



WITTENSTEIN

alpha

Operating manual

Lubricator LUC+400



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1. General information about this operating manual

This operating manual contains necessary information to safely operate the LUC+400 (FlexxPump4 - D), referred to as lubricator in the following.

If this manual is supplied with amendment sheets (e.g. for special applications), then the information in the amendment is valid. Contradictory specifications in this manual are therefore void.

The user should contact WITTENSTEIN alpha GmbH with any questions about special applications.

The actual and effective operator must guarantee and ensure that this manual including any amendments are read through by all persons assigned to install, operate, or maintain the lubricator, and that they fully comprehend them. For this reason, keep this manual in a suitable and ideally accessible location near the lubricator.

Inform colleagues who work in the area around the machine about the safety instructions so that no one sustains injuries.

The original manual was prepared in German, all other language versions are translations of the original instructions.

1.1 Signal words

The following signal words are used in this manual to indicate potential hazards, things that are forbidden and important information:

DANGER

This signal word indicates an imminent danger that will cause serious injuries or even death if not avoided.

WARNING

This signal word indicates a potential hazard that could cause serious injuries and even death if not avoided.

CAUTION

This signal word indicates a potential hazard that could cause minor or serious injuries if not avoided.

NOTICE

This signal word indicates a potential hazard that could lead to property damage.

INFO

This signal word indicates practical application tips or especially important information for handling the lubricator.

1.2 Safety symbols

The following safety symbols are used in this manual to indicate hazards, things that are forbidden and important information:

		
General danger	Electric voltage	Substances that represent a fire risk

1.3 Structure of the safety information

The safety information in this operating manual are structured as follows:

	CAUTION
	<p>The text explains the consequences of disregarding this information.</p> <ul style="list-style-type: none"> ■ The text uses direct address to provide instructions about what to do.

1.4 Information symbols

The following information symbols are used in the text and instructions in this manual:

- Prompts an action
- ➔ Indicates the results of an action
- ⓘ Provides additional information about the action

2. Safety

This manual, especially the safety instructions and the rules and regulations valid for the operating site, must be observed by all persons working with the lubricator. General legal rules and regulations as well as applicable rules and regulations on prevention of accidents (e.g. personal protective equipment (PPE)) and environmental protection must be observed.

2.1 EC/EU Directive

In scope of the EC/EU Directive, commissioning (recommissioning) of a machine at which the lubricator was installed and/or attached is prohibited until it is verified that the machine complies with all provisions of the applicable regulation. An EC/EU declaration of conformity for this lubricator can be found in the appendix (chapter 9.6).

2.2 Hazards

To avoid danger to the operator or damage to the machine, at which the lubricator is used, the lubricator may be put to use only for its intended use (chapter 2.5) and in a technically flawless and safe state.

Always read the general safety instructions before beginning work (chapter 2.7).

2.3 Personnel

Only technicians who have read and understood this operating manual may perform work on the lubricator. Local and/or company regulations apply accordingly.

2.4 Reasonably foreseeable misuse

Any usage of the lubricant that exceeds the maximum permitted technical data is considered misuse and is therefore prohibited.

2.5 Intended use

For the intended use of the lubricator, the following points must be observed:

- + The lubricator is approved only for industrial applications.
- + The lubricator may only be put into operation according to the technical specifications (chapter 3.7).
- + Unauthorized modifications to the lubricator are not permitted.
- + Read and observe the operating manual.
- + During operation of the lubricator, regular visual inspections must be carried out at the lubricator itself as well as the lubrication point. Any irregularities and their cause must be corrected immediately.
- + The cartridge must not be refilled.
- + The lubricator must not be opened or dismantled.
- + Only lubricants which are approved by the manufacturer may be used.
- + Applicable rules and regulations on occupational safety, prevention of accidents and environmental protection must be observed.
- + Any works or activities with or at the lubricator may only be carried out with authorization (chapter 2.3).

Any use other than the previously described intended use or non-compliance with one of the points specified above is regarded misuse. In this case no liability or warranty claims will be assumed.

2.6 Guarantee and liability

Any guarantee and liability claims are excluded for personal injury and/or material damage in case of:

- + Ignoring the information on transport and storage;
- + Misuse;
- + Improper or not carried out maintenance and repair;
- + Incorrect assembly / disassembly or incorrect operation;
- + Operation of the lubricator when safety devices and equipment are defective;
- + Operation of the lubricator without lubricant;
- + Operation of the lubricator with non-approved lubricant;
- + Operation of a heavily polluted lubricator;
- + Modifications or changes without written approval by WITTENSTEIN alpha GmbH.
- + Opening and/or partly or complete dismantling of the lubricator.

2.7 General safety instructions

The following safety instructions apply for the lubricator:

	<p style="text-align: center;">DANGER</p> <p>Defective or faulty electrical connections or unapproved, current-carrying components can cause serious injuries and even death.</p> <ul style="list-style-type: none"> ■ Have all electrical connection work performed by qualified technicians only. ■ Immediately replace damaged cables or plugs.
	<p style="text-align: center;">NOTICE</p> <p>Loose or overloaded screw connections can damage the lubricator.</p> <ul style="list-style-type: none"> ■ Mount and check all screw connections according to the specified admissible torques. Use the calibrated torque wrench.
	<p style="text-align: center;">WARNING</p> <p>Lubricants are flammable.</p> <ul style="list-style-type: none"> ■ In case of fire, do not use a jet of water to extinguish. ■ In case of fire, only use suitable extinguishing agents like powder, foam or carbon dioxide. ■ Always observe the applicable safety instructions by the lubricant manufacturer on the safety data sheet of the used lubricant.
	<p style="text-align: center;">CAUTION</p> <p>Lubricants can cause skin irritations.</p> <ul style="list-style-type: none"> ■ Avoid direct skin contact.
	<p style="text-align: center;">NOTICE</p> <p>Lubricants can pollute soil and water.</p> <ul style="list-style-type: none"> ■ Use and dispose of lubricants properly.

3. Function description

3.1 General information

The lubricator is designed as a highly compact piston pump for grease as lubricant. The pistons run with forced-control and in opposed directions. The lubricator is available as a version with one lubricant outlet as well as with two, three or four lubricant outlets, see chapter 5. The outlets are secured by integrated check valves. At each dispensing process, approx. 0.15 cm³ of lubricant are conveyed. This lubricator must be integrated in an external control system (e.g. PLC). The lubricator features an electrical interface for control. By means of output signals, the lubricator also enables remote monitoring for querying of the status and any potential error messages (e.g. empty cartridge). The lubricator is controlled via various input signals processed by microelectronics to ensure ideal supply of lubricants to lubrication points.

