SKF LRM2 Lubrication Remote Monitor

for wireless monitoring and control of
SKF lubrication pumps and lubrication components

Operating instructions

EN

Note!

These **operating instructions** describe the installation of an SKF LRM2 Lubrication Remote Monitor on SKF lubrication pumps approved for this application. Fault signals, fill level control, and interim lubrication can be remotely monitored, depending on the pump design. Programming is performed using an SKF Monitoring app installed in the LRM2 on which the pump parameters file (**.db) is loaded.

The additional description of the **SKF Monitoring app** (951-181-020-EN) provides information on programming deviating functionality.

The **operating instructions for UMTS/HSPA Fault Indicators** (951-181-021-EN) describes all programming options for the LRM2 in detail.

The SKF Monitoring app, SKF LRM2 user manual, and other SKF documents on programming are stored on the supplied LRM2 USB stick.

Version 03
951-181-022-EN

LINCOLN

SKF

EU Declaration of Conformity in accordance with Directive 2014/53/EU, Article 3 and 2014/30/EU

The manufacturer, SKF Lubrication Systems Germany GmbH, Walldorf Plant, Heinrich-Hertz-Str. 2-8, DE - 69190 Walldorf, hereby declares conformity of the device / the electrical equipment

Designation:	**SKF Lubrication Remote Monitor**
Type:	**LRM2**
Item number:	
Year of manufacture:	See rating plate

with all relevant provisions of the following Directives at the time of placing on the market. Furthermore, the following Directives and (harmonized) standards were applied in the applicable areas:

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

Standard	**Edition**	**Standard**	**Edition**	**Standard**	**Edition**	**Standard**	**Edition**
EN 50581	2012	DIN EN 61000-6-2	2006	DIN EN 61000-6-3	2011	DIN EN 60950-1	2006
DIN EN 61000-6-3	2011	Correction	2011	Correction	2012	Correction	2013
Correction	2012	draft EN 301 489-1 V2.2.0		EN 301 511 V12.5.1			
EN 62311	2008	draft EN 301 489-52 V1.1.0		EN 301 908-1 V11.1.1		EN 301 908-2 V11.1.1	
EN 55024	2010						

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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.

Copyright

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
- Improper reaction to malfunctions
- Unauthorized modifications to the product
- Intentional or gross negligence
- Use of non-original SKF spare components

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.

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Explanation of symbols and signs

	General warning		Risk of electrical shock		Risk of slipping		Suspended load
	Wear personal protective gear (goggles)		General notes		Disposal, recycling		Unauthorized persons must be kept away.
	Wear personal protective gear (protective footwear)		Unlock the product		Disposal of waste electrical and electronic equipment		
	CE marking						

	Warning level	Consequence	Probability
	DANGER	Death, serious injury	Immediate
	WARNING	Serious injury	Possible
	CAUTION	Minor injury	Possible
	ATTENTION	Property damage	Possible

Symbol	Meaning
●	Chronological instructions
○	Bullet list items
☞	Indicates the requirements that must be met for the actions described in the following

Abbreviations and conversion factors

re	regarding	°C	degrees Celsius	°F	degrees Fahrenheit
approx.	approximately	K	Kelvin	Oz.	ounce
i.e.	that is	N	Newton	fl. oz.	Fluid ounce
etc.	et cetera	h	hour	in.	inch
poss.	possibly	s	second	psi	pound per square inch
incl.	including	d	day	sq.in.	square inch
min.	minimum	Nm	Newton meter	cu. in.	cubic inch
max.	maximum	ml	milliliter	mph	miles per hour
min	minute	ml/d	milliliters per day	RPM	revolutions per minute
etc.	et cetera	ccm	cubic centimeter	gal.	Gallon
e.g.	for example	mm	millimeter	lb.	pound
kW	kilowatt	l	liter	hp	horsepower
U	voltage	db (A)	sound pressure level	kp	kilopound
R	Resistance	>	greater than	fpsec	feet per second
I	current intensity	<	less than	Conversion factors	
V	volt	±	plus minus	Length	1 mm = 0.03937 in.
W	watt	Ø	diameter	Area	1 cm^2 = 0.155 sq.in.
AC	alternating current	kg	kilogram	Volume	1 ml = 0.0352 fl.oz.
DC	direct current	RH	relative humidity		1 l = 2.11416 pints (US)
A	ampere	≈	approximately	Mass	1 kg = 2.205 lbs
Ah	ampere hour	=	equal to		1 g = 0.03527 oz.
Hz	Frequency (Hertz)	%	percent	Density	1 kg/cm^3 = 8.3454 lb./gal(US)
NC	normally closed contact	‰	per mil (thousandth)		1 kg/cm^3 = 0.03613 lb./cu.in.
NO	normally open contact	≥	greater or equal	Force	1 N = 0.10197 kp
		≤	less or equal	Pressure	1 bar = 14.5 psi
		mm^2	square millimeter	Temperature	°C = (°F-32) x 5/9
		rpm	Revolutions per minute	Power	1 kW = 1.34109 hp
				Acceleration	1 m/s^2 = 3.28084 $ft./s^2$
				Speed	1 m/s = 3.28084 fpsec
					1 m/s = 2.23694 mph

1. Safety instructions

1.1 General safety instructions

- The operator must ensure that the instructions are read 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. Putting the products into operation or operating them without having read the instructions is prohibited.
- Retain the instructions for further use.
- The products described here were manufactured according to the state of the art. Risks may, however, arise from non-compliant usage and may result in personal injury or damage to material assets.
- Any malfunctions which may affect safety must be remedied immediately. In addition to these instructions, the statutory 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.
- Familiarize yourself with the functions and operation of the product. The specified assembly and operating steps and their sequences must be observed.
- Any unclear points regarding proper condition or correct assembly/operation must be clarified. Operation is prohibited until issues have been clarified.
- Unauthorized persons must be kept away.
- Wear personal protective equipment.
- All safety regulations 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 must not 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 reinstalled immediately following conclusion of work and then inspected for proper function.
- Any malfunctions 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.

- Never use any part of the centralized lubrication system as a stand or step or for climbing.

1.3 Intended use

The SKF Lubrication Remote Monitor LRM2 monitors SKF lubrication points that are not connected to the control unit of the system/ machine or vehicle.
In the event of an empty reservoir or another lubrication problem, the LRM2 sends an SMS or, depending on the configuration, an e-mail to one or more cellular phones. The data can optionally be transferred with the process control level at the customer.
The LRM2's field of application includes industrial applications; use in mobile applications is possible only after consultation with SKF.
The connection of the SKF Lubrication Remote Monitor is customer-specific. The customer must ensure that there is sufficient, continuous network reception. It must also be ensured that no electromagnetic interference can occur. The corresponding Electromagnetic Compatibility standards must be observed.
Any other usage is deemed non-compliant with the intended use.

1.4 Foreseeable misuse

Any use of the LRM2 other than under the conditions specified in Section 1.3 and for the specified purpose is strictly prohibited. Particularly prohibited are use:

- In an explosion protection zone.

1.5 Modifications to the product

Unauthorized modifications and changes can have an unpredictable effect on safety. Unauthorized modifications and changes are therefore prohibited.

1.6 Prohibition of certain activities

The following activities must be performed only by employees of the manufacturer or authorized persons due to possibly undetectable sources of error or due to statutory requirements:

- Repairs or modifications

1.7 Inspections prior to delivery

The following tests were performed prior to delivery:

- Safety and functional tests

1.8 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
- Documentation on the enclosed SKF Lubrication Remote Monitor USB stick.

If necessary:

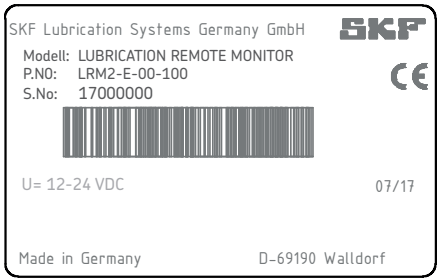
- Other relevant documents for integration of the product into the main machine, system

1.9 Notes on the rating plate

The rating plate provides important data such as the type designation, order number, etc.

To avoid loss of this data in case the rating plate becomes illegible, these characteristics should be entered in the manual.

Model _____
P. No. _____
S. No. _____



1.10 Note on CE marking

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

- 2014/30/EU
  Electromagnetic compatibility

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

1.11 Persons authorized to use the product

1.11.1 Operator

A person competent due to training, knowledge, and experience to execute the functions and activities associated with normal operation; this also includes the avoidance of possible hazards that may arise during operation.

1.11.2 Qualified mechanic

A person with appropriate technical training, knowledge, and experience who can recognize and avoid the hazards that may occur during transport, assembly, commissioning, operation, maintenance, repair, and dismantling

1.11.3 Qualified electrician

A person with appropriate technical training, knowledge, and experience who can recognize and avoid hazards that may result from electricity

1.12 Operation

The following must be observed during commissioning and operation:

- All information within this manual and all information within the referenced documents

- All laws and regulations that the operator must observe

1.13 Emergency shutdown

Shut down the product in an emergency by:

- Switching off the main machine in which the product is integrated

- If necessary, pressing the emergency on/off switch on the main machine

1.14 Transport, assembly, maintenance, malfunction, repair, shutdown, disposal

- All relevant persons must be informed of the activity prior to the start of this work. Precautionary operational measures, work instructions must be observed.
- Prior to performing work, the product and the machine in which the product will be integrated must be de-energized, depressurized, and secured against unauthorized activation.
- Take appropriate measures to ensure that moving, detached parts are immobilized during the work and that no limbs 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. Other units of the machine, the vehicle must not be damaged or impaired in their function by the installation.
- Work on electrical components may be performed only by qualified electricians. Note possible waiting times for discharge. Work on electrical components may be performed only in a voltage-free state and using tools suitable for electrical work.
- Establish the electrical connection only in accordance with the valid circuit diagram and in observance of the relevant regulations and the local electrical operating conditions.
- Do not touch cables or electrical components with wet or moist hands.
- Fuses must not be bridged. Always replace defective fuses with fuses of the same type.
- Drill required holes only on non-critical, non-load-bearing parts. Use existing boreholes. Do not damage lines or cables when drilling.
- Observe any possible wearing spots. Protect components appropriately.
- All components used must be designed for the maximum/minimum ambient temperature
- No parts may be subjected to torsion, shear, or bending.
- Check parts for contamination before use and clean if necessary.
- Adhere to the specified torques. Use a calibrated torque wrench when tightening.

