



Lubricators

CONCEPT4

User manual

Foreword

Lubricators CONCEPT4 work with minimal quantity lubrication, which ensures the controlled and efficient supply of lubrication points with selected, very high quality lubricants. The lubricators contain highly efficient, microprocessor-controlled piston pumps. Each piston pump has two outlets. Lubrication intervals and lubrication quantities can be set individually for each lubricant outlet under PLC control.

Current version A current electronic version (.pdf) of this user manual can be found at:
<http://medien.schaeffler.com> using the search term BA 67.

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About the user manual

This user manual is part of the product:

- Keep for future reference.

Symbols

The warning and hazard symbols are defined in accordance with ANSI Z535.6-2011.



In case of non-compliance, death or serious injury may occur. ⚠



In case of non-compliance, minor or moderate injury may occur. ⚠



In case of non-compliance, damage or malfunctions in the product or the adjacent construction may occur. ⚠

Mandatory signs

The mandatory sign is defined in accordance with DIN 4884-2 and DIN EN ISO 7010.



Use safety goggles

Availability

A current electronic version (.pdf) of this user manual can be found at <http://medien.schaeffler.com>.

Use the search term BA 67.

Legal guidelines

The information in this manual corresponded to the most recent status at the close of editing. The illustrations and descriptions cannot be used as grounds for any claims relating to devices that have already been delivered. Schaeffler Technologies AG & Co. KG accepts no liability for any damage or malfunctions if the device or accessories have been modified or used in an inappropriate manner.

Original user manual

The original user manual is taken to be a user manual in the German language. A user manual in another language is to be taken as a translation of the original user manual.

General safety guidelines	Any person working with the lubricator must read this chapter and observe the guidelines.
Usage for the intended purpose	The intended use of the lubricator is to supply rolling bearings that are installed in machines with grease. A lubricator may only be used in accordance with the technical data, see page 34.
Usage not for the intended purpose	<p>The device may not be used in or on vehicles.</p> <p>The device may not be used in environments with an explosion risk.</p> <p>The device must not be converted.</p>
Selection and qualification of personnel	<p>The device may only be mounted, commissioned, operated and maintained by qualified personnel. The scope of competence, area of responsibility and monitoring of personnel must be precisely regulated by the site operator.</p> <p>A person defined as qualified personnel:</p> <ul style="list-style-type: none"> ■ has all the necessary knowledge ■ is aware of all the hazards and safety guidelines ■ has read and understood this user manual. <p>If personnel do not possess the necessary knowledge, they must be given the necessary training and instruction.</p> <p>Upon request, Schaeffler can offer appropriate training courses.</p>

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Warning notice Prevent any interference in or modifications to the device, or the addition or removal of components not intended for the device, as this will compromise occupational safety and invalidate any warranty claims.

Before mounting the device, check for any external damage. If damage or some other defect is found, the device must not be commissioned.

Ensure that any unused outlets on the device remain open.

You may only install the device if you are a qualified electrician.

Ensure that the device is disconnected from the power supply and in a voltage-free state before carrying out any wiring work and opening or closing electrical connections.

Carry out the installation in accordance with the national and international regulations covering the installation of electro-technical equipment.

You may only operate the device within the limits described in the technical data. If the device is operated outside these limits, it may be destroyed.

Always use original replacement parts from Schaeffler Technologies AG & Co. KG for repairs.

Only dismount the device when it is disconnected from the power supply and in a voltage-free state.

Wear safety goggles at all times when handling the device.

Safety regulations All important safety specifications are described in the following sections.

Transport Do not throw the device and avoid exposure to severe shocks.

Storage To avoid promoting corrosion, the following ambient conditions must be ensured:

- humidity max. 65%, non-condensing
- no aggressive chemicals in the environment
- temperature from +5 °C to +40 °C.

The storage period in an unopened condition is a maximum of two years.

Mounting	<p>To avoid condensation, the mounting location must be selected so that the device is kept away from direct sunlight or direct radiated heat.</p> <p>The device may only be mounted and connected by a qualified professional in compliance with accident prevention regulations.</p>
Work on electrical devices	<p>When making connections to an electrical device, the following must be observed:</p> <ul style="list-style-type: none"> ■ connection to the power supply only by qualified electricians ■ correct wiring of the electrical components of the device ■ comparison of the voltage data with the available mains voltage.
Firefighting	<p>Extinguish burning grease using approved extinguishing agents only, such as powder, foam or carbon dioxide. Attempting to extinguish a grease fire with water will create a life-threatening darting flame.</p>
Maintenance and repair	<p>The device may only be maintained and repaired by a qualified professional in compliance with accident prevention regulations. Wear safety goggles at all times when handling the device.</p> <p>The device must be placed in a voltage-free state before starting repair work. All maintenance and repair work must be carried out when the device is completely shut down.</p> <p>Cleanliness must be ensured during all work performed on the device and cartridge. The penetration of water, liquids and foreign bodies into the device and cartridge must be avoided.</p>
Troubleshooting and rectification	<p>Troubleshooting and rectification may only be carried out by qualified professionals and in compliance with accident prevention regulations. Wear safety goggles at all times when handling the device.</p>
Disposal	<p>Lubricators and lubricant-soaked materials must be disposed of by environmentally acceptable methods.</p> <p>Electronic devices must be disposed of in accordance with the relevant regulations.</p>
Conversion	<p>The device must not be converted.</p> <p>In order to comply with directives on electromagnetic compatibility (EMC), the electrical installation (cables, shielding) must not be changed.</p>

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Description The lubricator is suitable for the minimal quantity lubrication of four lubrication points with grease.

