT 	**FAULT** Fault message signal	o LED flashes = Fault detected o LED lights up = Fault present
POWER 	POWER Control unit On/Off	LED lights up = Control unit switched on
	Function keys	Control key in combination with the display above the key Up arrow key menu control <Back menu level> / increase input value Down arrow key menu control <Forward menu level> / reduce input value Pressing triggers an interim lubrication. Briefly pressing selects an interim lubrication. Actuations while in configuration mode are ignored. Long pressing (> 3 seconds) stops all systems or resets error notifications. Long pressing acknowledges and clears error notifications.

Display elements of the control screen

Symbol	Status	Function
	Stopped/OFF	o The system was stopped by pressing the Reset key and can be restarted by briefly pressing the Running key.
	Pause	o Respective lubrication zone is in interval time
	Wait Temperature	o Waiting period temperature
	Waiting	o Lubrication zone waiting because other zone currently being lubricated
	Lube	o System is lubricating
	Hold	o Hold time
	Relief	o System is relieving pressure
	Running time	o Pump is running
	Secured/ Access denied	o No access as local admin or supervisor
	Access	o Access as local admin or supervisor
	Error	o Fault is present
	Digital inputs/outputs on	o Digital output is enabled
	Digital inputs/outputs off	o Digital output is disabled

2.1 LMC 301 controller unit

The SKF LMC 301 Controller is used to control SKF dual-line centralized lubrication systems, also referred to in the following as Dual-Line centralized lubrication systems. Depending on the system design, up to three independent lubrication zones can be controlled.
The SKF LMC 301 Controller handles control and monitoring of the system. The current system status is shown on the LMC 301 Controller's display. The user can quickly adapt the lubrication procedure by changing the lubrication intensity <<**Normal Cycle Set**>> to <<**Heavy Cycle set**>>.
The user can also access the current status (menu Overview States) and trigger an interim lubrication (menu Remote Manual Lube) if necessary.
The SKF LMC 301 Controller offers the following pump settings according to the system design:

- Up to three lubricant pumps
- Up to three lubrication zones (zones 1 to 3) per pump (main lines 1 to 3)
- Type of zone valves: 3/2 directional solenoid valves, EMU3, EMU2, MA/MP, DU1
- Time- or pressure-based lubrication monitoring
- Pump control and monitoring
- Temperature monitoring by internal or external sensor
- Automatic filling

The SKF LMC 301 Controller offers configurations for the following **zone settings** for each zone:

- Cycle Control, control mode time-based or counter-based
- Cycle Control for << light >> or <<**heavy**>> machine requirement with according selection of <<Light>> or <<Heavy>> lubrication
- Lubrication settings, specification of lubrication time or with counter controlled setting, specification of amount of pulses delivered by the machine
- Flow rate monitoring
- Alarm outputs and defined fault diagnostics

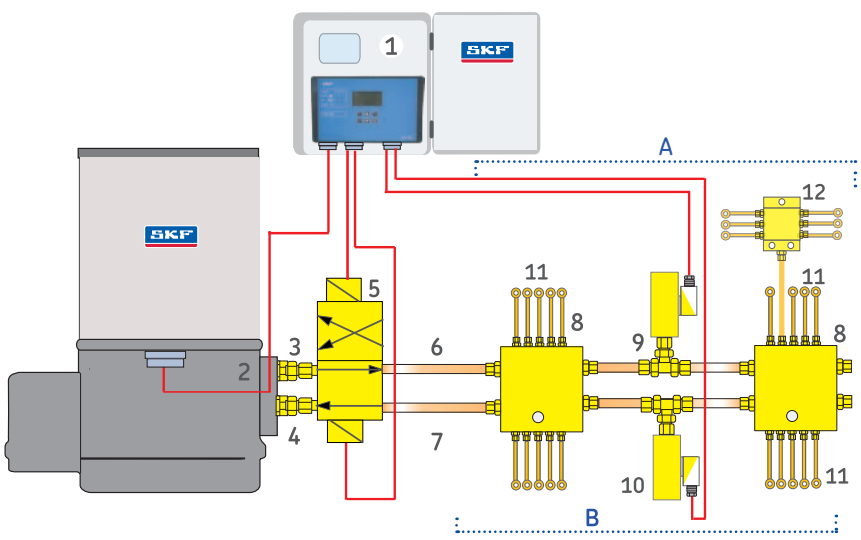
Some system settings and timings can be modified by the customer via the password level Local Admin. The settings can also be reset via the menu item
<<**Set Params to Default**>> for the selected lubrication system.
Selecting menu item
<<**Condition on Delivery**>> resets all stored values and settings to factory settings.

2.2 General design of a dual-line centralized lubrication system with one main line (Dual-Line) with two analog pressure sensors

☞see Figure 3

The following description applies to a 230 VAC dual-line centralized lubrication system for industrial use with one main line. Control unit LMC 301 (1) is installed in a control cabinet, with load unit and power supply for the pump motor and for the attached valves and sensors.
One grease supply line (3) and one grease return line (4) are flanged to the pump housing (2) of the dual-line pump. These are flanged with their respective ends to an electrical changeover valve (5).
Two main feed lines (6) (7) proceed from the electrical changeover valve to the dual-line metering devices in downstream alignment (8). An analog pressure sensor (9) (10) has been fitted ahead of each of the last dual-line metering devices of main feed line 1 (A) and main feed line 2 (B). The sensor transmits a signal corresponding to the existing pressure to the control unit (the control units compares the two signals). Fill level monitoring is performed by a fill level switch located in the pump reservoir. This switches the pump off when the minimum fill level has been reached.

Example of a dual-line centralized lubrication system with one main line, Fig. 3



2.2.1 Design of the equipment

☞see Figure 3

After the pause time elapses, the pump delivers lubricant to the electrical changeover valve (5) via the grease feed line (3). Depending on the changeover valve (5) setting, the lubricant is delivered onward to the dual-line metering devices (8) via main feed line 1 (6) or main feed line 2 (7).
With sustained feeding, the pressure in the actuated main feed line increases until the system resistance is overcome. The control and metering pistons of the dual-line metering devices are then actuated. Lubricant is dispensed to the lubrication points or the downstream progressive metering device (12) via the branch lines (11).
Once all metering devices have dispensed their quantity of lubricant (control and metering pistons are in their end position), the first half of the connected lubrication points in section (A) or (B) has been supplied with lubricant. The pressure builds further because the pump continues to feed lubricant.

A changeover signal is sent via the LMC 301 once a pre-defined differential pressure is reached between the pressurized and pressure-relieved main feed line (analog pressure sensors (9)/(10)). The changeover valve (5) switches over, relieving the previously pressurized main feed line while pressure increases in the previously relieved main feed line after a brief interval time.
The control and metering pistons are actuated once again and lubricant is dispensed to the lubrication points or to the progressive metering devices in downstream alignment (12) on the opposite side of the metering devices, section (A) or (B).
The LMC 301 Controller then switches off the dual-line pump (2) and the changeover valve (5) switches to pressure relief (pause). The pump fill level is monitored by a fill level switch.

Fault notifications can be shown via an external indicator lamp (connected to fault output, in addition to the display).

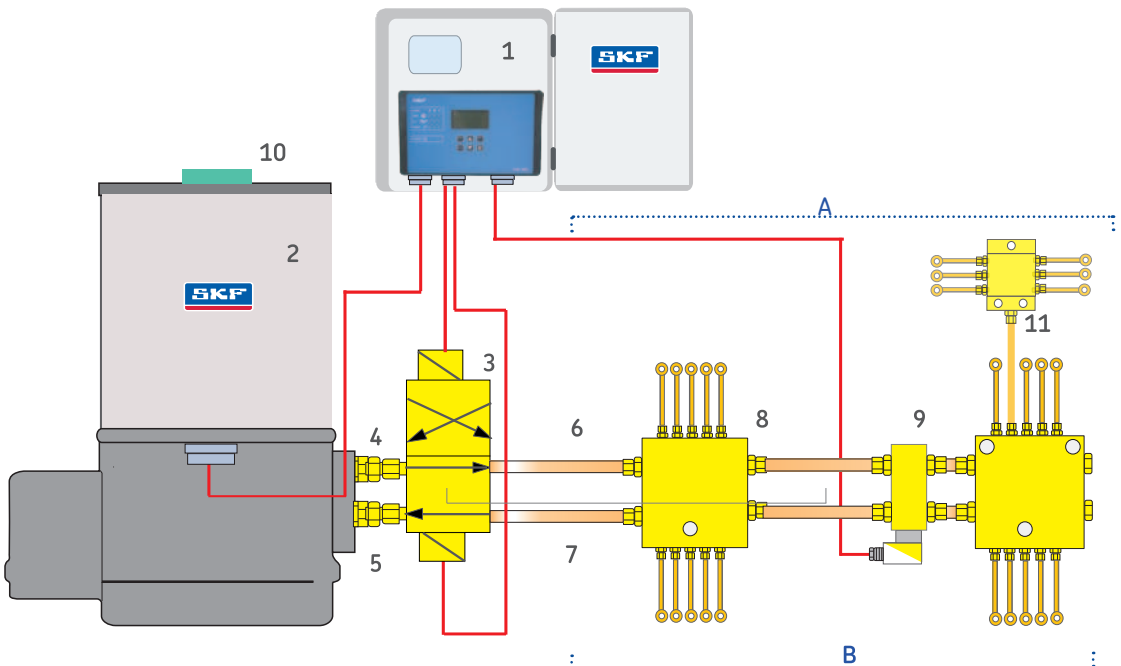
2.3 General design of a dual-line centralized lubrication system with one main line (Dual-Line) with differential pressure switch

☞see Figure 4

The following description applies to a 400 VAC dual-line centralized lubrication system with one main line.
The LMC 301 Controller (1) is installed in a Dual-Line control cabinet, with a load unit and power supply for the pump motor and the attached valves and sensors.
Depending on the pump design, the changeover valve described below (3) can be attached directly to the pump (2) (grease lubrication pump unit FK, model FK2) or, in case of systems with high operating pressure, separated from the pump (grease lubrication pump unit FK, model FK3).
On the latter design, one grease feed line (4) and a grease return line (5) are flanged to the pump housing of the dual-line pump. These are fastened with their respective ends to the electrical changeover valve (3).
Two main feed lines (6) (7) proceed from the electrical changeover valve to the dual-line metering devices in downstream alignment (8).

Once all metering devices have dispensed their quantity of lubricant (control and metering pistons are in their end position), the first half of the connected lubrication points in section (A) or (B) has been supplied with lubricant. The pressure builds further because the pump continues to feed lubricant.
A model DDS50/1 differential pressure switch (9) is fitted ahead of the last dual-line metering device. It contains two NO-contacts. The differential pressure switch measures the differential pressure between main feed lines 1 and 2 (6/7).
A signal is sent to the LMC 301 when a differential pressure of Δp = 50 bar is reached. The LMC 301 then switches the changeover valve (3), relieving the previously pressurized main feed line, while pressure increases in the previously relieved main feed line after a brief interval time. The control and metering pistons of the metering devices (8) are actuated once again and lubricant is dispensed to the lubrication points or to the progressive metering devices in downstream alignment (11) on the opposite side of the metering devices, section (A) or (B).
Fill level monitoring is performed by an ultrasonic sensor located in the pump reservoir. The ultrasonic sensor (10) has two switching points. When the minimum fill level is reached, switching point 1 passes a signal to the LMC 301, which then switches off the pump. When the maximum fill level is reached, switching point 2 passes a signal to the system control unit.
This makes it possible to operate an external filling pump with both signals via the system control unit.

Example of a dual-line centralized lubrication system with one main line, with SSY204 changeover valve and DDS50/1 differential pressure switch, Fig. 4

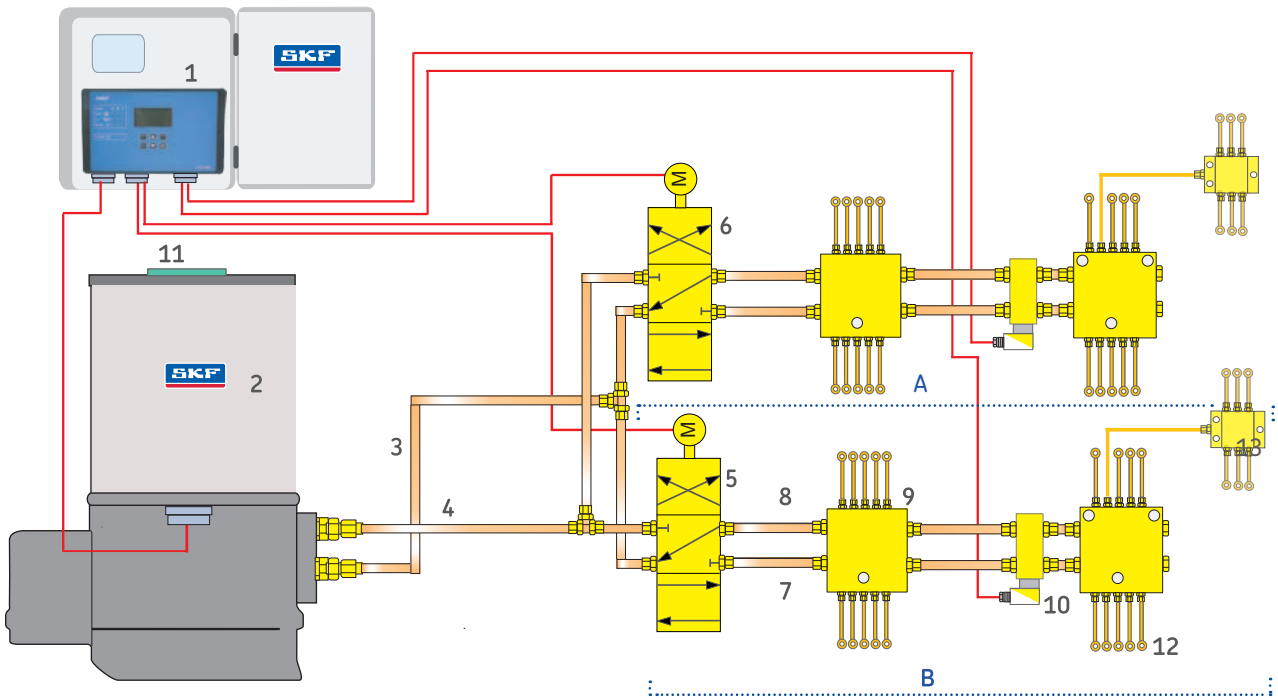


2.4 General design of a dual-line centralized lubrication system with two main lines with one differential pressure switch each

☞see Figure 5

The following description applies to a 400 VAC dual-line centralized lubrication system with two main lines.
The LMC 301 Controller (1) is installed in a Dual-Line control cabinet, with a load unit and power supply for the pump motor and the attached valves and sensors.
A grease feed line (4) and a grease return line (3) are connected to the pump (2). Both lines, the grease feed line and the grease return line, are installed on the other end to the electrical changeover valves (5/6) of lines 1 and 2.
For each electrical changeover valve (EMU3...(5/6), two main feed lines (7) (8) lead to the dual-line metering devices (9) in downstream alignment.
Once all metering devices have dispensed their quantity of lubricant (control and metering pistons are in their end position), the first half of the connected lubrication points in section (A) or (B) has been supplied with lubricant. The pressure builds further because the pump continues to feed lubricant.
A model DDS50/1 differential pressure switch (10) is fitted ahead of the last dual-line metering device. It contains two NO-contacts. The differential pressure switch measures the differential pressure between main feed lines 1 and 2 (7/8).
A signal is sent to the LMC 301 Controller when a differential pressure of Δp = 50 bar is reached.
The LMC 301 Controller then switches the changeover valve (5), relieving the previously pressurized main feed line, while pressure builds up in the previously relieved main feed line. The control and metering pistons of the metering devices (9) are actuated once again and lubricant is dispensed to the lubrication points (12) or to the progressive metering devices in downstream alignment (13) on the opposite side of the metering devices, section (A) or (B).
Fill level monitoring is performed by an ultrasonic sensor located in the pump reservoir. The ultrasonic sensor (11) has two switching points. When the minimum fill level is reached, switching point 1 passes a signal to the controller, which then switches off the pump.
When the maximum fill level is reached, switching point 2 passes a signal to the system control unit.
This makes it possible to operate an external filling pump with both signals via the system control unit.
A 2/2 directional control valve can be additionally installed if multiple pumps (2) feed the dual-line centralized lubrication system. It ensures that the pump assigned to each line is relieved during the pressure relief process.

Example of a dual-Line dual-line centralized lubrication system with two main lines, each with one EMU3 changeover valve and each with one DDS50/1 differential pressure switch, Fig. 5



3. Technical data

3.1 General technical data

Characteristics, design	
Mounting position	Vertical, see Page 14
Dimensions	(LxWxH) 270 x 170 x 90 mm
Display	60x30 mm128x64 pixels
Ambient conditions	
Altitude	AC ≤ 2000 m / DC ≤ 5000 m
Ambient/operating temperature	AC -10 to +50°C
Ambient/operating temperature	DC -40 to +70°C
Maximum relative humidity	80% to 31°C, declining linearly to 50 % relative humidity at 40°C
The LCD display only operates down to	- 20°C
Storage temperature	- 40 to + 70°C
Application	
	≤ 150 VAC or 24 VDC, indoor/outdoor [3]) UL overvoltage category III, pollution category 2
	> 150 to ≤ 240 VAC, only permissible for indoor, UL overvoltage category II, pollution category 2
Connectivity via terminal strip	
Inputs:	10 count, short-circuit-proof, 2 of which analog
Outputs:	8 count, relay outputs NO-contact 8 A
Residual ripple relative to operating voltage	±5% acc. to DIN 41755

Characteristics, design	
Protection and monitoring	
Current limit	Sustained short-circuit-proof
Overload-proof/open-circuit-proof	Yes
Protection class [1]) [4])	IP 65, protection class only with permissible cable glands **PG-M20,** without UL certification
Power consumption (electronic consumers)	
Internal fuse (LMC Controller)	3 A
Input AC	
Input voltage	100-240 VAC (50/60 Hz)
Fusing provided by customer (slow)	4 A (100-240 VAC)
Input DC [2]) [3])	
Input voltage	24 VDC ±10 %
Fusing (slow)	10 A

1) Cable gland/blind plug - see page 93
2) Protective measures that must be taken for designated usage: “Protective Extra Low Voltage” (PELV) and “Safe Extra Low Voltage” (SELV).
3) Application for outdoors (outdoors installation) was not tested in the context of/certification with the UL standard.
4) The protection class for the LMC 301 Controller was not tested as part of the UL certification.

Characteristics, design	
Output rating of relays	
Connection directly to relay 01/02	100-240 VAC/max. 15 A
Connection directly to relay 01/02	24 VDC/max. 15 A
Output terminal strip 01 to 08	24 VDC; 100-240 VAC/max. 8 A

Note: Do not operate two different operating voltages (AC and DC) within the same terminal strip!

Safety	DIN EN 60204-1
Protection class	Class I
Connection cables provided by customer	
Temperature stability	>70 °C

EMC

Interference suppression	VDE 0875 T 11, DIN EN 55011 Class A
Emitted interference	acc. to DIN EN 61000-6-3
Immunity	acc. to DIN EN 61000-6-2

Note: The emitted interference meets the requirements for industrial use; use in a residential area may cause interference under some circumstances.

Characteristics, design	
LMC 301 Versions	**Order No.**
24 VDC	086500
100 to 240 VAC	086501
24 VDC I/O	086502
100 to 240 VAC I/O	086503

4. Delivery, returns, and storage

4.1 Checking the delivery

Immediately after receipt, the delivery must be checked for completeness according to the shipping documents. Any transport damage must be reported to the transport company immediately. The packaging material should be preserved until any discrepancies are resolved.

4.2 Return shipments

Before return shipment, all parts must be cleaned and properly packed (i.e., according to the requirements of the recipient country). There are no restrictions for land, air, or sea transport.

The following must be marked on the packaging of return shipments:

	Do not top load / This side up
	Keep dry
	Handle with care, Do not drop

WARNING

Personal injury/property damage

Do not drop the product.

The following conditions apply to storage:

4.3 Storage

4.3.1 Electronic and electrical devices

- Dry and dust-free surroundings, storage in well ventilated dry area
- Storage time: max. 24 months.
- Relative humidity: < 65%.
- Storage temperature: -40 to +70°C.
- No direct sun or UV exposure
- Protected against nearby sources or heat or cold

4.3.2 General notes

- The product(s) can be enveloped in plastic film to provide low-dust storage.
- Protect against ground moisture by storing on a shelf or wooden pallet.
- Bare metallic surfaces must be protected using anti-corrosion agents. Check corrosion protection every 6 months and reapply if necessary.

5. Assembly

5.1 General

Only qualified technical personnel may install, operate, maintain, and repair the LMC 301 Lubrication Monitor Controller. Qualified technical personnel are persons who have been trained, assigned, and instructed by the operator of the final product into which the described Lubrication Monitor Controller is incorporated.
Such persons are familiar with the relevant standards, rules, accident prevention regulations, and operating conditions as a result of their training, experience, and instruction. They are qualified to carry out the required activities and in doing so recognize and avoid potential hazards.
The definition of qualified personnel and the prohibition against employing non-qualified personnel are laid down in DIN VDE 0105 and IEC 364.

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

NOTICE

Observe Technical data (Chapter 3).

5.2 Setup and attachment

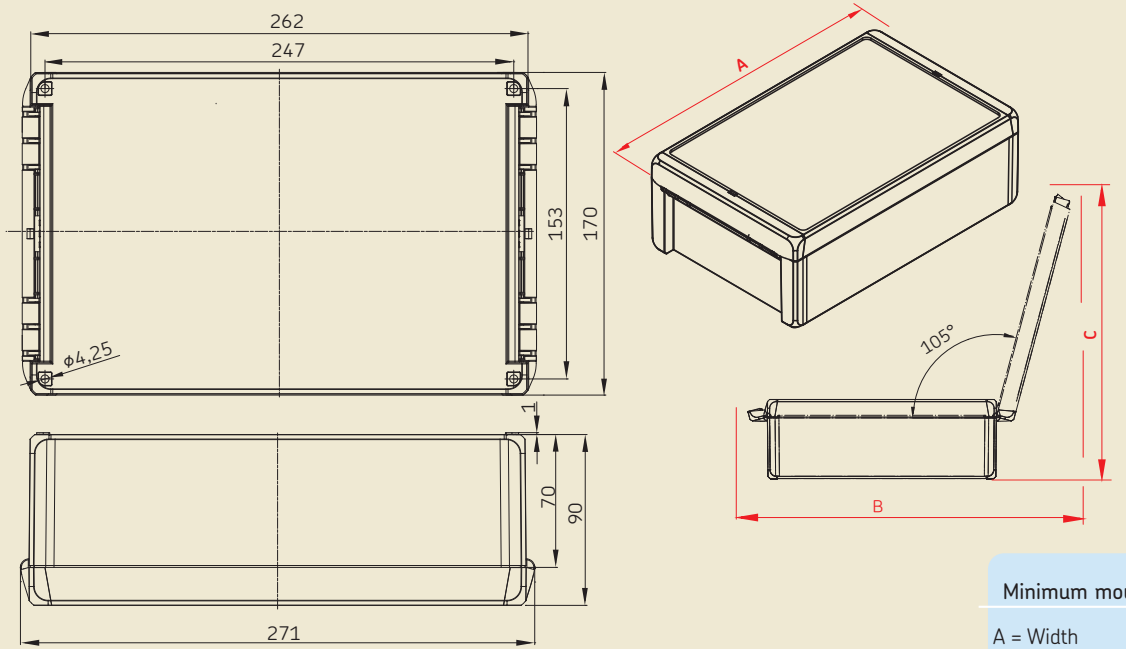
The product should be protected from humidity and vibration, and should be mounted so that it is easily accessible, allowing all further installation work to be done without difficulty. Ensure that there is sufficient air circulation to prevent excessive heating.
For the maximum permissible ambient temperature, see "Technical data."
The mounting position of the product is as shown in the assembly drawing.

WARNING

Personal injury / property damage
Drill assembly holes in such a way that no lines, units, or moving parts are damaged or their function impaired.
Maintain safety clearances and comply with regulations for assembly and accident prevention.

5.2.1 Port dimensions, assembly holes, and minimum mounting dimensions

Fig. 6



Minimum mounting dimensions	
A = Width	330 mm
B = height	450 mm
C = depth	350 mm

5.2.2 Opening the controller unit

☞ see Figures 6 and 7

- Insert a flat tip screwdriver (1) with a maximum blade width of 5.5 mm into the opening slot (2)
- Tilt the screwdriver (1) slightly to the right to open the cover (3)

☞ Open the cover by briefly clicking and then opening the cover by hand.

Opening the controller unit, Fig. 7

5.2.3 Minimum mounting dimensions

To ensure enough space for maintenance work and possible disassembly of the product, ensure that the minimum mounting dimensions (Fig. 6) are maintained.

5.2.4 Assembly of the controller unit

☞ see Figure 6

The controller unit is installed using 4 cheese-head screws of thread size M4. If M4 tapped bores are used to fasten the unit, the screws must have a minimum length of 15 mm. Fastening material to be provided by the customer:

- o Cheese-head screws with hexagon socket (4x) acc. to DIN6912-M4x.. -8.8
- o Washers (4x) acc to. DIN EN ISO 7090-4-200HV
- o Self-locking nuts M4 (4x) acc. to DIN EN ISO 10511; drill assembly holes (Ø 4.3 mm) acc. to assembly drawing (Fig. 4) and the conditions on the surface.

- Clean surface to remove drilling chips.
- Open the controller unit, place it on the surface, and roughly align it.
- Pass cheese-head screws (4x) through the fixing holes on the controller unit and the mounting surface
- Apply washers to cheese-head screws, gently tighten cheese-head screws.
- Align the controller unit, tighten cheese-head screws

Tightening torque 4 Nm

5.3 Electrical connection

5.3.1 General

The controller unit is supplied with 100-240 V AC voltage or optionally with 24 V DC voltage.
In both designs, the cables are introduced through a cable fitting with a clamping range of Ø 4.5mm to 10mm and terminal blocks with tension springs (maximum conductor cross-section 2.5mm, conductor stripping length 15mm).