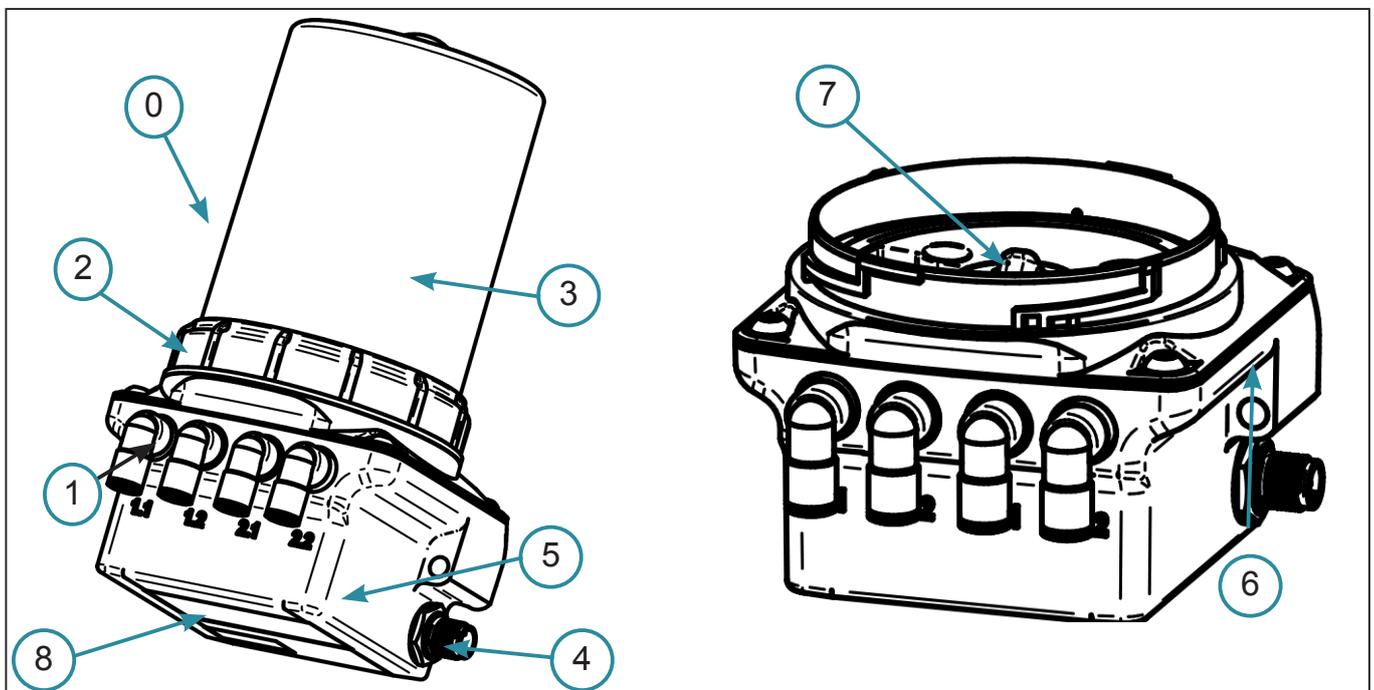


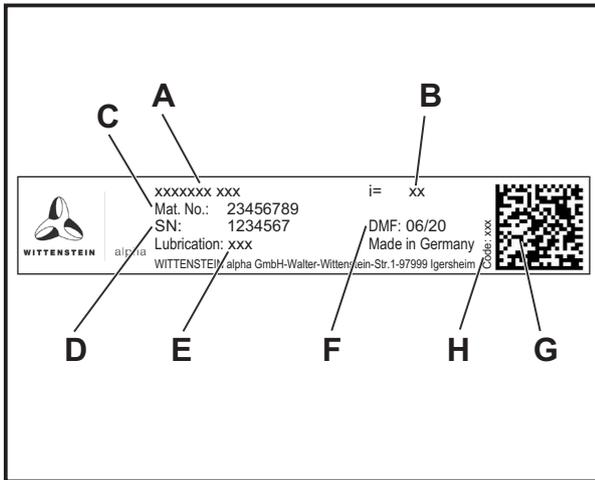
Fig. 1 Overview of the lubricator

No.	Designation
0	Lubricator
1	Lubricant outlet or outlets (different variants possible)
2	Retaining ring
3	Top part
4	M12x1 interface
5	Name plate
6	Through hole for assembly
7	Lubricant inlet with thread for cartridge
8	CE mark

3.2 Name plate

The name plate is attached to the lubricator housing. The position of the name plate is described in chapter 3.1, fig. 1.

Designation	
A	Ordering codes (see chapter 3.4)
B	+24 V DC
C	Input signal PLC Lubricator
D	Ground (GND)
E	Lubricator output signal
F	Date of manufacture
G	Data matrix code (optional)



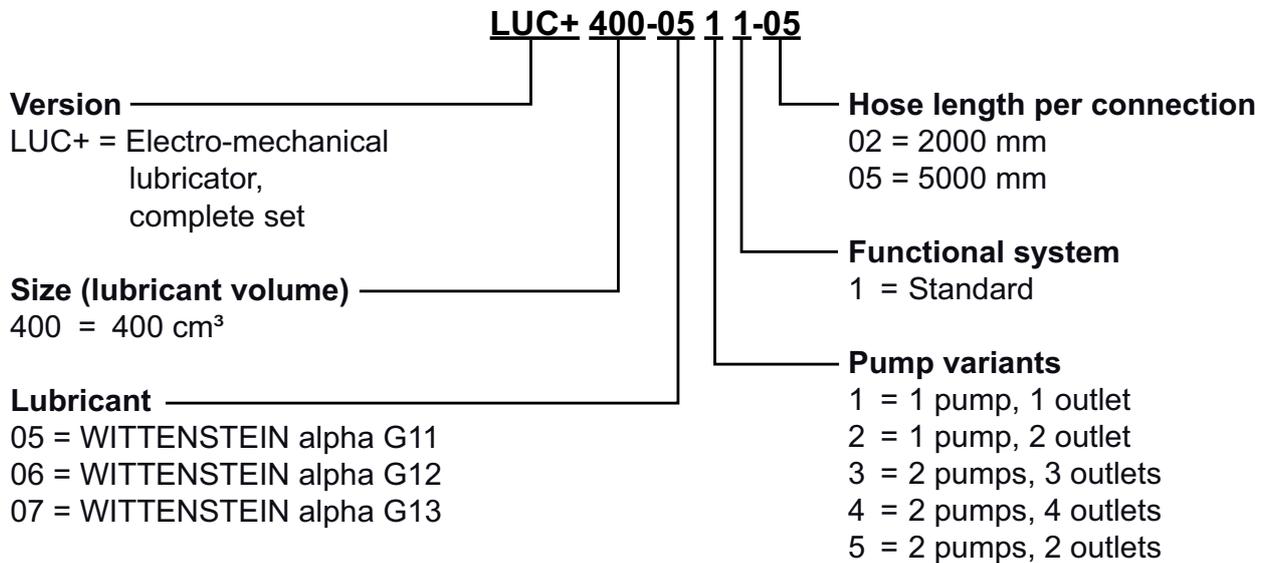
3.3 Marking

The CE mark is attached to the lubricator housing. The position of the CE mark is described in chapter 3.1, fig. 1.

Manufacturer

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 Fax: +49-(0)9721-47396-69
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3.4 Ordering codes



3.5 Dimensions

Dimensions can be found

- in our catalog,
- under www.wittenstein-alpha.de.

3.6 Scope of delivery

The lubricator is available in different versions. They can be distinguished by general features, the number and type of lubricant outlets as well as the included accessories.

3.7 Technical data

Housing			
Dimensions without top part		111 x 56.5 x 108 (W x H x D)	mm
Dimensions with top part for 400ml Cartridge		111 x 198.5 x 108 (W x H x D)	
Weight (without cartridge)	approx.	1190	g
Assembly option		Through bore for M6 screw	
Mounting position		Any for grease, vertical for oil variant	
Housing material		Die-cast zinc / PA 6.6 GF30 / POM	
Outlet material		Nickel-plated brass	
Operating temperature		-10 ... +60°	°C
Lubricant and hydraulics			
Cartridge volume		400	cm ³
Lubricant properties		Grease up to NLGI, class 2	
No. of outlets		1 / 2 / 3 / 4	
Hydraulic connection		Via PA hose	
Number of lubrication points per outlet		Up to 10 in connection with progressive distributor*	
Max. pressure		70 (-10%/+15%)	bar
Max. continuous operating pressure		70	bar
Conveyed volume	per stroke	0.15	cm ³
Electrics			
Display		Not available	
Operating voltage		24 (20V...28V)	V DC
Fuses		0.75 (slow)	A
Protection class		IP 54	
Power consumption		$I_{\max} < 0.3$ $I_{\text{bias}} < 0.025$	A
For further information on electrics, please refer to chapters 7 or 8!			

* The specified value depends on the actual application and may deviate considerably in individual cases depending on the used lubricant and other conditions.

4. Transport and storage

4.1 Packaging

The lubricator is delivered in outer packaging (cardboard box) and – depending on the scope of delivery, with a lubricant cartridge and other accessories – in the same bundle. For protection against humidity and dirt, these are additionally packaged in PE foil. Dispose of the packaging materials at the recycling sites intended for this purpose in compliance with applicable national and operational regulations.

After receipt of the lubricator, check the completeness of the delivery against the delivery note.

Immediately notify the carrier, the insurance company, or WITTENSTEIN alpha GmbH in writing of any potentially missing parts or damage.

4.2 Transport

	NOTICE
	<p>Hard knocks, for instance because of falling or hard dropping, can damage the lubricator.</p> <ul style="list-style-type: none">■ Do not throw the lubricator.

4.3 Storage

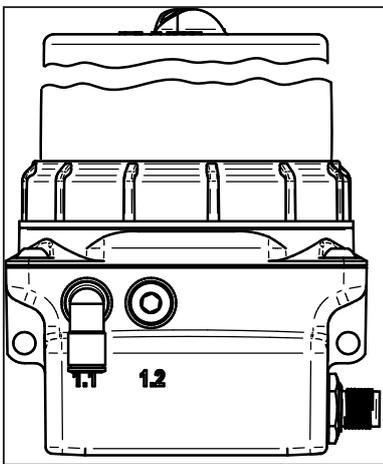
Store the lubricator in its original packaging in vertical position under dry, frost-protected conditions at an ambient temperature of +5°C to +30°C. The maximum unopened storage time is 2 years.

For storage logistics, the "First-In-First-Out principle" (FiFo) is recommended.

5. Variants

The lubricator serves as small central lubrication system for supply of one or several lubrication points. Depending on the actual application case, the lubricator can also be used for reliable and clean lubrication supply to a few more lubrication points. Parts of the system accessories of the manufacturer (e.g. splitters, progressive distributions or lubrication gears) can be connected to the lubricator to extend the number of supplied lubrication points over the number of outlets. The lubricator is available as variants with one or with two pump bodies (PB). The outlets of pump body 1 are marked on the housing with 1.1 and 1.2, the outlets of pump body 2 with 2.1 and 2.2.

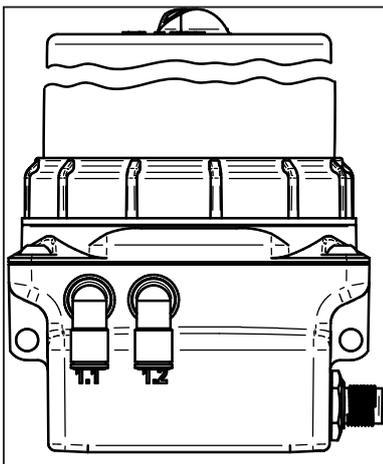
5.1 LUC+400, 1 pump body, 1 outlet (ordering code: LUC+400-xx11-xx)



At the lubricator **LUC+400-xx11-xx**, the theoretical two outlets of the installed pump body are internally combined. With each stroke, the outlet is supplied with 0.15 cm³ of lubricant.