Design The device has a zinc die-cast housing, which contains the micro-processor-controlled piston pumps and the electronic control unit. A replaceable grease cartridge is inserted above the piston pumps. A replaceable grease cartridge is inserted above the piston pumps.

- ① Upper housing part
- ② Grease cartridge
- ③ Outlets
- ④ Multi-function interface
- ⑤ Protective cap

Figure 1
Design of lubricator



Grease cartridge The grease is supplied in cartridges. A grease cartridge cannot be refilled. Special empty cartridges are the exception to this. The responsibility for using reusable empty cartridges and refilling the cartridges with suitable grease lies with the operator.

Further information Information on suitable accessories can be found in TPI 252, Lubricators.

Outlets The device has two piston pumps. Each piston pump has two outlets.

- ① Outlets of piston pump 1
- ② Outlets of piston pump 2

Figure 2
Outlets



Splitters or progressive distributors can be connected to increase the number of lubrication points to be supplied via the number of outlets.

Further information Information on suitable accessories can be found in TPI 252, Lubricators.

Multi-function interface The 4-pin connector with an external thread M12×1 (communication interface and power supply) is connected to the socket on the lubricator.

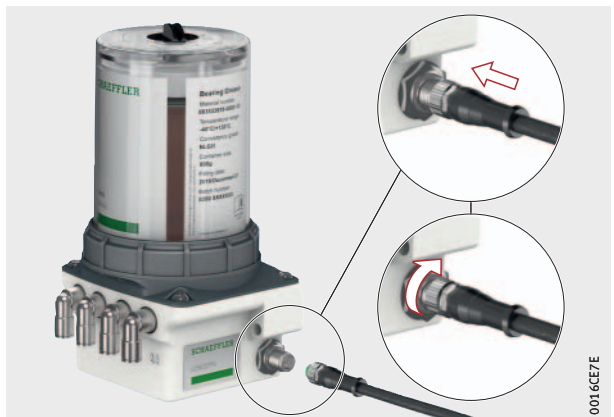


Figure 3
Multi-function interface

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Scope of delivery In order to obtain a complete system ready for operation, a lubricant cartridge and accessories must also be ordered.

Note Only original accessories may be used.

Further information Information on the combination of components required to obtain a complete system ready for operation, such as lubricant lines, connection fittings, connection cables and cartridges, can be found in TPI 252, Lubricators.

Transport and storage The packaging does not protect the product against damage during transportation.

NOTICE

The electronics and plastic parts may be damaged or destroyed by strong vibrations. Avoid dropping the device and exposure to severe shocks. <

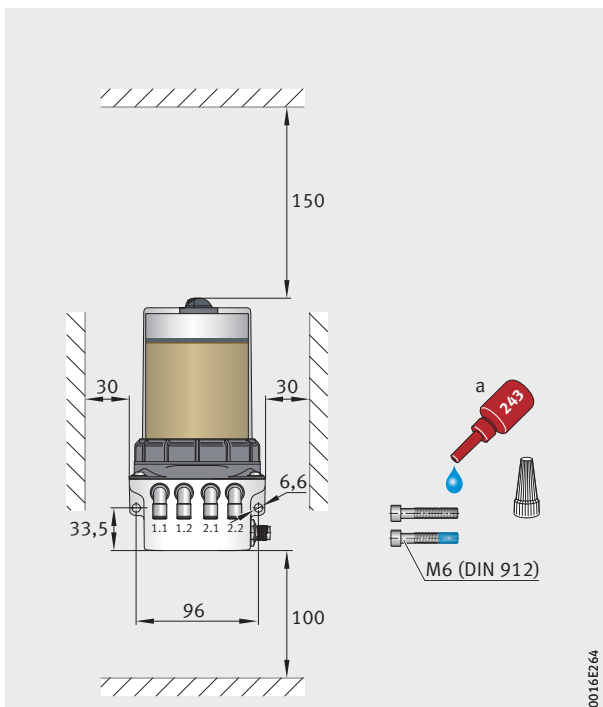
Ambient conditions To avoid promoting corrosion, the following ambient conditions must be ensured during storage:

- humidity max. 65%, non-condensing
- no aggressive chemicals in the environment
- temperature from +5 °C to +40 °C.

Mounting The illustrated fasteners should be used. The fasteners are not included in the scope of delivery.
For the dimensions of the device, see page 34.

a = screw retention,
medium strength

Figure 4
Fastening dimensions



► Mount the lubricator as close as possible to the lubrication points.

Further information Information on the length of the lubricant lines can be found in TPI 252, Lubricators.

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Commissioning During commissioning, the lubricator is filled with lubricant and bled. The power supply is also available.

NOTICE Compressed air can damage the seals and introduce contaminants into the lubricator. Use brushes and cloths to clean the parts. <

Fitting the grease cartridge ► To fit the grease cartridge, proceed as shown, *Figure 5 to Figure 8*, page 14.