NOTICE

The mains voltage (supply voltage) must match the specifications on the type plate of the Lubrication Monitor Controller.
Check the fuse protection of the electrical circuit. Use only fuses with the prescribed amperage,

Consult Chapter 3, Technical Data, for the electrical characteristics of the controller unit.

The connections on the controller unit are established according to the customer-specific design of the lubrication system/main lines. The system manufacturer is thus liable for correct connection to the controller unit.

NOTICE

The Lubrication Monitor Controller contains electronic components that can be destroyed by accidental electrostatic charge or discharge (ESD).
To prevent possible damage due to ESD, hands and any tools must be discharged on a bare grounded position on the installation site prior to performing any work on the opened control unit.
Conductors or components within the device must not be touched under any circumstances.

NOTICE

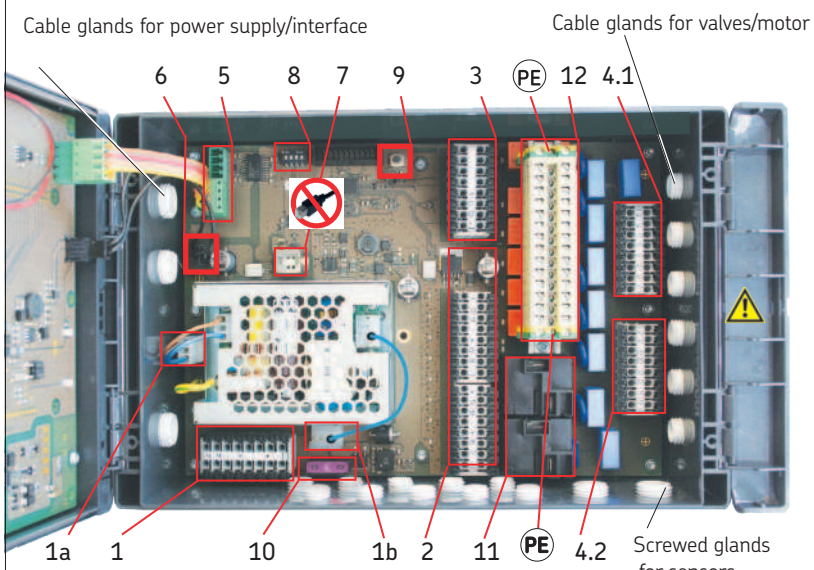
On the controller unit's electrical connections, ensure that appropriate measures prevent interference between signals due to inductive, capacitive, or electro-magnetic couplings.
Shielded cables must be used in places where electrical interference fields can distort signal transmissions despite separate laying of cables.
The rules and empirical values for "EMC-compliant" cabling must be taken into consideration.

5.3.2 Terminal board 100-240 VAC

Connections on mainboard, design 100-240 VAC, Fig. 8

NOTICE

Only one operating voltage (24 VDC or 100-240 VAC) can be connected to terminal strip 4.1 or 4.2.).
Do not operate two different voltages within a terminal strip!



Legend to Figure 8

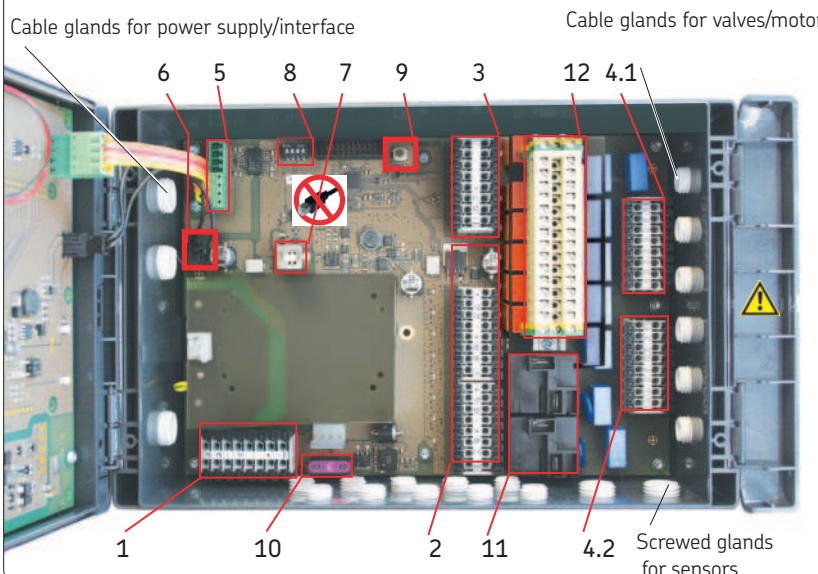
No.	Description		Chapter
1	Power supply	X1	5.3.6
1a	Internal 100-240 VAC connection for the AC/DC power supply unit		
1b	Internal 24 VDC connection from AC/DC power supply unit to the board		
2	Digital inputs	X2	5.3.9
3	Digital/analog inputs	X3	5.3.10
4	4.1 Relay outputs	X4	5.3.8
	4.2 Relay outputs	X4	
5	RS485 interface		
6	24 VDC output for mainboard		
7	USB port (external) Do not use connection!		
8	DIP switch addresses		5.3.11
9	RESET switch Hardware reset		
10	Fuse, FK1 3A as per ISO 8820-3		
11	Load switching relay (2x)	X5	5.3.7
12	PE/ground terminals for relay outputs. Grounding connection established by customer!	X6	5.3.8

5.3.3 Terminal board 24 VDC

Connections on mainboard, 24 V DC design, Fig. 9

NOTICE

Only one operating voltage (24 VDC or 100-240 VAC) can be connected to terminal strip 4.1 or 4.2.).
Do not operate two different voltages within a terminal strip!



Legend to Figure 9

No.	Description		Chapter
1	Power supply	X1	5.3.6
2	Digital inputs	X2	5.3.9
3	Digital/analog inputs	X3	5.3.10
4	**4.1** Relay outputs	X4	5.3.8
	4.2 Relay outputs	X4	
5	RS485 interface		
6	24 VDC output for mainboard		
7	USB port (external) Do not use connection!		
8	DIP switch addresses		5.3.11
9	RESET switch Hardware reset		
10	Fuse, FK1 3A as per ISO 8820-3		
11	Load switching relay (2x)	X5	5.3.7
12	PE/ground terminals for relay outputs Grounding connection established by customer!	X6	5.3.8

5.3.4 Line routing

☞ see Figures 8 and 9

The lines are laid through cable glands attached on both sides and on the bottom. The attached cable glands are provided for the following lines:
Cable glands on left side:
o Power supply
o Master/slave connection
Cable glands on right side:
o Relay outlets (load-dependent)
o Pump motor
Cable glands on bottom:
o Inputs and outputs for monitoring units (sensors)

- Loosen the cable gland
- Draw the connection cable (provided by customer) into the cable gland
- Connect the connection cable (provided by customer)
  according to the wiring diagrams (see Figs. 11 to 18)
- Tighten the cable gland

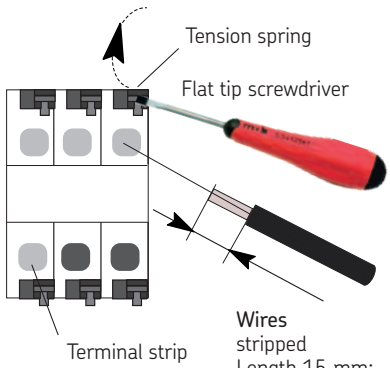
5.3.5 Connecting the wires

☞ see Figures 8 and 9
and Fig. 10

The wires on the terminal strips for:
o power connection (item 1)
o digital outputs (item 2)
o analog outputs (item 3)
o relay (item 4)
are connected via a tension spring mechanism. Proceed as follows:

- Press the tension spring back using the flat tip screwdriver
- Insert flexible cable leads into the terminals
- Release pressure on the tension spring
- Check that the wires are securely connected

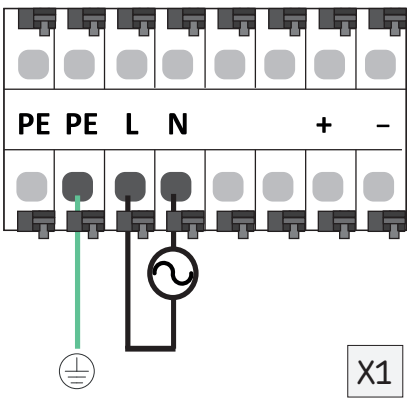
Fig. 10



5.3.6 Power supply 100 to 240 VAC and 24 VDC

☞ see Figure 8, item 1, and Fig. 11

Terminal diagram 100-240 VAC, Fig. 11

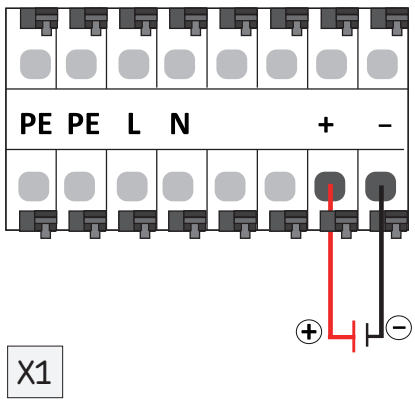


- Connect customer-provided cable for power supply acc. to terminal diagram 100 to 240 VAC, Fig. 11

☞ The 24 VDC is generated internally.
Do not connect externally generated 24 VDC to terminal (+) or terminal (-).

☞ see Figure 9, item 1, and Fig. 12

Terminal diagram 24 VDC, Fig. 12

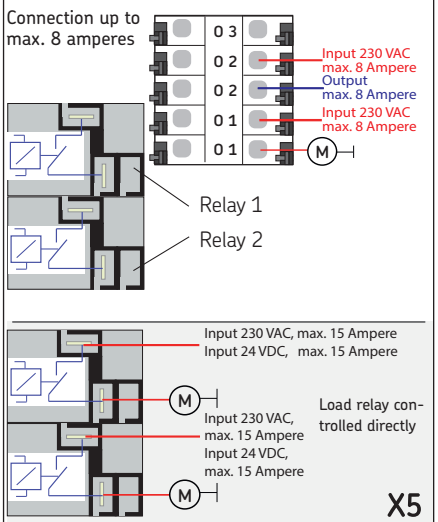


- Connect customer-provided cable for power supply acc. to terminal diagram 24 VDC, Fig. 10

5.3.7 Load switching relay

☞ see Figures 8/9, item 11, and Figure 13

Example of load switching relay, Fig. 13

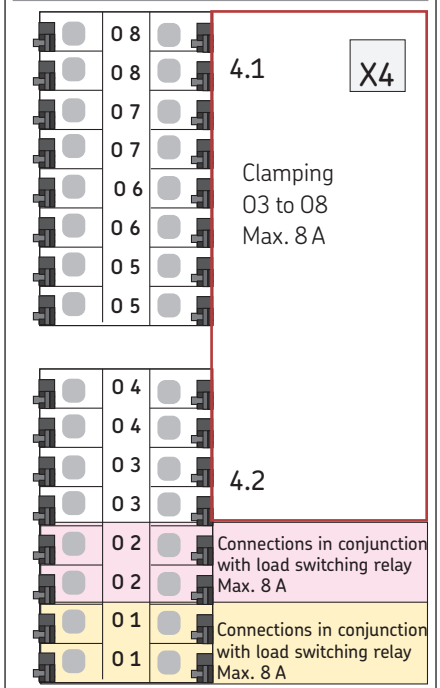


- Connect (loop) customer-provided load voltage cable to both terminals of the load relay.

5.3.8 Terminal strip for relay outputs

☞see Figures 8/9, item 4, and Figs. 14 and 15

Connection example for relay outputs, Fig. 14

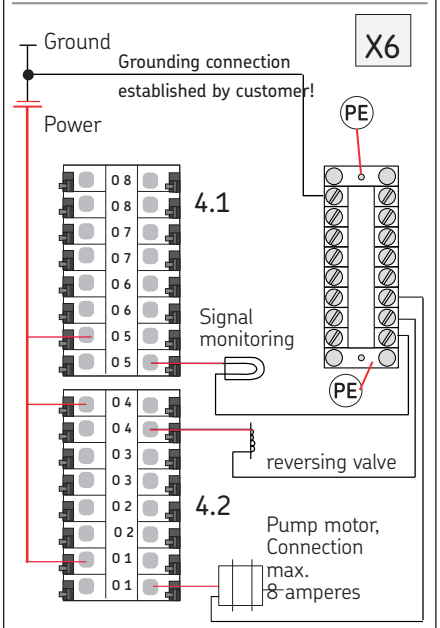


The outputs on the terminal strip **X4** are provided for downstream relays or loads installed by the customer. Note the following:
Two terminal rows (e.g.: 01/01) are provided for each connection. Both are connected to the switching contacts of the corresponding relay.
The customer's power supply must be connected to one of the terminal rows, while the load contact is connected to the second, opposite terminal row. The ground connection is established via the ground terminal strip on the controller, which must be grounded by the customer (see Figure 15).
The load on outlets 01 and 02 can optionally also be connected directly to the load relay (see Fig. 13).

NOTICE

Only one operating voltage (24 VDC or 100-240 VAC) can be connected to terminal strip 4.1 or 4.2.). Do not operate two different voltages within a terminal strip!

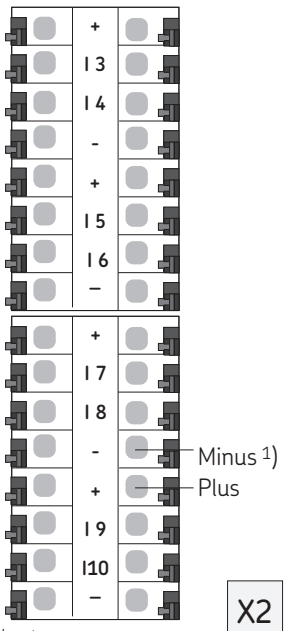
Relay outputs, connection example 24 VDC, Fig. 15



5.3.9 Terminal strip for digital inputs

☞see Figures 8/9, item 2, and Figure 16

Terminal strip for digital inputs, Fig. 16



The digital inputs are provided for:

- o Pressure switch
- o Proximity switch
- o Flow sensor
- o Lubricant level switch
- o Interim lubrication switch

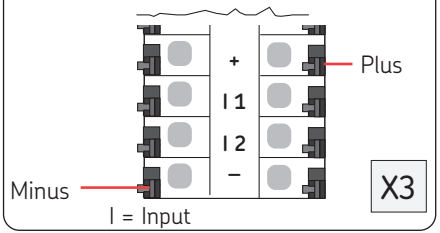
- On the digital switch, attach power supply (+) to plus terminal (+)
- On the digital switch, attach ground connection (-) to minus terminal (-)
- On the digital switch, attach signal line for digital switch to corresponding input terminal (I3 to I10)

1) No grounding connection (minus) is supported for two-wire sensor designs (plus + signal).

5.3.10 Terminal strip for analog-capable inputs

☞see Figures 7/8, item 3, and Figure 17

Terminal strip for analog-capable inputs, Fig. 17



The analog-capable inputs are provided for:

- o Pressure transducer
- o Temperature switch
- o Switch polled in mA or volt, e.g., 4-20 mA, 1-6 volt

- On the analog switch, attach power supply (+) to plus terminal (+)
- On the analog switch, attach ground connection (-) to minus terminal (-)
- On the analog switch, attach signal line to corresponding input terminal (I1 /I2)

5.3.11 Adding an additional IO connection to RS485 interface

☞see Figures 8/9, item 8
☞see Figures 18/19

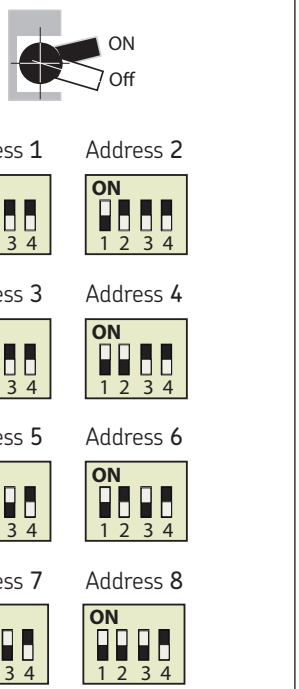
Another IOPCB communication connection can be established using the two RS485 connectors (5).
Up to 7 “IOPCBs” can be connected to a mainboard. Each IOPCB must be supplied separately.

NOTICE

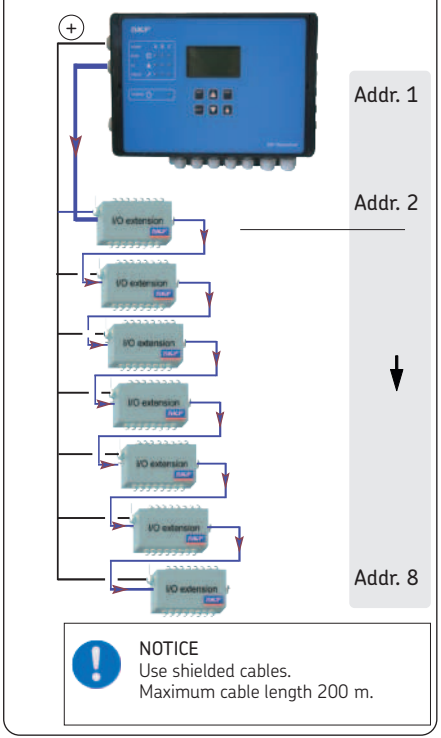
A separate address must be assigned to each IO board!

To differentiate between multiple IOPCBs in an RS485 daisy chain, each IOPCB needs its own address.
This can be set in the binary code using the DIP switch (address switch).
If all four DIP switches are set to **above**, the address is "1".
see Figure 16 for further addresses.

Setting IO addresses, Fig. 18



Daisy chaining with external IO boards, Fig. 19



6. Configuration by operator/local admin

General

There are two options for configuring the controller:

o Configuration with PC software and USB connection -see Chapter 6.1. The PC software application is designed for the operating systems Windows XP, Windows 7, and Windows 8 and is included as data media with the controller. The software can also be downloaded as freeware from the SKF website. After installing the program, data transfer occurs via the USB interface in the controller.
SKF recommends this procedure for initial installations.

o Configuration of the system using the display attached to the controller and the menu keys (see Chapter 6.2.).
The complete configuration can be done via the controller display and the associated menu keys.

6.1 Configuration of the controller unit with PC software

☞ see Figure 21

- Download the file for the LMC 301 software from the SKF homepage at http://www.skf.com/LMC301/ LMC 301 PC Software
- Close all applications on the laptop
- Open the file
- Enter the password "skfmc2013"

☞ The LMC 301 software installs automatically. SKF recommends not starting any other applications during this period.

- Install the controller unit (Chapter 5)
- Open the controller unit (Chapter 5.2.2)
- Connect the USB cable (2) from the laptop on the inside of the controller lid (1)
- Turn on the power supply

NOTICE

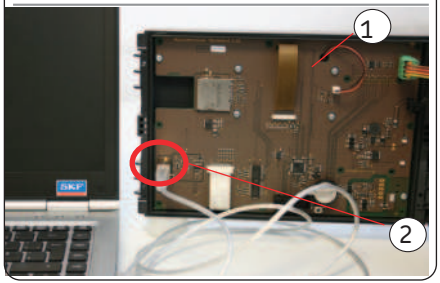
The USB cable may only be connected to the USB port installed inside the controller lid on the LMC 301.
- see Fig. 21, item 2.

- Start the LMC 301 software

☞ The description of the PC configuration is included with the software.

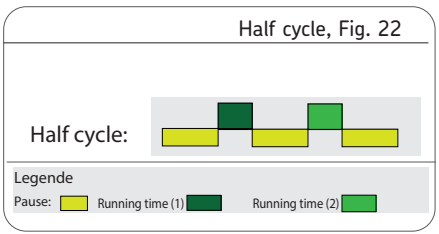
- Configure according to the included description for configuration on the PC

Connecting the USB cable, Fig. 21



6.2 System mode half cycle

In a half cycle, the controller enters runtime 1 after the defined interval time. After runtime 1 elapses and the changeover signal is received, pressure is relieved in the pressurized main feed line (1 or 2). At the same time, the control unit enters interval time. Runtime 2 follows after pressure is relieved and the interval time elapses. After runtime 2 elapses and the changeover signal is received, pressure is relieved in the pressurized main feed line (1 or 2). At the same time, the control unit enters interval time.
A complete lubrication cycle consisting of two half-cycles, separated by an interval time, is thus completed.



6.2.1 Press. Sensor at EOL

Various sensors can be used to record the system pressure at the end of the main lines. In addition to sensors with NC contacts or NO-contacts, transducer sensors whose response is in the volt or mA areas are generally used. With all these versions, the respective inputs for line 1 and line 2 must be defined.
The following applies additionally to the transducer versions:
To define the measurement range, enter their specific measurement ranges <<**Minimal Value**>> / <<**Maximal Valve**>>.
Defining the pressure range permissible for the particular system requires entry of the << **Min. Abs**olute **Pressure**>> and the <<**Maximal Abs**olute **Pressure**>>.
Defining the permissible pressure difference between line 1 and line 2 requires entry of the << **Min. Dif**ferential **Pressure**>> and the <<**Maximal Differential Pressure**>>
Make the settings on both transducers (for line 1 and line 2) immediately.

Based on the permissible measurement range, the two transducers will measure the pressure present at line 1 and line 2 and forward this to the LMC 301. The Controller monitors pressure reduction on the relieved line and the pressure build-up of the actuated line. At the same time, the Controller compares the values with the entries for permissible differential pressure. When the desired differential pressure << **Min. Differential Pressure**>> and << **Min. Absolute Pressure**>> is reached, the Controller enters interval time and switches off the pump.

6.3 Configuration of the controller unit via the display on the controller unit

6.3.1 States/Overview

After switching on the supply voltage, the Overview / States menu appears on the display.
The current parameter settings and values are displayed. This is done continuously and automatically.
The parameters and settings can optionally be accessed using the two arrow keys ▲▼

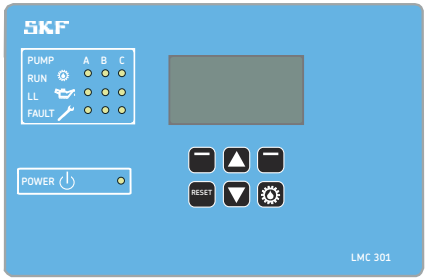
No entries can be made and the symbol shows a closed lock 🔒.
To change the configuration, select the menu item Menu using the control key ▬.
This will take you to the Main menu.
Changes can be made within the main menu only after entering the password.
This is done in the Login settings menu level.
When entering the password, there is a differentiation between Local Admin (customer access) and Supervisor (only service staff, no customer access).
The open lock icon 🔓 indicates that the system has been unlocked.

NOTICE

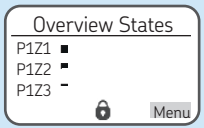
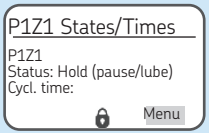
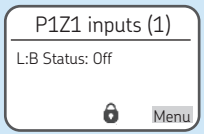
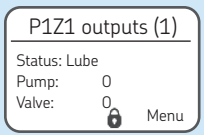
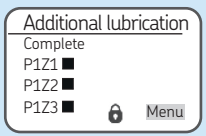
To save data, press the Control key Save for at least 3 seconds.

6.3.2 Display and control elements of control screen

Display, Fig. 23



Status overview and triggering an additional lubrication

Symbol	Status	Function
		Pressing the **down arrow key** provides a status overview of the pumps and zones (P1Z1 = pump 1/zone 1 to max. P3Z3 pump 3/zone 3).
		Pressing the **down arrow key** again displays the remaining interval time or remaining runtime for the currently selected pump/zone (for example, P1Z1).
		Pressing the **down arrow key** again displays the activated inputs for the currently selected pump/zone.
		Pressing the **down arrow key** again displays the activated outputs for the currently selected pump/zone.
		Pressing the Remote Manual Lube button for five seconds causes an interim lubrication to be performed on the complete system or the activated zones (P1Z1 = pump 1/zone 1 to max. P3Z3 pump 3/zone 3).

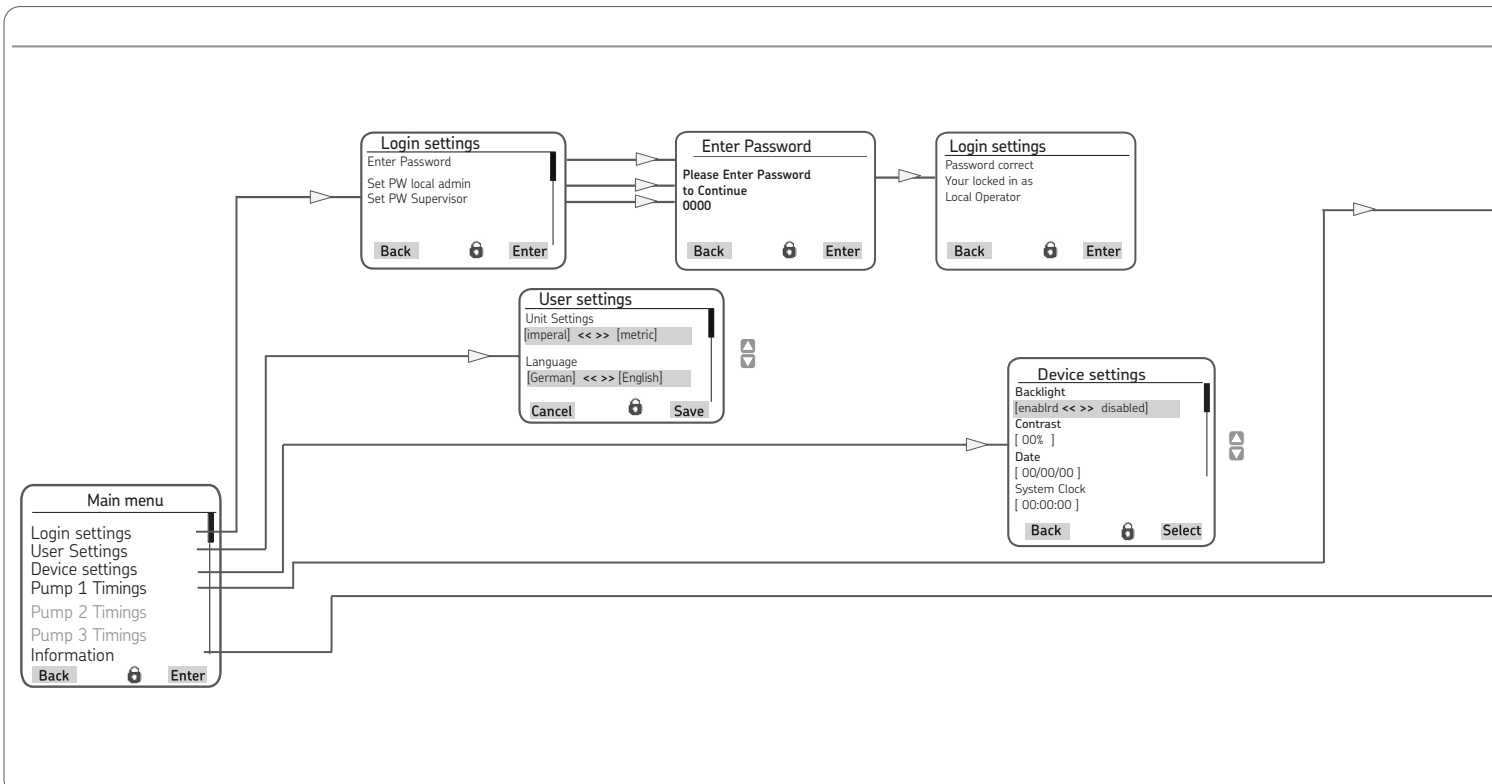
Display and control elements of control screen

Symbol	Designation	Function
	Display	o Menu display/Display of values and parameters/Fault display o The right bar ( ) indicates that the menu extends beyond the current display
PUMP	**PUMP** Pumps A B C	Pump/main line A / B / C per pump Max. of 3 main lines possible
RUN 	**RUN**ning Active control	LED lights up = Indication of currently active pump/active control line (A/B/C)
LL 	Low Level Minimum fill level reached	LED lights up = Minimum fill level (pump A / B / C) reached
FAULT 	**FAULT** Fault message signal	o LED flashes = Fault detected o LED lights up = Fault present
POWER 	POWER Control unit On/Off	LED lights up = Control unit switched on
	Function keys	Control key in combination with the display above the key Up arrow key menu control <Back menu level> / increase input value Down arrow key menu control <Forward menu level> / reduce input value Pressing triggers an interim lubrication. Briefly pressing selects an interim lubrication. Actuations while in configuration mode are ignored. Long pressing (> 3 seconds) stops all systems or resets error notifications. Long pressing acknowledges and clears error notifications.