Number of pump bodies	1
No. of outlets	1
Lubrication volume differences per pump body	Not applicable, as only one pump body

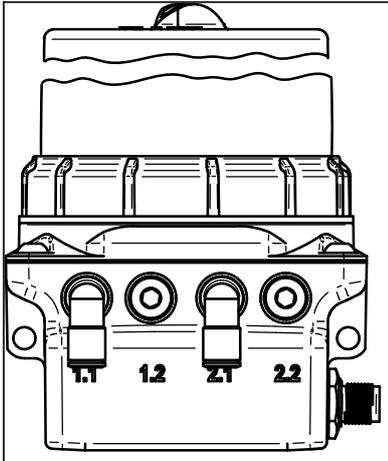
5.2 LUC+400, 1 pump body, 2 outlets (ordering code: LUC+400-xx21-xx)



At the lubricator **LUC+400-xx21-xx**, two outlets are supplied with identical volumes of lubricants. With each stroke, one outlet is supplied with 0.15 cm³ of lubricant. The outlets are successively supplied with lubricant.

Number of pump bodies	1
No. of outlets	2
Lubrication volume differences per pump body	Not applicable, as only one pump body

5.3 LUC+400, 2 pump bodies, 2 outlets (ordering code: LUC+400-xx51-xx)

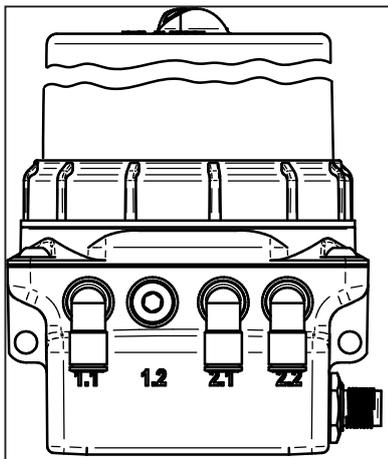


At the lubricator **LUC+400-xx51-xx**, the theoretical two outlets per installed pump body are internally combined. With each stroke, one outlet is supplied with 0.15 cm³ of lubricant. The outlets are successively supplied with lubricant.

By individual control of both pump bodies, the lubricator enables setting of dosing volume differences at outlet 1.1 to outlet 2.1. An explanation of the different control signals can be found in chapter 8.2.

Number of pump bodies	2
No. of outlets	2
Lubrication volume differences per pump body	Yes

5.4 LUC+400, 2 pump bodies, 3 outlets (ordering code: LUC+400-xx31-xx)



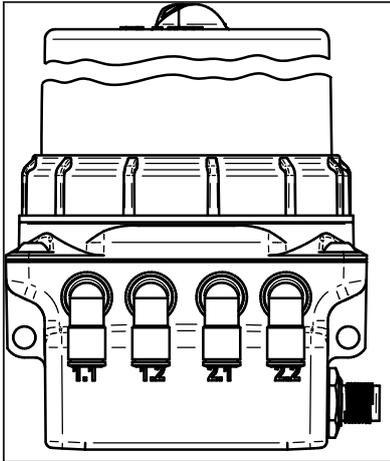
At the lubricator **LUC+400-xx31-xx**, the theoretical two outlets of the first pump body are internally combined in one outlet 1.1. With each stroke, one outlet is supplied with 0.15 cm³ of lubricant. The outlets are successively supplied with lubricant.

By individual control of both pump bodies, the lubricator enables setting of dosing volume differences at outlet 1.1 to outlets 2.1 and 2.2. An explanation of the different control signals can be found in chapter 8.2.

ⓘ At even activation of both pump bodies, outlet 1.1 is supplied with twice the lubricant volume of outlets 2.1 or 2.2 due to the internal combination of the outlets of the first pump body.

Number of pump bodies	2
No. of outlets	3
Lubrication volume differences per pump body	Yes

5.5 LUC+400, 2 pump bodies, 2 outlets (ordering code: LUC+400-xx41-xx)



At the lubricator **LUC+400-xx41-xx**, every possible outlet is supplied separately. With each stroke, one outlet is supplied with 0.15 cm³ of lubricant. The outlets are successively supplied with lubricant.

By individual control of both pump bodies, the lubricator enables setting of dosing volume differences at outlets 1.1 and 1.2 to outlets 2.1 and 2.2. An explanation of the different control signals can be found in chapter 8.2.

Number of pump bodies	2
No. of outlets	4
Lubrication volume differences per pump body	Yes

6. Assembly

6.1 Preparations

Before beginning to work, inform yourself about the lubricator by reading this operating manual and particularly the general safety instructions (chapter 2.7). Thoroughly prepare the assembly location.



NOTICE

Among other things, compressed air can lead to damage to the seals of the lubricator and to contamination of the lubricator or lubricant by dirt and particles.

- Do not use compressed air.
- Make sure that the assembly location is not considerably contaminated.

6.2 Assembly

Electrical interface connection

- Connect the lubricator with a suitable connection cable and via the M12x1 interface at the bottom of the lubricator to the external voltage supply or control system.

① Depending on the application, connection cables with straight or angled socket can be used.

① For the properties of the connection cable, please refer to chapter 8.1.

**DANGER**

Defective or faulty electrical connections or unapproved, current-carrying components can cause serious injuries and even death.

- Have all electrical connection work performed by qualified technicians only.
- Immediately replace damaged cables or plugs.
- Observe the five safety rules of electrical engineering before starting electrical installation work:
 - Switch off the power supply
 - Secure against unintended reactivation
 - Ensure that there is no voltage
 - Ground and short-circuit
 - Cover neighboring and electrified parts

6.3 Commissioning

The lubricator is delivered with an inserted cartridge in vented condition as a ready-to-install component. Yellow hose fittings have been inserted in the outlets. The provided hose lines have already been prefilled with the respective lubricant.

Carefully assemble the lubricator according to the steps described in chapter 6.2. For initial commissioning, the following steps may be required depending on the scope of delivery:

1. Mechanical attachment

Mechanically attach the lubricator with the through holes at the housing. Observe the permissible maximum tightening torques!

2. Electrical connection

Connect the lubricator via the M12x1 interface and a suitable cable to the external voltage supply or external control system (PLC). The lubricator is now activated.

3. Checking the assembly

Make sure that the lubricator is properly and fully assembled. Particularly the voltage supply must be ensured, and a lubricant cartridge be attached.

4. 12-seconds signal execution

① Not required if lubricators are delivered with the cartridge inserted.

Execute the 12-seconds signal. The detailed description can be found in chapter 8.2.4. Afterwards, the lubricator executes a specific number of strokes to convey the lubricant from the cartridge to the outlet.

5. Hydraulic connection

Hydraulically connect the device to be supplied to the lubricator via the provided prefilled hoses. Ensure that lines and connection elements are tight and properly assembled.

① If possible, use lines prefilled with the respective lubricant!

6. Checking the settings at the lubricator

Check the basic settings at the lubricator with the values required for the lubrication point and adjust as necessary. Any changes must be made in the PLC program.

7. Operation and control

7.1 General information

What you should know about operation and control of the lubricator:

- ✓ For operation and control, the lubricator must be integrated into a control system (PLC), see chapters 7 and 8.
- ✓ The single-use changeable cartridges with a lubricant capacity of 400ml ensure controlled and stable quality of lubricants and are filled without any trapped air. The lubricator offers reliable supply to lubrication points and prevents downtime of machinery. This version of the lubricator is designed exclusively for grease lubricants.
- ✓ This version of the lubricator cannot be used without lubricant cartridge. Depending on the ordered version, the cartridge may already be included in the scope of delivery and connected to or inserted in the lubricator.
- ✓ In case of any questions regarding your applications and the correct settings for the lubricator, please contact **WITTENSTEIN alpha GmbH**.
- ✓ For operation and control, the lubricator must be integrated into a control system (PLC). Depending on the signals received from the external control system (PLC), one or several strokes are executed by the lubricator to dispense lubricant (0.15 cm³ per stroke). Depending on the internal condition of the lubricator (e.g. empty cartridge), different output signals are provided by the lubricator.

● Make sure that your PLC program is suitable for your application and that the lubrication point is supplied with the correct volume of lubricants per time unit. If this is the case, the lubricator can be used.
If this is **not** the case, adjust your PLC program accordingly.