NOTICE If contaminants enter the lubricator, the piston pumps will be damaged. Clean the upper housing part prior to detaching, if contaminated. <



Figure 5
Detach the upper housing part

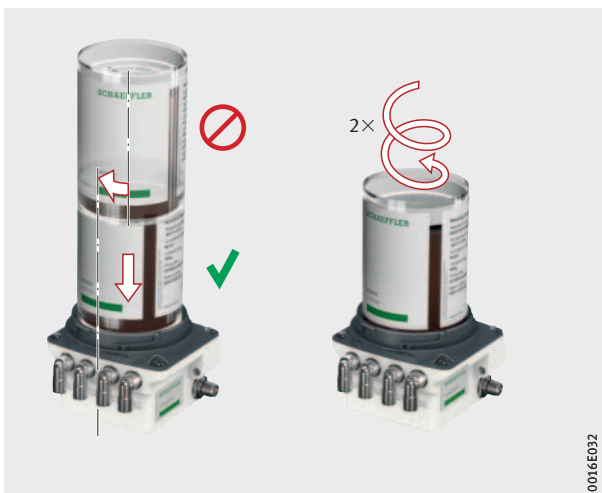
NOTICE

If contaminants enter the lubricator, the piston pumps will be damaged. Clean the grease cartridge prior to insertion, if contaminated. ◀

Figure 6
Removing the seal
on the grease cartridge



Figure 7
Fitting the grease cartridge



NOTICE

If force is used in an attempt to screw the grease cartridge into place in the wrong position, the lower housing part may become damaged. Fit the grease cartridge so that the label is aligned centrally with the outlets and do not use excessive force when screwing the cartridge into place. ◀

NOTICE

Contaminants can enter the lubricator if the grease cartridge is not fully screwed into place. Screw-mount the grease cartridge through two revolutions, to ensure it is seated correctly. ◀

CAUTION

Risk of injury due to parts springing off if the collar ring is not fitted correctly. The upper housing part is preloaded after mounting. Rotate the collar ring in a clockwise direction until you feel it click into place at the end stop. ◀

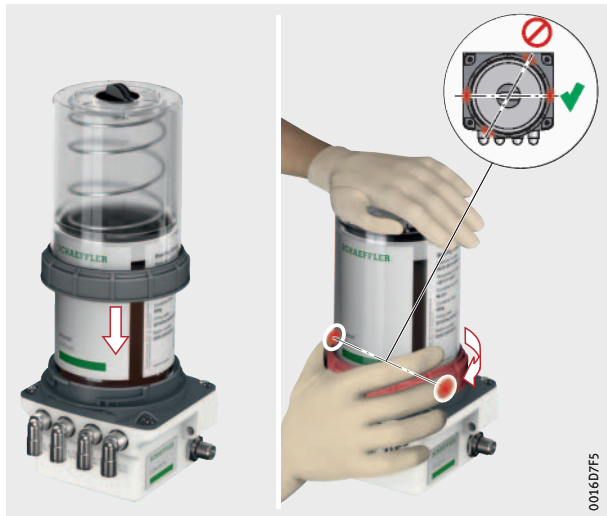


Figure 8
Fitting and securing
the upper housing part

Connecting the connection cable

The connection cable can transmit the supply voltage and control signals.

NOTICE

A defective connection cable can damage the device. Replace a defective connection cable immediately. <

NOTICE

Failure to observe the safety regulations may result in damage to the device. Ensure that all electrical connection work is carried out exclusively by qualified personnel who observe the safety regulations. <

NOTICE

Exceeding the permissible connection values will cause serious damage to the device. Observe the permissible connection values, see page 34. <

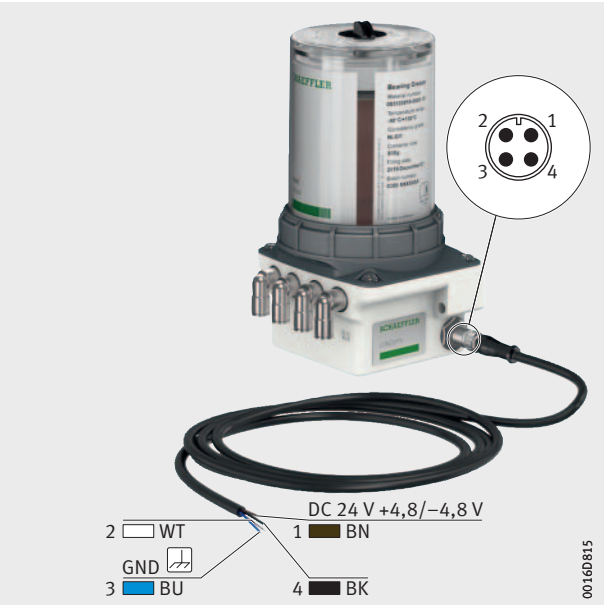


Figure 9
Connecting
the connection cable

Connector assignment

PIN	Assignment	Colour
1	Input voltage DC 24 V +4,8/-4,8 V, operating voltage stabilised at DC 24 V	Brown (BN)
2	Input signals for controlling the individual pump outputs	White (WT)
3	Output, ground (GND)	Blue (BU)
4	Output signal	Black (BK)

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Planning external control with PLC


The lubricator must be integrated into an external controller (PLC) for operation. The lubricator dispenses the required lubricant quantity via various input signals. Remote monitoring is possible as a function of the output signals for the purpose of querying the fill level of the cartridge and any error messages.

For further information on the control signals, see page 17.

Bleeding the lubricator

- ▶ Activate the function FIL via the external controller (PLC) using the 12-seconds signal.
- ▷ The lubricator delivers 20 lubricant doses per outlet.
The total duration for carrying out the function FIL is approx. 12 minutes per pump body.

NOTICE

Air in the lubricant line can damage the lubrication point due to insufficient lubrication. Bleed the lubricator every time it is commissioned. 

- ▶ Carry out the function FIL for as long as necessary until grease emerges from the outlets. It may be necessary to carry out the function FIL several times until lubricant emerges.

For detailed information on the 12-seconds signal (function FIL), see page 23.

Operation

Operating modes


The device works with pulse control through the connection of an external controller (PLC). A corresponding program must be created in the PLC to operate the lubricator.