1.15 Initial commissioning

Ensure that:

- All connections are properly connected.
- No external sources of interference are present.

1.16 Cleaning

- Only external cleaning is permitted; use compatible cleaning agents (non-flammable/non-corrosive) for this application.
- Do not use stream-jet equipment or high-pressure cleaners. This may damage electrical components.
  Observe the IP protection class.
- Cleaning work must not be performed on conducting components.

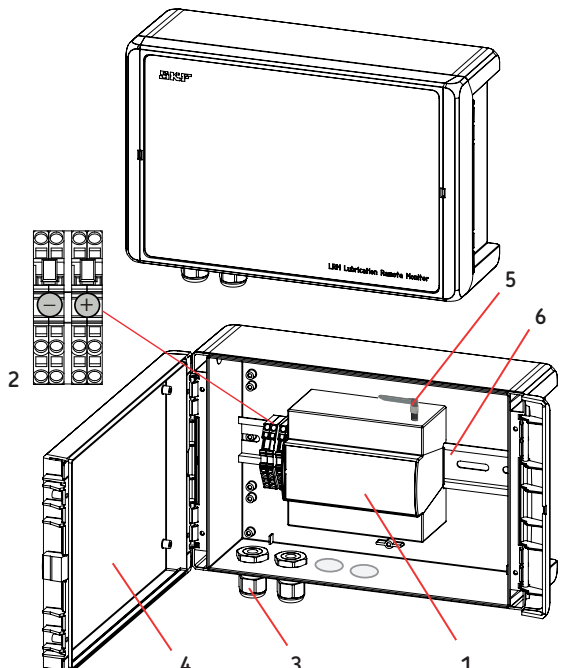
1.17 Residual risk

Residual risk	Remedy
Life cycle: Assembly	
o Power supply of the pump to be adapted is not switched off.	• Switch off/interrupt the power supply.
Life cycle: Commissioning / operation	
o LRM2 house is installed in an unprotected location	• Install the LRM2 house so that it is protected in another way or is equipped with a protective housing
Life cycle: Setup, retrofit	
o LRM2 network plug is pulled out of the cable hardness/port due to carelessness.	• Exercise caution when connecting the network plug; do not apply tension to it.
Life cycle: Malfunction, troubleshooting, maintenance, repair	
o After loosening and tightening the adapter cables, these are not connected securely enough.	• Tighten these securely after working on the cable harnesses
Life cycle: Decommissioning, disposal	
Power supply of the pump to be adapted is not switched off.	• Switch off/interrupt the power supply.

2. Overview, functional description

2.1 Standard version (LRM2-E- xx-xxx and LRM2-A- xx-xxx)

Overview, Fig. 1

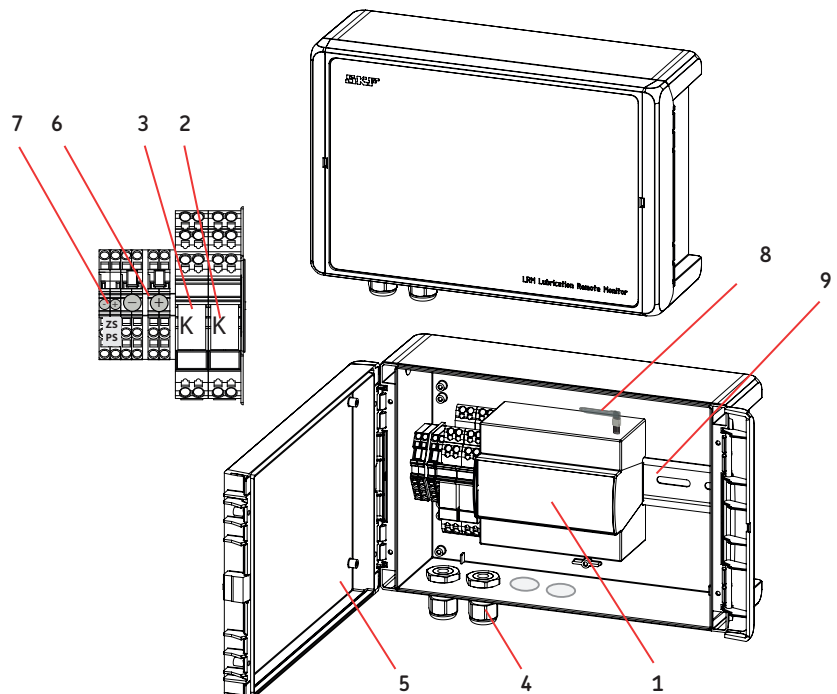


Legend to Figure 1

Item	Description
1	LRM module - see Section 2.3
2	Terminal strips (4x)
3	Cable glands (M16, 2x) (clamping range 4-10 mm)
4	Housing cover with housing
5	LRM transmission antenna
6	DIN rail

2.2 Version with change-over relay (LRM2-E- xx-xxx and LRM2-A- xx-xxx)

Overview, Fig. 2



Legend to Figure 2

Item	Description
1	LRM module - see Section 2.3
2	Change-over relay K2
3	Change-over relay K1
4	Cable glands (M16, 2x) (clamping range 4-10 mm)
5	Housing cover with housing
6	Terminal strips (+/- connections)
7	Terminal strips (for connecting pressure switch (PS) or cycle switch (ZS))
8	LRM transmission antenna
9	DIN rail

2.3 Modem assignment (EU and US)

Function lights/slots, Fig. 3

Designation	Description	Function
1	Reset key	
Press once briefly		Resets the software and restarts it. (soft reset)
Press for at least 3 seconds		Resets the hardware and restarts it. (hard reset)
Briefly press three times within 2 seconds		Deletes all settings and resets the device to factory defaults
2	**SIM card slot**	Support for 1.8 V and 3.0 V SIM cards Format Mini SIM (2FF), locked
Briefly press on the SIM card		Ejects the SIM card
IN 1	Status LED for input 1	Input 1 closed/open
IN 2	Status LED for input 2	Input 2 closed/open
Out 1	Status LED for output 1	Output 1 closed/open
Out 2	Status LED for output 1	Output 2 closed/open
Status LED		Green = VPN active, red = init/update
Power LED		Lit= Power supply connected
Signal LED		Blinking = Current signal input
LAN 10/100		Speed of LAN connection in Mbit/s
LAN Link LED		Blinking = Data traffic
COM LED		PPP link

LED	Color	Function	LED => off	Flashing	Blinking	On
LAN 10/100	Green	10/100 Mbit/s	10 Mbit/s			100 Mbit/s
LAN link	Green	Link			Data traffic	Connected
Power	Green	Supply	Missing			Present
COM	Green	PPP link	Offline			Establishing
	Orange	PPP link				Established
Signal	Green	SIM card	No signal or logged out	PPP-Data traffic	Field strength, see following Blinking cycle table	
Status	Green	VPN				VPN connection established
	Red	Status				Initialization, FW update
In1	Green	Input 1	open			Closed
In2	Green	Input 2	open			Closed
OUT1	Green	Output 1	open			Closed
OUT2	Green	Output 1	open			Closed

Signal LED blinking cycles	Valence	Signal quality
900 ms on, 100 ms off	20 .. 31	Very good
200 ms on, 200 ms off	13 .. 19	Good
100 ms on, 900 ms off	0 .. 12	Poor
Off	99 (not detectable)	Insufficient

2.4 Functional description

The SKF Lubrication Remote Monitor (LRM2) is a cost-effective solution for monitoring lubricant pumps in difficult-to-access areas.
The LRM2 (2G/3G, UMTS/HSPA) monitors SKF lubrication pumps that have not been connected to monitoring systems of machine or equipment control units. The LRM2 can also be used as a telecommunications module.
It has two digital inputs and two digital outputs. The inputs can be used individually as monitoring signals.
Typically, the fill level signal “Reservoir prewarning min.” as well as fault notifications (distributor errors) are monitored.
An output signal can also be controlled using the Global System for Mobile Communications (GSM). An output signal is typically used to start the triggering of an interim lubrication.

In case of an empty signal or another lubrication problem, the LRM2 will inform the maintenance staff by SMS or by e-mail, depending on the configuration. The notification is sent to one or more cellular phones. The information can thus be processed in time and countermeasures can be initiated. The data can optionally be transferred through the process control level at the customer. This requires only an LRM2 and a cellular phone.
The status is configured and displayed via a Web server built into the LRM2 that permits free access to the Web interface and local devices through a secure and simple VPN connection in all networks.
A Monitoring app specially aligned to monitoring the pump is created using the server. After starting the LRM2 and starting the installation app, set the basic data such as PIN, PUK, and telephone number(s).

The SKF Lubrication Remote Monitor, which is maintanence-free, operates continuously; it can be programmed so that after a predefined interval it automatically sends a status report for the pump being monitored by SMS or forwards the data over the Internet to a customer’s Condition Monitoring Cloud that, for example, visualizes the incoming values and processes alarms or events.

SKF recommends enabling the SMS setting. The alarm and restore messages are registered with time and date. Most existing SKF lubrication pumps can retrofitted with the LRM2. Contact SKF Service for this.

Depending on the pump design and type of signal switching, the LRM2 is available with and without a change-over relay. In the design with a cross-over relay, a potential (+) fill level signal from the pump is converted by the change-over relay into a potential-free (-) signal and passed to the model's input signal.
The LRM2 is also available in designs with different frequency ranges, for the US market (LRM2-A-**) and for the European market (LRM2-E-**) as standard.

3. Technical data

3.1 General technical data

Field of application	Industrial applications
Mounting position	Any, but not rotating
Operating temperature range	-30...+70°C
Storage temperature	-30...+70°C
Humidity	0 .. 95% (non-condensing)
Protection class	IP 66
Cable glands	M16 clamping range of flexible cable leads (ø) 4-10 mm
Clamping range of LRM connecting terminals	0.25-2.5 mm^2
Weight	Approx. 1.3 kg with packaging

3.2 Transmission unit

Power supply	12 to 24 V DC (+/- 20%)
Idle power consumption (logged in)	Approx. 1 W
Connected power consumption	Max. 3 W
Level inputs	HIGH level = 3-12 V (contact open or voltage strength for external supply) LOW level = 0-1 V
Power consumption of an active input against GND (internal 3.3 V)	Typically 0.5 mA (when input activated by connection to GND)
Switching output, max. switching voltage	30 V (AC/DC)
Switching output, max. current load	1 A (DC) 0.5 A (AC)

Radiated power	EGSM 850 and 900: Class 4	2 W
	GSM 1800 and 1900: Class 1	1 W
	EGSM 850 and 900: Class E2	0.5 W
	GSM 1800 and 1900: Class E2	0.5 W
	UMTS 2100, WCDMA FDD BdI: Class 3	+24 dBm +1/-3 dB (**LRM2-E**- xx-xxx)
	UMTS 900, WCDMA FDD BdVIII: Class 3	+24 dBm +1/-3 dB (**LRM2-E**- xx-xxx)
	UMTS 1900, WCDMA FDD BdII: Class 3	+24 dBm +1/-3 dB (**LRM2-A**- xx-xxx)
	UMTS 850, WCDMA FDD BdV: Class 3	+24 dBm +1/-3 dB (**LRM2-A**- xx-xxx)

Note! Max. specification for IMON-U300 applies to occasional data transfer and use of no more than two LAN ports. Functional limitations (especially in data transmission) may occur.
Supply voltage, input voltage, and switched voltage are Safety Extra Low-Voltage (SELV) and Limited Power Source (LPS).