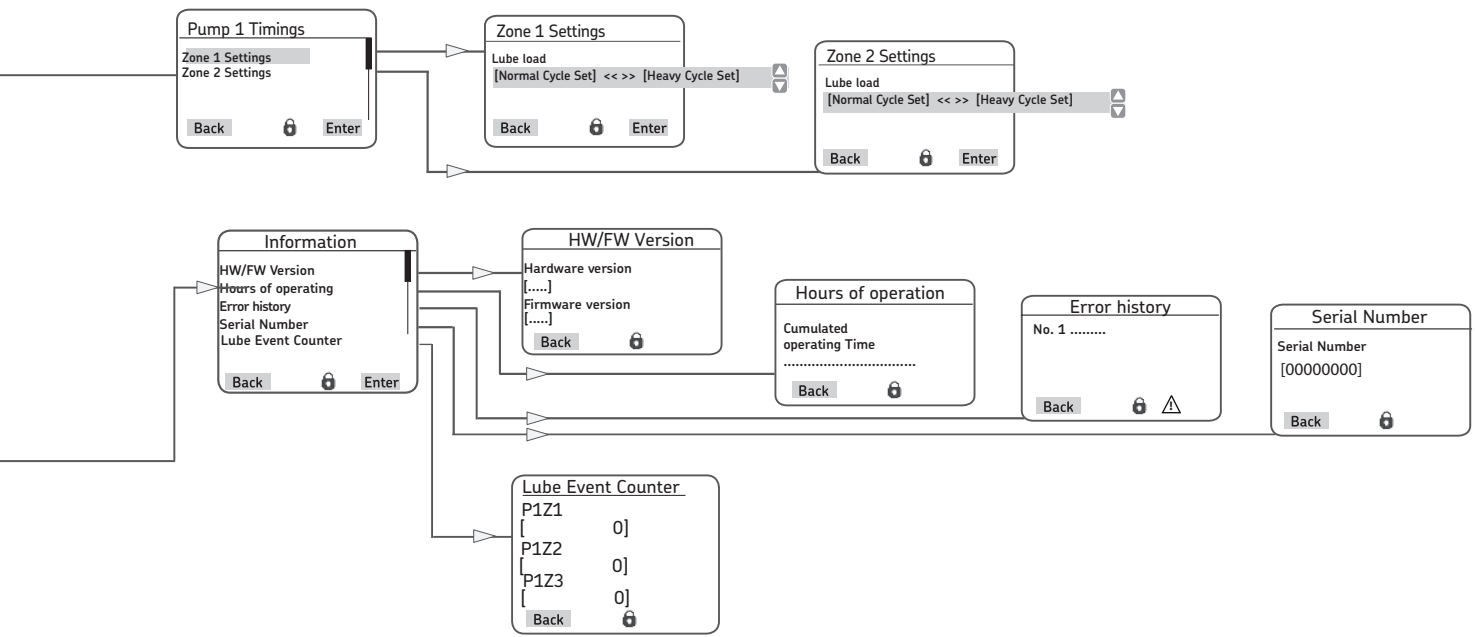
Display elements of the control screen

Symbol	Status	Function
	Stopped/OFF	o The system was stopped by pressing the Reset key and can be restarted by briefly pressing the Running key.
	Pause	o Respective lubrication zone is in interval time
	Wait Temperature	o Waiting period temperature
	Waiting	o Lubrication zone waiting because other zone currently being lubricated
	Lube	o System is lubricating
	Hold	o Hold time
	Relief	o System is relieving pressure
	Running time	o Pump is running
	Secured/ Access denied	o No access as local admin or supervisor
	Access	o Access as local admin or supervisor
	Error	o Fault is present
	Digital inputs/outputs on	o Digital output is enabled
	Digital inputs/outputs off	o Digital output is disabled

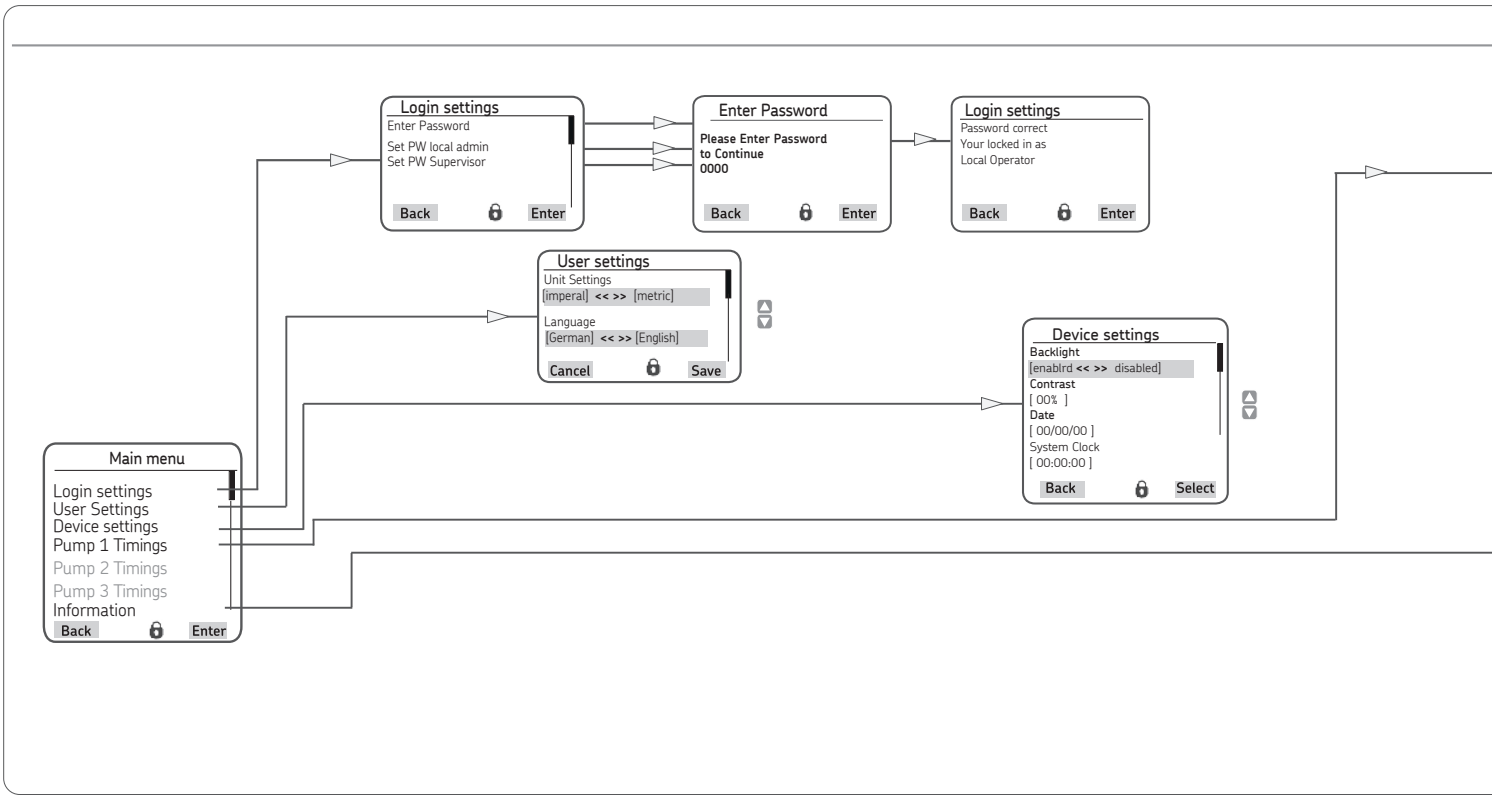
6.3.3 Menu navigation for operators without password access



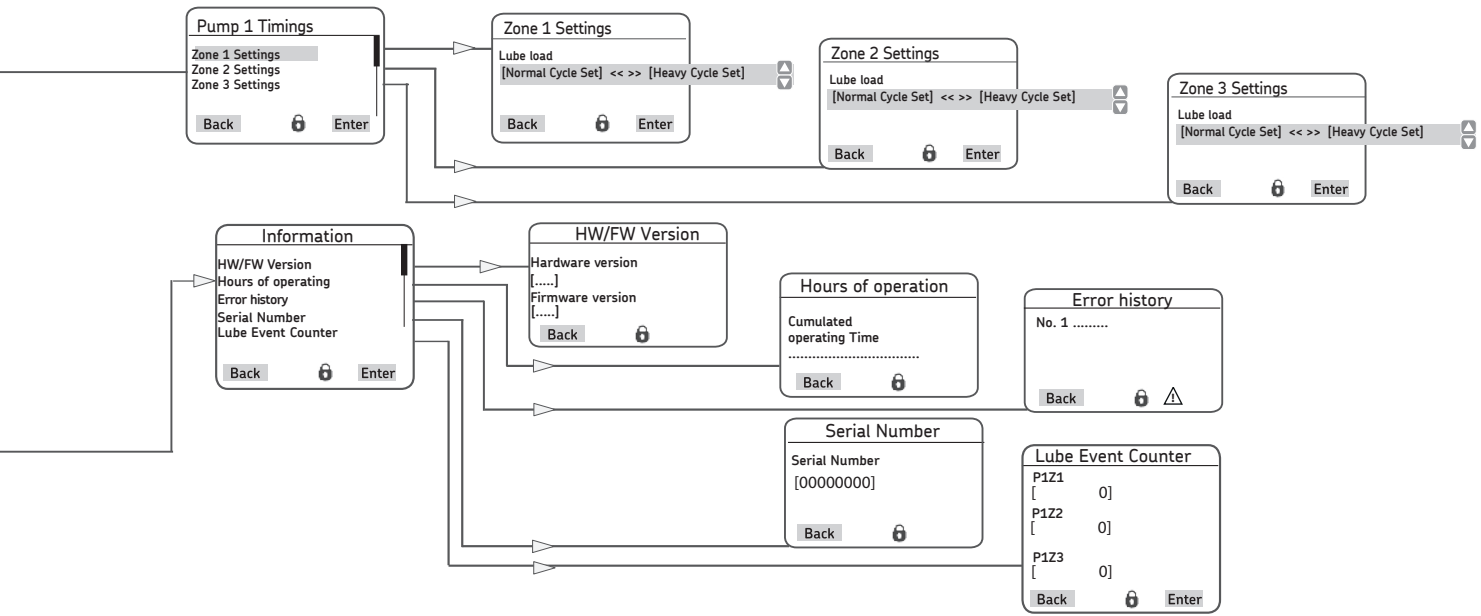
Setting options for operators without password access, Fig. 24



6.3.4 Menu navigation for local admins with password access

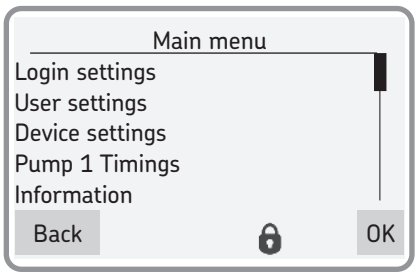


Setting options for local admins, Fig. 25



6.3.5 Main menu

Main menu, Fig. 246



NOTICE

The description of the main menu is based on settings that the end customer can adjust. (**password level Set PW local admin**)

The main menu shows the following options:

Login settings
☞see Chapter 6.3.5
The <Login settings> menu is used to manage access to the menus with a password. The password can also be changed here.

Setting options for operators without password access
☞see Chapter 6.4
In this menu, the measurement units (metric or inch) and the language for the user menu can be selected.

Device settings
☞see Chapter 6.5.2
In this menu, the display properties of the screen, such as backlight or contrast, can be modified. The date and time are also set here.

Pump 1 Timings
☞see Chapter 6.5.3
The timing of the pump and the settings for the associated main line are performed here. Up to three pumps can be activated, each with up to three zones (zone1 to zone3).

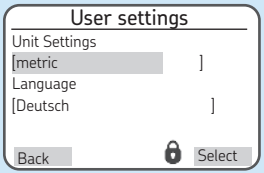
Information
☞see Chapter 6.5.6
The hardware and firmware versions are stored in this menu. The hours of controller operation, the error history, and the serial number of the controller unit can also be viewed here.
Further, the total lubrication cycles for each pump and zone are shown here (example pump 1, zone 1=>P1Z1).

6.4 Setting options without (with) password access

User settings

Step	Button	Display	Description
User settings - Set units and menu language			
1	Menu	Overview States P1Z1: Menu	• Press <**Menu** control key> ☞ You will be taken to the main menu
2	OK	Main menu Login settings User settings Device settings Pump 1 Timings Information Back OK	• Use <**down arrow key**> to select the User settings menu item • Confirm with <**Co**ntrol key OK> ☞ You will enter the User settings menu
3	Select Save	User settings Unit Settings [metric] Language [German] Back Select	• Use **<down arrow key>** to select the Language [English/Deutsch] menu item • Press <**Control** key Select> • Use **<down/up arrow key>** to select the language [English/**Deutsch**] • Press <**Cont**rol key Save>

User settings

Step	Button	Display	Description
User settings - Set units and menu language			
4			• Use **<up arrow key >** to select the Unit Settings menu item [Imperial/Metric] • Press <**Control** key Select> • Use **<down/up arrow key >** to select Input Settings[Imperial/**Metric**] • Press <**Cont**rol key Save> • Press <**Cont**rol key Back> ☞You will return to the User settings menu

6.5 Setting options for local admins (setters) with password access

Login settings

Step	Button	Display	Description
Login settings - Enter Local Admin password			
1	OK ▲ ▼	**Main menu** Login settings User settings Device settings Pump 1 Timings Information **Login settings** Enter Password Set PW local admin Set PW Supervisor Back OK **Enter Password** Enter Password to continue 0000 Cancel OK Password Correct You are logged in as Local Admin Back OK	• Press <Control key OK> ☞ You will enter the Login settings menu. The following menu items are available: o Enter password (enter existing password) o Set Password Word local admin for customer's personnel (change password) o Set PW Supervisor for SKF Service and SKF dealers (change password) o If the password has already been entered (open lock), the menu item **Log Off** is also available. • Use **<down/up** arrow key> to select Set PassWord local admin. • Press <Control key OK> ☞ You will enter the Enter Password menu The password contains four characters that can be either numerals or letters. • Use **<down/up** arrow key> to set the first character of the password • Confirm the entry with <Control key OK> • Repeat the entry for the following 3 password characters • Press <Control key Back> ☞ You will return to the Login Settings menu.

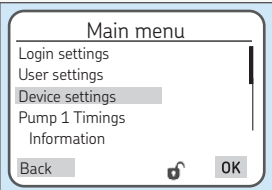
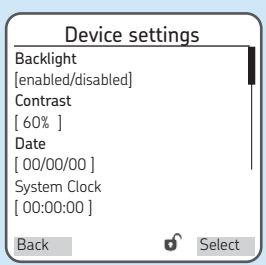
6.5.1 Password change

Login settings

Step	Button	Display	Description
Login settings - change existing password			
2	OK OK	Main menu Login settings User settings Device settings Pump 1 Timings Information Back OK Login settings Enter Password Set PW local admin Set PW Supervisor Log Off Back OK Local Admin Old password 0000 New password 0000 Back OK	• Press <Control key OK> ☞You will enter the **Login settings** menu. • Use **<down/up arrow key>** to select Enter Password • Enter current password (see previous chapter) • Use **<down/up arrow key>** to select password level Set PassWord local admin (customer service) or Set PW Supervisor (SKF Service) • Press <Control key OK> ☞You will enter the Set PW local admin or Set PW Supervisor menu. The current password and the entry field for the new password are displayed in this menu. • Enter the new password as described above under Enter Password ☞You will return to the **Login Settings** menu.

6.5.2 Device settings

Device settings

Step	Button	Display	Description
Device settings- Display, system date, and system time			
1			• Use <**down/up** arrow key> to select Device settings • Press <**Co**ntrol key OK> ☞ You will enter the Device Settings menu. The following menu items are available: o Backlight (display enabled/disabled) o Contrast (display 0-100%) o Date (year/month/day) o System Clock (seconds/minutes/hours) o Use <**down/up** arrow key> to select a menu item • Press <**Contro**l key Select> • Use <**down/up** arrow key> to specify the value • Use <**Cont**rol key Save> to save the entry ☞ If there are multiple entries, the cursor automatically moves to the next entry field after saving. • Press <**Cont**rol key Back> ☞ You will return to the Main menu.
			

6.5.3 Pump 1 Timings

General

Up to three pumps can be connected to the LMC 301 Controller; the maximum amount of zones (main lines) that the Controller can control is limited to three.
Up to three main lines (zone 1 to zone 3) can be programmed per pump.

These can be accessed in the Main menu under:

Pump 1 Timings
- Zone 1 Settings
- Zone 2 Settings
  (if 2nd line present)
- Zone 3 Settings
  (if 3rd line present)

Depending on the access level, the following settings can be made:

- Relief settings (only with 3/2 directional solenoid valves)
- Zone settings with:
  - Lube Load
  - Normal Cycle Time
  - Heavy Cycle Time
  - Monitoring Time
  - Hold time

6.5.4 Operator level without password access

- see Pages 42/43 and Pages 48/49

The following entries can be made here:

o <<**Normal Cycle Set**>>

or

o <<**Heavy Cycle Set**>>

The two lubrication settings differ in terms of the duration of work cycle time.
The cycle time consists of the pump cycle time + interval time - see Figure 22.
A longer lubrication time is typically programmed for Heavy Cycle Set compared with Normal Cycle Set.

Pump 1 Timings

Step	Button	Display	Description
Pump 1 Timings User Settings- without password level			
1	OK	Main menu Login settings User settings Device settings Pump 1 Timings Information Back OK	• Use < **down/up**arrow key> to select Pump 1 Timings • Press <**Co**ntrol key OK> ☞ You will enter the Zone 1 Settings menu. ☞ The following menu items are available: o Zone 1 Settings • Press <**Co**ntrol key OK> • Press <**Control** key Select> • Use <**down/up** arrow key> to select **Normal Cycle Set** or **Heavy Cycle Set** • Press <**Cont**rol key Save> to save the selection • Press <**Cont**rol key Back> ☞ You will return to the Pump 1 Timings menu.
	OK Select	Pump 1 Timings Pump Timings Zone 1 Settings Zone 2 Settings Zone 3 Settings Back OK	
	Save Back	Pump 1 Timings Lubrication settings [Normal Cycle Set] Back Select	

6.5.5 Local Admin (setter) or supervisor with password access

- see Pages 44/45 and Pages 50 to 51

Local Admin password
Factory setting: **1000**

The following entries can be made at this password level:

Pump Timings

- o Setting for zone relief time
- o Setting for pump relief time

Zone 1 Settings

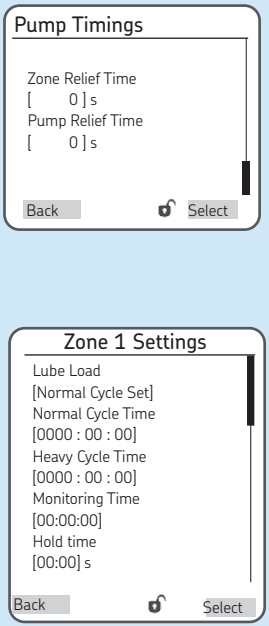
- o Selection of lube load <<**Normal Cycle Set**>> or <<**Heavy Cycle Set**>>,
- o Entry of <<**Normal Cycle Time**>> for basic lubrication
- o Entry of <<**Heavy Cycle Time**>> for increased lubricant demand
- o Entry of monitoring time << **Monitoring Time**>>
- o Entry of holding time, delay time of zone valves

The procedure is typically identical for setting parameters for the main lines (zone 1 to zone 3).

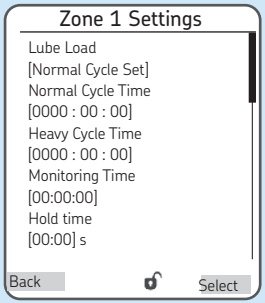
Pump 1 Timings

Step	Button	Display	Description
Pump 1 Timings- with password level Local Admin or Supervisor			
1	OK	Main menu Login settings User settings Device settings Pump 1 Timings Information Back OK	• Use < **down/up**arrow key> to select Pump 1 Timings • Press <**Co**ntrol key OK> ☞You will enter the Zone 1 Settings menu. ☞The following menu items are available: o Pump Timings (pump relief time, menu only when 3/2 zone valves activated) o Zone 1 Settings o Zone 2 Settings, if applicable If 3/2 zone valves activated: • Use <down arrow key> to select Pump Timings • Press <Control key OK>
	OK	Pump 1 Timings Pump Timings Zone 1 Settings Zone 2 Settings Back Ok	

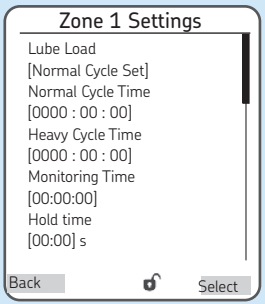
Pump 1 Timings

Step	Button	Display	Description
Pump 1 Timings- with password level Local Admin or Supervisor			
2	Select ▲▼ Save Back Select ▲▼ Save Back ▲▼ OK		☞You will enter the Zone 1 Settings menu. The following menu items are available: **Zone Relief Time** ☞Entry of the time value during which all zone valves are actuated **Pump Relief Time** • Entry of the time value during which the pump is switched to pressure relief • Press <**Control** key Select> • Use <**down/up** arrow key> to select Zone Relief Time and/or: • Use <**down/up** arrow key> to select Pump Relief Time • Press <**Control** key Select> • Use <**down/up** arrow key> to set the time frame • Press <**Control** key Save> • Press <**Control** key Back> o Use <**down/up** arrow key> to select Zone 1 Settings • Press <**Control** key OK> ☞You will enter the Zone 1 Settings menu.

Pump 1 Timings

Step	Button	Display	Description
Pump 1 Timings- with password level Local Admin or Supervisor 🔓			
3			☞The following menu items are available: o **Lube Load:** Selection between Normal Cycle Set and Heavy Cycle Set. The two lubrication settings differ in terms of the duration of cycle time. A longer lubrication time is typically programmed for Heavy Cycle Set compared with Normal Cycle Set. o **Normal Cycle Time:** Entry of the time unit for a normal lubrication process. The total value to be entered consists of pump cycle time+holding time+interval time. The lubrication time is the time required by the lubrication system to build up pressure in the respective zone until all metering devices in the zone have actuated or reversed. The interval time is the time differential between the set cycle time and the required pump cycle time + holding time. The entry is in hours/minutes/seconds. o **Heavy Cycle Time**: Entry of the time unit for a lubrication process with increased lubricant demand. The heavy cycle time has the same structure as the normal cycle time. The entry is in hours/minutes/seconds. o **Monitoring Time:** Monitoring of lubrication time Pressure build-up must be completed within the monitoring time (time slot). o **Hold time:** After the end of the pump cycle time, the controller switches off the pump, though pressure relief by the zone valves is delayed by the holding time. The entry is in minutes and seconds.

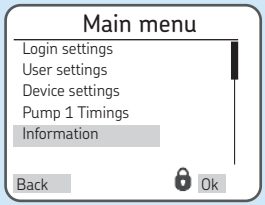
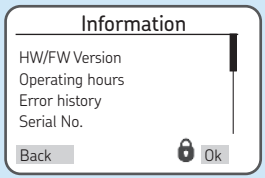
Pump 1 Timings

Step	Button	Display	Description
Pump 1 Timings- with password level Local Admin or Supervisor			
3	Select Select Save OK Save Back		o Use <**down/up** arrow key> to select Zone 1 Settings • Press <**Control** key Select> • Use <**down/up** arrow key> to select Normal Cycle Set (or Heavy Cycle Set) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between Normal Cycle Set /Heavy Cycle Set • Press <**Cont**rol key Save> • Use <**down** arrow key> to select the Normal Cycle Time menu item • Press <**Control** key Select> • **Use** <**down/up** arrow key> to enter an eight-digit cycle time [**hhhh:mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Use <**down** arrow key> to select the Load Cycle Time menu item • Press <**Control** key Select> • **Use** <**down/up** arrow key> to enter an eight-digit Heavy Cycle Time [**hhhh:mm:ss**] • Press <**Cont**rol key Save> • Repeat the process for menu items Monitoring Time and Holding Time • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

6.5.6 Information

The information menu simply presents information. Parameters cannot be changed, and error notifications cannot be cleared.