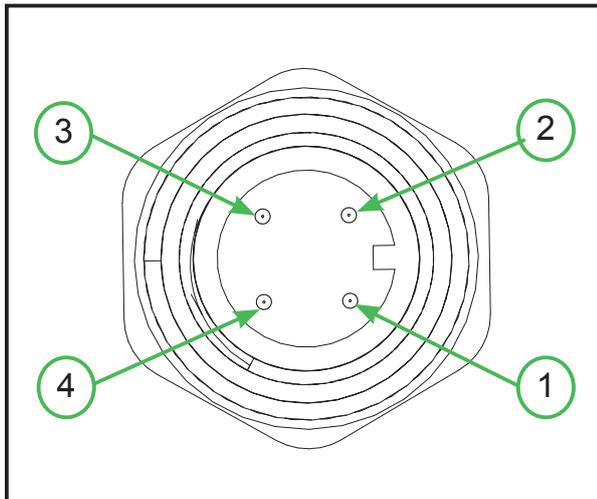
① To use the lubricator, it must first be properly assembled and installed, and afterwards activated. Assembly is very easy and described in detail in chapter 6.2.

① For special versions of the lubricator, the dedicated instructions and information on the provided note must be observed!

8. Input and output signals – external control system (PLC)

The lubricator only works as pulse-controlled lubrication system if unchangeable input signals (high-level) are transmitted in a defined order from the PLC to the lubricator via PIN 2. Via high/low-level signals picked up at PIN 4, the lubricator indicates the respective status to the PLC and enables comprehensive control and differentiated evaluation of the different conditions by suitable programming of the PLC. For incorporation of the lubricator into an external control system, one input and one output must be provided on the control side.

8.1 Pin assignment – external control system (PLC)



Pin assignment – external control system (PLC)		
PIN	Assignment	Color
1	+24 V DC	Brown
2	Input signal PLC of the lubricator	White
3	Ground (GND)	Blue
4	Lubricator output signal	Black
Type: M12x1 plug socket; 4-pin A-coded		

For electrical connection to the external control system (PLC) of a system, the lubricator is equipped with a 4-pin plug socket in the form of a connector with standard M12x1 port.

① The lubricator can be fully shut down by disconnecting the supply voltage. After reconnection of the supply voltage, the lubricator executes a self-test and resumes its function after receipt of an input signal from the PLC.

① For operation of the lubricator via an external control system (PLC), a program corresponding to the communication protocol must be prepared in the PLC.

① The output signal at PIN 4 can be picked up for further processing (e.g. indicator light or external control system). A maximum admissible output current of $I_{max} < 20\text{mA}$ must not be exceeded. Inductive loads (e.g. relays) must not be connected!

① After extended standstill of the lubricator, the "quick check" should be carried out manually. To do so, execute a specific number of dispensing processes via the PLC (chapter 8.2).

8.2 Input signals – external control system (PLC)

The lubricator provides the following unchangeable defined control signals (input signals), which must be transmitted by the PLC to the lubricator via PIN 2 of the electrical M12x1 interface as high-level signal (+24 V DC).

The control signals must be generated by the external control system (PLC) as high-level signal (+24V) via specific times, each with a tolerance of +/- 0.1s

Signal duration in seconds	Designation	Function	Detail Chapter
2 high	2-seconds signal	1 stroke PB1	8.2.1
5 high	5-seconds signal	1 stroke PB2	8.2.2
8 high	8-seconds signal	1 stroke PB1 and PB2	8.2.3
12 high	12-seconds signal	FIL function	8.2.4
14 high	14-seconds signal	Error acknowledgment	8.2.5

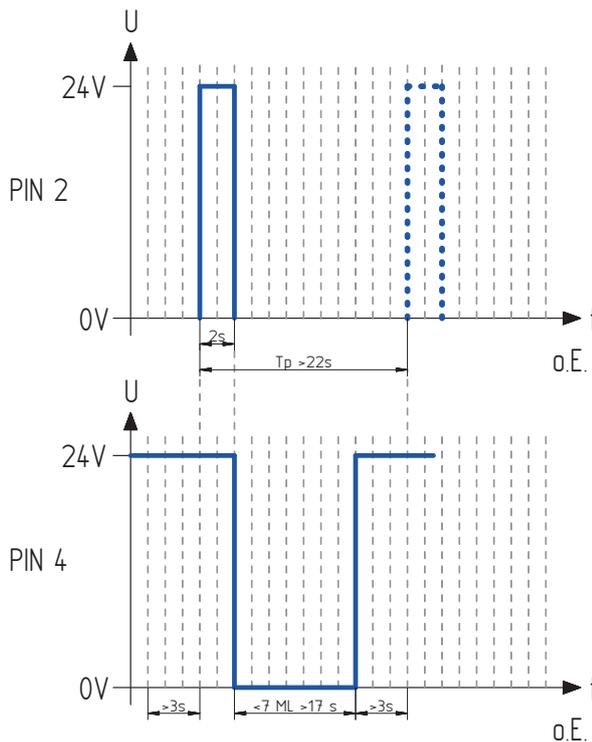
① The input signals which can be processed by the lubricator depend on its design. Compare the lubricator with the different designs described in chapter 5 to identify the relevant signals to be used for control of the lubricator. The designation of your lubricator can be found on the name plate attached to the side, see chapter 3.2, fig. 1.

① The lubricator only processes the control signals specified in the table up to a maximum length of 14 seconds. In case of a high-level signal (+24 V DC) outside of the tolerance, there is no reaction from the lubricator. In case of a high-level signal (+24 V DC) for more than 15 seconds at PIN2 of the electrical interface, there is no reaction from the lubricator.

8.2.1 2-seconds control signal

The 2-seconds control signal triggers one single dispensing process at pump body 1. After a specific pause time, this control signal can be repeated, or a different control signal can be transmitted.

The lubricator reacts to control signals at PIN 2 only in a specific operating status. The operating statuses are transmitted by the lubricator via PIN 4 as high-/low-level signal and must be picked up and processed accordingly in the PLC.



T_p : Pause time

MR: Motor run

Description:

✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

- The lubricator sends a permanent output signal (high-level) to PIN 4 indicating readiness to the external control system (PLC). This output signal must be active permanently and without interruption for >3 seconds. Only if this condition is met, activation by an external control system is possible.
- The 2-second control signal with a high-level signal duration of 2 (1.9 ... 2.1) seconds can be sent to the lubricator from the external control system (PLC).

● Directly after release of the signal the motor run (MR) of the lubricator is started and 0.15 cm^3 of lubricant is conveyed to the outlet. At the same time as the start of motor run (MR), a low-level output signal is sent for confirmation by the lubricator to the external control system (PLC) for the duration of the motor run (MR).

● The motor runtime (MR) depends on various conditions like the counter-pressure established or present in the hydraulic system and the temperature. The motor runtime (MR) of the lubricator is 7...17 seconds.

● After completion of a faultless and successful motor run (MR), the output signal to the lubricator changes from a low-level to a high-level signal.

① Not before >3 seconds after the end of the faultless and successful motor run, the next control signal can be sent by the external control system (PLC). In the meantime, the lubricator does not process any control signals.

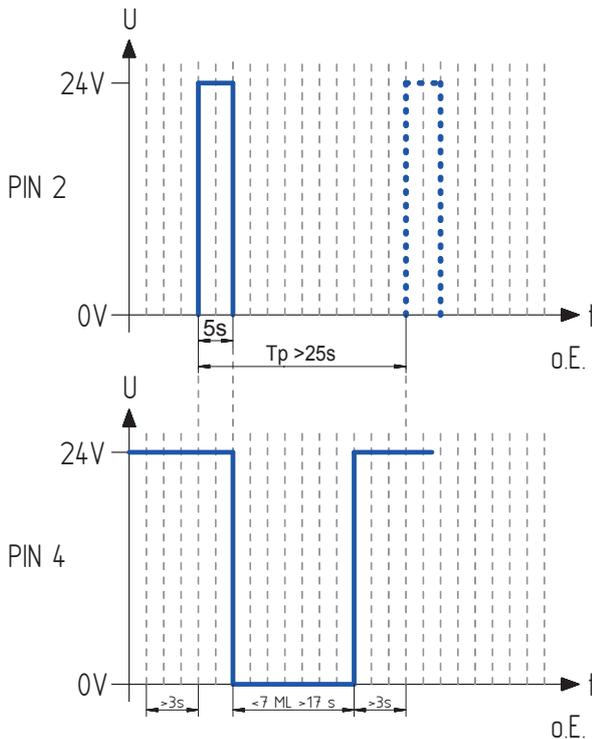
① To ensure reliable and clear recognition of the control signal, a pause time must be observed. For the 2-second control signal, a pause time (T_p) of at least 22 seconds applies for the lubricator between two identical or different control signals.

① If an error is recognized by the integrated microelectronics of the lubricator during or directly after the end of a motor run (MR), this fault is transmitted to the external control system (PLC) by means of a respective output signal (chapter 8.3).

8.2.2 5-seconds control signal

The 5-seconds control signal triggers one single dispensing process at pump body 2 if a pump body 2 is present. After a specific pause time, this control signal can be repeated, or a different control signal can be transmitted.

The lubricator reacts to control signals at PIN 2 only in a specific operating status. The operating statuses are transmitted by the lubricator via PIN 4 as high-/low-level signal and must be picked up and processed accordingly in the PLC.