3.2.1 Mobile radio

Mobile radio frequencies	**LRM2-E**- xx-xxx: 2G: 900/1800 **LRM2-A**- xx-xxx: 2G: 850/1900	3G: 900/2100 3G: 850/1900
Effective data rate	Up to 921.6 kbit/s (DL, UL)	
Services	UMTS/HSPA, GPRS/EDGE Class 12, GSM CSD (incoming and outgoing), SMS (incoming and outgoing)	
Antenna	SMA socket	
SIM	1 slot for mini SIM (1.8 V or 3.0 V)	

3.2.2 Router/interface/configuration/inputs and outputs/programming

Router	
Function	Dial-In, Dial-Out, Callback, connection management, DHCP server, Full NAT (Port Forwarding, Netmapping), DNS Relay, dynDNS support, SNMP, NTP Client and Server, buffered real-time clock
Safety	OpenVPN (Client and Server), IPsec, PPTP, Firewall, 10 users for Dial-In, authentication by PAP/CHAP/MS-CHAP/MS-CHAP 2, dialing filter for Dial-Out, Linkloss Detection, Failed Login Detection, GRE
LAN	1x Ethernet RJ45 (10/100 Mbps, MDI/MDI-X, Autobauding)
System messages	Notification by SMS, e-mail, and SNMP of start, connection established, VPN tunnel, SMS receipt, automatic update
Serial interface	
RS232	1 x RS232/D-SUB-9(f): Serial Ethernet gateway (incoming and outgoing connections, Modbus TCP/RTU gateway, modem emulation) or port for connecting cable for Siemens LOGO!™ 1 x RS232 half-duplex, RX/TX, pluggable screw terminal (either RS485 or RS232 usable in half-duplex)
RS485	D+ and D-, pluggable screw terminal
Configuration	
Router	Local and remote Web interface, text and binary files, automatic updates
Monitoring	Local and remote Web interface, mySQL database
Inputs and outputs / programming	
Digital inputs	2x via pluggable screw terminal, activated by connection to GND
Digital outputs	2x via pluggable screw terminal, potential-free change-over relay
Programming	User access to embedded Linux (sandbox), 150 MB of persistent storage, socket access, example programs: E-mail and SMS client, serial logger, etc.

3.3 Type code / versions

Important equipment features of the product can be identified based on the type code. The type code is on the product's rating plate.

	Example	**L**	**R**	**M**	**2**	**-**	**E**	**-**	**0**	**0**	**-**	**1**	**0**	**0**					
	Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Product designation:	Lubrication Remote Monitor 2	**L**	**R**	**M**	**2**	-		-			-								
Country code:	**Europe** and **Asia** (no UL/CSA/FCC)					-	**E**	-			-								
	USA (with UL/CSA/FCC/US frequency band)					-	**A**	-			-								
Pumps / product families:	P203, P603, P653 (without coupling relay)					-		-	**0**		-								
	KFG (with coupling relay and always in housing) (2 coupling relays)					-		-	**1**		-								
	If 2 AC pumps are switched to one LRM (4 coupling relays)					-		-	**2**		-								
	If 3 AC pumps are switched to one LRM (6 coupling relays)					-			**3**		-								
Programming:	Joint empty signal and fault signal (on KFG or P versions)					-		-		**1**	-								
	Separate empty signal and fault signal (only in P versions, not KFG)					-		-		**0**	-								
Housing:	In box (LMC housing)					-		-			-	**1**							
	Only base unit										-	**0**							
Optional:	No												**0**	**0**					
Special versions:	Free																		

Order example
Lubrication Remote Monitor 2 (LRM2) Use within Europe (E), for pump versions P203, P603, P653 (0), separate empty signal and fault signal (0) with LRM housing (1), without options (00), yields the order number: **LRM2-E-00-100**.

4. Delivery, returns, storage

4.1 Delivery

After receipt of the shipment, it must be inspected for any shipping damage and for completeness according to the shipping documents. Immediately inform the transport carrier of any shipping damage.
The packaging material must be preserved until any discrepancies are resolved. Safe handling must be ensured during on-site transport.

4.2 Return shipment

Before return shipment, all contaminated parts must be cleaned and properly packed (i.e., according to the requirements of the recipient country).

The product must be protected from mechanical effects such as impacts. There are no restrictions for land, air, or sea transport.

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

4.3 Storage

Before usage, check products for damage that may have occurred during storage. This applies in particular to parts made of plastic and rubber (due to embrittlements) as well as components prefilled with lubricant (due to aging).

The following conditions apply to storage:

- The permissible storage temperature range corresponds to the operating temperature range (see “Technical data”).
- Dry, low-dust, vibration-free, in closed rooms
- No corrosive, aggressive substances at the storage location (e.g., UV rays, ozone)
- Protected against animals
- In the original product packaging
- Protected from nearby sources of heat or cold
- In case of large temperature fluctuations or high humidity, take appropriate measures (e.g., heating/air conditioning) to prevent the formation of condensation water.

5. Assembly

5.1 General information

CAUTION

Fire hazard and damage to the product due to overcurrent in the device supply.
Secure the product using a suitable fuse against currents greater than 1.6 A.

CAUTION

Damage to health due to inadequate distance between antennas and persons
The antenna must be at least 20 cm away from persons during operation. This applies in particular to persons with a pacemaker.

Only qualified technical personnel may install the products specified in the instructions.

During assembly, pay attention to the following:

- Other units must not be damaged by assembly work.
- The product must not be installed within range of moving parts.
- The product must be installed at a sufficiently large distance from sources of heat or cold.
- Electrostatic discharges can damage the product. Take general protective measures for handling electrostatically sensitive components.
- Incomplete disconnection from the power supply can damage the product.
- If a redundant power supply is implemented, disconnect each supply circuit with its respective disconnector in order to disconnect the device from the power supply.
- Observe the IP protection class of the product.
- Fire hazard and damage to the product due to overvoltage and voltage spikes from the mains supply.
- Install suitable overvoltage protection.
- Never let the device come into contact with ketones (e.g., acetone) or chlorinated hydrocarbons, such as dichloromethane.
- Maintain safety clearances and comply with statutory regulations for assembly and accident prevention.
- Follow the mounting position requirements in “Technical data” (Chapter 4).

5.2 Assembly location

The product should, to the extent possible, be protected from humidity and vibration, and should be mounted so that it is easily accessible. This facilitates further installation, inspection, and maintenance work on the product.
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.

5.3 Mechanical connection

5.3.1 Minimum mounting dimensions

To ensure enough space for maintenance work or clearance for possible disassembly of the product, ensure that the minimum mounting dimensions indicated in Figure 5 are maintained.

5.4 Tightening torques

The specified torques must be observed during assembly and repair.	
LRM2 to base, machine, control cabinet	3 Nm + 0.5 Nm
Cable glands	2 Nm ± 0.5 Nm

5.5 Opening the controller unit

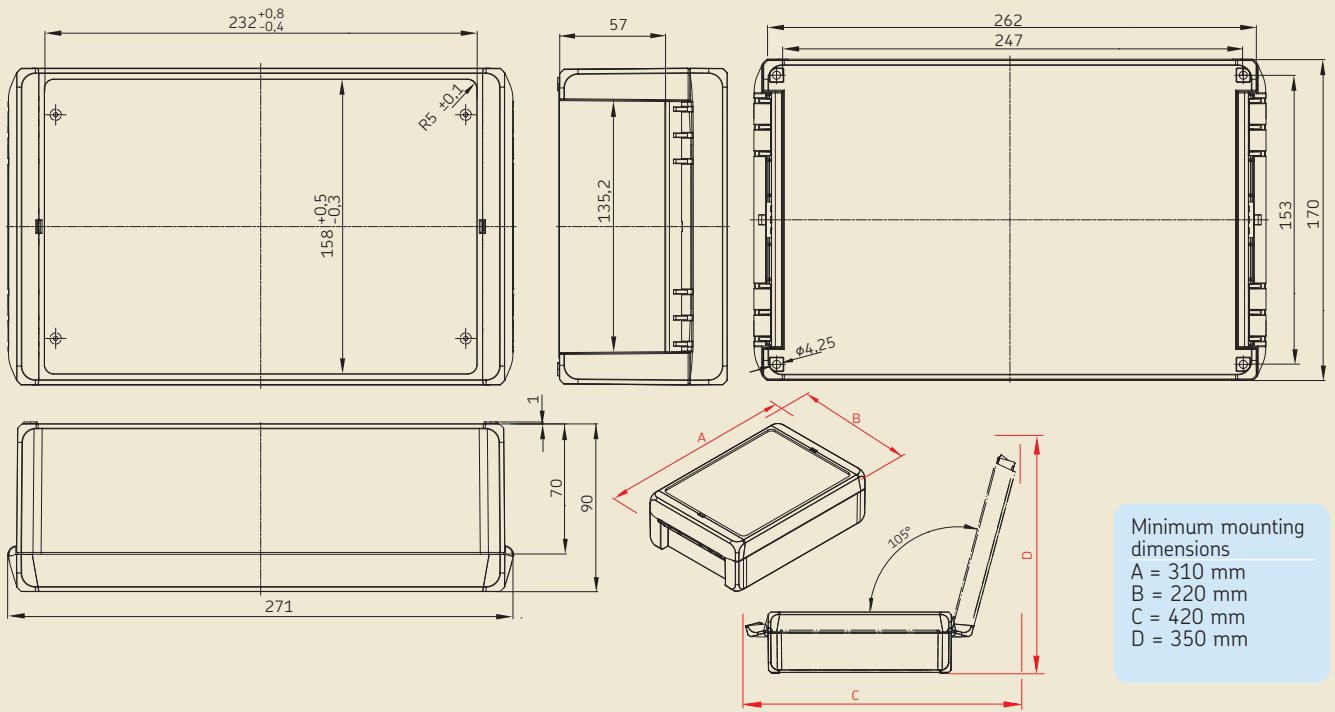
- Insert a flat-tip screwdriver (**1**) with a maximum blade width of 5.5 mm into the opening slot (**2**)
- Tilt the screwdriver (**1**) slightly to the right to open the cover (**3**)

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

Opening the controller unit, Fig. 4

5.6 Port dimensions, assembly holes, and minimum mounting dimensions

Fig. 5



Minimum mounting dimensions
A = 310 mm
B = 220 mm
C = 420 mm
D = 350 mm

5.7 Installin the controller unit

☞ See Figure 5
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. 1) and the conditions on the surface.
- Clean surface to remove drilling chips.
- Open the LRM2 housing, place it on the surface, and roughly align it.
- Pass cheese-head screws M4 (4x) through the fixing holes on the housing and mounting surface.
- Apply washers to cheese-head screws, gently tighten cheese-head screws.
- Align LRM2 housing, tighten cheese-head screws

Tightening torque 3 Nm

5.8 Electrical connection

5.8.1 General notes

WARNING

Assembly work may only be performed by qualified technical personnel - see Chapter 1.3.
De-energize the product prior to beginning work.
Local electrical operating conditions regulations (e.g., DIN, VDE) must be observed.