Information

Step	Button	Display	Description
Information menu - without password level			
1	OK OK Back Back	 	• Use <**down/up arrow key**> to select Information • Press <**Co**ntrol key OK> ☞You will enter the Information menu. ☞The following menu items are available: o **HW/FW Version**: Display of the controller unit's hardware and software version o **Hours of operation**: Current number of operating hours of the controller unit o **Error history**: previous error notifications, with error coding o **Serial Number**: Serial number of the control unit o **Lube Cycle Counter**: Displays the total lubrication cycles per pump and zone • Use <**down/up** arrow key> to select a menu item • Press <**Co**ntrol key OK> • Press <**Cont**rol key Back> ☞You will return to the Information menu. • Press <**Cont**rol key Back> ☞You will return to the Main menu.

6.6 Examples of dual-line systems

Several examples of dual-line centralized lubrication systems with an LMC 301 Controller are listed below and can be used as the basis for local admins to make their settings. The individual examples are divided into three sections.
Section 1 is a brief textual description of the structure of the single-line centralized lubrication system shown.

Section 2 shows the structure of the particular single-line centralized lubrication system (system design) with the associated LMC 301 terminal diagram.

Section 3 shows the customer programming of the LMC 301 Controller via its display and keyboard (see Chapter 6.3).

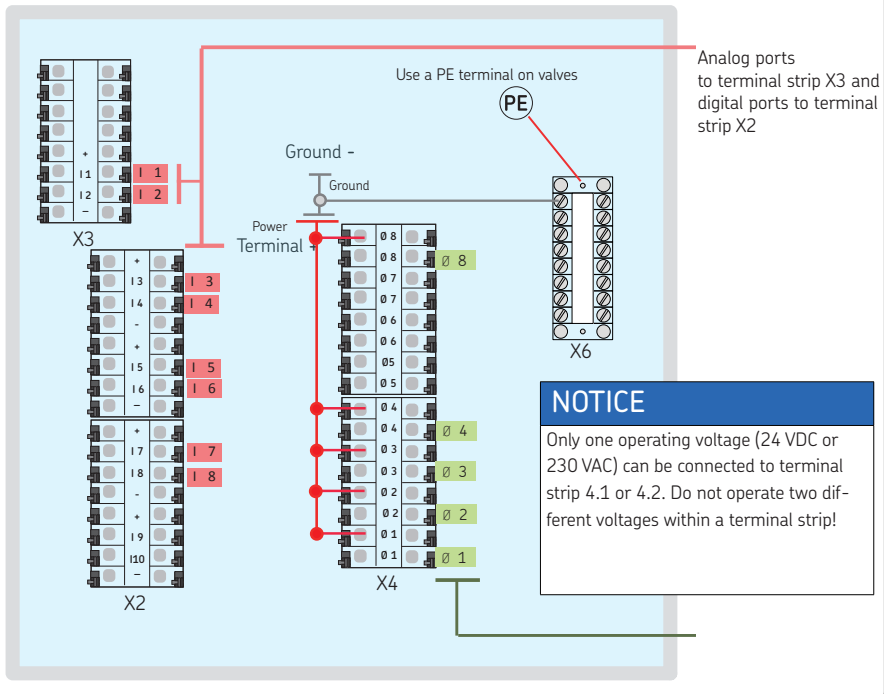
6.6.1 2-zone dual-line centralized lubrication system with 3/2 directional solenoid valves and DDS50 differential pressure switch

☞see Figures 26 and 27

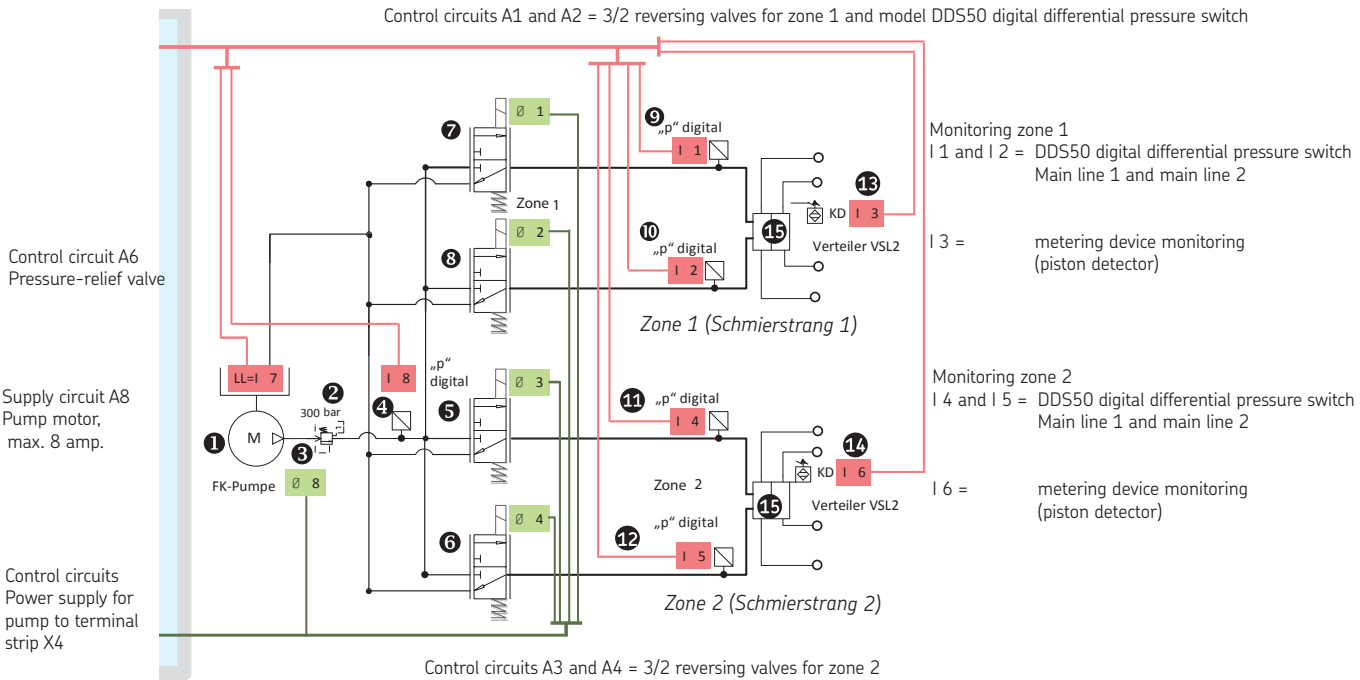
Design

The example applies to a dual-line centralized lubrication system with two zones (zone 1/zone 2 (line 1/line 2)).
It is composed of the main components Dual-line pump (**1**) with pressure-regulating valve (**2**) and dual-line metering devices (**15**) A main line (**3**) with a pressure switch (**4**) is flanged to the pump and switches off the pump once the set maximum pressure is reached. The main line (**3**) connects the pump outlet with the four 3/2 directional solenoid valves for zone 1 (**5/6**) and zone 2 (**7/8**).
A model DDS50 differential pressure switch (**9** to **12**) is fitted at the end of each line ahead of the last metering device to monitor pressure/changeover pressure.
Further, a piston detector is fitted on the last metering devices (**13/14**) to monitor the lubrication cycles. Chapter 3 contains a general functional description.

LMC 301, electrical terminal diagram, Fig. 25

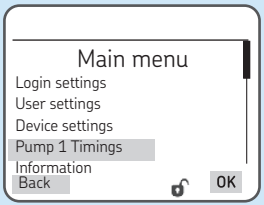
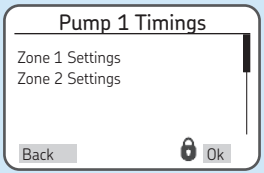


System design, Fig. 26



Customer programming of the LMC 301 unit via the controller display and controller keys

Programming via the LMC 301 display

Step	Button	Display	Description
1			The following requirements are met: • User settings have been made according to Chapter 6.3.5 • Login settings have been made according to Chapter 6.3.6 (only at Local Admin level) • Device settings have been made according to Chapter 6.3.7
Timing User Settings			
2	 	 	• Use < **down/up**arrow key> to select Pump 1 Timings • Press <**Co**ntrol key OK> ☞You will enter the Zone 1 Settings menu. ☞The following menu items are available: o Zone 1 Settings o Zone 2 Settings • Use <**down/up** arrow key> to select the Zone 1 Settings menu item • Press <**Co**ntrol key OK>

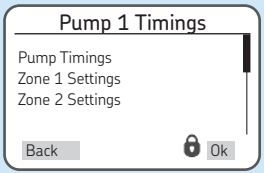
Pump 1 Timing and Cycle Control

Step	Button	Display	Description
Pump 1 Timing User Settings			
2	Select Save	Zone 1 Settings Lube Load [Normal Cycle Set] Normal Cycle Time [0000:00:00] Heavy Cycle Time [0000:00:00] Monitoring Time [00:00:00] Hold time [12:00 AM] Back Select	☞You will enter the Zone 1 Settings menu. ☞The following menu items are available: o <<**Normal Cycle Set**>> or <<**Heavy Cycle Set**>>: Entry of lubrication intensity, normal or heavy cycle set o **Normal Cycle Time**: Entry of cycle time for normal cycle set o **Heavy Cycle Time:** Entry of cycle time for increased lubricant demand (longer pump cycle time) o **Monitoring Time:** Monitoring of the lubricating time; the lubricating cycle must be completed within the monitoring time (time slot). o **Hold time:** After the end of the pump cycle time, the controller switches off the pump, though pressure relief by the zone valves is delayed by the holding time. • Use <**down/up** arrow key> to select Normal Cycle Set (or Heavy Cycle Set) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between Normal Cycle Set /Heavy Cycle Set • Press <**Control** key Save> • Use <**down** arrow key> to select the Normal Cycle Time menu item • Press <**Control** key Select> • **Use** <**down/up** arrow key> to enter an eight-digit cycle time [**hhhh:mm:ss**] ☞Press <**Control** key OK> to advance to the next digit • Press <**Control** key Save>

Pump 1 Timing and Cycle Control

Step	Button	Display	Description
Pump 1 Timing User Settings			
2	▼ Select ▲ ▼ OK Save	Zone 1 Settings Lube Load [Normal Cycle Set] Normal Cycle Time [0000:00:00] Heavy Cycle Time [0000:00:00] Monitoring Time [00:00:00] Hold time [12:00 AM] Back Select	• Use <**down** arrow key> to select the Load Cycle Time menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter an eight-digit cycle time [**hhhh:mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Press <**Cont**rol key Save> • **Use <down arrow key>** to select the **Monitoring Time** menu item • Press <**Control** key Select> • **Use** <**down/up** arrow key> to enter a six-digit cycle count [**hh:mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Press <**Cont**rol key Save> • **Use <down arrow key>** to select the Holding time menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter a four-digit cycle count [**mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Press <**Cont**rol key Save>

Pump 1 Timing and Cycle Control

Step	Button	Display	Description
Pump 1 Timing User Settings- Zone 2 Settings			
3			• Use <**down/up** arrow key> to select the Zone 2 Settings menu item • Press <**Co**ntrol key OK> • Make settings according to the procedure for Zone 1 Settings
4			• Press <**Cont**rol key Back> to confirm the entry

6.6.2 2-zone dual-line centralized lubrication system with EMU3 changeover valve and 2 pressure switches

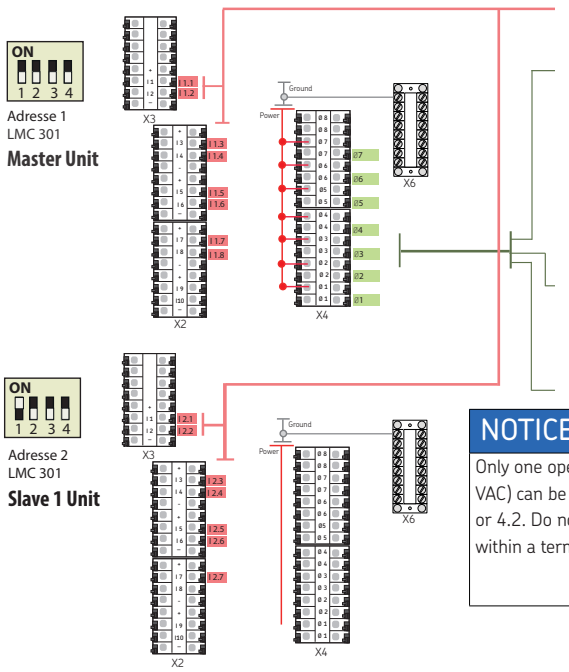
☞see Figures 27 and 28

Design

The example applies to a dual-line centralized system with two zones (zone 1/zone 2 (line 1/line 2)).

It is composed of the main components dual-line pump (**1**) with pressure-regulating valve (**2**), two electrical 4/3 zone valves (**5/6**) (EM03), and dual-line metering devices (**13**). A main line (**3**) with a pressure switch (**4**) is flanged to the pump and switches off the pump once the set maximum pressure is reached. The main line (**3**) connects the pump outlet with the two electrical 4/3 reversing valves for zone 1 (**5**) and zone 2 (**6**). A PT pressure switch (**7** to **10**) for pressure monitoring (change-over pressure) is fitted at the end of each line ahead of the last metering device. Further, a piston detector is fitted on the last metering devices (**11/12**) to monitor the lubrication cycles. Chapter 3 contains a general functional description.

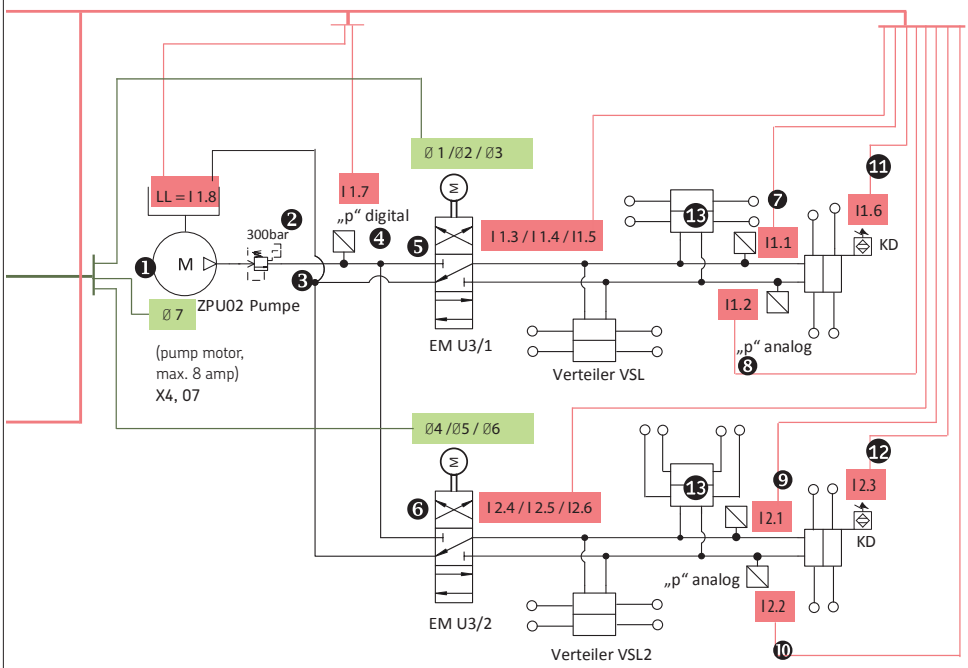
LMC 301, electrical terminal diagram, Fig. 27



NOTICE

Only one operating voltage (24 VDC or 230 VAC) can be connected to terminal strip 4.1 or 4.2. Do not operate two different voltages within a terminal strip!

System design, Fig. 28

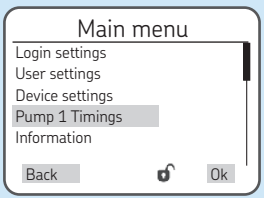
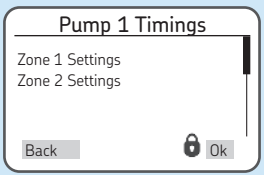


Monitoring zone 1 analog pressure switches
I 1.1 Main line 1
I 1.2 Main line 2
I 1.6 Metering device monitoring (piston detector)

Monitoring zone 2 analog pressure switches
I 2.1 Main line 1
I 2. 2 Main line 2
I 2.3 Metering device monitoring (piston detector)

Customer programming of the LMC 301 unit via the controller display and controller keys

Programming via the SKF Flex-Control display

Step	Button	Display	Description
1			The following requirements are met: • User settings have been made according to Chapter 6.3.5 • Login settings have been made according to Chapter 6.3.6 (only at Local Admin level) • Device settings have been made according to Chapter 6.3.7 • Master and slave devices must communicate with each other via DIP switches
Timing User Settings			
2	 	 	• Use < **down/up**arrow key> to select Pump 1 Timings • Press <**Co**ntrol key OK> ☞You will enter the Zone 1 Settings menu. ☞The following menu items are available: o Zone 1 Settings o Zone 2 Settings • Use <**down/up** arrow key> to select the Zone 1 Settings menu item • Press <**Co**ntrol key OK>

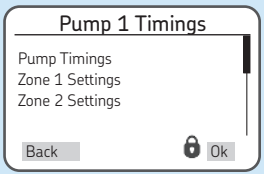
Pump 1 Timing and Cycle Control

Step	Button	Display	Description
Pump 1 Timing User Settings			
2	Select Save	Zone 1 Settings Lube Load [Normal Cycle Set] Normal Cycle Time [0000:00:00] Heavy Cycle Time [0000:00:00] Monitoring Time [00:00:00] Hold time [12:00 AM] Back Select	☞You will enter the Zone 1 Settings menu. ☞The following menu items are available o <<**Normal Cycle Set**>> or <<**Heavy Cycle Set**>>: Entry of lubrication intensity, normal or heavy cycle set o **Normal Cycle Time**: Entry of cycle time for normal cycle set o **Heavy Cycle Time:** Entry of cycle time for increased lubricant demand (longer pump cycle time) o **Monitoring Time:** Monitoring of lubrication time The lubricating cycle must be completed within the monitoring time (time slot). o **Hold time:** After the end of the pump cycle time, the controller switches off the pump, though pressure relief by the zone valves is delayed by the holding time. • Use <**down/up** arrow key> to select Normal Cycle Set (or Heavy Cycle Set) • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select between Normal Cycle Set /Heavy Cycle Set • Press <**Contro**l key Save> • Use <**down** arrow key> to select the Normal Cycle Time menu item • Press <**Contro**l key Select> • Use <**down/up** arrow key> to enter an eight-digit cycle time [**hhhh:mm:ss**] ☞Press <**Co**ntrol key OK> to advance to the next digit • Press <**Contro**l key Save>

Pump 1 Timing and Cycle Control

Step	Button	Display	Description
Pump 1 Timing User Settings			
2	▼ Select ▲ ▼ OK Save	Zone 1 Settings Lube Load [Normal Cycle Set] Normal Cycle Time [0000:00:00] Heavy Cycle Time [0000:00:00] Monitoring Time [00:00:00] Hold time [12:00 AM] Back Select	• Use <**down** arrow key> to select the Load Cycle Time menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter an eight-digit cycle time [**hhhh:mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Press <**Cont**rol key Save> • Use <**down** arrow key> to select the Monitoring Time menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter a six-digit cycle count [**hh:mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Press <**Cont**rol key Save> • Use <**down arrow key**> to select the Holding time menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter a four-digit cycle count [**mm:ss**] ☞ Press <**Co**ntrol key OK> to advance to the next digit • Press <**Cont**rol key Save>

Pump 1 Timing and Cycle Control

Step	Button	Display	Description
Pump 1 Timing User Settings- Zone 2 Settings			
3			• Use<**down/up** arrow key> to select the Zone 2 Settings menu item • Press <**Co**ntrol key OK> • Make settings according to the procedure for Zone 1 Settings
4			• Press <**Cont**rol key Back> to confirm the entry

7. Operation/decommissioning and disposal

☞ Explanation of display symbols and controls - see Chapter 6.3.2.

Dual-line centralized lubrication systems with LMC 301 Controller typically operate automatically.
If the LMC 301 Controller is enabled (green POWER LED is lit), the display shows the current lubrication routine.
Any saved error messages can be read by pressing arrow key down.

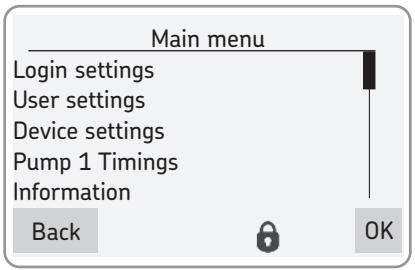
Errors must be resolved immediately!
Lubricant transport in the lubrication lines and the lubricant fill level in the lubricant reservoir must be subjected to regular visual inspection.
Top up the lubricant if the fill level is too low.

Dispose of the battery
in an environmentally friendly way

7.1 User-configurable setting options

The customer can access the menus stored in the Main menu (see Fig. 29) and make some settings. The procedure is described in Chapters 6.3.3 and 6.5.3.

Main menu, Fig. 29



NOTICE

When saving data, make sure to press Control key Save for at least three seconds.

NOTICE

The description of the main menu is based on the setting options that the end customer can adjust.

The main menu shows the following options:

Login settings
The <Login settings> menu is used to manage access to the menus with a password. The password can also be changed here.

User settings
In this menu, the measurement units (metric or inch) and the language for the user menu can be selected.

Device settings
In this menu, the display properties of the screen, such as backlight and contrast, can be modified. The date and time are also set here.

Pump 1 Timings
In this menu, the timing of the pump and the settings for the associated main line are set

Information
The hardware and firmware versions are stored in this menu. The hours of controller operation, the error history, and the serial number of the LMC 301 can also be viewed here.

7.2 Temporary shutdown

Temporary shutdown is performed by disconnecting the electrical supply connections. Observe the instructions in the chapter "Assembly" while doing so.
If the product is to be shut down for an extended period of time, also follow the instructions in Chapter "Transport, delivery, and storage."

7.3 Recommissioning

After a brief down time:
- o Check the supply voltage - green POWER LED must light up
- o Perform visual inspection
- o Switch on the product

After extended down time:
- o Perform safety checks
- o Trained maintenance personnel inspect/ replace the button cell battery- see Maintenance chapter
- o Check the supply voltage - solid green POWER LED
- o Perform visual inspection
- o Switch on the product

7.4 Shutdown and disposal

If the product is to be shut down permanently, observe the legal requirements for disposal of contaminated parts/equipment.

NOTICE

Observe the local regulations and laws regarding disposal.

8. Maintenance

8.1 General

WARNING

Electric shock

De-energize the controller prior to beginning work.
Only qualified personnel authorized by the operator may perform work on the controller.
The electrical operating conditions and local regulations (e.g., DIN, VDE) must be observed.

NOTICE

Only original SKF spare parts may be used. Unauthorized alterations and the use of non-original spare parts and accessories are prohibited and nullify the statutory warranty.

NOTICE

The LMC 301 Controller contains electronic components that can be destroyed by accidental electrostatic charge or discharge (ESD). To prevent possible damage due to ESD, hands and any tools must be discharged on a bare grounded position on the installation site prior to performing any work in the area of the opened control unit's circuit board. Conductors or component connections within the device must not be touched under any circumstances

Dismantling of the product or individual parts of the product within the statutory warranty period is prohibited and voids any claims.

SKF products are low-maintenance.
The following work/inspections should be performed to ensure proper function:

- The button cell battery attached to the inside of the controller lid must be replaced before its expiration after 24 months - see Chapter 8.3.

The interior of the controller is not designed to be cleaned. Cleaning of the interior using liquids is prohibited!
A 3-amp blade-type fuse protects against overload. Replace the fuse once it has actuated - see Chapter 9.1.

Contact the SKF Service department in case of problems with the LMC 301 controller unit.

8.2 Maintenance schedule

The maintenance intervals are system-specific and are affected by environmental influences such as dust and temperature. The maintenance intervals are therefore defined by the system manufacturer/ operator based on the specific operating conditions.

		Inspection	
No.	Compo-nent	Inspection	Remedy
1	LMC 301	o Check that all cable glands are securely connected on a regular basis o Check that housing is se-curely connected	• Tighten cable glands if necessary • Tighten assembly mounting screws if necessary - see Chapter 5.2.3
2		o Battery replacement o Fuse replacement	• see battery replacement in Chapter 8.3 • see fuse replacement in Chapter 9.1
3		o Install software update	• see software update in Chapter 8.4

Dispose of electronic components and plastic in an environmentally friendly way

8.3 Battery replacement

☞see Figure 30

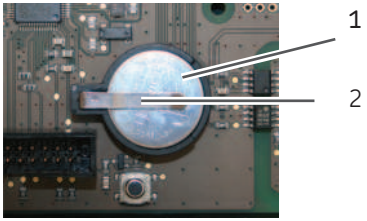
To avoid possible loss of data, replace the lithium button cell battery after no later than 24 months.
The battery replacement procedure should be done quickly and not last longer than 30 seconds.

- Switch off dual-line centralized lubrication system
- Switch off the power supply to the LMC 301
- Open the lid of the control unit as described in Chapter 5.2.2
- Open the lid
- Use a screwdriver to loosen and remove the button cell battery (1) from its bracket (2)

☞To prevent possible oxidation of the contact surfaces, touch the new button cell battery only on the sides!

- Install the new button cell battery

Battery replacement, Fig. 30



3V lithium button cell battery, model CR 3032

Li-ion Batterie

EWC-CODE: 16 06 05

Dispose of the battery in an environmentally friendly way

8.4 Software update

A software update can be loaded onto the LMC 301 Controller using the SKF NGL program.
Information and updates are available from the SKF Service department or online at http://www.skf.com/LMC301/.

9. Malfunctions, causes, and remedies

The following tables provide an overview of possible malfunctions and their causes. Contact the SKF Service department if you cannot remedy the malfunction.

WARNING

Electric shock
De-energize the controller prior to beginning work.
Only qualified personnel authorized by the operator may perform work on the controller unit.
The electrical operating conditions and local regulations (e.g., DIN, VDE) must be observed.