An input and an output must be provided on the control side to integrate the lubricator into an external controller.

Input signals at PIN 2 are transmitted by the controller.

Output signals at PIN 4 can be picked up via HIGH/LOW level for further processing (for example, indicator lights or external controller).

NOTICE

Exceeding the output current will cause serious damage to the device. The maximum permissible output current must not exceed $I_{\max} < 20 \text{ mA}$. Do not connect an inductive load (for example, relay). 

The lubricator can be switched off completely by shutting off the supply voltage. Once the supply voltage has been reconnected, the device carries out an automatic check and works after receiving an input signal from the PLC.

4-pin plug, connector assignment

Power is supplied via PIN 1 and PIN 3. The PLC must send a control signal to PIN 2. The lubricator transmits signals to the PLC via PIN 4. A signal has one of the following two states:

- HIGH
- LOW.

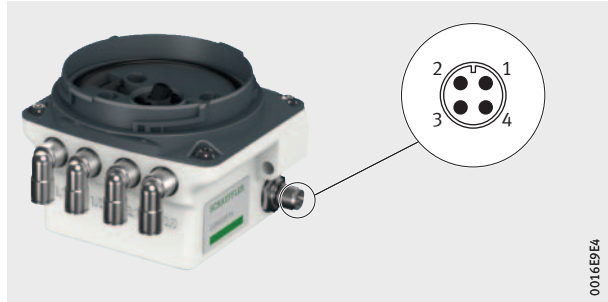


Figure 10
4-pin plug

00165E4

Connector assignment

PIN	Assignment	Colour
1	Input voltage DC 24 V +4,8/-4,8 V, operating voltage stabilised at DC 24 V	Brown (BN)
2	Input signals for controlling the individual pump outputs	White (WT)
3	Output, ground (GND)	Blue (BU)
4	Output signal	Black (BK)

Input signals at PIN 2

The input signals trigger the grease dispensing process or are used to acknowledge error messages. A further input signal can only be sent after a certain pause time. The lubricator only reacts to control signals at PIN 2 in certain operating modes. These operating modes are output via PIN 4 as HIGH/LOW level and must be picked up and processed on the control side.

Overview of signals

Input signal	Description of function
2-seconds signal	Stroke at pump body 1
5-seconds signal	Stroke at pump body 2
8-seconds signal	Stroke at pump bodies 1 and 2
12-seconds signal (FIL)	Bleed pump, for example at first use
14-seconds signal (CLr)	Acknowledge the error message

Signals for dispensing lubricant The lubricator only processes defined control signals. The pulse signals for controlling the pump bodies are defined for the following factors:

- are stated in seconds
- accuracy $\pm 0,1$ s
- pause time between two pulses as a function of the signal.

The input signal with a defined signal length (HIGH level) is sent from the external controller to the lubricator. Immediately after the input signal drops, the motor starts running and the defined lubricant quantity is transported to the outlet. At the same time, the device sends a LOW level as an output signal to the external controller while the motor is running.

The lubricator sends a continuous output signal (HIGH level) to PIN 4, which indicates to the external controller that it is ready for operation. The input signal is only registered if the prior output signal was at a constant HIGH level for at least three seconds.

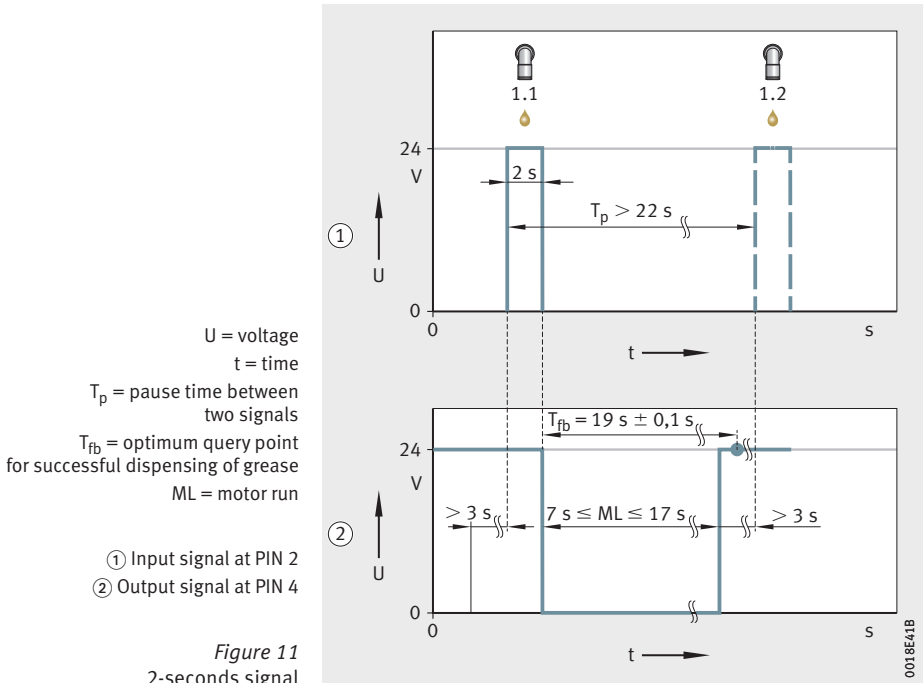
The motor running time is dependent on various conditions, such as the design of the hydraulic system, back pressure and temperature.

For reasons of functional safety, no input signals are detected while the piston pump motors are running if external control by means of a PLC is used.