Connect the power cables in such a way that no forces are transferred to the product (stress-free connection).

ATTENTION

Check the fuse protection of the electrical circuit. Use only fuses with the prescribed current intensity.

ATTENTION

Communication between the SKF Lubrication Remote Monitor and the customer's system takes place according to customer specifications and programming.

The system manufacturer is therefore liable for proper connection of the SKF Lubrication Remote Monitors and its programming.

The SKF Lubrication Remote Monitor can be used for all LRM2-approved pump versions. Depending on the SKF pump version, the 24 VDC Monitor is supplied by the pump's power supply or the customer-supplied power supply.

The LRM2 is adapted between pump-supplied and customer-supplied power supply using an adapter cable set.

The adapter cable set consists of one or two cables supplied loose: one power supply cable and one signal transmission cable. The cable sets differ primarily in:

- Pump version, e.g., P203 or KFGS
- Pump voltage 24 VDC/110/230 VAC

Pin assignment:

- Fill level monitoring
- Fault notification signal
- Interim lubrication

These cables are equipped on the pump side with adapter plugs/adapter sockets and only with flexible cable leads to the LRM2.

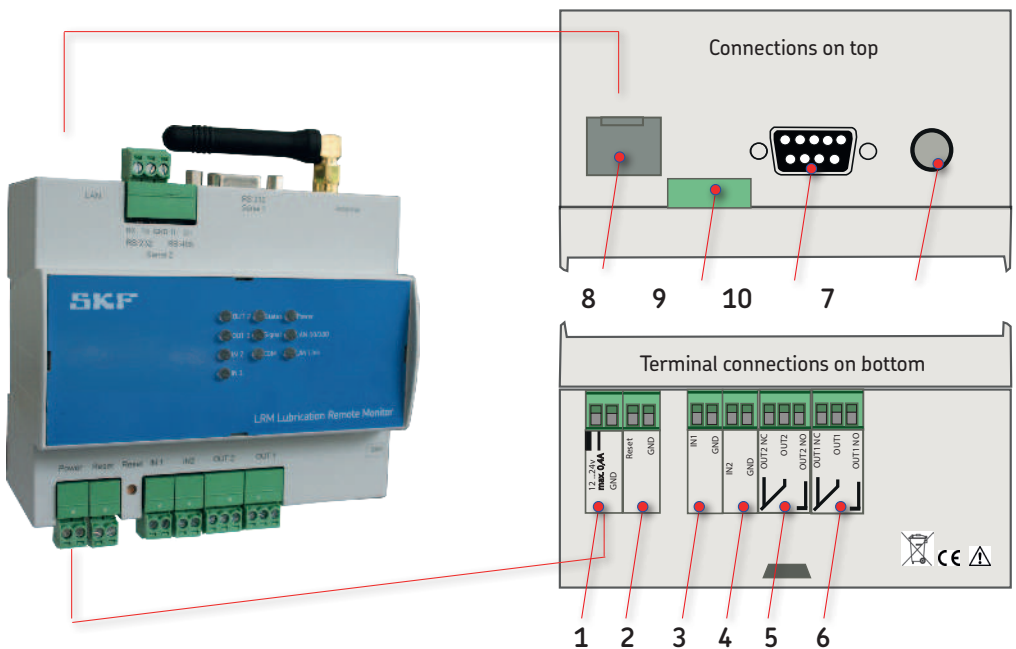
The flexible cable leads are connected to the LRM2 according to the terminal diagram of the respective pumps; see Chapters 5.8.5 to 5.8.7.
The clamping range of the cable clamps is 0.25-2.5 mm.

Consult Chapter 3, "Technical data," for the electrical characteristics of the SKF Lubrication Remote Monitor.

Below is a breakdown of the installation description by pump types.

5.8.2 LRM2 pin assignment

Pin assignment of LRM2 module, Fig. 6



Item	Designation	Description
1	12...24V DC	**Power supply 12 V – 24 V DC**
	GND	**Ground**
2	Reset	Reset input
	GND	Ground
3	IN 1	**Input 1 on distributor error**
	GND	Ground
4	IN 2	**Input 2 on empty signal**
	GND	Ground
5	OUT 2 NC	Output 2 NC (normally closed) contact
	OUT 2	Output 2
	OUT 2-NO	Output 2 NO (normally open) contact
6	OUT 1-NC	Output 1 NC (normally closed) contact
	OUT 1	Output 1
	OUT 1-NO	**Output 1 for interim lubrication** NO (normally open) contact
7		Mobile radio antenna connection (SMA socket) **Note!** If using an outside-mounted antenna, the shielding of the antenna system must be connected to the building installation's grounding.

Item	Designation	Description
For connections for optional applications, see the user manual for the LRM2 Module		
8		Ethernet port (RJ45, 10/100 BT) 10/100 Mbit/s full-duplex autosense; automatic detection of crossover or patch wiring.
9		Serial interface Serial 2 (RS485 or optional RS232 half-duplex RX/TX) Max. baud rate 115,200 bit/s; 3.3 V level referenced to GND
10		Serial interface Serial 1 (RS232 connection V.24/V.28) Max. baud rate 115,200 bit/s; hardware handshake RTS/CTS; software handshake XON/XOFF; various data formats

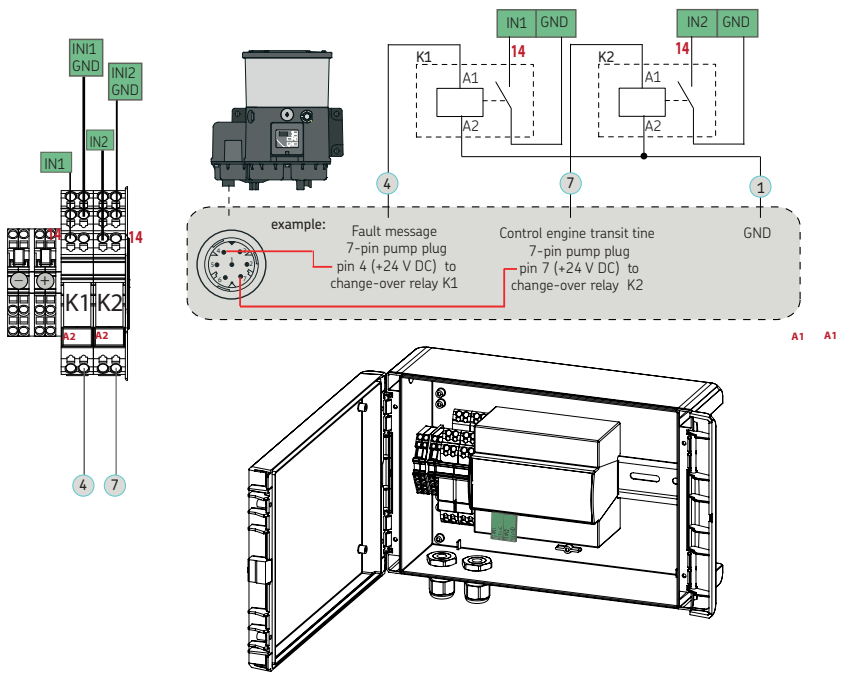
5.8.3 Version with change-over relay (LRM2-E-** and LRM2-A-**)

Version LRM2-*-1* comes with two signal change-over relays (K1 and K2) in addition to the previous standard version LRM2-*-0*. This makes it possible to change signal states.

A potential (+) fault notification signal (pin 4) from the pump is converted by change-over relay K1 into a potential-free signal (-) and passes to the modem's input signal (IN1).

Further, a potential (+) motor run monitoring signal (pin 7) from the pump can be converted into a potential-free signal (-) by signal change-over relay K2 and passed to the modem's input signal (IN2).