NOTICE

The LMC 301 Controller contains electronic components that can be destroyed by accidental electrostatic charge or discharge (ESD).
To prevent possible damage due to ESD, hands and any tools must be discharged on a bare grounded position on the installation site prior to performing any work on the opened controller. Conductors or components within the device must not be touched under any circumstances.

NOTICE

Defective controller must be replaced. Only SKF Service is capable of repairing them.

9.1 Fuse replacement

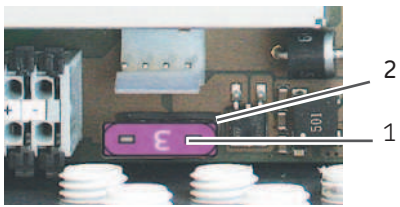
☞ see Figure 31

NOTICE

Before replacing a defective fuse, first remedy the cause of the malfunction.

- **Remedy the cause of malfunction!**
- Remove the defective blade-type fuse (1) from the fuse holder (2)
- Insert a new 3-amp blade-type fuse (1) into the fuse holder (2)

Fuse replacement, Fig. 31



Blade-type fuse FK1 3A (32 V)
acc. to ISO 8820-3

9.2 Display of fault notifications via fault LED

Fault display, Table 2

Display	Fault status	Fault output	Cause
FAULT LED is off	No error		
ERROR LED flashing red	Pump1/Zone1 = A Pump1/Zone2 = B Pump1/Zone3 = C		Error has occurred in the indicated area. Read error notification on display.
Error LED is on	Error		Hardware error

9.3 Display of fault notifications on the screen

Code	Fault message signal	Error
[001]	Pump/Zone Config	Pump zone configuration not valid
[002]	Pump Sens. Offline	Input sensor at pump not available
[003]	Pump Sensor Config	Input sensor at pump: wrong settings
[004]	Pump Sens. Address	Input sensor at pump: address multiple
[005]	Pump Sensor Fault	Input sensor at pump: value too high
[006]	Pump Sensor NC	Input sensor at pump: Open Loop detected
[007]	Remote Offline	Input remote: not available
[008]	Remote Config	Input remote: wrong settings
[009]	Remote Address	Input remote: address multiple

Code	Fault message signal	Error
[010]	Pump Offline	Output pump not available
[011]	Pump Config	Output pump wrong settings
[012]	Remote Address	Output pump address multiple
[013]	LL Sensor Offline	Input Low Level not available
[014]	LL Sensor Config	Input Low Level wrong settings
[015]	LL Sensor Address	Input Low Level address multiple
[016]	LL Sensor Fault	Input Low Level sensor: value too high
[017]	LL Sensor NC	Input Low Level: Open Loop detected
[018]	HL Sensor Offline	Input High Level: not available
[019]	HL Sensor Config	Input High Level: wrong settings
[020]	HL Address	Input High Level: address multiple
[021]	LL Output Offline	Output Low Level: not available
[022]	LL Output Config	Output Low Level: wrong settings
[023]	LL Output Address	Output Low Level: address multiple
[024]	EOL Sensor Offline	Input sensor at Eol not available
[025]	EOL Sensor Config	Input sensor at Eol wrong settings
[026]	EOL Sensor Address	Input sensor at Eol address multiple
[027]	EOL Sensor Fault	Input sensor at Eol sensor value too high
[028]	EOL Sensor NC	Input sensor at Eol Open Loop detected
[029]	Rel/Cnt Offline	Input Rel/Cnt: not available
[030]	Rel/Cnt Config	Input Rel/Cnt: wrong settings
[031]	Rel/Cnt Address	Input Rel/Cnt: address multiple

Code	Fault message signal	Error
[032]	Spray Offline	Output Spray: not available
[033]	Spray Config	Output Spray: wrong settings
[034]	Spray Address	Output Spray: address multiple
[035]	Alarm Out Offline	Output Alarm: not available
[036]	Alarm Out Config	Output Alarm: wrong settings
[037]	Alarm Out Address	Output Alarm: address multiple
[038]	Valve Out Offline	Output Valve: not available
[039]	Valve Out Config	Output Valve: wrong settings
[040]	Valve Out Addresses	Output Valve: address multiple
[041]	Pressure at Pump	No pressure relief at pump
[042]	Pressure at EOL	No pressure relief at EOL
[043]	Monitoring Timeout	Monitoring timeout
[044]	GS.. Offline	Input Grease sensor: not available
[045]	GS.. Config	Input Grease sensor: wrong settings
[046]	GS.. Addresses	Input Grease sensor: address multiple
[074]	GS.. Fault	No pressure relief at Grease sensor..
[084]	GS.. No Flow	No pressure deploy at Grease sensor..
[094]	Lube Load Offline	Input Lube Load: not available
[095]	Lube Load Config	Input Lube Load: wrong settings
[096]	Lube Load Address	Input Lube Load: address multiple
[097]	Mtr Prot. Offline	Input Motor protection: not available
[098]	Mtr Protect Config	Input Motor protection: wrong settings
[099]	Mtr Prot. Address	Input Motor protection: address multiple

Code	Fault message signal	Error
[100]	Mtr Protection On	Motor protection on
[101]	Int Temp Offline	Input internal temperature: not available
[102]	Int Temp Config	Input internal temperature: wrong settings
[103]	Int Temp Address	Input internal temperature: address multiple
[104]	Temp Out of Range	Temperature out of Range
[105]	Ext Temp Offline	Input external temperature: not available
[106]	Ext Temp Config	Input external temperature: wrong settings
[107]	Ext Temp Address	Input external temperature: address multiple
[108]	Ext Temp Fault	Input external temperature: value too high
[109]	Ext Temp NC	Input external temperature: Open Loop detected
[110]	Reservoir empty	Reservoir empty
[111]	Filling Timeout	Filling Timeout
[112]	Prox Sw.. not available	Piston detector not available (only progessive systems)
[113]	Prox Sw.. Config	Piston detector wrong settings(only progessive systems)
[114]	Prox Sw.. Addresses	Input Proximity Switch address multiple
[142]	Prox Sw .. Timeout	Proximity Switch..Monitoring Timeout
[157]	Supply ExtIO..	Supply Error at IO Board..:
[158]	Int.Supply ExtIO..	Internal Supply Error at IO Board ::
[159]	Sensorcur. ExtIO..	Sensor Current Supply Error at IO Board..
[160]	IO Board offline..	IO Board.. offline
[161]	General ExtIO..	General Error: at IO Board..
[192]	Fill Pump Offline	Output Fill Pump: not available
[193]	Fill Pump Config	Output Fill Pump: wrong settings
[194]	Fill Pump Address	Output Fill Pump: address multiple

9.3 Dual-line control unit - Commissioning malfunctions

Fault	Cause	Remedy
Motor fails to start when the operating voltage is switched on	o Motor incorrectly connected o Pump timing not parameterized	• Check that motor connection is wired correctly • Inspect pump timing as described in Chapter 6.3.1
Pump does not switch off on reaching minimum fill level	o Fill level switch NC contact/NO-contact incorrectly configured	• Check connection on fill level switch
No pressure build-up	o Relief valve connected incorrectly o Directional solenoid valves for zone(s) incorrectly connected o Pressure switch PT not/incorrectly connected	• Check that connections are wired correctly
No pressure relief	o Reversing valve not/incorrectly connected	
	o Directional solenoid valves for zone(s) not/incorrectly connected o Pressure switch PT not/incorrectly connected	
	o Relief valve does not work	• Inspect relief valve, replace if necessary
	o Holding time too short (only with 2/2 directional solenoid valves)	• Extend holding time

9.4 System malfunction

Fault	Cause	Remedy
Motor fails to start when the operating voltage is switched on	o No operating voltage on motor o Phase absent	• Check mains connection • Check mains plug/cable and connect properly if necessary • Check operating voltage on motor • Check fuse • Check motor circuit breaker
	o Pump jammed	• Measure motor current If current is too high: • Dismantle pump, crank by hand: • if resistance is high, replace the pump.
	o Motor jammed	• Measure motor current If current is too high: • Dismantle motor, crank by hand: • If resistance is high, replace the motor.
Pump motor runs with difficulty and at a low speed	o Sluggish pump	• Measure motor current If current is too high: • Dismantle pump, crank by hand: • if resistance is high, replace the pump.
Motor runs with difficulty and at a low speed	o Sluggish motor	• Measure motor current If current is too high: • Dismantle motor, crank by hand: • If resistance is high, replace the motor.
	o Unsuitable lubricant (see “Technical Data,” Chapter 3)	• Remove lubricant from entire system and dispose of lubricant in the proper manner; fill system with suitable lubricant
	o Pressure too high, pressure-regulating valve is jammed or defective	• Check pressure-regulating valve and replace if necessary

Fault	Cause	Remedy
Motor runs with difficulty and at a low speed	o Ambient temperature too low (see "Technical Data," Chapter 3) o Aged grease, motor is overloaded o Motor circuit breaker has tripped	• Increase ambient temperature • Replace grease • Identify and resolve cause
Pump does not supply lubricant; no pressure build-up	o Pump jammed	• Measure motor current If current is too high: • Dismantle pump, crank by hand: • If resistance is high, replace the pump.
	o Motor jammed	• Measure motor current If current is too high: • Dismantle motor, crank by hand: • If resistance is high, replace the motor.
	o Incorrect rotational direction of motor	• Check pressure-regulating valve to make sure that opening pressure is correct and that there is no contamination or damage • If opening pressure is incorrect or if the pressure-regulating valve is damaged, replace the valve. Only use original SKF spare parts. • If contaminated, clean the pressure-regulating valve
	o or check valve on pump element defective or filter clogged	

Fault	Cause	Remedy
No pressure build up in the main line	o Air in the main line o Main line leaky or break in line	• Vent main line • Repair main line
	o Pressure-regulating valve does not close	• Check pressure-regulating valve to make sure that opening pressure is correct and that there is no contamination or damage • If opening pressure is incorrect and cannot be adjusted, or if the pressure-regulating valve is damaged, replace the valve. Only use original SKF spare parts. • If contaminated, clean the pressure-regulating valve
No pressure build up in the main line	o Reversing valve does not close	• Clean or replace reversing valve. Only use original SKF spare parts.
	o Unsuitable lubricant (see “Technical Data,” Chapter 3)	• Remove lubricant from entire system and dispose of lubricant in the proper manner; fill system with suitable lubricant
	o Fill level too low	• Top up lubricant
	o metering device clogged o Air in the lubrication system	• Clean metering device/injector nozzle • Vent the lubrication system.

9.5 Measures in response to malfunctions

Fault message signal	Cause	Remedy
Low-level signal	o Grease reservoir empty	• Fill grease reservoir
No pressure build-up at pump pressure switch	o Line broken	• Inspect lubrication system, replace broken lubrication line if necessary
	o Pump motor is defective	• Replace the pump
	o Sensor is defective	• Replace the sensor
No pressure build-up at reversing valve	o Blockage of pressure switch	• Check pressure switch for proper function, replace if necessary
	o Signal line is broken	• Check signal line for damage, replace if necessary
	o Monitoring time exceeded	• Adjust the monitoring time
	o Sensor is defective	• Replace the sensor

10. Spare parts/accessories

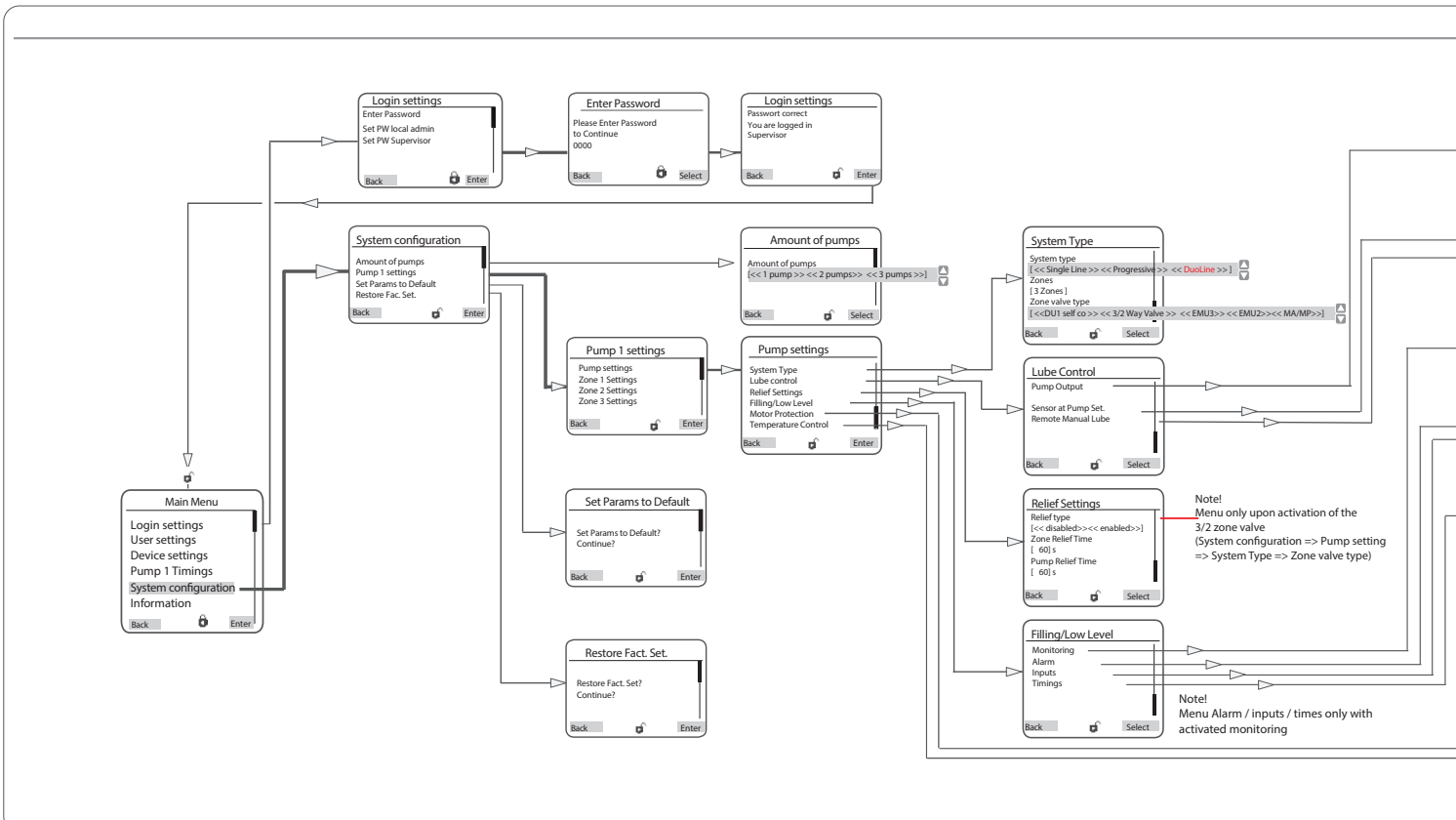
Spare parts and accessories Design (quantity 1x)	Size	Weight kg/pc.	Order No.
(Housing) LMC 301	WxHxD 271x170x90 mm	Approx. 2.5 kg	Housing is not available separately
Housing cover, complete			086504
USB cable			086505
PG-M20 cable gland set, protection class IP65, no UL certification (quantity 1)			
- with multiple sealing inserts (3x)			086506
- with single sealing insert (3)			086507
Cable gland PG-M20			
Complete, consisting of a cap nut (1), sealing insert for one cable (2) and screw insert (3)			3515-10-6020
Sealing insert (2)	2-wire, Ø 6 mm		3515-10-6620
Sealing insert (2)	4-wire, Ø 5mm		3515-10-7620
Blind plug			3515-10-6220
Matching sealing ring			3515-10-6320
Matching locknut			3515-10-6120
Cable glands, protection class IP65, with flexible metal pipe (FMC), approved for UL (quantity 1)			
Cable gland AMG-M20x1.5 as per UL514B			3515-07-2021
Locknut M20x1.5			3515-10-3620
Liquid-tight protection hose as per UL360 (piece goods, specify required length when ordering)			3515-07-2022

The customer installs the cable glands and the cable sets provided by the customer. The customer is therefore reliable for their correct installation.

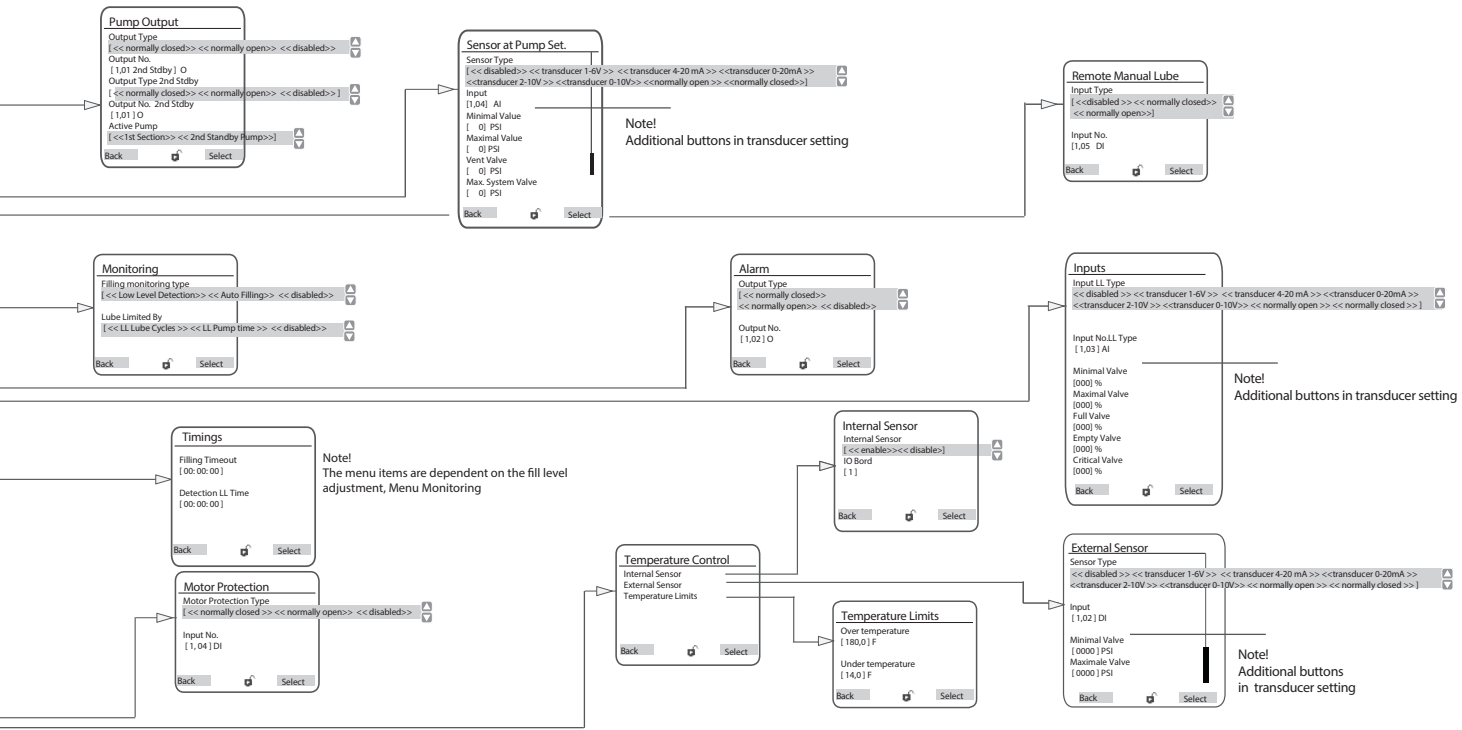
Blade-type fuse	FK1 3A (32 V) acc. to ISO 8820-3
3V lithium button cell batteryModel CR 3032	236-11066-1
LMC 301 software	http://www.skf.com/LMC301
Warning labels (- see page 12	246-078-289

11. System configuration

10.1 Menu navigation for system configuration - pump settings



Setting options for pump settings, Fig. 32

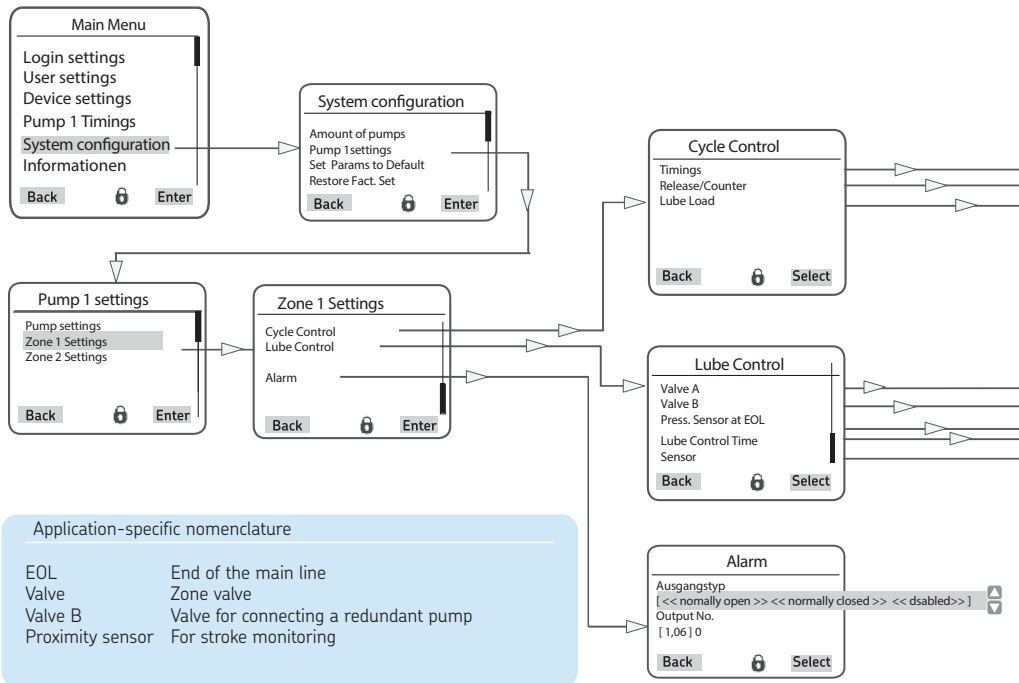


11.1 Menu navigation for system configuration - zone settings

11.1.1 With two 3/2 directional zone valves per zone

SKF 3/2 directional solenoid valves are high-performance ball seat valves for dual-line centralized lubrication systems.
These are available in an open design (C => B) for a max. permissible pressure of 500 bar or in closed design with a max. permissible pressure of 320 bar.

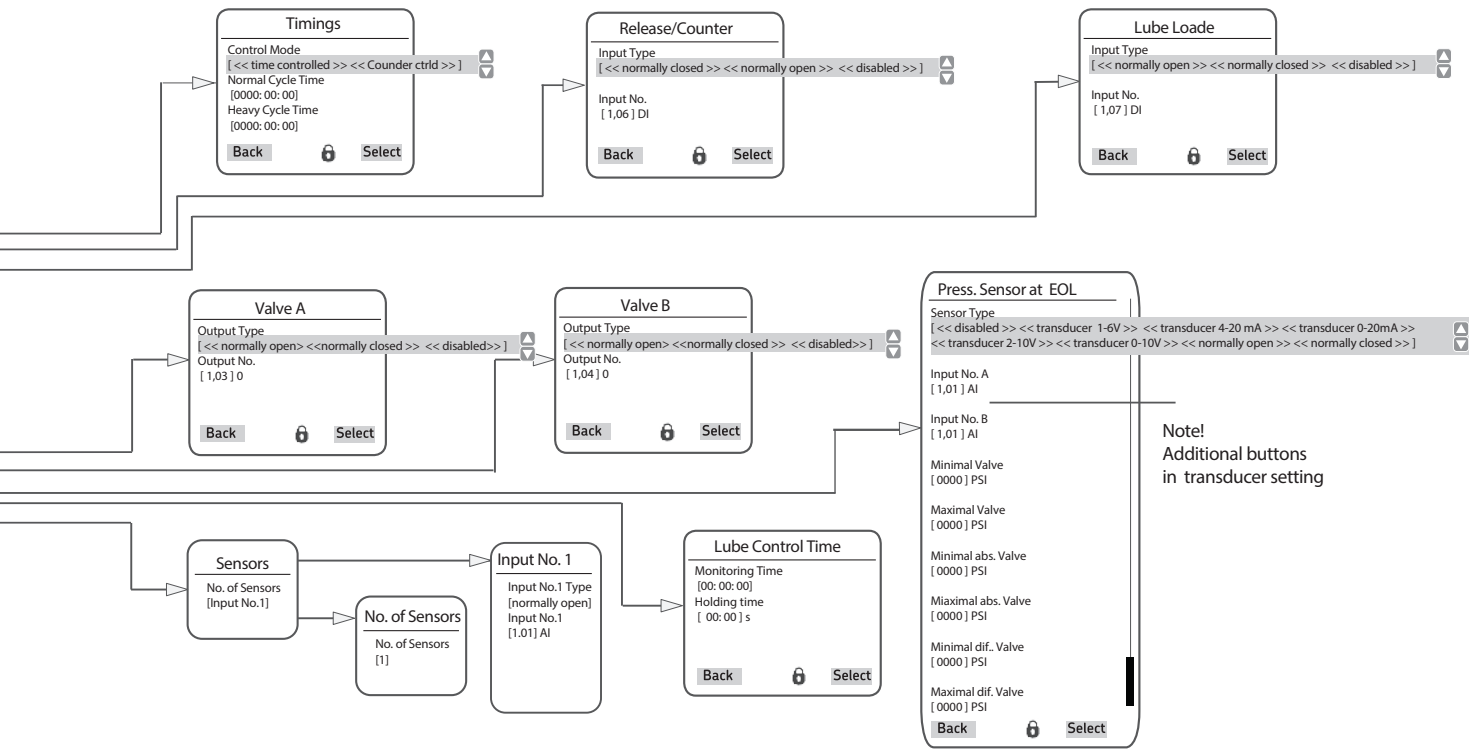
Instructions	
Directional control valves, open series	
Document No.	161-120-064
	161-120-065
Directional control valves, closed series	
Document No.	161-120-028
Document No.	**1-1703-EN**



Application-specific nomenclature

EOL	End of the main line
Valve	Zone valve
Valve B	Valve for connecting a redundant pump
Proximity sensor	For stroke monitoring

Setting options for zone settings, Fig. 33

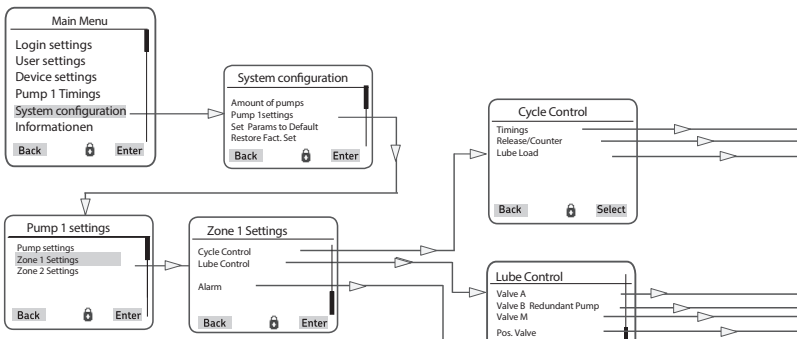


11.1.2 EM U3 per zone

The EM U3 is a compact, powerful electromotive change-over valve. Each of the three possible switching positions A, M, and B is recorded precisely with its own magnetic sensor. In the middle position, M, lines A and B can be discharged of pressure via return line R during the interval time. This increases the service life of the lubrication system components by reducing the pressure load and lubricant bleeding. The current position of the change-over cartridge is displayed by the position of the groove on the axis of the eccentric. A 24 V DC version and a 230 V AC version are available. AWS-E variant is also available as shutoff valve and directional spool valve.