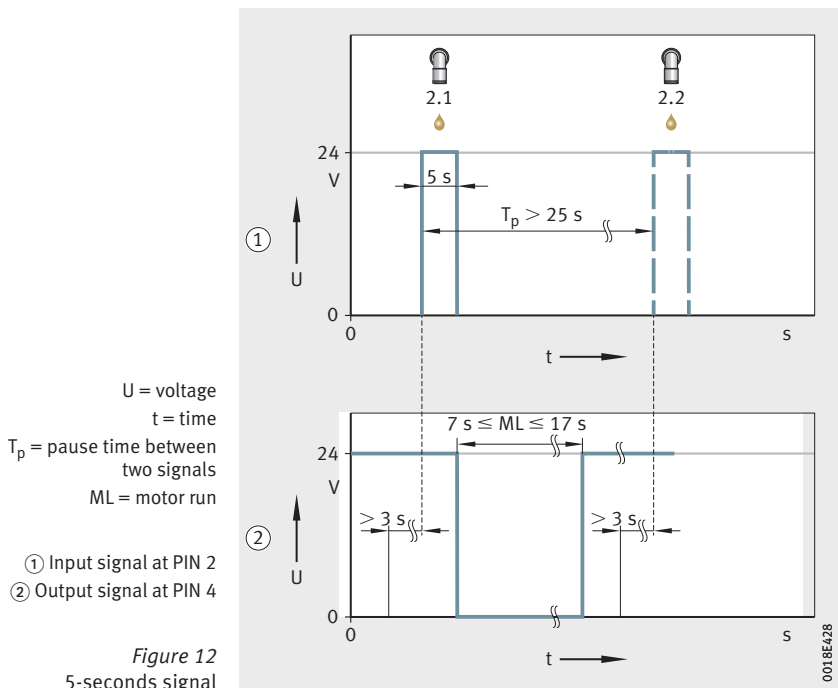
Further information Further information can be found in TPI 252, Lubricators.

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2-seconds signal The 2-seconds signal triggers a grease dispensing process at one of the two outlets in pump body 1.



5-seconds signal



Lubricators CONCEPT4

8-seconds signal The 8-seconds signal triggers a grease dispensing process at one of the two outlets in pump body 1 and in pump body 2.

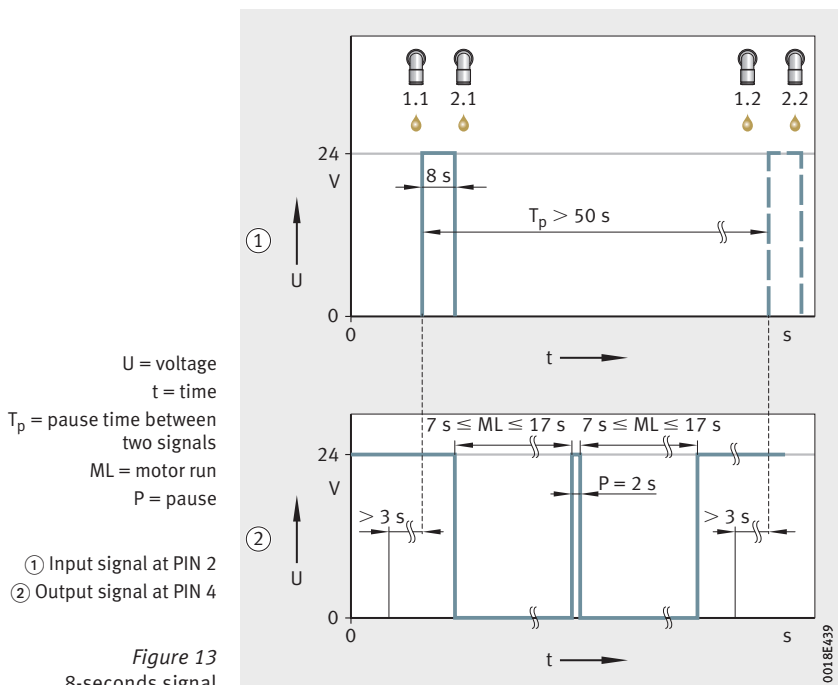


Figure 13
8-seconds signal

**12-seconds signal
(function FIL)**

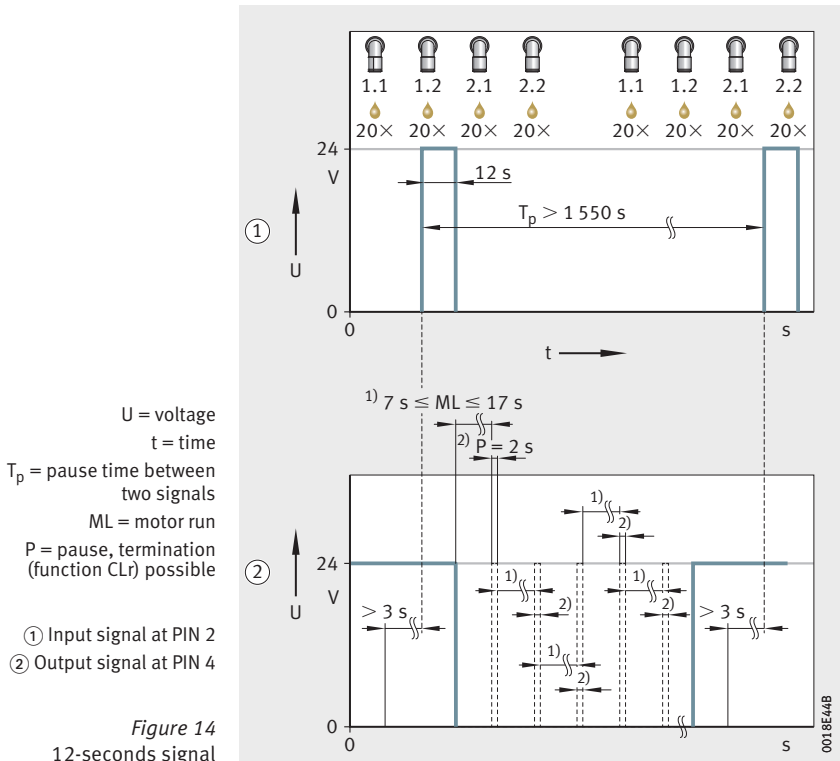
The 12-seconds signal triggers the function FIL. In total, 12,8 cm³ of lubricant is transported from the grease cartridge in 20 dispensing processes per outlet. The total time for carrying out the function FIL once is approx. 12 minutes. The operation is complete as soon as lubricant emerges from the outlet. It may be necessary to carry out the function FIL several times until lubricant emerges. If the empty level is reached during function FIL, the outstanding delivery strokes are continued once the cartridge has been replaced.