Change-over relay for LRM2 module, Fig. 7



5.8.4 Connection P203 pump version with 7-pin pump bayonet plug, with fault notification, fill level monitoring, monitoring of piston detector and interim lubrication 3A2-1 (-see P203 operating instructions, Page 55) (12-24 VDC)

Pump item number: 94823

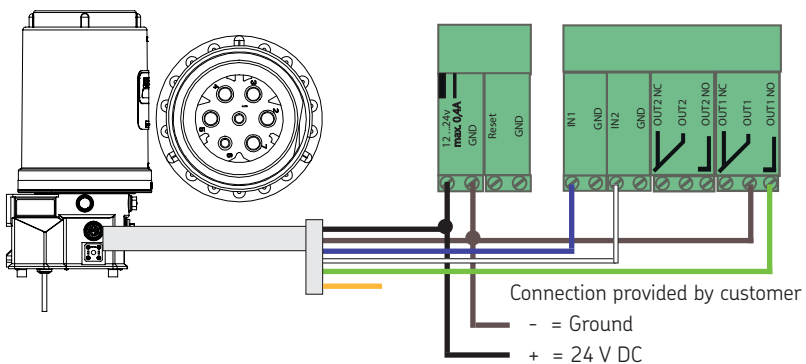
Connecting the adapter cables

- Connect pin 2 to LRM “GND”
- Connect pin 3 to LRM “12-24 V max.0.4A”
- Connect pin 4 to LRM terminal “IN2”
- Connect pin 6 LRM “IN1”
- Connect pin 7 to LRM “OUT1”

Connect customer power supply; to do so:

- Connect customer-supplied “24 V DC” connection to LRM “12-24 V max.0.4A”
- Connect customer-supplied “GND ground” connection to LRM terminal “GND”

P203, 12 to 24 VDC, pin assignment of LRM2 module, Fig. 8



Pin	Cable color	Connection	Function	DB file
1	Red		Not assigned	**P203_24V.db** Load (path file) Monitoring => System => Update =>**P203_24V.db**
2	Brown	GND	Ground connection	
3	Black	12...24 VDC	Power supply	
4	White	LRM IN2	fill level indicator minimum	
5	Yellow		Not assigned	
6	Blue	LRM IN1	Distributor error	
7	Green	LRM OUT1	Interim lubrication (Z)	

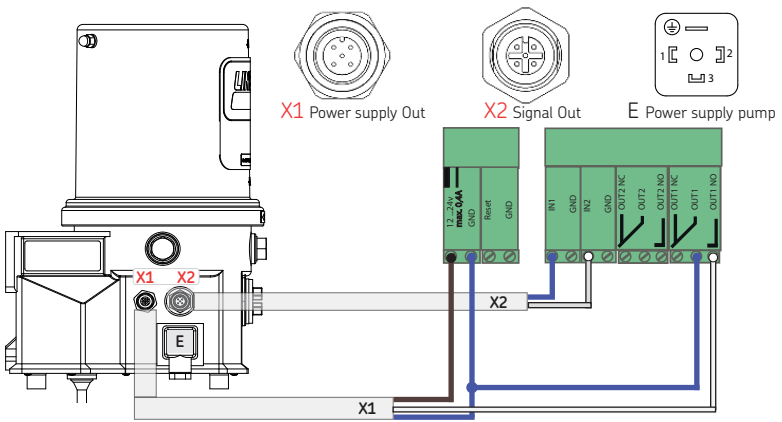
5.8.5 Connection P203 pump version with cubical plug and two 5-pin M12x1 plugs, fill level monitoring, monitoring of piston detector and interim lubrication 4A2-1 - see P203 operating instructions, Chapter 11.3 (110-230 VAC)

Pump item number: 644-46994-4

Connecting the adapter cables

- Screw cable harness socket outlet **X1** for pump power supply to pump plug X1
- Connect the brown flexible cable lead of cable harness **X1** to LRM2 clipped connection 12...24V
- Connect the blue flexible cable lead of cable harness **X1** to LRM2-GRD (Ground) and LRM2-OUT1
- Connect the white flexible cable lead of cable harness **X1** to LRM2-Out1 NO (interim lubrication, NO-contact)
- Screw cable harness plug **X2** for signal input onto pump socket X2
- Connect the blue flexible cable lead of cable harness **X2** to LRM2-IN1 (signal input 1)
- Connect the gray flexible cable lead of cable harness **X2** to LRM2-IN2 (signal input 2)
- Connect the pump power supply, socket **E**, according to the wiring diagram of the P203 operating instructions

P203, 110 to 230 VAC, pin assignment of LRM2 module, Fig. 9



Plug/assignment		Cable color	Connection	Function	DB file
X1	1	Brown	12...24 VDC	Power supply	**P203_230V.db** Load (path file) Monitoring => System => Update =>P203_230V.db
	2	White	OUT1 NO	Remote Manual Lube	
	3	Blue	GND	Ground connection	
		Blue	OUT1	Interim lubrication (Z)	
X2	3	Blue	IN1	Distributor error	
	5	Grey	IN2	Empty signal	
E	1	Black	L1	230 V AC	
	2	Blue	N	Neutral lead	
	3			Not assigned	
	PE	Green-yellow	⏚		

5.8.6 Connectivity for a KFGS pump version for 12-24 VDC power supply and 7-pin pump bayonet plug, with pump run monitoring, machine or pressure contact, fill level monitoring, and interim lubrication (-see KFG operating instructions, 951-170-213-EN (Vehicle))

Connecting the 7-pin adapter cable

- Connect pin 1 to LRM terminal strip “GRD -”
- Connect pin 2 to LRM terminal strip “Power supply +”
- Connect pin 3 to LRM terminal “OUT1 NO”
- Connect pin 4 to LRM relay “K1”
- Connect pin 5 to terminal strip “ZS/PS +”
- Connect pin 6 to terminal strip “ZS/PS”
- Connect pin 7 to LRM relay “K2”

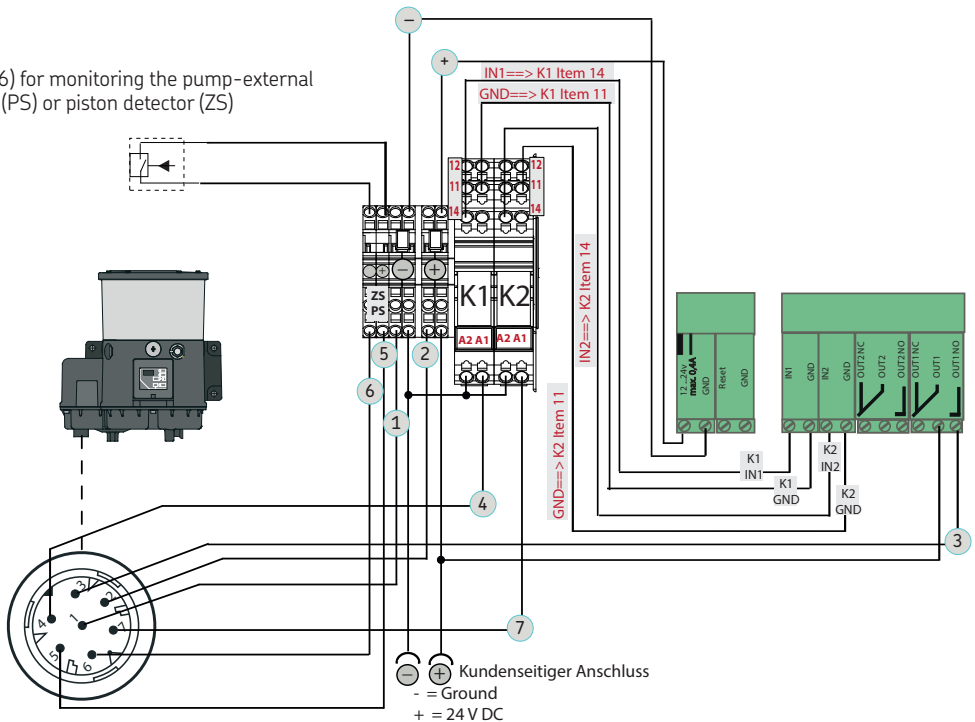
Connect customer power supply; to do so:

- Connect customer-provided “24 V DC” connection to LRM terminal strip “Power supply +”
- Connect customer-provided connection “24 V DC” to LRM terminal “OUT 1”
- Connect customer-provided connection to LRM terminal strip “Ground connection”

Pin	Code	Connection	Function	DB file
1	M	GND	Ground connection	**KFGS_24V.db** Load (path file) Monitoring => System => Update =>**KFGS_24V.db**
2	L+	12...24 VDC	Power supply	
3	DK		Resetting a possible fault signal and simultaneously triggering an interim lubrication	
4	SL2	K1, pin A1	Signal/fault	
5	+	PS	Pressure switch (pump-internal)	
6	Signal	PS	Pressure switch (pump-internal)	
7	SL1	K2, pin A1	Pump switch on signal	

KFG (S), 12 to 24 VDC, pin assignment of LRM2 module, Fig. 10

Connections (5/6) for monitoring the pump-external pressure switch (PS) or piston detector (ZS)



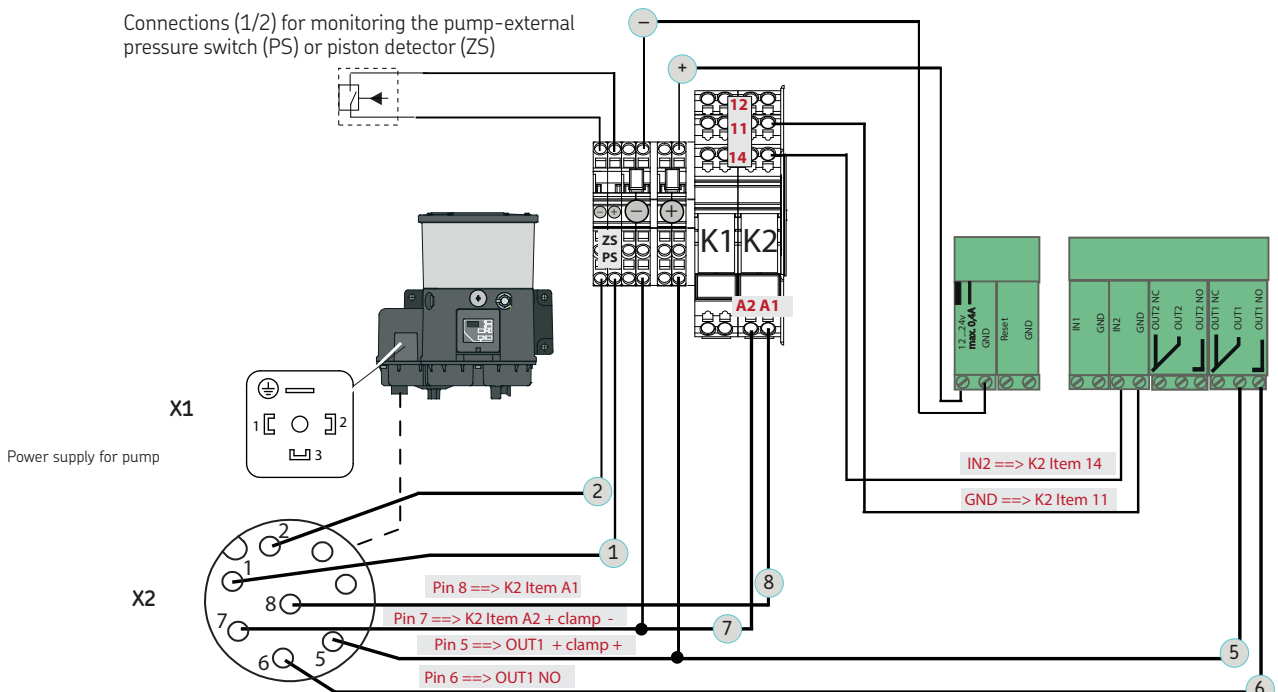
5.8.7 Connecting a KFGS pump version with a cubical plug for 110-230 VAC power supply and an 8-pin pump bayonet plug, with fill level monitoring, interim lubrication (MK/DK), and fault signal (-see KFGS operating instructions, 951-170-212-EN (Industrial)