Tp: Pause time

MR: Motor run

- Directly after release of the signal the motor run (MR) of the lubricator is started and 0.15 cm^3 of lubricant is conveyed to the outlet. At the same time as the start of motor run (MR), a low-level output signal is sent for confirmation by the lubricator to the external control system (PLC) for the duration of the motor run (MR).
- The motor runtime (MR) depends on various conditions like the counter-pressure established or present in the hydraulic system and the temperature. The motor runtime (MR) of the lubricator is 7...17 seconds.
- After completion of a faultless and successful motor run (MR), the output signal to the lubricator changes from a low-level to a high-level signal.

ⓘ Not before >3 seconds after the end of the faultless and successful motor run, the next control signal can be sent by the external control system (PLC). In the meantime, the lubricator does not process any control signals.

Description:

✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

- The lubricator sends a permanent output signal (high-level) to PIN 4 indicating readiness to the external control system (PLC). This output signal must be active permanently and without interruption for >3 seconds. Only if this condition is met, activation by an external control system is possible.
- The 5-seconds control signal with a high-level signal duration of 5 (4.9 ... 5.1) seconds can be sent to the lubricator from the external control system (PLC).

① To ensure reliable and clear recognition of the control signal, a pause time must be observed. For the 5-seconds control signal, a pause time (T_p) of at least 25 seconds applies for the lubricator between two identical or different control signals.

① If an error is recognized by the integrated microelectronics of the lubricator during or directly after the end of a motor run (MR), this fault is transmitted to the external control system (PLC) by means of a respective output signal (chapter 8.3).

8.2.3 8-seconds control signal

The 8-seconds control signal triggers one single dispensing process at pump body 1 and pump body 2 if a pump body 2 is present. After a specific pause time, this control signal can be repeated, or a different control signal can be transmitted.

The lubricator reacts to control signals at PIN 2 only in a specific operating status. The operating statuses are transmitted by the lubricator via PIN 4 as high-/low-level signal and must be picked up and processed accordingly in the PLC.

Description:

✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

- The lubricator sends a permanent output signal (high-level) to PIN 4 indicating readiness to the external control system (PLC). This output signal must be active permanently and without interruption for >3 seconds. Only if this condition is met, activation by an external control system is possible.
- The 8-seconds control signal with a high-level signal duration of 8 (7.9 ... 8.1) seconds can be sent to the lubricator from the external control system (PLC).
- Directly after release of the signal the motor run (MR) of the lubricator is started and 0.15 cm³ of lubricant is conveyed to the outlet. At the same time as the start of motor run (MR), a low-level output signal is sent for confirmation by the lubricator to the external control system (PLC) for the duration of the motor run (MR).
- The motor runtime (MR) depends on various conditions like the counter-pressure established or present in the hydraulic system and the temperature. The motor runtime (MR) of the lubricator is 7...17 seconds.
- After completion of a faultless and successful motor run (MR), the output signal to the lubricator changes from a low-level to a high-level signal.

ⓘ Not before >3 seconds after the end of the faultless and successful motor run, the next control signal can be sent by the external control system (PLC). In the meantime, the lubricator does not process any control signals.

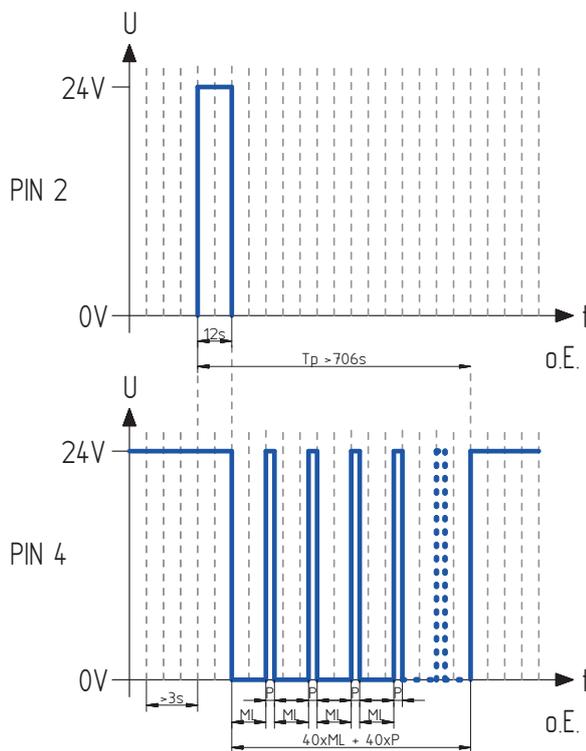
ⓘ To ensure reliable and clear recognition of the control signal, a pause time must be observed. For the 8-seconds control signal, a pause time (T_p) of at least 45 seconds applies for the lubricator between two identical or different control signals.

ⓘ If an error is recognized by the integrated microelectronics of the lubricator during or directly after the end of a motor run (MR), this fault is transmitted to the external control system (PLC) by means of a respective output signal (chapter 8.3).

8.2.4 12-seconds control signal

The 12-seconds control signal triggers the FIL function by the external control system. A total of 40 dispensing processes per pump body are automatically executed one after the other. After a specific pause time, this control signal can be repeated, or a different control signal can be transmitted.

The lubricator reacts to control signals at PIN 2 only in a specific operating status. The operating statuses are transmitted by the lubricator via PIN 4 as high-/low-level signal and must be picked up and processed accordingly in the PLC.



Description:

✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

- The lubricator sends a permanent output signal (high-level) to PIN 4 indicating readiness to the external control system (PLC). This output signal must be active permanently and without interruption for >3 seconds. Only if this condition is met, activation by an external control system is possible.
- The 12-seconds control signal with a high-level signal duration of 12 (11.9 ... 12.1) seconds can be sent to the lubricator from the external control system (PLC).

T_p : Pause time
 P: Pause
 MR: Motor run

- Directly after release of the signal the first motor run (MR) of the lubricator is started and 0.15 cm^3 of lubricant is conveyed to the outlet. At the same time as the start of motor run (MR), a low-level output signal is sent for confirmation by the lubricator to the external control system (PLC) for the duration of the motor run (MR).
- The motor runtime (MR) depends on various conditions like the counter-pressure established or present in the hydraulic system and the temperature. The motor runtime (MR) of the lubricator is 7...17 seconds.
- After completion of every faultless and successful motor run (MR), the output signal to the lubricator changes from a low-level to a high-level signal for a short pause time of $P = 0.5$ seconds.
- This is followed by a total of 40 successive motor runs and dispensing processes. In this process, a lubricant volume of $40 \times 0.15 \text{ cm}^3 = 6.0 \text{ cm}^3$ is conveyed from the cartridge to the outlet.

① Not before >3 seconds after the end of the last faultless and successful motor run, the next control signal can be sent by the external control system (PLC). In the meantime, the lubricator does not process any control signals.

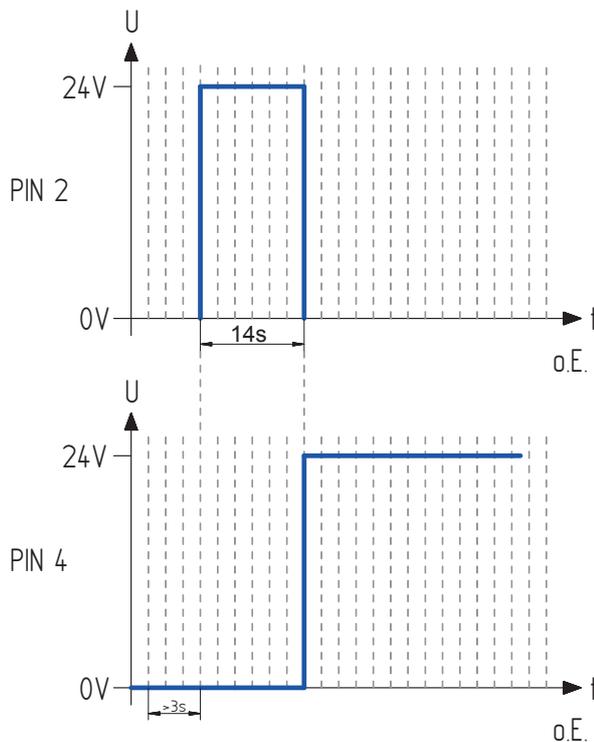
① To ensure reliable and clear recognition of the control signal, a pause time must be observed. For the 12-seconds control signal, a pause time (T_p) of at least 706 ($T_p = MR_{\max} \times 40 \text{ strokes} + P \times 40 \text{ strokes} + \text{tolerance}$) seconds applies for the lubricator between two identical or different control signals.

① At a lubricator with two pump bodies, triggering of the 12-seconds control signal leads to 40 filling strokes **per pump body**. The pause time (T_p) is doubled.

① If an error is recognized by the integrated microelectronics of the lubricator during or directly after the end of a motor run, this fault is transmitted to the external control system (PLC) by means of a respective output signal (chapter 8.3.4).

8.2.5 14-seconds control signal

The 14-seconds control signal serves for acknowledgment of error messages. This is the only control signal that can be processed by the lubricator if a low-level output signal is sent. Irrespective from the general possibility of remote error acknowledgment, the cause of every error message must be identified and corrected.



Description:

- ✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.
- ✓ An error occurred at the lubricator.