NOTICE

Air in the lubricant line can damage the lubrication point due to insufficient lubrication. Bleed the lubricator every time it is commissioned. <

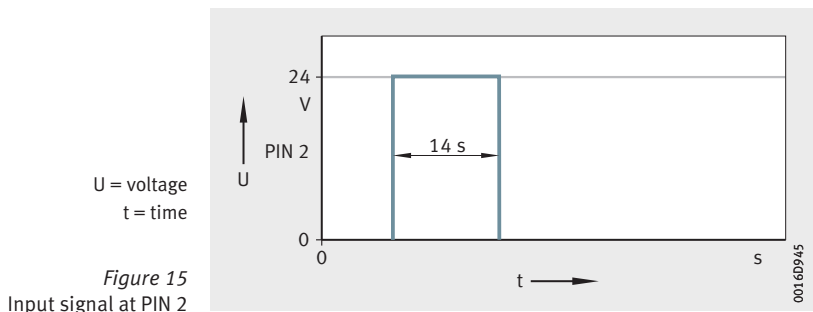
This function is required for:

- initial operation
- bleed the piston pumps.



The function FIL can be terminated using the 14-seconds signal (function CLr). However, the pump will only pick up the signal within the pause time between two motor runs.

14-seconds signal (function CLR) This function is used to delete critical error messages. For an overview of possible error messages, see page 29.



After the end of the control signal, the internal micro-electronics carries out a self-test. If the internal check is successful, the output signal changes from a LOW level to a HIGH level. This clears the error and the device is ready for operation. If the internal check is unsuccessful, the device continues to transmit the LOW level as an output signal. In this case, further troubleshooting steps must be taken, see page 29.

Output signals at PIN 4 The possible output signals that may be present at PIN 4 are described in, *Figure 17 to Figure 19*, page 28.

These signals can be used for diagnosis of the operating status.

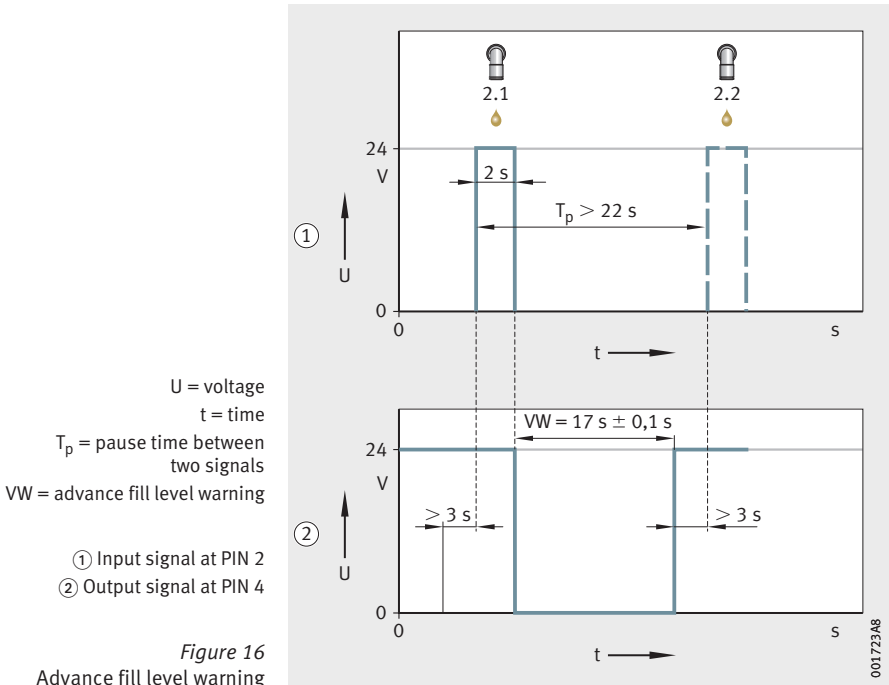
Overview of signals

Output signal	Status information
LOW level (for 17 seconds)	Advance fill level warning
LOW-HIGH level (0,5-Hz square wave signal, continuous)	Empty level
LOW level (continuous)	Lubricant dispensing unsuccessful

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Advance fill level warning

The lubricator is equipped with a sensor that signals an advance fill level warning when a remaining fill quantity of 80 cm³ grease is reached (20% usable cartridge volume remains). The replacement sourcing or substitution of the cartridge can be planned without time pressure within the remaining running time.



The visualisation of the advance fill level warning via an external controller (PLC) should only take place after three consecutive signal indications.