Connecting the 8-pin adapter cable to plug-in connection X2

- Connect pin 1 to LRM ZS/PS terminal strip “Power supply +”
- Connect pin 2 to LRM ZS/PS terminal strip “Ground connection -”
- Connect pin 5 to terminal strip “Power supply +” and to “OUT1”
- Connect pin 6 to terminal strip “OUT1 NO”
- Connect pin 7 to LRM relay “K2 pin A1” and to terminal strip “Ground (GND)”
- Connect pin 8 to LRM relay “K2 pin A2”
- Connect plug X1 according to pump connection diagram

Plug/assignment		Code	Function	DB file
X2	1	ZS (+)	Cycle switch/pressure switch	**KFGS_230V.db** Load (path file) Monitoring => System => Update =>**KFGS_230V.db**
	2	ZS (signal)	Cycle switch/pressure switch	
	3		Not assigned	
	4		Not assigned	
	5	MK/DK	Machine contact/pressure contact (+)	
	6	MK/DK	Machine contact/pressure contact	
	7	SL2	Fault signal (GRD) (-)	
	8	SL2	Fault signal (+)	
X1				
	1	L1	Main machine switch ON	
	2	N	Neutral lead	
	3		Plug without internal connection	
	⏚	PE	Grounding	

KFG (S), 110 to 230 VAC, pin assignment of LRM2 module, Fig. 11



6. Configuration using the LRM2 app

6.1 Configuring the LRM Module

The configuration of the LRM2 Module as described below applies only to the settings required for SKF pumps. Other settings such as connections to logic elements, server connections, or other freely programmable settings are described in detail in the LRM2 Module user manual (951-181-021-EN) and in the SKF Installation app (951-181-020-EN).
This is located on the enclosed SKF USB stick.

6.1.1 Technical conditions

Technical conditions	
1	Max. line length for antennas, power supplies, inputs and outputs and other signals: 30 m
2	Cable cross-section: 0.25 to 2.5 mm², flexible lines require ferrules

6.1.2 Requirements

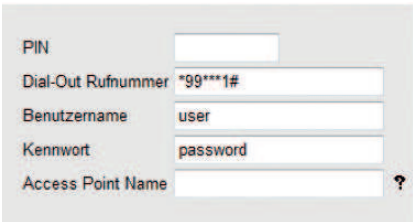
Requirements			
1	The LRM2 Module is connected in accordance with the corresponding wiring digram, Chapter 5.8.3 to 5.8.7.		
2	**The power supply is interrupted** (device is not connected to power supply)		
	Procedure		
3	The SIM card is inserted into the LRM2 module		
4	The power supply (12 V ... 24 V DC (±20%)) is switched on (connect to terminals 12...24 V and GND)		
5	LRM2 Module (Router (LAN)) is connected to the configuration PC by an Ethernet cable		 **ATTENTION!** Only use LAN cables with a connection marked red.
6	The SKF USB stick is located in the configuration PC's PC-USB slot		

6.1.3 Settings using the LRM2 app

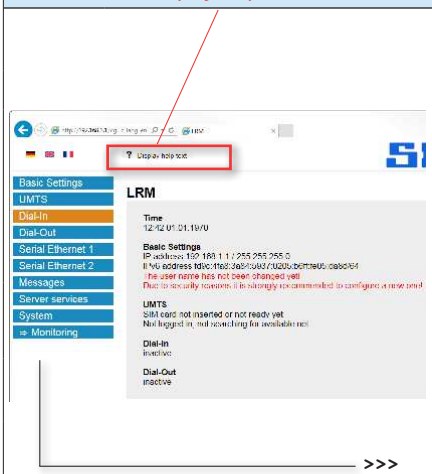
Step	Process Description	
!	If a DHCP client is activate on the PC, continue with Step 5. Otherwise, either enable the DHCP client or configure a static IP address.	
LAN settings using a configuration PC (Windows 7 / Windows 10)		
1	• Open the Network and Sharing Center (press the ⊞ **Windows key** then search for "Sharing")	
2	• Select <<LAN Connection>> and then <<Properties>>	
3	• Enable (click on) Internet protocol version 4 (TCP/IPv4) and select Properties	**Set a static IP address** Use the following IP address *(example)*: IP address: 192 . 168 . 1 . 1 Subnet mask: 255 . 255 . 255 . 0 Standard gateway: 192 . 168 . 1 . 1 Preferred DNS server: 192 . 168 . 1 . 1
!	Before changing the TCP/IP settings, please note the existing values so that you can restore them later.	
4	• Enable DHCP client / Automatically obtain IP address	
!	After enabling the DHCP client, it is recommended that you briefly unplug and then re-insert the network cable.	
Access to Web interface (press Windows 7 key combination of Windows key and "R" key)		
5	• Enter IP address of the router in the browser's address bar - Default: **192.168.1.1**	
!	If a proxy server is enabled in your browser, it must be deactivated or the IP address of the router has to be added as an exception.	
6	• Log in with user name Default: << **skf** >> and password: << **lrm** >>	(note: write skf and lrm in lowercase!)
!	All modified data is transferred to the router only after pressing the (OK) button.	(OK) Confirm settings
!	○ **Display the help texts in the header to get helpful information about the individual parameters in the Web interface.**	? Display help text

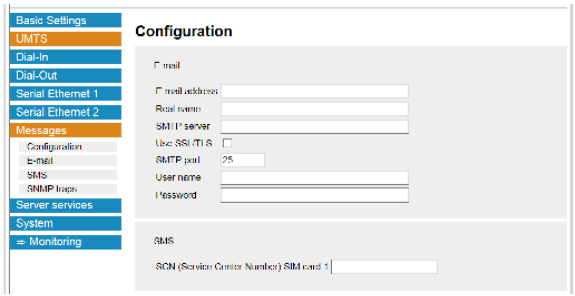
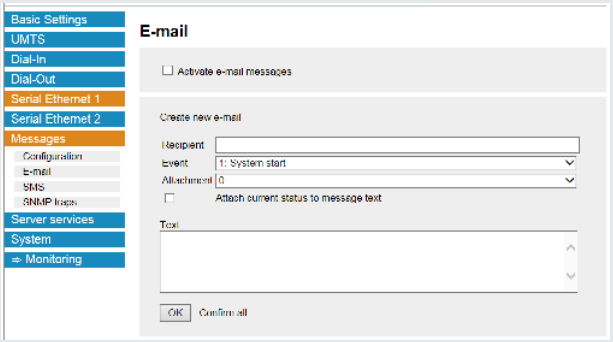
6

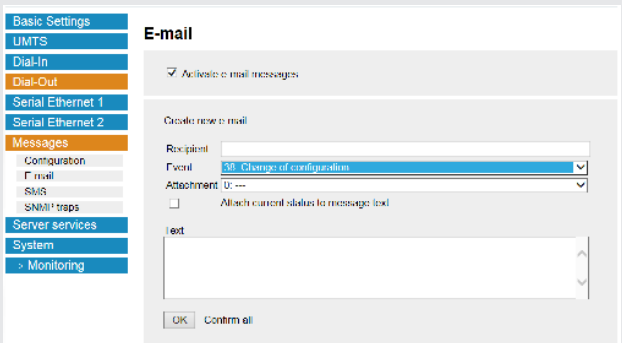
Step	Process Description
Configuration as Internet router	
!	**If the LRM2 is in delivery mode or has been reset to default settings, the Quick start after factory reset configuration option will appear after login.**
7	• Enter the SIM card PIN
8	• Enter the user name and password for authentication with the provider (must not be empty)
9	• Enter the Access Point Name (APN)
!	This data is located in the contract documents for your SIM card or can be queried from the provider. The APNs for common providers can be displayed by clicking "?".
10	• Confirm settings with OK
!	When a connection is being established, the **COM LED** lights up green ● and it lights up orange ● once an Internet connection has been established. If a connection to the SKF Connectivity Suite VPN is configured, the **status LED** will light up green ● once it is established.



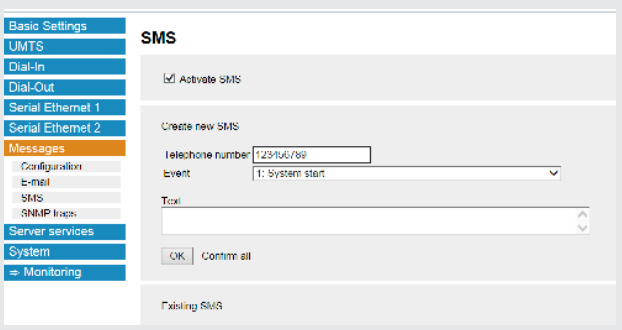
All mandatory configuration steps are thus completed. Further configuration is dependent on your specific application. You will find the description of other often required settings on the following page.