- The lubricator sends a permanent output signal (low-level) to PIN 4 indicating an error to the external control system (PLC). This output signal must be active permanently and without interruption for >3 seconds.
- The 14-seconds control signal with a high-level signal duration of 14 (13.9 ... 14.1) seconds can be sent to the lubricator from the external control system (PLC).

● After the control signal, the following automatic checks are carried out by the integrated microelectronics of the lubricator:

- + If this internal check is **successful**, the output signal at the lubricator changes from a low-level to a high-level signal, the fault is thus acknowledged, and the lubricator is ready again.
- If this internal check is **not successful**, the lubricator continues sending a low-level output signal. The error still applies. For further measures in this case, refer to: Chapter 8.3.4.

ⓘ Not before >3 seconds after the high-level output signal is active again at PIN 4, the control signal can be sent by the external control system (PLC). In the meantime, the lubricator does not process any control signals!

ⓘ Irrespective from the general possibility of remote error acknowledgment, the cause of every error message must be identified and corrected.

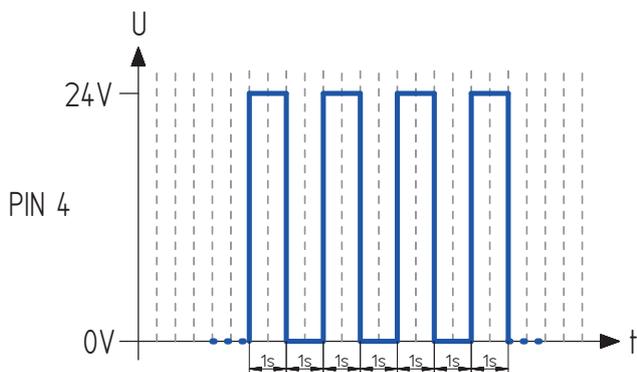
8.3 Output signals – external control system (PLC)

Designation	Output signal (PIN 4)	Detail
Ready	High, permanent	Chapter 8
Control signal received	High, permanent	Chapter 8
Dispensing	Low, 10...18 seconds	Chapter 8
Empty cartridge	0.5Hz square-wave signal, permanent	Chapter 8.3.1
Fault	Low, permanent	

If a permanent low-level output signal (0V) is active at PIN 4 for more than 3 seconds and no dispensing is currently executed by the lubricator, an error occurred at the lubricator. The signal only indicates that an error occurred at the lubricator. The cause must be identified and corrected by the operator. Chapters 8.3.2, 8.3.3 and 8.3.4 provide procedures and possible causes for the error messages at the pump.

8.3.1 Empty cartridge

The lubricator is equipped with a sensor recognizing when the lubricant cartridge is empty. If the cartridge is empty, the conveying of lubricant by the lubricator is interrupted. This way, it can be ensured that no air enters the lubricator or lubricant lines. The empty message is sent to the external control system (PLC). For this, a dedicated and unique output signal can be easily, quickly and reliably recognized by the external control system (PLC).



Description:

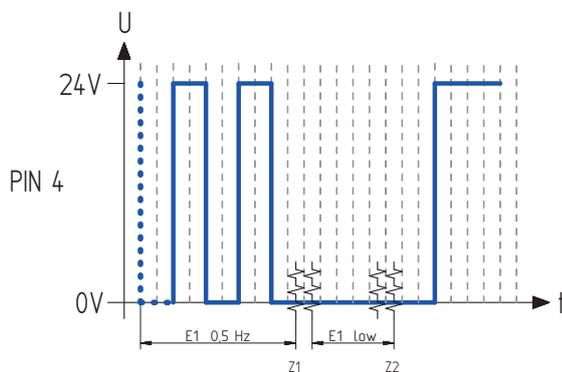
✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

● The empty signal can only occur directly after dispensing.

● Acknowledgment of the empty signal is not necessary nor possible. Troubleshooting measures are described in chapter 9.2.

ⓘ Until the empty cartridge is removed, the lubricator does not process any control signals.

The transfer of the output signals when changing a cartridge at the switched-on lubricator is illustrated and described below:



Z1: Removal of empty cartridge
 Z2: Connection of new cartridge

Description:

✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

● The empty cartridge occurred after dispensing, the output signal of the lubricator is the 0.5Hz square-wave signal (empty signal) (0/+24V).

● Z1 indicates the time the empty cartridge is removed. The output signal of the lubricator now changes from a 0.5Hz square-wave signal to a permanent low signal (0V).

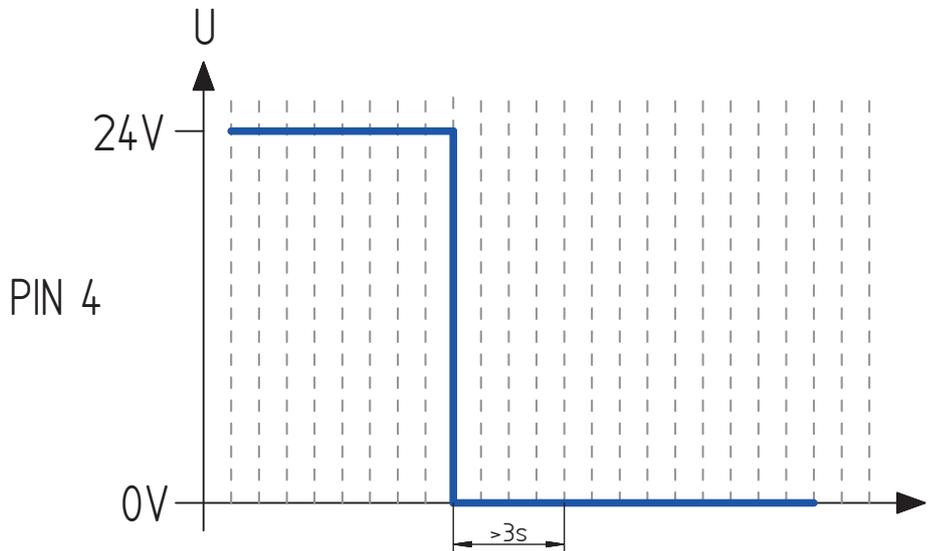
● Z2 indicates the time a new full cartridge is connected. The output signal of the lubricator now changes from the permanent low signal (0V) to a permanent high signal (+24V). This way, the lubricator signals to the external control system (PLC) that it is ready again.

● If the empty cartridge signal has occurred during execution of the 12-seconds control signal, the remaining strokes are executed after attachment of the new cartridge.

ⓘ Until all errors are corrected, the lubricator does not process any control signals.

8.3.2 Overload error

During dispensing, the overload error indicates a hydraulic overload, i.e. if the maximum pressure is exceeded.

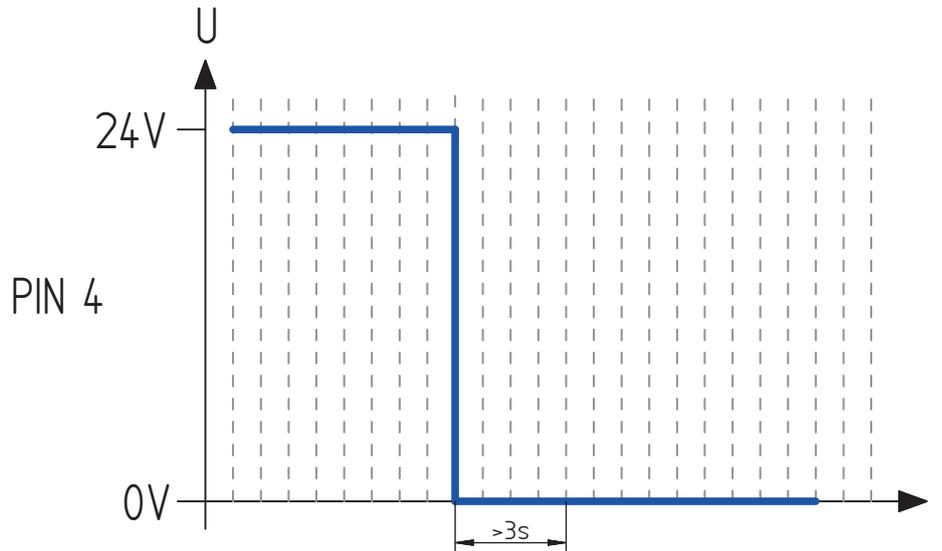


Description:

- ✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.
 - ✓ Directly before the "overload" error occurs, the lubricator was successfully activated by the external control system (PLC) and has attempted to execute dispensing.
 - When the maximum admissible pressure is reached during/after dispensing, the lubricator sends a permanent low-level output signal (0V) at PIN 4 to the external control system (PLC).
 - Check the connection lines between the lubricator and the supplied lubrication points and correct any causes.
 - The overload error must be acknowledged with the 14-seconds control signal (chapter 8.2.5) after correction of the cause(s).
- ⓘ Until all errors are corrected, the lubricator does not process any control signals.

8.3.3 Undervoltage/overvoltage error

The undervoltage/overvoltage error indicates that the voltage supply of the lubricator is not within the required parameters.