Instructions

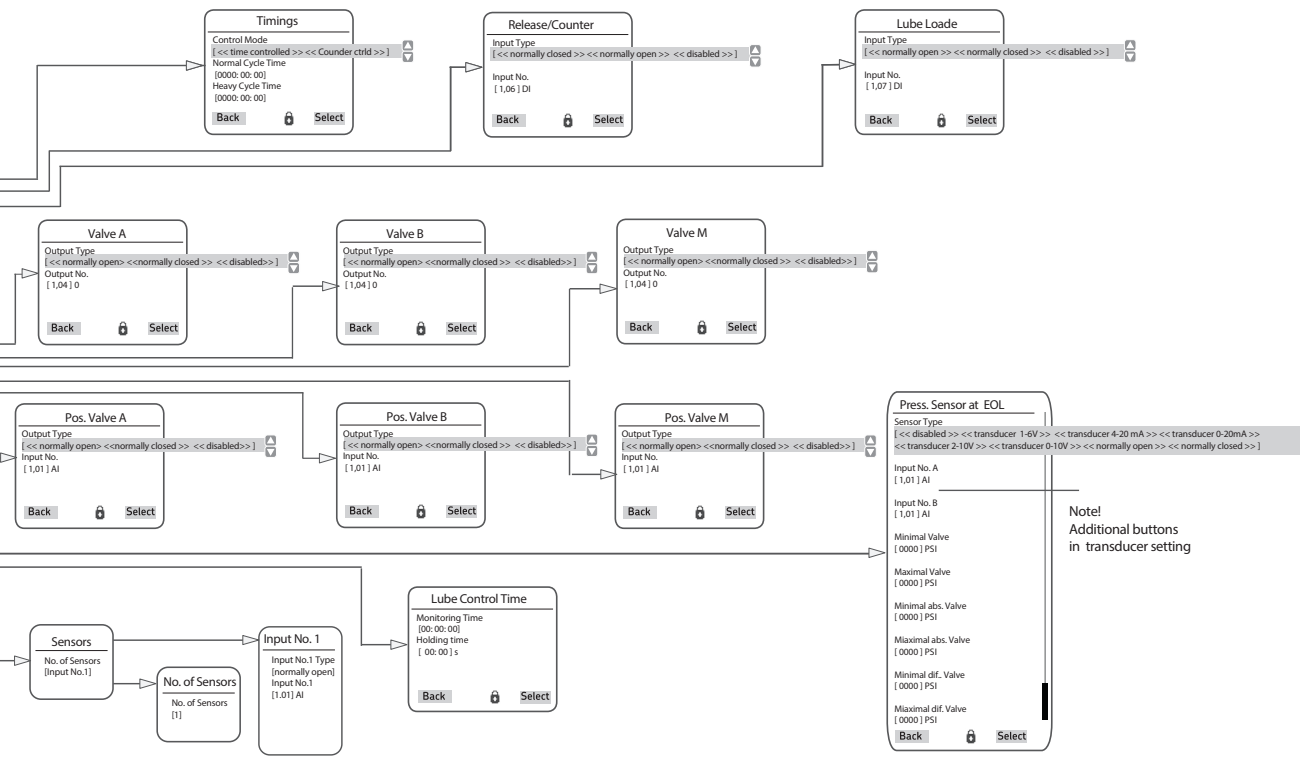
Electromotive change-over valve /electromotive directional spool valve of series EMU3/ WS-E,
Document No. 951-171-001-EN



Application-specific nomenclature

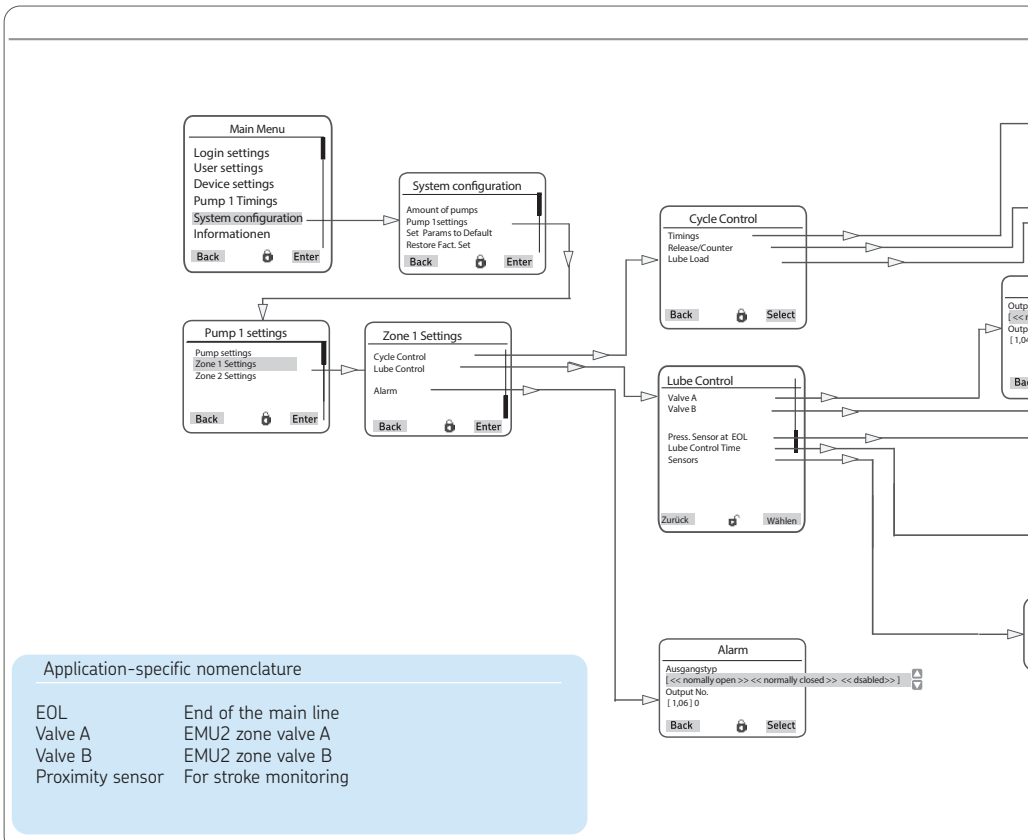
EOL	End of the main line pressure monitoring
Valve A	EM U3 zone valve A
Pos. Valve A	Check-back signal of switching process for valve A
Valve B	EM U3 zone valve B
Pos. Valve B	Check-back signal of switching process for valve B
Valve M	EM U3 valve for pressure relief of the two main lines
Pos. Valve M	Check-back signal of switching process for valve M
Proximity sensor	Stroke monitoring on the metering devices

Setting options for zone settings with zone valve EM U3, Fig. 34



11.2.3 EM U2 per zone

The EM U2 is an electromotive change-over valve. The change-over is performed by a 4/2 or a 3/2 directional spool valve that is actuated by a DC geared motor. The motor is controlled by a signal from the attached discharge pressure monitor. The motor rotation is converted into stroke movement of the change-over piston by an eccentric and an eccentric rocker.
Once the piston end position is reached, the position switch turns off the motor.
The change-over piston remains in its position until the next time the motor is actuated.



Application-specific nomenclature

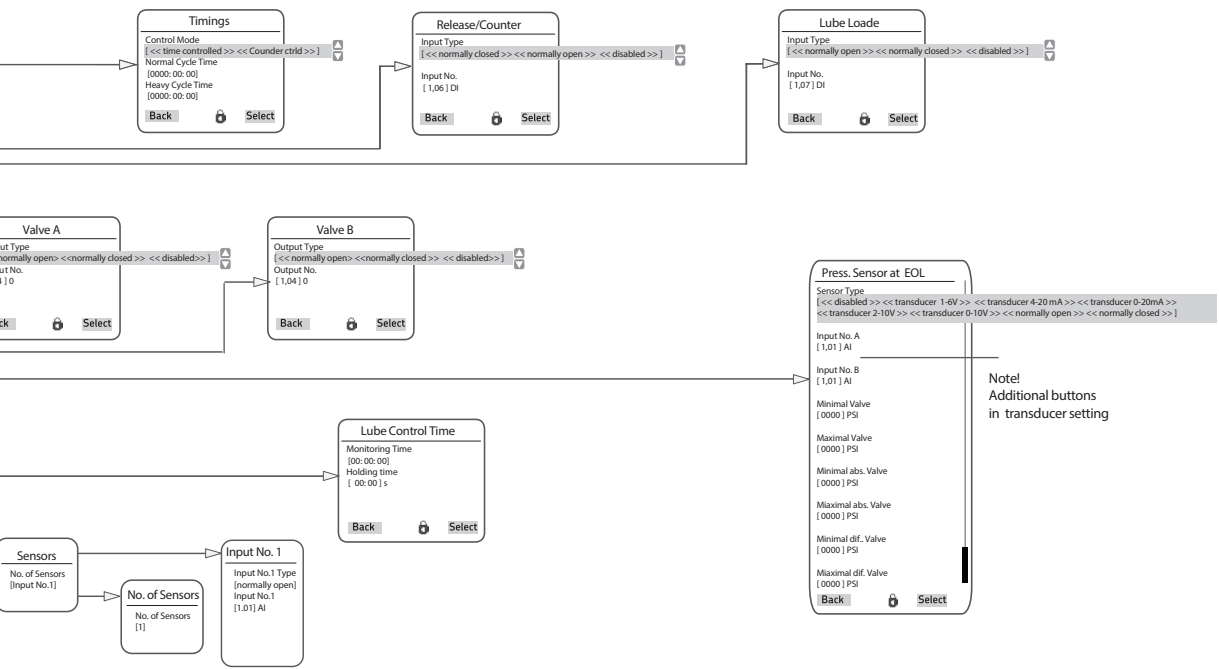
EOL	End of the main line
Valve A	EMU2 zone valve A
Valve B	EMU2 zone valve B
Proximity sensor	For stroke monitoring

Instructions

Electromotive changeover valve EM U2-KN with electromotive 2/2 and 3/2 directional spool valves WS-E-W...KN

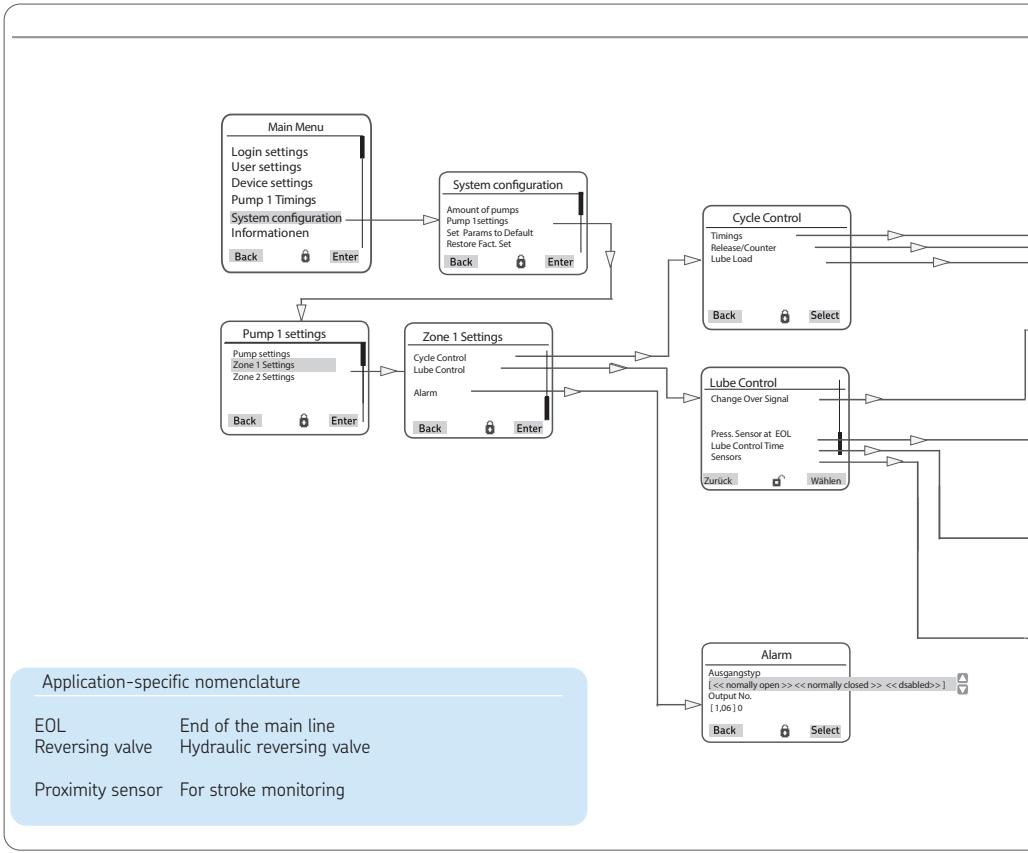
Document No. 1.3DE-28801-A12
1.3G-28001-C06

Setting options for zone settings with zone valve EM U2, Fig. 35



11.1.3 DU1 auto-changeover per zone

The principle behind the operation of the DU1 corresponds to that of a hydraulically controlled 4/2 directional control valve. The DU1 supplies an amount of lubricant fed by the pump into one of the two main lines, while the other main line is connected to the return flow connection of the pump.
Once the change-over pressure is reached, the DU1 switches a valve piston against the DU1's internal spring force. The pressure in the pre-pressurized main line is then relieved towards the pump reservoir.
The lubricant in the main line can be released. At the same time, a change-over is performed to pressurize the previously relieved main line.



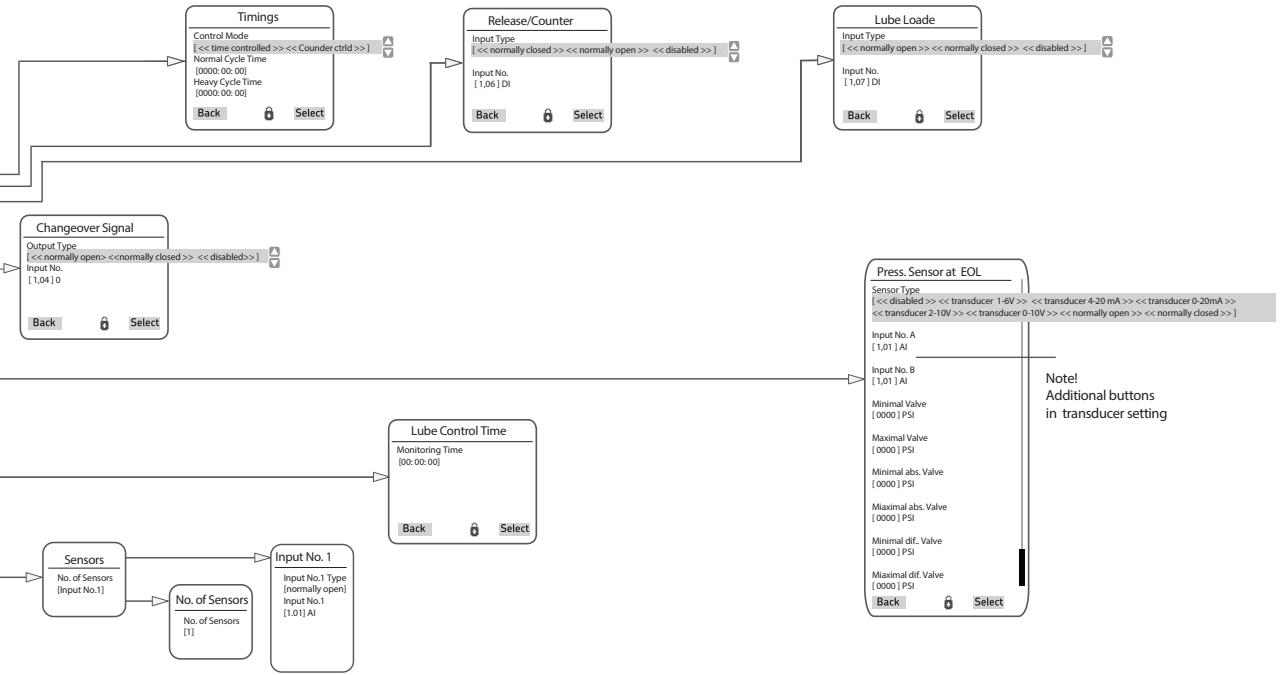
Instructions

Pressure-controlled change-over valve DU1, **Document No. 951-171-011-EN**

Application-specific nomenclature

EOL	End of the main line
Reversing valve	Hydraulic reversing valve
Proximity sensor	For stroke monitoring

Setting options for zone settings with zone valve DU1, Fig. 36



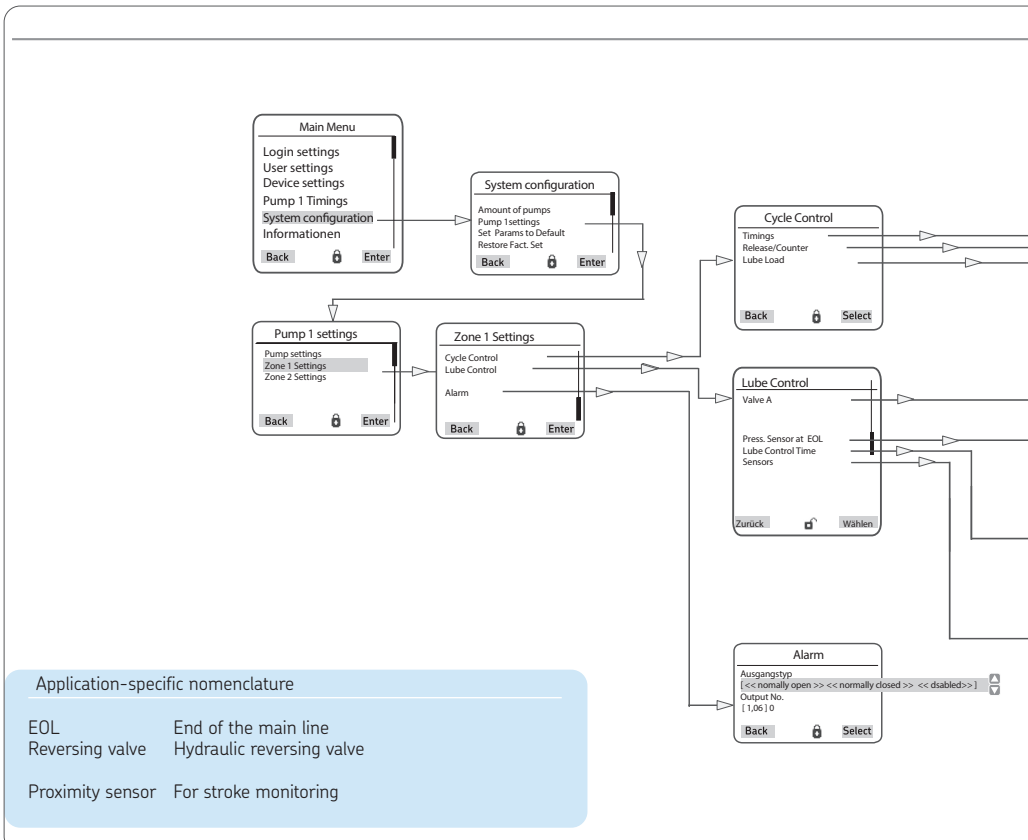
11.1.4 MA/MP per zone

The model MP2 pneumatically actuated change-over valve with the model WS-P2 pneumatically actuated directional spool valve corresponds largely to the principle of the pneumatically actuated 4/2 directional control valve, which supplies the lubricant fed by the pump into one of the two main lines while the other main line is connected to the return flow connection of the pump.

Instructions

Model MP2 pneumatically actuated change-over valve and model WS-P2 pneumatically actuated directional spool valve

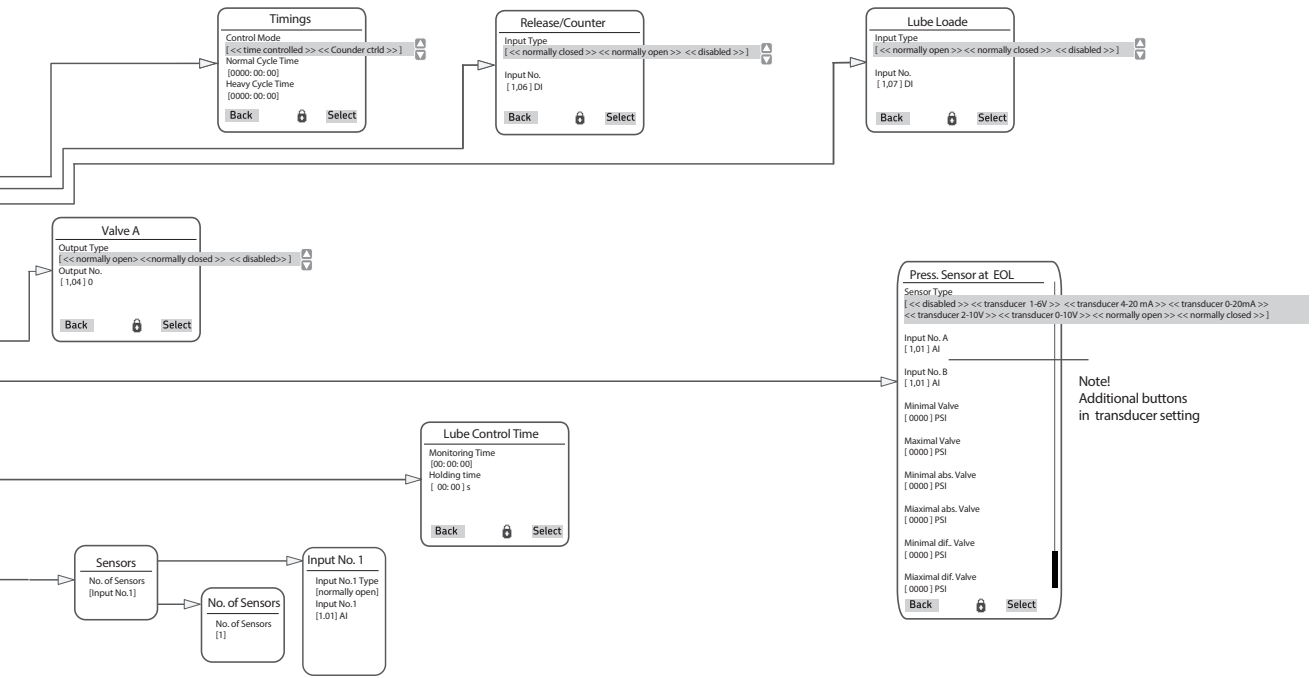
Document No. 1.3G-48001-C07
1.3G-58001-B02



Application-specific nomenclature

EOL	End of the main line
Reversing valve	Hydraulic reversing valve
Proximity sensor	For stroke monitoring

Setting options for zone settings with zone valve MA / MP, Fig. 37



11.2 Menu structure for system configuration

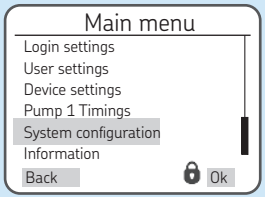
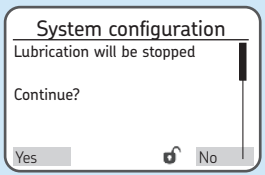
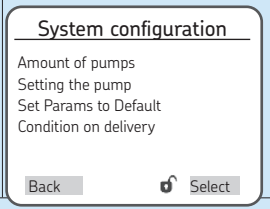
NOTICE

SKF Service menu
This level is password-protected and cannot be accessed from the operator level or the Local Admin level.
Settings can be made only in the Supervisor password level.

All essential controller and system settings for an SKF dual-line centralized lubrication system are made in the System configuration menu level.
These settings can and may only be made by SKF Service.