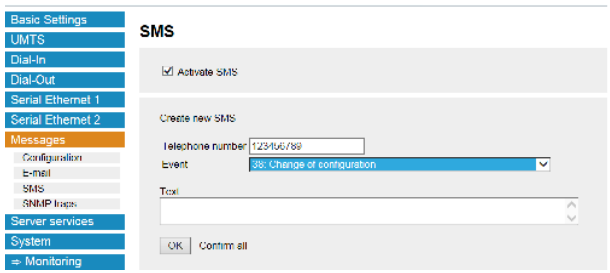
Step	Setting Options Basic Screen
Basic Screen of the LRM2 App	
? Display help text	Accessibility of supporting information per menu item
	**Basic Settings** — Specification of basic settings for the Web interface; IP address (LAN), routing; host name; MAC filter; Radius; CLI **UNTS** — Entry of the SIM card number and specification of the provider/radio network **Dial-In** — Enabling of Dial-In (network connection from PC to modem) and specification of basic settings for Dial-In; Routing; Firewall; Open VPN Server; Open VPN Client; PPTP Server; PPTP Client; IPsec; GRE **Dial-Out** — Enabling of Dial-Out (network connection from modem to PC) and definition of basic settings for Dial-Out; Routing; dialing filter; Firewall; Port Forwarding; Open VPN Server; Open VPN Client; PPTP Server; PPTP Client; IPsec; GRE **Serial-Ethernet 1** — If using the router as a serial-Ethernet gateway, define/activate the serial-Ethernet gateway; interfaces; mode emulator **Serial-Ethernet 2** **Messages** — Basic settings such as configuration of e-mail account; e-mail recipient; SMS; SNMP traps **Server services** — Configuration of server services such as DNS; Dyn. DNS Update; DHCP; Router Advertiser; Proxy; IPT; SNMP Agent: MCIP **System** — Reading and configuration of: System Data; Time; Reset; Update; Download; Sandbox; Debugging **=> Monitoring** — Status display; setup application; monitoring; action; system; wizards

Step	Configure the LRM2 Module, define e-mail settings and event	
Enable e-mail messages menu (data can be exchanged via e-mail and/or SMS)		
11	• Click menu **Messages=> Configuration** (LRM2 module) ○ Configure a new e-mail account for the LRM2. The e-mail address entered here identifies the sender of the message (LRM Module). ○ In addition to the new e-mail address for the LRM2, the provider details also have to be added.	
	• Enter the e-mail address • Enter the sender name or a text block for sending	
	• Enter the user name and password	
12a	• Click menu **Messages=> E-mail** (Recipient address) • Enter **Recipient** e-mail address • Event 1: Select **System start** • If necessary, select an attachment (such as **1:System message**) • If necessary, enter a text description for the message • Save entries: OK Confirm settings	

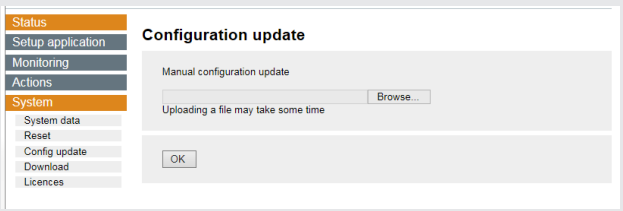
12b	• Enter **Recipient** e-mail address	
	• Event **38:** Select **Change of configuration** • If necessary, select **Attachment** • If necessary, enter a text description for the message • Save entries: (OK) Confirm settings	
12c	• Press the **Enable e-mail messages** ☑ button	
12d	• For further recipients, repeat the entries (8a to 8c)	

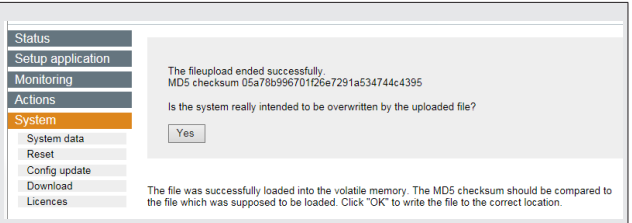
Enable SMS messages menu (data can be exchanged via SMS and/or via e-mail)	
13a	• Click menu **Messages=> Configuration** (LRM2 module) • Click **Enable SMS receipt** ☑ button
13b	• Click **Messages=> SMS** menu (Recipient phone number) • Enter Recipient **phone number** • Event **1:** Select **System start** • If necessary, enter a text description for the message • Save the entries, press the (OK) **Confirm settings** button

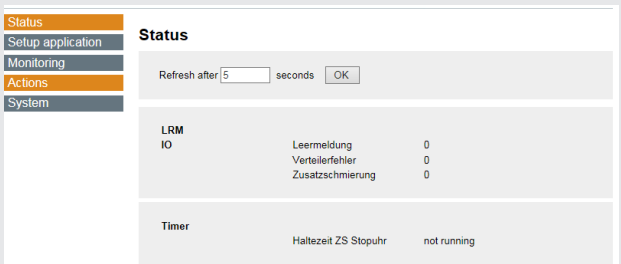


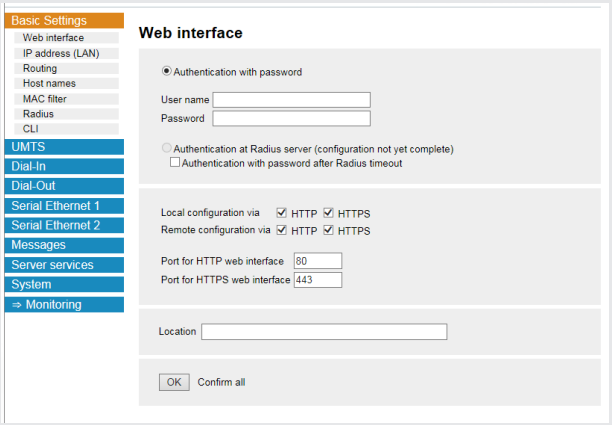
13c	• Click the **Enable system messages** ☑ menu	
13d	• Enter Recipient **phone number**	
	• Event **38:** Select **Change of configuration** • If necessary, select Attachment • If necessary, enter a text description for the message • Save entries: **Press** (OK) **Confirm settings**	
13e	• For further recipients, repeat the entries (9a to 9d)	

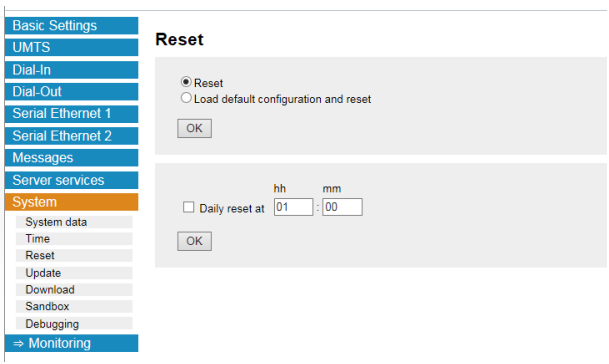
ATTENTION! The enclosed USB stick contains pump-specific programming data that is uploaded to the Monitoring app as a *.db file as described below (steps 14/15). In case of unlisted pump types or deviating parameter settings, proceed according to the description of the SKF Monitoring app, document No. 951-180-xxx-EN. This is likewise located on the enclosed USB stick.

Step	Import pump-specific settings (**.db parameter file)	
Enable Menu => Monitoring (monitoring settings), load update file (pump-specific data)		
14	• Click Menu**=> Monitoring** (Monitorings)	
15	• Click Menu **System** (System settings) • Click Menu **Configuration update** • In the menu **Manually update the configuration => click Browse** Selection box **Choose File** • Load the pump-specific parameters file ***.db** stored on the SKF USB stick. • Confirm upload of the parameters file by clicking the button **Yes**	

	○ The file contains all the pump-specific settings required for monitoring and remote control of the pump. • Save the entries, press the (OK) button	

Step	Status query	
	The status query displays the current status of all configured functions and updates it continuously. By default, empty signal, distributor error, and interim lubrication as well as the holding time of the centralized lubrication system after a pump stop are displayed.	
Menu Monitoring => Status		
16	• Click menu **Monitoring=> Status** ○ If the ***.db file is installed correctly, the monitored functions such as empty signal, distributor error, interim lubrication, and the current holding time of the centralized lubrication system will be displayed.	

Step	Define access details	
	To prevent manipulation of the configuration by unauthorized persons, the user name and password for access to the Web interface need to be changed. This setting is made in the LRM2 app, under the Basic Settings menu.	
LRM2-App => Menu Basic Settings => Web Interface		
17	• Click menu **Basic Settings > Web-Interface** • Enter new **user name** • Enter new **password** ○ Depending on customer requirements, further parameters can be enabled/disabled or modified. Specifically, these are local/remote configuration, HTTP/HTTPS port, and location. • Confirm the settings with the (OK) button	

Step	Restarting the router	
	If the router needs to be restarted during configuration or operation, this can be done without losing the settings.	
LRM2-App => System menu=> Reset => Restart		
18	• Click menu **System > Reset > Restart** • Confirm the settings with the (OK) button ○ Alternatively, briefly press the Reset button on the front of the device once (see Chapter 2.3, position 1, Soft reset)	
Step	**Resetting the router**	
	○ If the router needs to be reset to factory settings (e.g., if it has already been used), it can be returned to the condition on delivery.	
19	• Click menu **System > Reset > Reload basic settings and restart** • Confirm the settings with the (OK) button ○ Alternatively, briefly press the Reset button on the front of the device three times within 2 seconds (see Chapter 2.3, position 1, Soft reset)	
Step	**Resetting the router (hard reset)**	
	○ If the router is no longer accessible for some reason, it can be restarted and initialized (settings are not lost in the process).	
20	• Press the Reset button on the front of the device for at least 3 seconds (Hard reset) (see Chapter 2.3, item 1, Soft reset)	

7. Commissioning

7.1 General information

The product described here functions automatically. The SKF Lubrication Remote Monitor should, however, be subjected to regular visual inspection.

7.2 Visual monitoring

☞See Figure 12
For system monitoring, the SKF Lubrication Remote Monitor is equipped with ten diodes whose function is described in detail in Chapter 2.3. These display the current status for commissioning and during operation.

LED monitoring, Fig. 12

Designation	Status	Function
IN 1	Input 1	Distributor error (lit=pending, not lit=no error)
IN 2	Input 2	Empty signal (lit=pending, not lit=no error)
Out 1	Output 1	Remote Manual Lube (Lit= Is activated; No light = No action)
Out 2	Output 2	Unassigned
Status LED		Green = VPN active, red = init/update
Power LED		Lit = Power supply connected
Signal LED		Blinking = Current signal input
LAN 10/100		Speed of LAN connection in Mbit/s
LAN Link LED		Blinking = Data traffic
COM LED		PPP link

7.3 Conduct a functional test

☞See Figure 13

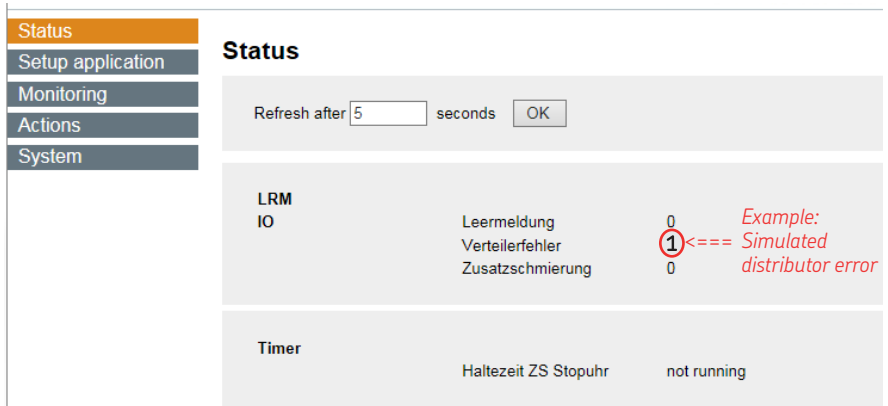
Conduct a functional test after successfully configuring the SKF Lubrication Remote Monitor.
The SKF Monitoring app is active immediately after configuration. To check for proper function, close one or both inputs. If necessary, bridge the connections.
The current status of the created elements (inputs and outputs as well as flags) is displayed directly on the status page of the SKF Monitoring app (note the update intervals).