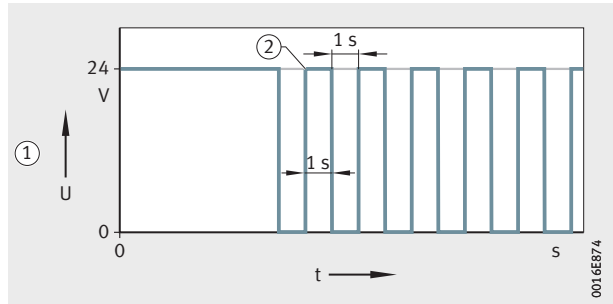
The advance fill level warning is a purely informative signal.
The lubricator continues to process all control signals until the empty cartridge level is detected.

Empty level The empty cartridge level is indicated by a 0,5-Hz square wave signal (LOW-HIGH level).

Once the empty level has been reached, the lubricator will cease to deliver lubricant or process any more control signals. This ensures that no air can enter the lubricator or lubricant lines.

- ① Output signal at PIN 4
- ② Empty level detected

Figure 17
Output signal
for empty level



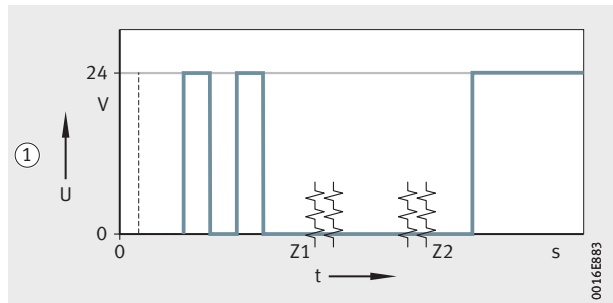
The empty level signal cannot be cleared and continues without interruption until the cartridge is replaced.

The transition across the output signals when replacing a cartridge with the lubricator switched on is illustrated as follows, *Figure 18*.

- Z1 = removing the empty cartridge
- Z2 = inserting the new cartridge

- ① Output signal at PIN 4

Figure 18
Output signal
when changing the cartridge



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The output signal for the empty level is the 0,5-Hz square wave signal (LOW-HIGH-level). At time Z1, when the cartridge is removed, the signal changes to a permanent LOW level. The time Z2 marks the insertion of the new cartridge, from which point a permanent HIGH signal is sent.

For further information on changing cartridges, see page 32.

Error message A permanent LOW level indicates that the lubricant was not dispensed successfully.

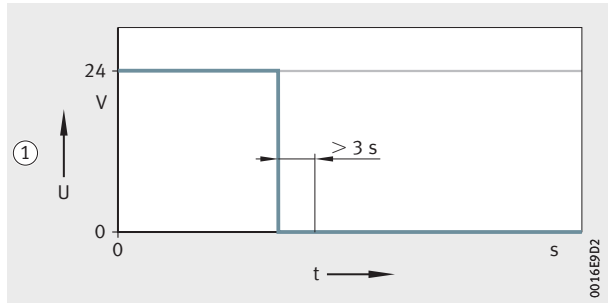


Figure 19
LOW level
if lubricant was not dispensed

In the case of a permanent LOW level, the operator must carry out troubleshooting on the device in a defined sequence.

Troubleshooting and rectification

This chapter describes the errors as well as their remedy.

Continuous LOW level

The troubleshooting sequence in the event of a permanent LOW level is as follows:

- ① Check the power supply.
- ② Dispense grease from the device.
- ③ Carry out a manual back pressure measurement of all lubricant lines using a manual grease gun.
- ④ Check lubricant line and lubrication point.

Power supply ①

Details	Evaluation
<ul style="list-style-type: none">■ Remove plug.■ Check whether there is a DC 24 V power supply.	<ul style="list-style-type: none">■ Voltage values unacceptable? Then restore the supply voltage.■ Voltage values acceptable? Then insert the plug. Clear the error. Perform self-test.■ Successful? Then the error has been eliminated.■ Unsuccessful? Then continue with ②.

Dispensing of grease ②

Details	Evaluation
<ul style="list-style-type: none">■ Disconnect all lubricant lines from the device.■ Trigger a 12-seconds signal.	<ul style="list-style-type: none">■ Irregular or no discharge of grease (grease bead > 2 cm) at the outlets? Then send the device in.■ Regular discharge of grease (grease bead > 2 cm) at the outlets? Then continue with ③.

Manual back pressure measurement ③

Details	Evaluation
<ul style="list-style-type: none">■ Use manual grease gun with pressure manometer.■ Ensure that the grease is identical.■ Slowly feed in the grease approx. > 15 s/stroke.	<ul style="list-style-type: none">■ $p_{max} < 65 \text{ bar}$? Then send the device in.■ $p_{max} > 65 \text{ bar}$? Then continue with ④.

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④ Lubricant line and lubrication point

Details	Evaluation
<ul style="list-style-type: none"> Remove any kinks in the lubricant line. Clear any blockages (grease separation = separation of base oil and thickener) due to over-aged grease in the lubricant line and at the lubrication point. 	<ul style="list-style-type: none"> Successful? Then the error has been eliminated.

Note If you are unable to clear the error and eliminate the cause, contact your specialist dealer. To avoid compromising warranty claims, only send the lubricator in with the grease cartridge screwed into place.

Maintenance



In the event of incorrect maintenance and depending on the type of machine or system involved, there is a risk of accidents resulting in severe injury or death. Only perform maintenance work on stationary machines. Do not disable any safety devices unless it is absolutely necessary in order to reach the lubricator. Reconnect all safety devices on completion of the maintenance work. ◀

Note After the maintenance work has been completed, carry out a test run by triggering the 2-seconds signal.