Description:

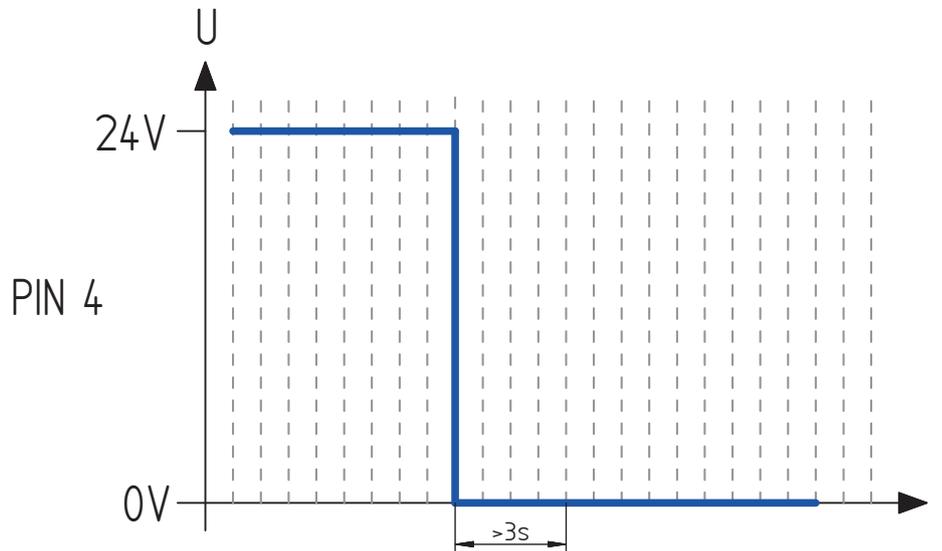
✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

- If the supply voltage is too low, the lubricator sends a permanent low-level output signal (0V) at PIN 4 to the external control system (PLC).
- Check the supply voltage and compare it with the parameters specified in the technical data of the lubricator.
- The undervoltage/overvoltage error must be acknowledged with the 14-seconds control signal (chapter 8.2.5) after correction of the cause(s).

ⓘ Until all errors are corrected, the lubricator does not process any control signals.

8.3.4 Fatal error

The error E4 (fatal error) indicates that the integrated microelectronics have recognized a fatal error and that the lubricator is not working within the permissible parameters. This may be caused by mechanical, electronic or other defects.



Description:

✓ The lubricator is properly connected both to an external control system via the electrical interface and to the voltage supply.

- The (fatal) error E4 was recognized during (internal) diagnosis.
- The error E4 can have different causes:
 1. Increased voltage for a short time, 28...30V, and too short motor runtime.
 2. The connected supply voltage was too low and the motor runtime too long.

In these cases, the error is corrected by switching the lubricator off and on again. Important! Between switching the lubricator off and on, 60 seconds must be waited.

If the error E4 still persists, disassemble the lubricator and return it with the lubricant cartridge and a description of the error to **WITTENSTEIN alpha GmbH**.

ⓘ Do not open the lubricator without permission! Observe the applicable information and regulations for intended use (chapter 2.5) and warranty (chapter 2.6) specified in this manual!

9. Maintenance and disposal

- Before carrying out any maintenance or work, please note the general safety instructions (see chapter 2) and observe all applicable local and operational safety regulations.
- Do not bypass or deactivate any safeguards without authorization!

9.1 Maintenance schedule

The following maintenance schedule for the lubricator must be observed:

Maintenance	Commis- sioning	After 500 hours or 3 months	Annually	If necessary
Cleaning	x	x	x	x*
Visual inspection	x	x	x	x*
Cartridge change	x**		x***	x*

* Depending on application conditions and lubricant consumption

** Depending on the delivery condition (ordered version)

*** Recommended after 2 years at the latest

9.1.1 Visual inspection

- Check the entire lubrication system (lubricator and any connected accessories including lines and distribution) by careful visual inspection for external damage (e.g. loose lines).
- Check the condition of the lubrication point for correct lubricant supply.
- Replace damaged or defective parts immediately to ensure a continuous and permanent lubrication.
- Check the fill level in the cartridge on the lubricator.
- Check any error messages at the lubricator and correct the causes respectively.

9.1.2 Cleaning

- Clean the lubricator by suitable means (e.g. absorbent cloths) to remove dirt.



NOTICE

Among other things, compressed air can lead to damage to the seals of the lubricator and to contamination of the lubricator or lubricant by dirt and particles.

- Do not use any compressed air for cleaning of the lubricator.

9.1.3 Recommissioning

- Reinstall all safeguards and make sure that all tools have been removed from the hazard area.
- Make sure that the lubricator is activated.
- Carry out a "quick check" (test run) with the 2-seconds signal (chapter 8.2.1).

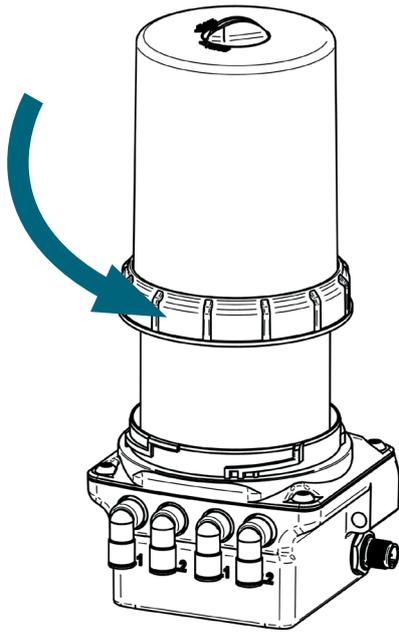
9.2 Cartridge change

	<p style="text-align: center;">NOTICE</p> <p>Already opened lubricant cartridges must not be reattached to the lubricator, as the integrated stroke counter of the lubricator is automatically reset by the cartridge sensor after a cartridge is removed.</p> <ul style="list-style-type: none"> ■ Always use full lubricant cartridges.
	<p style="text-align: center;">NOTICE</p> <p>Only use original lubricant cartridges with lubricants approved by the manufacturer.</p> <ul style="list-style-type: none"> ■ Observe the maximum storage time of lubricants filled in cartridges.
	<p style="text-align: center;">NOTICE</p> <p>Refilling of empty or open lubricant cartridges is not possible.</p>
	<p style="text-align: center;">NOTICE</p> <p>Make sure that the same lubricant is used in the new cartridge as already used before. Make sure that only cartridges with the same capacity are used.</p> <ul style="list-style-type: none"> ■ Compare the information on the lubricant cartridge.

The change of lubricant cartridges at the lubricator is very easy and only requires five steps.

The cartridge only needs to be changed if it is empty or if the useful life of the lubricant was exceeded. Cartridges can be changed during normal operation of the lubricator. Besides changing the cartridge, no additional measures are necessary!

✓Empty cartridge at the lubricator.



1. Removal the top part from the drive unit of the lubricator.

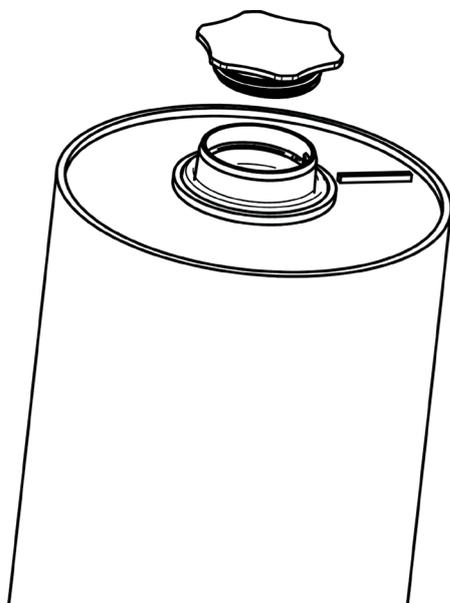
- Turn the union nut counter-clockwise to remove the top part from the drive unit.

ⓘ Ensure that the work is carried out under clean conditions. Dirt and particles must not enter the lubricant inlet. If necessary, carry out any cleaning before (chapter 9.1.2).

2. Removal of empty cartridge.

- Turn the lubricant cartridge counter-clockwise to remove it from the lubricator and dispose of it.