Holding time (holding time for cycle switch stopwatch) is displayed only if the pump has been activated and the time is actively elapsing.

To send the SMS, a SIM card must be inserted and the fault monitor must be configured accordingly (PIN, SCN).

If the SMS message does not appear, check all connections and settings again.

Current status of inputs and outputs, Fig. 13



8. Operation

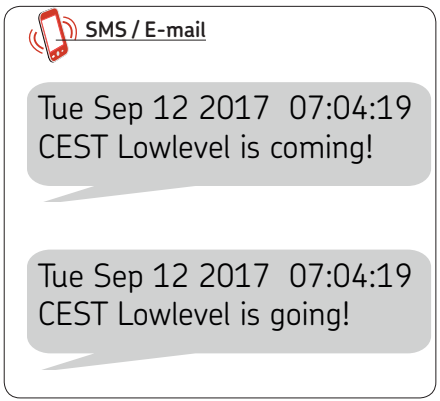
The SKF Lubrication Remote Monitor LRM2 is programmed to detect when a distributor error occurs or the minimum fill level is reached and to send this signal to a pre-defined group of persons by SMS or e-mail.
This group of persons can then trigger an interim lubrication.

The following pages show the signal received as an SMS and the command to be issued for an interim lubrication.

8.1 Incoming SMS or e-mail on distributor error

Example	Legend
Tue	Weekday of message
Sep 12	Date of message
07:04:19	Time of message
CEST CET	Central European Summer Time Central European Time
Distributor error incoming!	Fault notification Distributor error
Distributor error resolved!	Distributor error signal withdrawn

8.2 Incoming SMS or e-mail on minimum fill level



Example	Legend
Tue	Weekday of message
Sep 12	Date of message
07:04:19	Time of message
CEST CET	Central European Summer Time Central European Time
Lowlevel incoming!	Pump fill level display Minimum fill level reached
Distributor error resolved!	Pump fill level display Fill level above minimum

8.3 Trigger interim lubrication

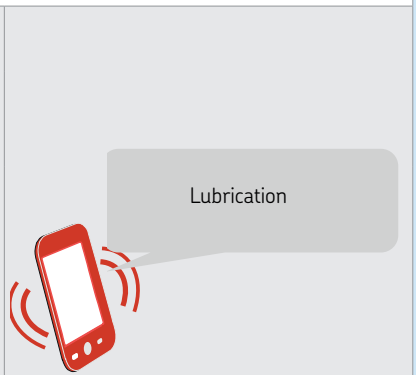
Interim lubrication

<*Lubrication*>: Trigger interim lubrication

An interim lubrication can be triggered on the pump during commissioning, to check pump function, or in the event of a lubrication problem.

Description	SMS command
Interim lubrication interim location	***Lubrication***

- Enter e-mail address of the receiving device (LRM2)
- Enter the command <**Lubrication**> in the text field
- Send the e-mail



9. Maintenance

9.1 General

WARNING

De-energize the product prior to beginning work.
Electrical connections for the product may only be established by qualified personnel authorized to do so by the operator. The electrical operating conditions and local regulations (e.g., DIN, VDE) must be observed.

SKF products are low-maintenance. All connections and fittings must be regularly inspected for proper seating to ensure proper function.
Dismantling of the product or individual parts thereof is not permitted and voids any claims.

ATTENTION

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.

9.2 Software update

SKF recommends periodically checking the current version of the software.
Updates can be requested or downloaded from SKF Service or over the Internet *http://www.skf.com/group/products/lubrication-solutions/lubrication-system-components/control-units-and-software/control-units/lrm2/index.html*

10. 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.

Malfunction on the LRM2	Cause	Remedy
No input signal	o No power supply	• Check power supply
No output signal	o No network connection	• Check network connection, use dipole antenna if necessary
	o Network malfunction due to sources of electronic interference	• Eliminate sources of electronic interference
	o Incorrect programming	• Check programming, re-enter if necessary
	o Cable connected incorrectly	• Check that cable connections are installed correctly, see Chapter 6
	o SIM card error	• Check SIM card for proper function

11. Questions and answers

Question	Answer
SMS is not being sent. Where is SMS sending configured?	In order to send an SMS using the Monitoring app, SMS sending must be configured in the router. The following settings are required for this: Service Center Number (SCN): • If the SCN cannot be read from the SIM card, enter it manually on the page Messages -> Configuration (confirm with OK). You can find the SCN in your contract documents or receive it from your provider. • Enable SMS messages: • In order to send an SMS using the Monitoring app, SMS messages must be enabled on the page Messages -> SMS (confirm with OK).
SMS is not received. Where is SMS receipt configured?	In order to receive an SMS using the Monitoring app, SMS receipt has to be configured in the router. The following settings are required for this: • Enable SMS receipt • In order to receive an SMS using the Monitoring app, SMS receipt has to be enabled on the page Messages -> Configuration (confirm with OK).
E-mail is not being sent. Where is e-mail sending configured?	In order to send an e-mail using the Monitoring app, e-mail sending must be configured in the router. The following settings are required for this: E-mail account: • In order to send messages by e-mail, an e-mail account must be configured in the router on the page Messages -> Configuration (confirm with OK). You can obtain the exact details for your e-mail account from your e-mail provider. Enable e-mail messages: • In order to send an e-mail using the Monitoring app, e-mail messages must be enabled on the page Messages -> E-mail (confirm with OK).

Question	Answer
Why if receipt of a message not recognized?	If an incoming message is not recognized, i.e., monitoring for the receipt of this message is not triggered, check the content of the message carefully. Typos, different capitalization, and some special characters may cause a message not to be recognized.
Why does the Dashboard respond to input slowly or not at all?	Input delays may be due to the browser being used. We recommend using an alternative browser.
Why do I not see my changes in the Dashboard?	The browser may be composing the Dashboard page from its cache storage. We recommend clearing the browser cache or reloading the page by pressing the F5 function key (on common browsers).
No network connection to the LRM2	Antenna is loose or the LRM is positioned unfavorably; if necessary, change the position of the LRM2 or use a dipole antenna (see Accessories).
No Power Alarm message although no power supply.	The internal battery is discharged (after extended storage). Charge the battery by connecting the power supply to the LRM2 for an extended period.
No connection from the PC software to the LRM2	Check whether the correct COM port is configured

12. Shutdown, disposal

12.1 Temporary shutdown

Temporary shutdown is performed by:

- Switching off the main machine
- Disconnecting the product's power supply

12.2 Permanent shutdown, disassembly

Permanent shutdown and disassembly of the product must be planned properly by the operator and conducted in compliance with all applicable requirements.

12.3 Disposal

Countries within the European Union

Waste should be avoided or minimized to the extent possible. The disposal of products contaminated with lubricant must be performed by a recognized waste disposal company in compliance with environmental protection requirements and waste disposal regulations as well as the requirements of local authorities.

The producer of waste is responsible for its specific classification, as the European Waste Catalog provides for different disposal keys for waste that is the same but of different origin.

Dispose of or recycle electrical components in accordance with WEEE Directive 2012/19/EU.

Plastic or metallic parts can be disposed of as industrial waste.

Batteries
can be disposed of through an appropriate collection location.

Countries outside the European Union

Disposal is carried out according to the applicable laws and regulations of the country.

13. Spare parts

Spare parts and accessories		
Design (quantity 1x)		**Link/order No.**
LRM2 software update		http://www.skf.com/group/products/lubrication-solutions/lubrication-system-components/control-units-and-software/control-units/lrm2/index.html
2G/3G magnetic base antenna (3 m length)	 2G/3G dipole antenna	**236-11335-8**

14. FCC Statement/Export Restrictions/Licenses

14.1 FCC Statement

Note: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

14.2 Export restrictions

The chipsets for analog modems and mobile radio adapters for the LRM2 are subject to export restrictions under the US ECCN classification (5A991).
At the time of the publication of this document, the export of these communication devices to any of the following countries is therefore prohibited:
Cuba, Iran, North Korea, Sudan, Syria.

The latest list of countries can be found in the section "Country Group E" in the document "Supplement No. 1 to Part 740" of the Export Administration Regulations (EAR) (http://www.bis.doc.gov) or: (https://www.bis.doc.gov/index.php/forms-documents/regulations-docs/452-supplement-no-1-to-part-740-country-groups/file).
Please contact US authorities directly for an exception to these regulations.
We explicitly point out that the US export regulations can have legal effect in Germany. Under American law, American companies may, among other things, be prevented from trading with foreign offenders of the EAR.

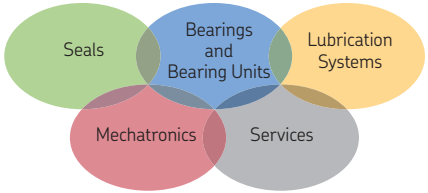
Export restriction!
Possible offense against export regulations.

This device utilizes encryption technologies and is therefore subject to export control under German (AL classification 5A002) and European (EC DUAL USE Regulation 428/2009) law. **SKF holds authorization for export from Germany from the German Federal Office for Economic Affairs and Export Control.** This can be requested if necessary.

This device may contain components of US origin. Any export requirements under US law (ECCN classification) are, where necessary, specified in documents or can be requested at any time.

14.3 Licenses

Some software technologies and programs used in the firmware of the LRM2 are bound by licenses. These licenses are listed in the SKF user manual for the LRM2 modem, document number 951-181-021-EN.
The source code for these LRM2 firmware components bound by license can be obtained from SKF on request.



The Power of Knowledge Engineering

Over the course of more than a century, SKF has specialized in five fields of competence and acquired a wide range of application expertise. We utilize this experience to provide innovative solutions to OEMs and other manufacturers in practically all industrial sectors worldwide.
Our five fields of competence are: Bearings and bearing units, seals, mechatronics (combining mechanical and electronic components to improve the performance of classic systems), and extensive services from 3-D computer stimulations and modern condition monitoring systems for high reliability to system management SKF is a leading global company and guarantees its customers uniform quality standards and global product availability.

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