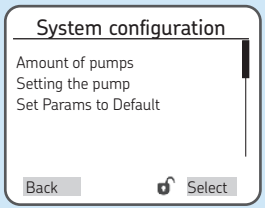
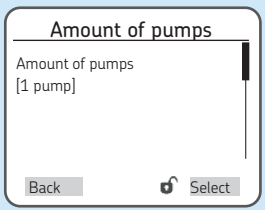
Supervisor password
Factory setting: **2020**

System configuration

Step	Button	Display	Description
System configuration - Amount of pumps, Pump settings, Set Params to Default - only in Supervisor password level			
1			☞ Requirement: Supervisor password level is enabled. • Use <**down/up** arrow key> to select System configuration • Press <**Co**ntrol key OK> ☞ You will enter the System configuration menu.
			☞ You will be asked "Lubrication will be stopped - Continue?" • Press <**Yes** control key> ☞ You will enter the System configuration menu. The following settings can be made: o Amount of pumps- see Chapter 11.4 o Configuration of pumps see Chapter 11.5 o Set Params to Default/ Condition on Delivery see Chapter 11.7
			

11.3 Amount of pumps

Selecting the amount of pumps

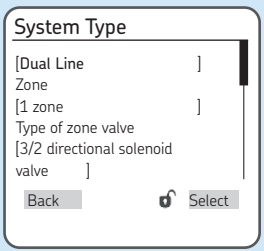
Step	Button	Display	Description
Select the amount of pumps - only in Supervisor password level			
1		 	• Open the System configuration menu • Use <**down /up** arrow key> to select Amount of pumps menu ☞ Entry of the maximum number of pumps for the entire lubrication system • Press <**Co**ntrol key OK> • You will enter the Amount of pumps menu. • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the amount of pumps (maximum of 3 pumps) • Press <**Cont**rol key Save> • Press <**Cont**rol key Back> ☞ You will return to the System configuration menu

11.4 Pump settings

Pump settings => Pump 1 settings =>Pump settings

Step	Button	Display	Description
Configuring the pumps - only in Supervisor password level			
1	OK	System configuration Amount of pumps Pump 1 settings Set Params to Default Back Select	• Open the System configuration menu (see Chapter 7.3) • Use <down/**up** arrow key> to select Pump settings (1-3) menu • Press <**Co**ntrol key OK> • You will enter the Pump settings (1-3) menu
	OK	Pump 1 settings Pump settings Zone 1 Settings Back Select	• Use <**down/up** arrow key> to select **Pump settings** • Press <**Co**ntrol key OK> ☞ You will enter the Pump settings menu. The following settings can be made: o System Type — Step 2, Specification of lubrication system (**Dual-Line**) **amount of zones** and **type of zone valves** o Lube Control — Step 3, Lubrication control mode o Relief Settings — Step 4, Specification of the pressure relief (only for 3/2 directional solenoid valves) o Filling/Low Level monitoring — Step 5, Specification of setting parameters for fill level o Motor Protection — Step 6, Actuation of the motor circuit breaker o Temperature Control sensor — Step 7, Specification and activation of the temperature
		Pump settings System Type Lube Control Relief Settings Filling/Low Level Motor Protection Temperature Control Back Select	

Pump settings => Pump settings => System Type

Step	Button	Display	Description
1.1			• Use < **down/up** arrow key> to select the desired setting • Press <**Co**ntrol key OK> • You will enter the selected menu.
System Type In this menu, the lubrication system is assigned to the pump that has already been selected. For dual-line centralized lubrication systems, activate Dual-Line. Also set the amount of zones/main lines (1-3) and the type of zone valves (change-over valves) via EM U2, EM U3, DUI1 auto-change-over, MA/MP, or 3/2 directional solenoid valve. When the 3/2 directional solenoid valve is activated, the new submenu Relief Settings will appear in the previous menu, with the option to configure the pressure relief time for pump and zone.			
2			• Use <**down/up** arrow key> to select Dual-Line • Press <**Contro**l key Select> • Press <**Contro**l key Save> • Use <**down/up** arrow key> to select Amount of zones ☞ Zones: Set the total amount of lubrication zones (main lines) here. A maximum of three zones are possible. • Press <**Contro**l key Select> • Press <**Contro**l key Save> • Use <**down/up** arrow key>to select the Type of zone valves ☞ Specify the zone valves used. Select between EMU2, EMU3, DU1 auto-change-over, MA/MP, or 3/2 directional solenoid valves. ☞ Press <**Contro**l key Select> • Press <**Contro**l key Save> • Press <**Contro**l key Back>

Pump settings => Pump settings => Lube Control => Pump Output

Step	Button	Display	Description
Lube Control Entry and monitoring of the lubrication system are done in this menu			
3	OK	Lube Control Output Pump Sensor at Pump Set. Additional lubrication Back Ok	• Press <**Co**ntrol key OK> ☞ The following settings are available: o **Pump Output** - Entry of the pump-specific parameters o **Pump Sensor Setting** - Setting for the sensor between pump and zone valve o **Remote Manual Lube** - Setting for the Input Type for remote manual lube
Pump Output The type of pump output for the active pump and for the redundant pump is specified in this menu			
3.1	OK Save Select Select OK Back	Output Pump Output Type [normally open] Output No. [1.01] 0 Output Type 2 Redundant Pump [normally open] Output No. [1.01] 0 Back Select	• Use <**Co**ntrol key OK> to select **Pump Output** ☞ You will enter the **Pump Output** menu • Use <**down/up** arrow key> to select Output Type: Select normally open, normally closed, or disabled • Press <**Cont**rol key Save> • Use <**down** arrow key> and <**Control** key Select> to enter **Output No.** ☞ Entering the output No. specifies the controller terminal of the pump motor. • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the output number • Press <**Co**ntrol key OK> • Repeat the procedure for the following output type 2, redundant pump • Press <**Cont**rol key Back>

Pump settings => Pump settings => Lube Control => Lube Control Mode => Sensor at Pump Set.

Step	Button	Display	Description
Sensor at Pump Set. The pump sensor is specified in this menu			
3.2	OK	Sensor at Pump Set. Sensor Type [normally open] Input [1.00] DI Back Select	• Press <Control key OK> ☞ You will enter the **Sensor at Pump Set.** menu ☞ The following settings are available: o disabled o [transducer 1-6 V] [transducer 4-20 mA] [transducer 0-20 mA][transducer 2-10 V] o NC contact o NO contact

Pump settings => Pump settings => Lube Control => Sensor at Pump Set.

Step	Button	Display	Description
3.3	Select Select Save Back OK Back	Sensor at Pump Sensor Type [transducer 4-20 mA Input [0.00] AI Minimal Value [0000] PSI Maximal Value [0000] PSI Operating pressure [0000] PSI Maximum system value [0000] PSI Back Select	With transducer: • Press <**Select** arrow key> • Select transducer type [transducer 1-6 V] [transducer 4-20 mA] [transducer 0-20 mA] [transducer 2-10 V] • Press <**down** arrow key> The following settings are available: o Input - the first or second input is configurable as an analog value (AI) ☞ Entering the output No. specifies the controller terminal of the pump sensor. DI stands for digital input, and AI stands for analog input. o Minimal Value - entry of the minimum permissible system pressure (in PSI) of the pump o Maximal Value - entry of the maximum permissible system pressure (in PSI) of the pump o Operating Pressure - Entry of the operating pressure for switching pump on/off (in PSI) • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the respective values • Press <**Control** key Save> • Press <**Control** key Back> • Press <**Control** key OK> • Press <**Control** key Back>

Pump settings => Pump settings => Lube Control=> Remote Manual Lube

Step	Button	Display	Description
Remote Manual Lube Settings for the Remote Manual Lube system input			
3.4	OK Select ▲▼ ▲▼ Select ▲▼ OK Back	Additional lubrication Input Type [normally closed] Input No. [0.00] DI Back Select	• Press <Control key OK> ☞ You will enter the Remote Manual Lube menu The following settings are available: Input Type o NC contact o NO contact o disabled - no remote control connected **Input number** o Input number of normally closed/normally open contact (DI = digital input) • Press <Control key Select> • Use <down/up arrow key> to select Input Type normally closed, normally open, or disabled With normally closed or normally open input type: • Use <down/up arrow key> to select Input Number (normally closed/normally open) • Press <Control key Select> • Use <down/up arrow key> to set the input number • Press <Control key OK> • Press <Control key Back>

Pump settings => Pump settings => Relief Settings (only for 3/2 zone valves)

Step	Button	Display	Description
Relief Settings For zones with 3/2 directional solenoid valves (zone valves), the zone valves are actuated once again when the pump is off after a complete lubricating cycle is finished (zone 1 to max. zone 3). Time-dependent relief of the main lubrication line (pump to zone valves) occurs.			
4	OK Select Select Save Back	Relief Settings Zone Relief Time [0] s Pump Relief Time [0] s Back Select	• Press <Control key OK> ☞ You will enter the Relief Settings menu The following settings are available: **Zone Relief Time** ☞ Entry of the time value during which all zone valves are actuated **Pump Relief Time** • Entry of the time value during which the pump is switched to pressure relief • Press <Control key Select> • Use <down/up arrow key> to select Zone Relief Time and/or: • Use <down/up arrow key> to select Pump Relief Time • Press <Control key Select> • Use <down/up arrow key> to set the time frame • Press <Control key Save> • Press <Control key Back>

Pump settings => Pump settings => Filling/Low Level => Monitoring

Step	Button	Display	Description
Filling/Low Level	Select and configure the fill level switch		
5	OK ▲ ▼	Filling/Low Level Monitoring Alarm Inlets Timings Back Select	• Press <**Co**ntrol key OK> ☞You will enter the Filling/Low Level menu The following settings are available: o Monitoring - see Step 5.1; with active monitoring also following menu items: o Alarm - see Step 5.2 o Inputs - see Step 5.3 o Timings - see Step 5.4 • Use <**down/up** arrow key> to select a menu item
Fill Level Control	Specify the type of fill level control		
5.1	OK Select ▲ ▼ ▲ ▼ Save Back	Monitoring Filling monitoring type [Low Level Detection] LL Lube Limited By [disabled] Back Select	• Press <**Co**ntrol key OK> ☞You will enter the Monitoring menu • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select Filling monitoring type ☞The following settings are available: o Automatic Filling o Low Level Detection o disabled • Use <**down/up** arrow key> to select the type of filling • Press <**Con**trol key Save> • Press <**Con**trol key Back>

Pump settings => Filling/Low Level => Monitoring => Low Level Detection

Step	Button	Display	Description
Fill Level Control	Specify the type of fill level control		
5.1	OK Select ▲▼ ▲▼ Save Back	Monitoring Filling monitoring type [Low Level Detection] LL Lube Limited By [disabled] Back Select	**In menu selection Low Level Detection:** ☞You will enter the LL Lube Limited By menu • Press <**Contro**l key Select> ☞The following settings are available: o Empty pump time o Empty lubricating cycles o disabled • Use <**down/up** arrow key> to select the type of lubrication limit • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

Pump settings => Pump settings => Filling/Low Level => Alarm

Step	Button	Display	Description
Alarm	Setting for the Alarm system output		
5.2	OK Select Select Save Select Save Back	Alarm Output Type [normally closed] Output No. [0.00] 0 Back Select	• Press <**Co**ntrol key OK> ☞You will enter the Alarm Settings menu • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select Output Type ☞The following settings are available: o NC contact o NO contact o disabled • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select Output Type • Press <**Con**trol key Save> ☞With normally closed and normally open contacts: • Press <**down** arrow key> • Press <**Contro**l key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Con**trol key Save> • Press <**Con**trol key Back>

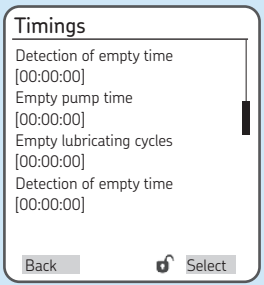
Pump settings => Pump settings => Filling/Low Level =>Inputs

Step	Button	Display	Description
Inputs Selection of fill level switch - input type			
5.3	OK Select Save Select Save Back	Inlets Input No. LL Type [normally open] Input No. Empty [0.00] AI LL Detection Mode [intermitting] Back Select Inlets Input No. LL Type [transducer 4-20 mA] Input No. LL [0.00] AI Minimal Value [000] % Maximal Value [000] % Full Value [000] % Empty Value [000] % Critical Value [000] % Back Select	• Press <**Co**ntrol key OK> ☞You will enter the Inputs menu • Press <**Control** key Select> • Use <**down/up** arrow key> to select Output Type The following settings are available: o normally closed/normally open /disabled/transducer 4-20mA/transducer 0-20 mA/ transducer 2-10V/transducer 0-10V/transducer 1-6V • Press <**Con**trol key Save> With transducer: • Press <**down** arrow key> ☞The following settings are available: o Minimal Value o Maximal Value o Full Value o Empty Value o Critical Value o Press <**Control** key Select> • Use <**down/up** arrow key> to enter the value • Press <**Con**trol key Save> • Press <**Con**trol key Back>

Pump settings => Pump settings => Filling/Low Level =>Inputs

Step	Button	Display	Description
Inputs Selection of fill level switch - input type			
5.3	▼ Select ▲▼ Save ▼ Select ▲▼ Save Back	Inlets Input No. LL Type [normally open/normally closed] Input No. Empty [0.00] AI Empty Detection Mode [intermitting] Back Select	With normally closed and normally open contacts: • Press <**down** arrow key> • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the value • Press <**Control** key Save> • Use<down arrow key> to select option Steady, Intermitting no LL, Intermitting LL • Press <**Control** key Select> • Use <**down/up** key> to make a selection • Press <**Control** key Save> • Press <**Control** key Back>

Pump settings => Pump settings => Filling/Low Level =>Timings

Step	Button	Display	Description
Timings Set the delay time for low level signal and filling. The individual menu items depend on the settings in the Monitoring menu			
5.4	▼ Select ▲▼ Save ▲▼ Save Back		• Press <**Co**ntrol key OK> ☞You will enter the Timings menu • Press <**Control** key Select> • **Use** <**down/up** arrow key> to enter the value for detection of empty time • Press <**Co**ntrol key OK> • Press <**Cont**rol key Save> ☞Depending on the monitoring configuration: • Use <**down/up** arrow key> to enter the value for empty pump time or: • Use <**down/up** arrow key> to enter the value for empty lubricating cycles • Use <**down/up** arrow key> to enter the value for detection of empty time • Press <**Co**ntrol key OK> • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

Pump settings => Pump settings => Motor Protection

Step	Button	Display	Description
Motor Protection			Connection settings for the external auxiliary contact of the motor circuit breaker
6	OK OK	Motor Protection Motor Protection Type [normally open] Input No. [0.00] DI Back Select	• Press <**Co**ntrol key OK> ☞You will enter the Motor Protection Settings menu The following settings are available: o normally closed / normally open / disabled • Press <**Control** key Select> • Use <**down/up** arrow key> to make a menu selection • Press <**Cont**rol key Save> With normally closed and normally open contacts: • Press <**down** arrow key> • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the value • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

Pump settings => Pump settings =>Temperature Control => Internal Sensor

Step	Button	Display	Description
Temperature Control Set internal sensor (controller board) or external sensor			
7	OK Select ▲▼ OK	Temperature Control Int. Sensor Setting Exter. Sensor Setting Temperature Limits Back Select	• Press <**Co**ntrol key OK> ☞You will enter the Temperature Settings menu The following settings are available: o Internal Sensor/External Sensor o Temperature Limits
7.1	Select ▲▼ OK Select Save Back	Temperature Control Int.Sensor [active] IO Board [1] Back Select	• Press <**Contro**l key Select> • Use <**down/up** arrow key> to select Internal Sensor • Press <**Co**ntrol key OK> • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select **disabled/enabled** If enabled: ☞The new menu item IO Board [1] is for information only and the assignment cannot be changed. • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

Pump settings =>Temperature Control => Internal Sensor => External Sensor

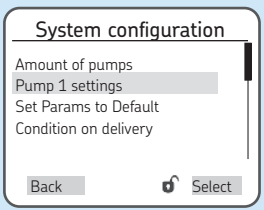
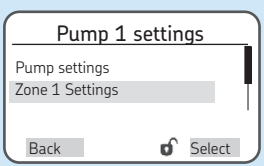
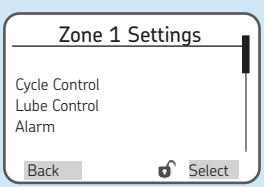
Step	Button	Display	Description
Temperature Control Set internal sensor (controller board) or external sensor			
7.1	OK Select OK	Temperature Limits Over temperature [000.0] F Under temperature [000.0] F Back Select	If internal sensor is enabled: • Use <**down** arrow key> to select Temperature Limit ☞ The following settings are available: o Over temperature o Under temperature • Use <**down/up** arrow key> to enter the respective values • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>
7.2	OK Select	External Sensor Sensor Type [disabled] Back Select	• Press <**Co**ntrol key OK> ☞ You will enter the External Sensor menu ☞ The following settings are available: o disabled o [transducer 1-6V] [transducer 4-20 mA] [transducer 0-20 mA] [transducer 2-10 V] [transducer 0-10 V] o NC contact o NO contact

Pump settings => Pump settings =>Temperature Control => External Sensor

Step	Button	Display	Description
7.2	Save Back	External Sensor Sensor Type [transducer 4-20 mA Input [0.00] AI Minimal Value [00.0] Fahrenheit Maximal Value [-00.0] Fahrenheit Back Select	With transducer: • Press <**down** arrow key> ☞ The following settings are available: o Input o Minimal Value o Maximal Value • Press <**Control** key Select> • Use < **down/up** arrow key> to enter the value • Press <**Control** key Save> • Press <**Control** key Back>
	▼ Select ▲ ▼ Save Back	Exter. Sensor Setting Sensor Type [normally closed] Input [0.00] AI Back Select	With normally closed or normally open contacts: • Press <**down** arrow key> • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the value • Press <**Control** key Save> • Press <**Control** key Back>

11.5 Zone 1 Settings (main line basic settings)

Zone basic settings — **Pump settings => Zone 1 Settings**

Step	Button	Display	Description
Configuring the zones - only in Supervisor password level			
1			• Open the System configuration menu (see Chapter 11.3) • Use <**down/up** arrow key> to select Pump settings (1-3) menu • Press <**Co**ntrol key OK>
			• You will enter the Pump settings (1-3) menu • Use <**down/up** arrow key> to select Zone 1 Settings • Press <**Co**ntrol key OK> • ☞ You will enter the Zone 1 Settings menu. The following settings can be made: o Cycle Control Step 2, Specification of cycle parameters such as Timings, Release/ Counter, and Lube Load o Lube Control **Specification of zone valves, see following sections** o Alarm Step 3
			

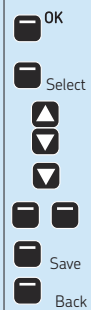
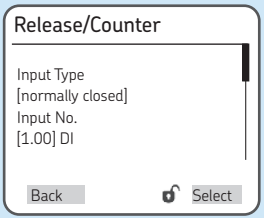
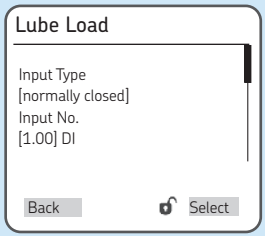
Zone basic settings

Pump settings => Zone 1 Setting => Cycle Control => Timings

Step	Button	Display	Description
Zone 1 Settings/ Cycle Control Cycle control for the respective zone			
2	OK Select Save Select Save Select Save Back	Cycle Control Timings Release/Counter Lube Load Back Select Timings Control Mode [<< time controlled >>><<counter ctrl] Normal Cycle Time [0000: 00: 00] Heavy Cycle Time [0000: 00: 00] Back Select	☞The following settings are available: o Timings o Release/Counter o Lube Load • Use <**down/up arrow key**> to select the Timings menu • Press <**Co**ntrol key OK> ☞The following settings are available: o Control Mode/Normal Cycle Time/Heavy Cycle Time • Use <**down/up** arrow key> to select Control Mode menu • Use <**down/up** arrow key> to select **time controlled** or **counter ctrld** menu • Press <**Cont**rol key Save> • Use <**down** arrow key> to select the **Normal Cycle Time** menu • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the value • Press <**Cont**rol key Save> • Use <**down** arrow key > to select the **Heavy Cycle Time** menu • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the value • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

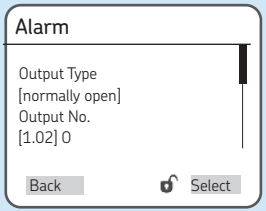
Zone basic settings

Pump settings => Zone 1 Settings => Release/Counter => Lube Load

Step	Button	Display	Description
Release/Counter	Trigger the lubricating cycle		
2.1			• Press <**Co**ntrol key OK> ☞ You will enter the Release/Counter menu • Press <**Control** key Select> • Use <**down/up** arrow key> in the Input Type menu to select normally closed, normally open, counter, or disabled ☞ With normally closed or normally open contacts or counter: • Press <**down** arrow key> • Use <**left/right** arrow key> to enter the input No. • Press <**Con**trol key Save> • Press <**Con**trol key Back>
Lube Load Switch from Normal Cycle Set to Heavy Cycle Set (increased lubricant delivery)			
2.2			• Press <**Co**ntrol key OK> ☞ You will enter the Lube Load menu • Press <**Control** key Select> • Use <**down/up** arrow key> in the Input Type menu to select normally closed, normally open, or disabled ☞ With normally closed or normally open contacts: • Press <**down** arrow key> • Use <**left/right** arrow key> to enter the input No. • Press <**Con**trol key Save> • Press <**Con**trol key Back>

Zone basic settings

Pump settings => Zone 1 Settings => Lube Control=> Alarm

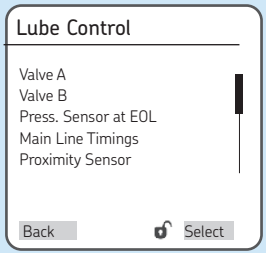
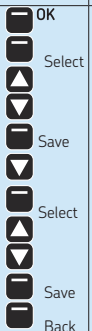
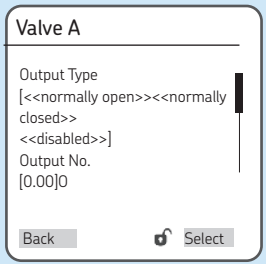
Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Alarm			
3			• Use <**down** arrow key> to select Alarm • Press <**Co**ntrol key OK> ☞You will enter the Alarm menu • Press <**Control** key Select> ☞The following settings are available: o disabled/normally open/normally closed • Use <**down/up** arrow key> to enter the function of the alarm • Press <**Cont**rol key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the Output • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

11.6 Zone 1 Settings with 3/2 zone directional control valves

☞see illustration of zones in Chapter 11.2.1

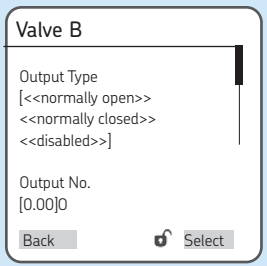
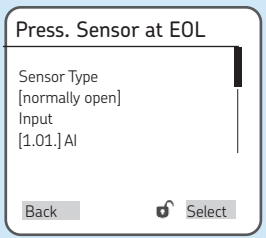
Settings with 3/2 directional solenoid valves

Pump settings => Zone 1 Settings => Lube Control

Step	Button	Display	Description
Zone 1 Settings/Lube Control Settings with 3/2 zone directional control valves			
1			• Use <**down/up** arrow key> to select the Lube Control menu • Press <**Con**trol key OK> ☞You will enter the Lube Control menu ☞The following settings are available: o Valve A (zone valve A) Step 1.1 o Valve B (zone valve B) Step 1.2 o Press. Sensor at EOL Step 1.3 o Main Line Timings Step 1.4 o Proximity Sensor Step 1.5/1.6
1.1			• Use <**OK** arrow key> to select valve A (zone valve A) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Con**trol key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Con**trol key Save> • Press <**Con**trol key Back>

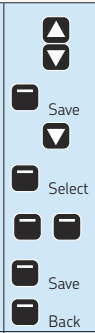
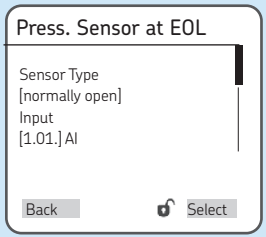
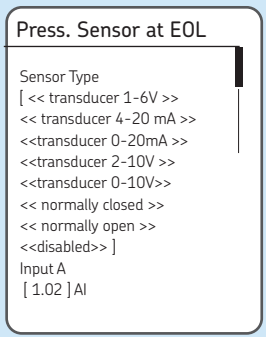
Settings with 3/2 directional control valves

Lube Control => Valve/ => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.2			• Use <**OK** arrow key> to select valve B (zone valve B) • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Contro**l key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Contro**l key Save> • Press <**Contro**l key Back>
1.3			• Use <**down** arrow key> to select Press. Sensor at EOL • Press <**Co**ntrol key OK> ☞ The following settings are available: o disabled / normally open / normally closed / transducer 0-10V / transducer 2-10V / transducer 0-20mA / transducer 4-20mA / transducer 1-6V • Use <**down/up** arrow key> to select the sensor type

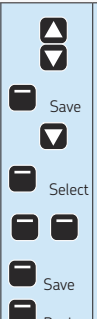
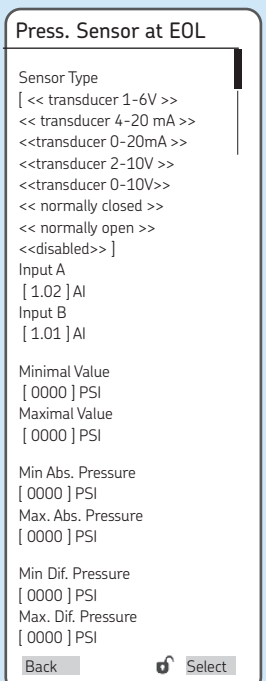
Settings Settings with 3/2 directional control valves

Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.3			**With sensor selection as normally closed or normally open:** • Use <**down/up** arrow key> to select the sensor type normally closed or normally open • Press <**Contr**ol key Save> • Use <**down** arrow key> to select the Input menu item • Press < **Contr**ol key Select> • Use <**right/left** arrow key> to enter the Input No. • Press <**Contr**ol key Save> • Press <**Contr**ol key Back>
			**With sensor selection as transducer** (see p. 41 for functional description of transducer): • Use <**down/up** arrow key> to select the sensor type transducer • Press <**Contr**ol key Save> • Use <**down** arrow key> to select the **Input A** menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the **Input No.** • Press <**Contr**ol key Save> • Repeat entry for **Input B**

Settings with 3/2 directional solenoid valves

Lube Control => Relief Valve => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.3			• Use <**down** arrow key> to select the **Minimal Value** (minimum permissible opening pressure) menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the **Minimal Value** (PSI) • Press <**Control** key Save> • Repeat entry for **Maximal Value** (maximum permissible opening pressure) • Use <**down** arrow key> to select the **Min. Absolute Pressure** menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the **Min. Absolute Pressure** (PSI) • Press <**Control** key Save> • Repeat entry for **Min. Absolute Pressure** • Use <**down** arrow key> to select menu item **Min. Differential Pressure** (minimum permissible differential pressure between the two main lines) • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the **Min. Differential Pressure** (PSI) • Press <**Control** key Save> • Repeat entry for **Max. Differential Pressure** (maximum permissible differential pressure between the two main lines)

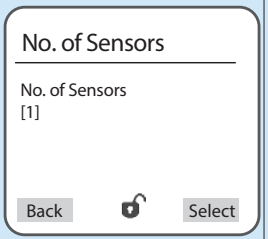
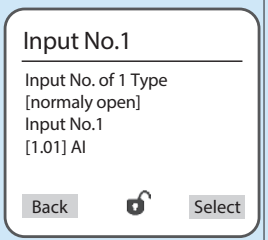
Settings with 3/2 directional solenoid valves

Lube Control => Main Line Timings / Proximity Switch

Step	Button	Display	Description
Monitoring Time	Monitoring of pressure build-up time		
1.4	Select OK Save Back	Main Line Timings Monitoring Time [00: 00: 00] Hold time [00: 00: 00] Back Select	• Press <**Control** key Select> • Use <**right/left** arrow key> to enter the monitoring time for zone 1 • Press <**Control** key OK> • Press <**Control** key Save> • Use <**down** arrow key> to select the **Holding time** menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the **holding time** • Press <**Control** key Back>
Proximity switch			
1.5	Select OK Save Back	No. of Sensors No. of Sensors [1] Back Select	• Use <down/up arrow key> to select the sensors menu • Press <**Control** key OK> • You will enter the Sensor menu • The following settings are available: • No. of Sensors • Input No 1

Settings with 3/2 directional solenoid valves

Lube Control => Main Line Proximity Switch

Step	Button	Display	Description
Proximity switch			
1.5	Select OK Save Back	 	• Press <Enter control key> to select No. of Sensors • Use <down/up arrow key> to enter the No. of Sensors • Press <Control key OK> • Press <Control key Save> • Press <Control key Back> • Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 type • Press <Control key Save> • Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 value • Press <Control key Save> • Press <Control key Back> • Repeat the procedure if Sensor 2 is activated

Zone 2 settings (main lines)

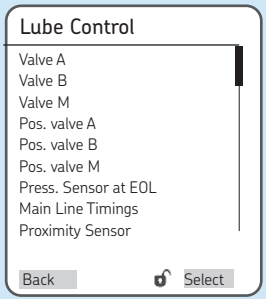
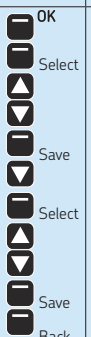
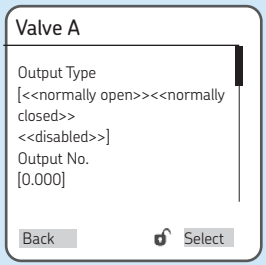
The procedure for settings for zone 2 is identical with that for zone 1, Chapter 11.6.1.