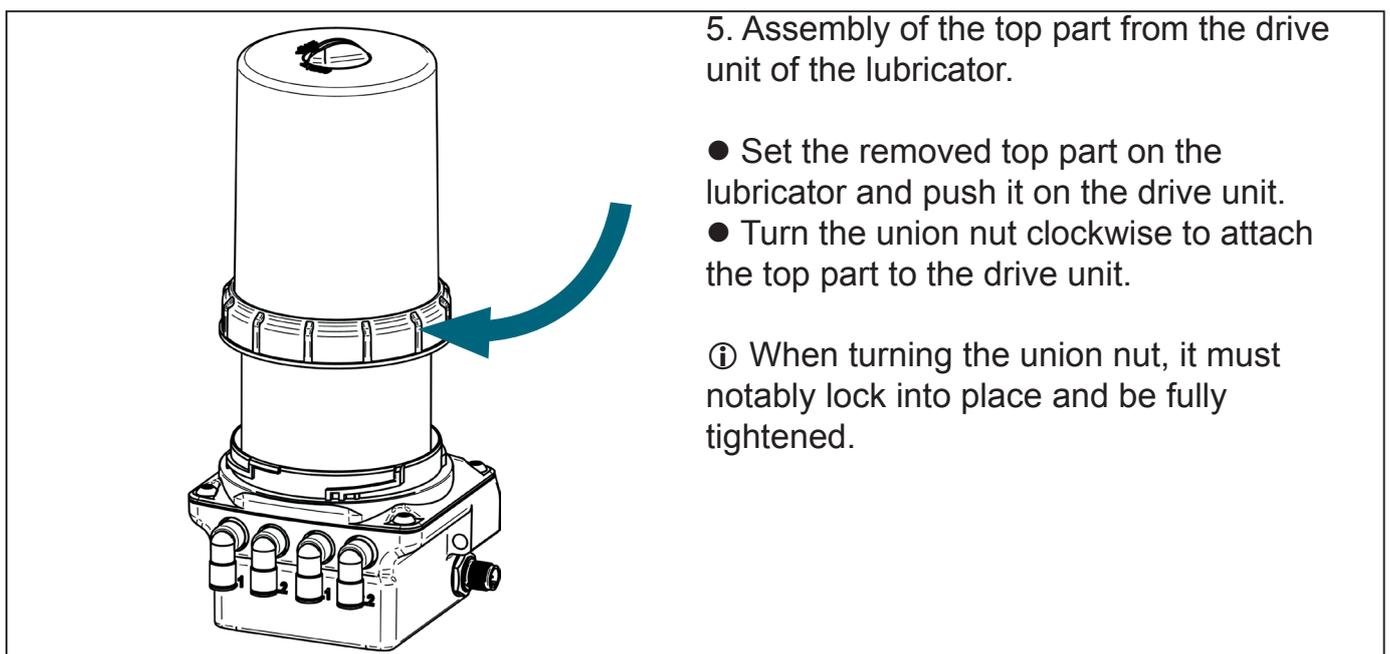
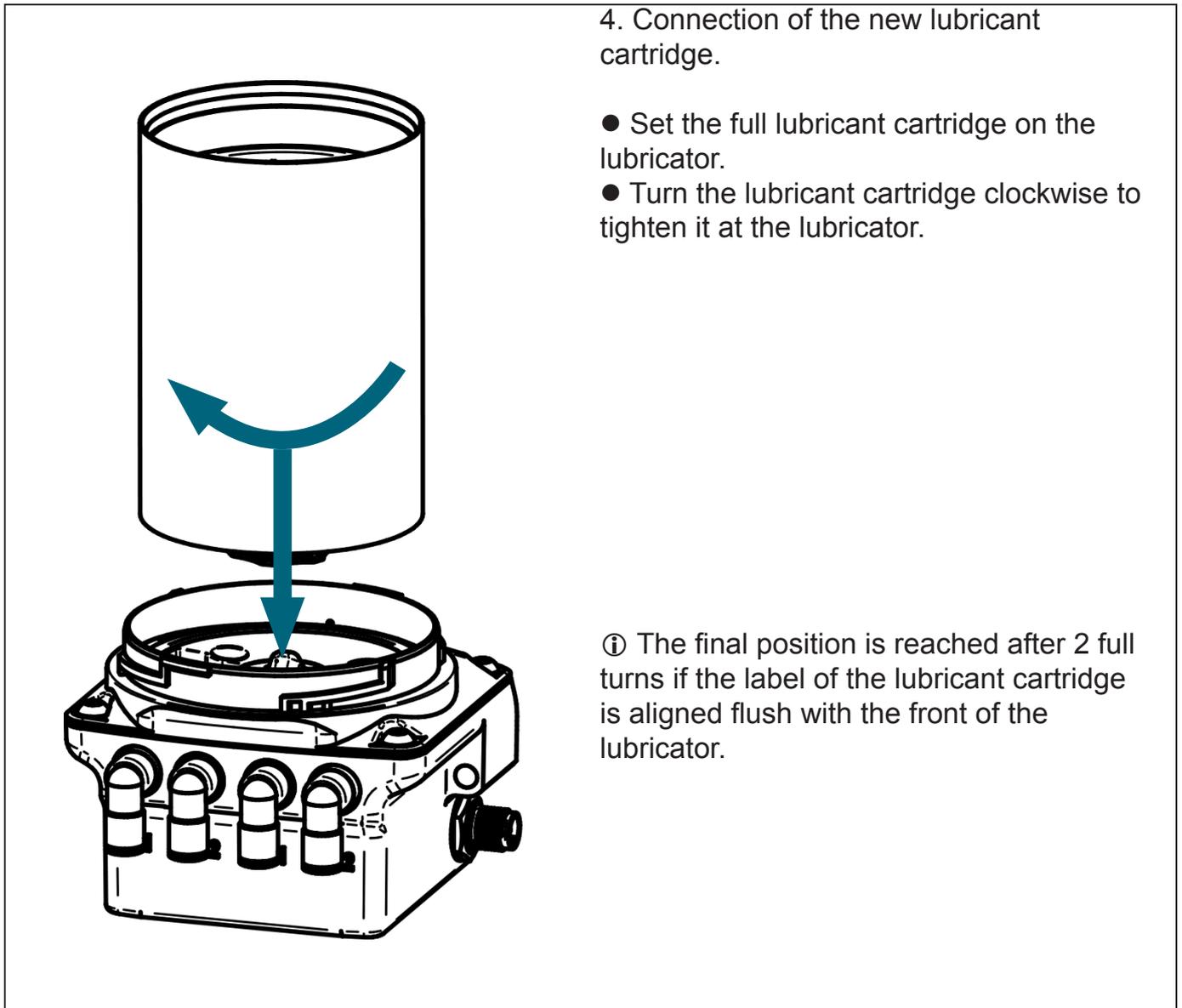
ⓘ Ensure that the work is carried out under clean conditions. Dirt, fluids and particles must not enter the cartridge.



3. Unscrewing the cartridge cap.

- Turn the cap of the lubricant cartridge counter-clockwise to open it and remove it.

ⓘ Ensure that the work is carried out under clean conditions. Dirt, fluids and particles must not enter the cartridge.



- All work must be carried out according to the provided description.
- ➡ If an error was indicated by the return signal before the cartridge change, the display goes off. Separate acknowledgment is not required.
- ① If the empty cartridge occurred during a dispensing cycle (conveying), it is automatically interrupted and continued after the work is completed.

9.3 Disposal

- For disposal of the lubricator as well as any empty or opened cartridges, applicable national regulations must be observed.
 - For disposal, the respective safety data sheets and disposal instructions for the individual components must be observed.
- ① Refilling of empty lubricant cartridges is not possible.

9.4 Lubricants

Only use lubricants approved by WITTENSTEIN alpha GmbH in dedicated original cartridges exclusively developed for the lubricator.

	NOTICE
	The lubricants used depend on the individual application. The respective designation can be found on the label of the cartridge.

For further information about lubricants, documentation and safety data sheets, please contact WITTENSTEIN alpha GmbH directly.

9.5 Line lengths

In general, the lubricator should be installed as closely as possible to the device to be supplied (lubrication point). Ideally, this should be directly at the lubrication point. If this is not possible due to space restrictions or reasons regarding accessibility, lines can be used between the lubricator and the lubrication point (e.g. distribution).

If the lubricator cannot be installed directly at the lubrication point, please contact the manufacturer to verify your application.

Due to variations in temperature, the used grease, hoses and accessories, no general statement can be made about the possible length of any hoses at the lubricator.

9.6 EC/EU declaration of conformity



Declaration of EG conformity

According to the Machinery Directive 2006/42/EG of 2006, May 17th

Herewith the manufacturer
TriboServ GmbH & Co. KG, Gelthari-Ring 3, D-97505 Geldersheim,
declares that the following lubricating systems

FlexxPump4 – D211, D212, D222, D223, D224, D211A, D212A, D222A, D223A, D224A
FlexxPump4 – D411, D412, D422, D423, D424, D411A, D412A, D422A, D423A, D424A
as well as the FlexxPump4 – D... with the suffix OIL

delivered by us, concerning design and construction as well as the model put into circulation,
comply with the EG directives 2006/42/EG.

In particular, the following harmonized standards were applied:

EN 12100:2011-03 Safety of machinery

According the EG directive on Electromagnetic Compatibility 2014/30/EU

The manufacturer herewith declares that the following lubricating systems

FlexxPump4 – D211, D212, D222, D223, D224, D211A, D212A, D222A, D223A, D224A
FlexxPump4 – D411, D412, D422, D423, D424, D411A, D412A, D422A, D423A, D424A
as well as the FlexxPump4 – D... with the suffix OIL

delivered by us, concerning design and construction as well as the model put into circulation,
comply with the above mentioned EU directive.

In particular, the following harmonized standards were applied:

EN 61000-6-2, EN 61000-6-4 Electromagnetic Compability (EMC)

Authorized representative for the compilation of technical documentation:

Dr.-Ing. Michael Weigand
General Manager
TriboServ GmbH & Co. KG
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Geldersheim, 31.01.2020



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