Maintenance plan

Maintenance	Commis- sioning	After 100 hours or after three months	Annually	As necessary
Cleaning	●	●	●	●
Visual inspection	●	●	●	●
Replacing the cartridge	●	—	●	●

● Maintenance required.

Cleaning Clean on the device with a brush and cloths.

NOTICE

Compressed air can damage the seals and force contaminants into the lubricator. Do not use compressed air for cleaning. <

Visual inspection During the visual inspection, the entire lubrication system is checked for external damage:

- Check the condition of the lubrication points for correct supply of lubricant.
- Replace damaged or defective parts immediately to ensure permanent lubrication.
- Check the fill level of the cartridge.
- Check the device for error messages and eliminate the cause.

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Replacing the cartridge

After replacing the cartridge, the depleted cartridge must be disposed of in accordance with the manufacturer's disposal instructions.

NOTICE

The empty level detection system counts the number of lubricant deliveries. If only a partially filled grease cartridge is used, the empty level detection system will fail and the lubrication point may become damaged. Only use a completely filled grease cartridge. ◀

- ▶ Ensure that the lubricator is supplied with voltage for reliable detection of the cartridge.

NOTICE

The upper housing part is preloaded. Risk of injury due to parts springing off when opening the upper housing part. Carefully loosen the collar ring and upper housing part. ◀

- ▶ To change the grease cartridge, proceed as shown, *Figure 20* and *Figure 6*, page 12 to *Figure 8*, page 14.



Figure 20

Remove the upper housing part

Decommissioning In decommissioning, the following must be observed:

- The machine must be shut down.
- The whole installation must be placed in a voltage-free state.
- The lubricator must be in a voltage-free state.
- The lubricant lines must be in an unpressurised state.

Disposal In order to prevent environmental contamination, disposal of the lubricator must be carried out in accordance with the directives of the relevant country of use.

If there are problems relating to disposal in compliance with legal requirements and in an environmentally responsible manner, the complete lubricator CONCEPT4 can be returned to Schaeffler Technologies AG & Co. KG for disposal.

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Technical data

CONCEPT4	
Designation	Value
Dimensions	108,5 mm×198,4 mm×110,8 mm
Mass (without grease cartridge)	≈ 1,3 kg
Lubricant volume (grease cartridge)	400 cm ³
Metering volume per outlet with one delivery stroke	0,16 cm ³ 0/–0,08 cm ³
Operating pressure	70 bar +10,5/–7 bar
Lubricant	Grease up to NLGI 2 ¹⁾
Operating temperature	–15 °C up to +60 °C
Number of outlets	4
Type of connection fitting	Angled, plug connection for PA hose
Outside diameter of the lubricant line ²⁾	8 mm
Operating voltage (stabilised)	DC 24 V +4,8/–4,8 V
Connector	M12×1, 4-pin
Protection type	IP54
Housing material	Die-cast zinc, PA66-GF30, POM

- 1) NLGI 3 taking into account the maximum length of the lubrication line, see TPI 252, Lubricators.
- 2) For suitable lubricant line, see TPI 252, Lubricators.

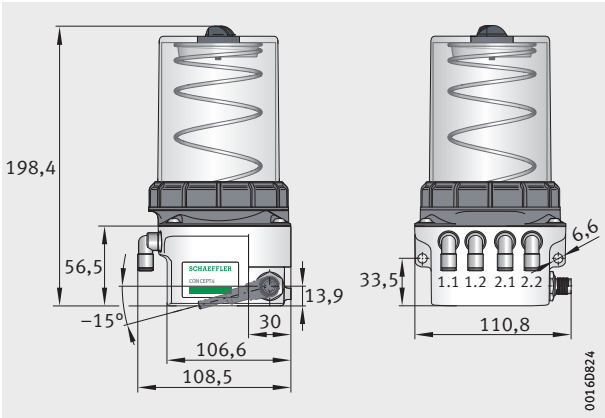


Figure 21
Dimensions

EU Declaration of Conformity

SCHAEFFLER

EU Conformity Declaration
within the meaning of Machinery Directive 2006/42/EC of 17 May 2006
within the meaning of the EC Directive Electromagnetic Compatibility 2014/30/EU

The manufacturer: Schaeffler Technologies AG & Co. KG
Georg-Schäfer-Str. 30
D-97421 Schweinfurt

hereby declares that, based on its design and type and also on its marketed version, the product specified below complies with the relevant safety and health requirements of the following EU directives: Machinery Directive 2006/42/EC and EMC Directive 2004/108/EC. Any changes made to the product that have not been agreed to by the manufacturer will cause this declaration to lose its validity.

The manufacturer bears sole responsibility for issuing this conformity declaration.

Product designation:	Lubrication system
Product name:	CONCEPT4 as well as C4
Type:	C4-1P-24VDC, C4-2P-24V and F-xxxxxx.ARCALUB (F-number with 6-digit numerical code in customer-specific design)

Applicable harmonized standards:

EN 12100:2011-03	Safety of Machinery
EN 61000-6-2, EN 61000-6-4	Electromagnetic Compatibility (EMC)

Name and address of the person authorized to compile the technical documents:


Peter Schuster
Head of Mechatronics

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Place, date:
Schweinfurt, 03/30/2020

This declaration certifies compliance with the directives specified above; however, it does not involve any guarantee of specific features. The safety information in the operating instructions must be followed.
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Figure 22

EU Declaration of Conformity

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