11.7 Zone 1 Settings with EM U3

☞see illustration of zones in Chapter 11.2.2

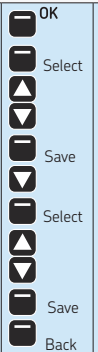
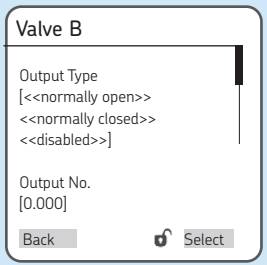
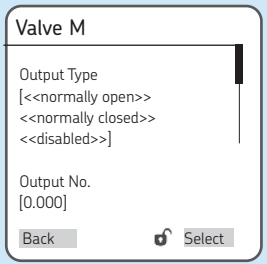
Settings with EM U3

Pump settings => Zone 1 Settings => Lube Control

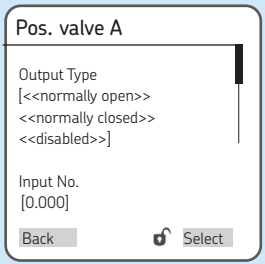
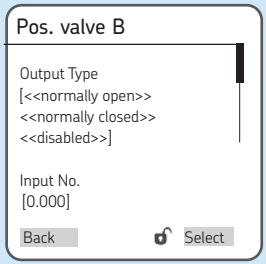
Step	Button	Display	Description
Zone 1 Settings/Lube Control Settings with EM U3 valves A/B/C			
1			• Use <**down/up** arrow key> to select the Lube Control menu • Press <**Co**ntrol key OK> ☞You will enter the Lube Control menu ☞The following settings are available: o Valve A (valve position A) / pos. Valve A Step 1.1 / 1.4 o Valve B (valve position B) / pos. Valve B Step 1.2 / 1.5 o Valve M (valve position M) / pos. Valve M Step 1.3/ 1.6 o Press. Sensor at EOL Step 1.7 o Main Line Timings Step 1.8 o Proximity Sensor Step 1.9
1.1			• Use <**OK** arrow key> to select valve A (activate valve position A) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Cont**rol key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

Settings with EM U3

Pump settings => Zone 1 Settings => Lube Control => Valve

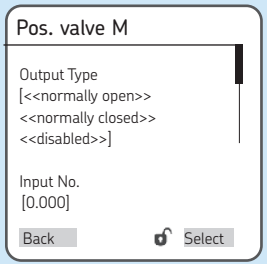
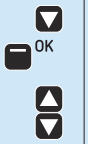
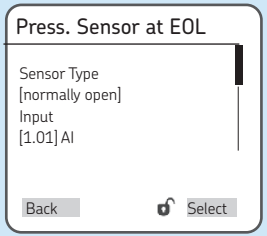
Step	Button	Display	Description
Zone 1 settings/position valve B and valve M			
1.2			• Use <**OK** arrow key> to select valve B (activate zone valve B) • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Contro**l key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Contro**l key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Contro**l key Save> • Press <**Contro**l key Back>
1.3			• Use <**OK** arrow key> to select valve M (valve position zone valves depressurized) • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Contro**l key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Contro**l key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Contro**l key Save> • Press <**Contro**l key Back>

Pump settings => Zone 1 Settings => Lube Control => Pos. Valve A, Pos. Valve B

Step	Button	Display	Description
Zone 1 settings/Check-back signals for change-over of valves A/B			
1.4			• Use <**OK** arrow key> to select pos. valve A (check-back signal for change-over of valve A) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Control** key Save> • Use <**down** arrow key> to select the Input No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the input No. • Press <**Control** key Save> • Press <**Control** key Back>
1.5			• Use <**OK** arrow key> to select pos. valve B (check-back signal for change-over of valve B) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Control** key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Control** key Save> • Press <**Control** key Back>

Settings with EM U3

Lube Control => Pos. Valve M => Press. Sensor at EOL

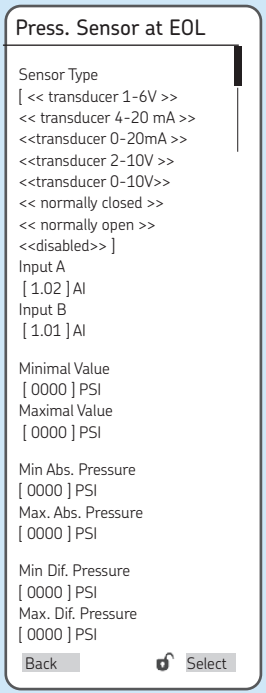
Step	Button	Display	Description
Zone 1 settings/Check-back signals for change-over of valve M			
1.6			• Use <**OK** arrow key> to select pos. valve M (check-back for valve B) for switching to depressurized) • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Contro**l key Save> • Use <**down** arrow key> to select the Input No. menu item • Press <**Contro**l key Select> • Use <**down/up** arrow key> to enter the input No. • Press <**Contro**l key Save> • Press <**Contro**l key Back>
1.7			• Use <**down** arrow key> to select Press. Sensor at EOL • Press <**Contro**l key OK> ☞ The following settings are available: o disabled / normally open / normally closed / transducer 0-10V / transducer 2-10V / transducer 0-20mA / transducer 4-20mA / transducer 1-6V • Use <**down/up** arrow key> to select the sensor type

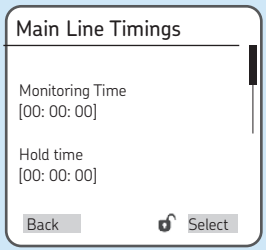
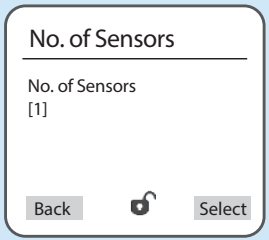
Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure - sensor at end of line (EOL)			
1.7	Save Select Save Back	Press. Sensor at EOL Sensor Type [normally open] Input [1.01] AI Back Select	**With sensor selection as normally closed or normally open:** (see page 41 for functional description of transducer) • Use <**down/up** arrow key> to select the sensor type normally closed or normally open • Press <**Con**trol key Save> • Use <**down** arrow key> to select the Input menu item • Press < **Con**trol key Select> • Use <**right/left** arrow key> to enter the Input No. • Press <**Con**trol key Save> • Press <**Con**trol key Back>
1.7	Save Select Save Back	Press. Sensor at EOL Sensor Type [<< transducer 1-6V >> << transducer 4-20 mA >> <<transducer 0-20mA >> <<transducer 2-10V >> <<transducer 0-10V>> << normally closed >> < normally open >> <<disabled>>] Input A [1.02] AI Input B [1.01] AI	**With sensor selection as transducer:** • Use <**down/up** arrow key> to select the sensor type transducer • Press <**Con**trol key Save> • Use <**down** arrow key> to select the Input A menu item • Press <**Con**trol key Select> • Use <**right/left** arrow key> to enter the Input No. • Press <**Con**trol key Save> • Repeat entry for **Input B**

Settings with EM U3

Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure - sensor at end of line (EOL)			
1.7			• Use <**down** arrow key> to select the Minimal Value (minimum permissible opening pressure) menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Minimal Value (PSI) • Press <**Control** key Save> • Repeat entry for Maximal Value (maximum permissible opening pressure) • Use <**down** arrow key> to select the Min. Absolute Pressure menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Min. Abs. Pressure (PSI) • Press <**Control** key Save> • Repeat entry for Min. Absolute Pressure • Use <**down** arrow key> to select menu item **Min. Dif**ferential **Pressure** (minimum permissible differential pressure between the two main lines) • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Min. Differential Pressure (PSI) • Press <**Control** key Save> • Repeat entry for Max. Differential Pressure (maximum permissible differential pressure between the two main lines)

Step	Button	Display	Description
Monitoring Time	Monitoring of pressure build-up time		
1.8	Select OK Save Back		• Press <**Control** key Select> • Use <**right/left** arrow key> to enter the monitoring time for zone 1 • Press <**Control** key OK> • Press <**Control** key Save> • Use <**down** arrow key> to select the **Holding time** menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the holding time • Press <**Control** key Back>
Proximity switch			
1.9	Select OK Save Back		• Use <down/up arrow key> to select the sensors menu • Press <Control key OK> • You will enter the Sensor menu • The following settings are available: • No. of Sensors • Input No 1

Settings with EM U3

Lube Control => Main Line Proximity Switch

Step	Button	Display	Description
Proximity switch			
1.9	Select OK Save Back	No. of Sensors No. of Sensors [1] Back Select	• Press <Enter control key> to select No. of Sensors • Use <down/up arrow key> to enter the No. of Sensors • Press <Control key OK> • Press <Control key Save> • Press <Control key Back>
		Input No.1 Input No. of 1 Type [normaly open] Input No.1 [1.01] AI Back Select	• Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 type • Press <Control key Save> • Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 value • Press <Control key Save> • Press <Control key Back> • Repeat the procedure if Sensor 2 is activated

Zone 2 Settings (main lines)

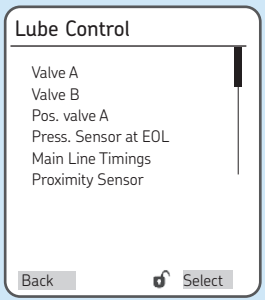
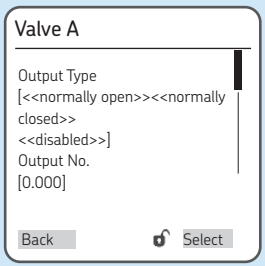
The procedure for settings for zone 2 is identical with that for zone 1, Chapter 11.6.2

11.8 Zone 1 Settings with EM U2

☞see illustration of zones in Chapter 11.2.3

Settings with EM U2

Pump settings => Zone 1 Settings => Lube Control

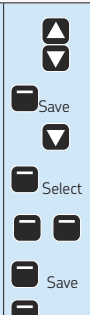
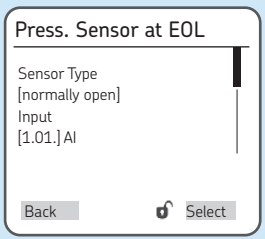
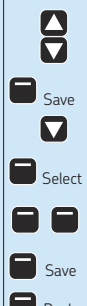
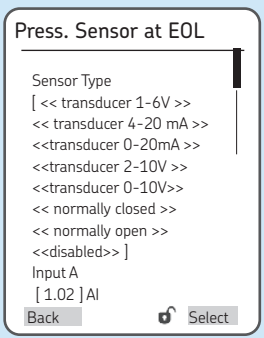
Step	Button	Display	Description
Zone 1 Settings/Lube Control Settings with EM U3 valves A/B			
1			• Use <**down/up** arrow key> to select the Lube Control menu • Press <**Co**ntrol key OK> ☞You will enter the Lube Control menu. ☞The following settings are available: o Valve A (valve position A) Step 1.1 o Valve B (valve position B) Step 1.2 o Press. Sensor at EOL Step 1.3 o Main Line Timings Step 1.4 o Proximity Sensor Step 1.5
1.1			• Use <**OK** arrow key> to select valve A (activate valve position A) • Press <**Control** key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Co**ntrol key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Control** key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Co**ntrol key Save> • Press <**Co**ntrol key Back>

Settings with EM U2

Pump settings => Zone 1 Settings => Lube Control => Valve

Step	Button	Display	Description
Zone 1 Settings/Position of Valve B			
1.2	OK Select Save Select Save Back	Valve B Output Type [<<normally open>> <<normally closed>> <<disabled>>] Output No. [0.000] Back Select	• Use <**OK** arrow key> to select valve B (activate zone valve B) • Press <**Contro**l key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Contro**l key Save> • Use <**down** arrow key> to select the Output No. menu item • Press <**Contro**l key Select> • Use <**down/up** arrow key> to enter the output No. • Press <**Contro**l key Save> • Press <**Contro**l key Back>
1.3	OK	Press. Sensor at EOL Sensor Type [normally open] Input [1.01] AI Back Select	• Use <**down** arrow key> to select Press. Sensor at EOL • Press <**Co**ntrol key OK> ☞ The following settings are available: o disabled / normally open / normally closed / transducer 0-10V / transducer 2-10V / transducer 0-20mA / transducer 4-20mA / transducer 1-6V • Use <**down/up** arrow key> to select the sensor type

Pump settings => Zone 1 Settings => Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.3			**With sensor selection as normally closed or normally open:** • Use <**down/up** arrow key> to select the sensor type normally closed or normally open • Press <**Con**trol key Save> • Use <**down** arrow key> to select the Input menu item • Press <**Con**trol key Select> • Use <**right/left** arrow key> to enter the Input No. • Press <**Con**trol key Save> • Press <**Con**trol key Back>
1.3			**With sensor selection as transducer:** (see p. 41 for functional description of transducer): • Use <**down/up** arrow key> to select the sensor type transducer • Press <**Con**trol key Save> • Use <**down** arrow key> to select the Input A menu item • Press <**Con**trol key Select> • Use <**right/left** arrow key> to enter the Input No. • Press <**Con**trol key Save> • Repeat entry for Input B

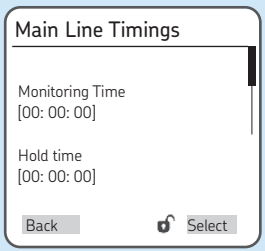
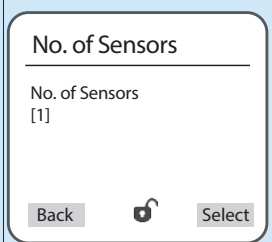
Settings with EM U2

Pump settings => Zone 1 Settings => Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.3	Save Select Save Back	Press. Sensor at EOL Sensor Type [<<transducer 1-6V>> <<transducer 4-20 mA >> <<transducer 0-20 mA>> <<transducer 2-10V >> <<transducer 0-10V>> << normally closed >> << normally open >> <<disabled>>] Input A [1.02] AI Input B [1.01] AI Minimal Value [0000] PSI Maximal Value [0000] PSI Min Abs. Pressure [0000] PSI Max. Abs. Pressure [0000] PSI Min Dif. Pressure [0000] PSI Max. Dif. Pressure [0000] PSI Back Select	• Use <**down** arrow key> to select the **Minimal Value** (minimum permissible opening pressure) menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Minimal Value (PSI) • Press <**Control** key Save> • Repeat entry for **Maximal Value** (maximum permissible opening pressure) • Use <**down** arrow key> to select the Min. Absolute Pressure menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Min. Absolute Pressure (PSI) • Press <**Control** key Save> • Repeat entry for Min. Absolute Pressure • Use <**down** arrow key> to select menu item Min. Differential Pressure (minimum permissible differential pressure between the two main lines) • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Min. Differential Pressure (PSI) • Press <**Control** key Save> • Repeat entry for Max. Differential Pressure (maximum permissible differential pressure between the two main lines)

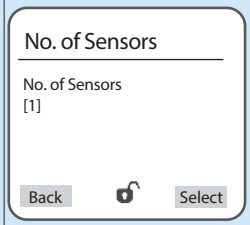
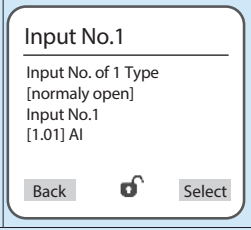
Settings with EM U2

Lube Control => Main Line Timings/Proximity Switch

Step	Button	Display	Description
Monitoring Time	Monitoring of pressure build-up time		
1.8	Select OK Save Back		• Press <**Control** key Select> • Use <**right/left** arrow key> to enter the monitoring time for zone 1 • Press <**Control** key OK> • Press <**Control** key Save> • Use <**down** arrow key> to select the **Holding time** menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the holding time • Press <**Control** key Back>
Proximity switch			
1.9	Select OK Save Back		• Use <down/up arrow key> to select the sensors menu • Press <Control key OK> • You will enter the Sensor menu • The following settings are available: • No. of Sensors • Input No 1

Settings with EM U2

Zone 1 Settings => Lube Control =>Main Line Proximity Switch

Step	Button	Display	Description
Proximity switch			
1.9	Select OK Save Back	 	• Press <Enter control key> to select No. of Sensors • Use <down/up arrow key> to enter the No. of Sensors • Press <Control key OK> • Press <Control key Save> • Press <Control key Back> • Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 type • Press <Control key Save> • Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 value • Press <Control key Save> • Press <Control key Back> • Repeat the procedure if Sensor 2 is activated

Zone 2 Settings (main lines)

The procedure for settings for zone 2 is identical with that for zone 1, Chapter 11.6.3

11.9 Zone 1 Settings with DU1 or with MA/MP

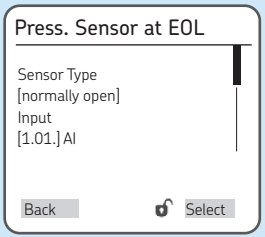
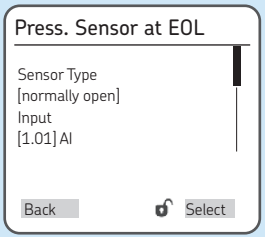
☞ see illustration of zones in Chapter 11.2.4 (DU1) or 11.2.5 (MA/MP)

Pump settings => Zone 1 Settings => Lube Control/Check-Back Signal with DU1/Valve with MA/MP

Step	Button	Display	Description
Zone 1 Settings/Lube Control			
1	▲ ▼	Lube Control Change-Over Signal Press. Sensor at EOL Main Line Timings Proximity Sensor Back Select	• Use <**down/up** arrow key> to select the Lube Control menu • Press <**Co**ntrol key OK> ☞ You will enter the Lube Control menu ☞ The following settings are available: o Change-over Signal for Hydraulic Changeover Step 1.1 o Press. Sensor at EOL Step 1.2 o Main Line Timings Step 1.3 o Proximity Sensor Step 1.4
1.1	OK Select ▲ ▼ Save ▲ ▼ Select ▲ ▼ Save Back	Change-Over Signal with DU1 valve for MA/MP Output Type [<<normally open>>><<normally closed>> <<disabled>>] Input No. [0.000] Back Select	• Use <**OK** arrow key> to select check-back signal for hydraulic change-over of DUI1 **or:** • Use <**OK** arrow key> to select valve for change-over with MA/MP • Press <**Co**ntrol key Select> • Use <**down/up** arrow key> to select between menu items normally open, normally closed, or disabled • Press <**Co**ntrol key Save> • Use <**down** arrow key> to select the Input No. menu item • Press <**Co**ntrol key Select> • Use <**down/up** arrow key> to enter the input No. • Press <**Co**ntrol key Save> • Press <**Co**ntrol key Back>

Settings with DU1 or MA/MP

Pump settings => Zone 1 Settings => Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.2			• Use <**down** arrow key> to select Press. Sensor at EOL • Press <**Co**ntrol key OK> ☞ The following settings are available: o disabled / normally open / normally closed / transducer 0-10V / transducer 2-10V / transducer 0-20mA / transducer 4-20mA / transducer 1-6V • Use <**down/up** arrow key> to select the sensor type
1.2			**With sensor selection as normally closed or normally open:** • Use <**down/up** arrow key> to select the sensor type normally closed or normally open • Press <**Cont**rol key Save> • Use <**down** arrow key> to select the Input menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Input No. • Press <**Cont**rol key Save> • Press <**Cont**rol key Back>

Pump settings => Zone 1 Settings => Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.2	Save Select Save Back	Press. Sensor at EOL Sensor Type [<< transducer 1-6V >> << transducer 4-20 mA >> <<transducer 0-20mA >> <<transducer 2-10V >> <<transducer 0-10V>> << normally closed >> << normally open >> <<disabled>>] Input A [1.02] AI Input B [1.01] AI Minimal Value [0000] PSI Maximal Value [0000] PSI Min Abs. Pressure [0000] PSI Max. Abs. Pressure [0000] PSI Min Dif. Pressure [0000] PSI Max. Dif. Pressure [0000] PSI Back Select	**With sensor selection as transducer** (see p. 41 for functional description of transducer): • Use <down/up arrow key> to select the sensor type transducer • Press <**Contr**ol key Save> • Use <**down** arrow key> to select the **Input A** menu item • Press <**Contr**ol key Select> • Use <**right/left** arrow key> to enter the **Input No.** • Press <**Contr**ol key Save> • Repeat entry for **Input B** • Use <**down** arrow key> to select the Minimal Value (minimum permissible opening pressure) menu item • Press <**Contr**ol key Select> • Use <**right/left** arrow key> to enter the Minimal Value (PSI) • Press <**Contr**ol key Save> • Repeat entry for **Maximal Value** (maximum permissible opening pressure) • Use <**down** arrow key> to select the Min. Absolute Pressure menu item • Press <**Contr**ol key Select> • Use <**right/left** arrow key> to enter the Min. Absolute Pressure (PSI) • Press <**Contr**ol key Save> • Repeat entry for Min. Absolute Pressure

Settings with DU1 or MA/MP

Pump settings => Zone 1 Settings => Lube Control => Press. Sensor at EOL

Step	Button	Display	Description
Zone 1 Settings/Lube Control Zone 1 Pressure sensor at end of line (EOL)			
1.2	Save Select Save Back	Press. Sensor at EOL Min Abs. Pressure [0000] PSI Max. Abs. Pressure [0000] PSI Min Dif. Pressure [0000] PSI Max. Dif. Pressure [0000] PSI Back Select	• Use <**down** arrow key> to select menu item Min. Differential Pressure (minimum permissible differential pressure between the two main lines) • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the Min. Differential Pressure (PSI) • Press <**Control** key Save> • Repeat entry for Max. Differential Pressure (maximum permissible differential pressure between the two main lines)
Main Line Timings Monitoring Time Monitoring of pressure build-up time			
1.3	Select OK Save Back	Main Line Timings Monitoring Time [00: 00: 00] Hold time [00: 00: 00] Back Select	• Press <**Control** key Select> • Use <**right/left** arrow key> to enter the monitoring time for zone 1 • Press <**Control** key OK> • Press <**Control** key Save> **With MA/MP:** • Use <**down** arrow key> to select the **Holding time** menu item • Press <**Control** key Select> • Use <**right/left** arrow key> to enter the holding time • Press <**Control** key Back>

Pump settings => Zone 1 Settings => Lube Control=> Proximity Switch

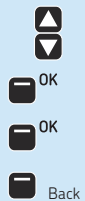
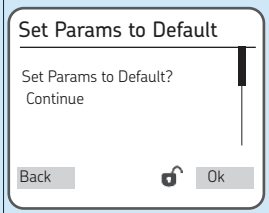
Step	Button	Display	Description
Proximity switch			
1.4	Select OK Save Back	Sensors No. of Sensors Input No. [1] Back Select	• Use <down/up arrow key> to select the sensors menu • Press <Control key OK> • You will enter the Sensor menu • The following settings are available: • No. of Sensors • Input No. 1
		No. of Sensors No. of Sensors [1] Back Select	• Press <Enter control key> to select No. of Sensors • Use <down/up arrow key> to enter the No. of Sensors • Press <Control key OK> • Press <Control key Save> • Press <Control key Back>
		Input No.1 Input No. of 1 Type [normaly open] Input No.1 [1.01] AI Back Select	• Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 type • Press <Control key Save> • Use <down/up arrow key> to select Input No. 1 • Press <Control key Select> to select Input No. 1 value • Press <Control key Save> • Press <Control key Back> • Repeat the procedure if Sensor 2 is activated

11.10 Set Params to Default

NOTICE

Resetting (Set Params to Default) loads the default values for the selected lubrication system.

Set Params to Default

Step	Button	Display	Description
System configuration / Set Params to Default Activating Set Params to Default resets the selected lubrication system. Entries made by the customer or service staff are overwritten.			
1			• Use <**down/up** arrow key> to select the Set Params to Default menu • Press <**Co**ntrol key OK> ☞ You will enter the Set Params to Default menu • Press <**Co**ntrol key OK> • The "Completed" message will appear after several seconds • Press <**Cont**rol key Back>

11.8 Resetting to condition on delivery

NOTICE

Resetting to condition on delivery resets all saved values to their factory settings.

Notes

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