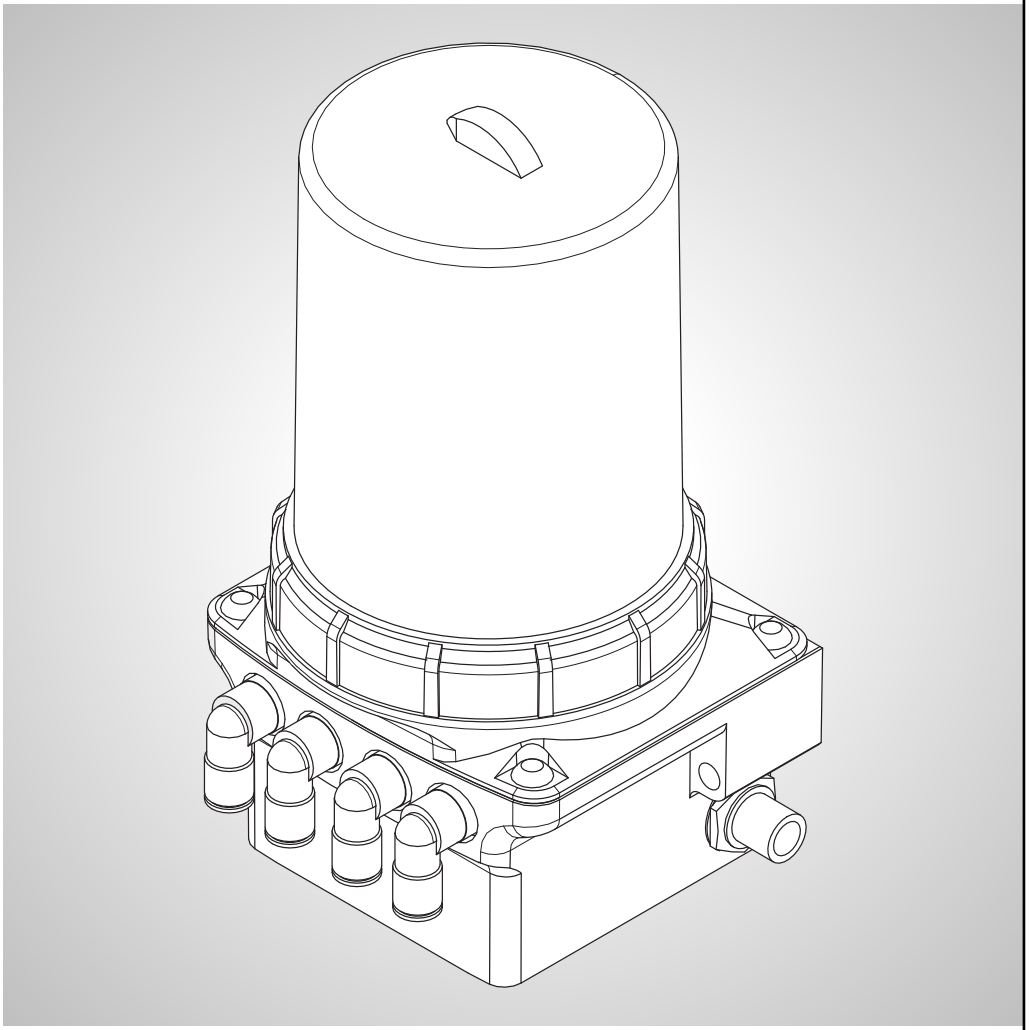
GÜDEL

OPERATING MANUAL

Lubrication system FlexxPump4 D



Project / Order:	B1X.xxxxxxxxx-xxxx
Bill of materials:	10xxxxxx
Serial number:	
Year of manufacture:	2021

GÜDEL

Translation of the original instructions

This manual contains standard illustrations that may deviate from the original. In the case of special models, options, or technical changes, the scope of delivery may differ from the descriptions here. Reprinting the instructions, in whole or in part, requires our permission. Subject to change due to technical improvements.

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Revision history

Version	Date	Description
2.0	04.03.2021	Added: • Transport ➲ 🗎 36 • Input signals external control ➲ Chapter 5.5.2, 🗎 46 • Output signals external control ➲ Chapter 5.5.3, 🗎 53 • Maintenance intervals ➲ 🗎 76 Structure modified: • Actuate ➲ Chapter 5.5, 🗎 44 • Maintenance tasks ➲ 🗎 76
1.0	26.11.2020	Basic version

Tab. -1 *Revision history*

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1 General

Read the entire manual before working with the product. The manual contains important information for your personal safety. The manual must be read and understood by all persons who work on the product in any of the product life phases.

1.1 Further applicable documentation

All documents delivered with this manual are further applicable documentation. They must be observed in addition to this operating manual for the safe handling of the product.

Document	Explanation	Target readership
FAQ: FlexxPump		• Sales / project management • Software engineer • Maintenance technician • Service technician • Fitter • Operating company • Electrical engineer
Module Catalog	only available in German, French and English	Sales / project management
Racks / Pinions Catalog	Only available in English and Russian	Sales / project management
Quick guide to checking lubrication system		• Maintenance technician • Service technician • Fitters
Lubrication Control Requirements	Only available in English	Software engineer

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Document	Explanation	Target readership
Lubrication quantity calculator	• Only available in English • Only available as Microsoft Excel	• Sales / project management • Software engineer
Software modules for standard control systems	Only available as ZIP file	Software engineer

Tab. 1-1 *Other applicable documentation*

1.2 Purpose of the document

This manual describes the following product life phases of the product:

- Commissioning
- Operation
- Maintenance
- Repairs
- Disposal

The manual contains the information required for using the product as intended. It is an essential component of the product.

The manual must be available at the product operation site throughout the entire service life of the product. If the product is sold, the manual must be transferred to the new owner.

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1.3 Explanation of symbols/abbreviations

The following symbols and abbreviations are used in this manual:

Symbol/Abbreviation	Use	Explanation
➲	For cross-reference	See
🗎	Possibly for cross-reference	Page
Fig.	Designation of graphics	Figure
Table	Designation of tables	Table
	In the tip	Information or tip

Tab. 1-2 Explanation of symbols/abbreviations

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2 Safety

2.1 Hazard symbols in the manual

2.1.1 Hazard warnings

The hazard warnings are defined for the following four types of danger levels:

⚠ DANGER

DANGER

DANGER identifies a hazard with high risk that could lead to serious injury or death.

⚠ WARNING

WARNING

WARNING identifies a hazard with medium risk that could lead to moderate injury.

⚠ CAUTION

CAUTION

CAUTION identifies a hazard with low risk that could lead to slight injury.

NOTE

NOTE

NOTE identifies a hazard that can lead to property damage.

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2.1.2 Explanation of warning symbol

Hazard warnings for personal injuries contain the symbol of the corresponding hazard.

Symbol	Explanation of symbols
	Hazards due to general causes
	Hazards due to environmental pollution
	Hazards due to dangerous electrical voltage

Tab. 2-1 *Explanation of warning symbol*

2.2 Product safety

Residual danger

The product is built using state-of-the-art technology. It was designed and constructed in accordance with the accepted safety regulations. However, some residual danger remains during its operation.

There is danger to the personal safety of the operator as well as for the product and other property.

Use

When operating the product, observe this manual and ensure that the product is always in perfect working order.

The product must never be modified or used in a manner contrary to its intended use. ➲ 25

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2.3 Danger areas

The danger area is the area at a product and/or in its surroundings where there is a potential of danger to the life or health of persons, or to the environment, or damage to property. The operator must secure the danger area (protective fence/sensors). No person is allowed access to the danger area. All safety provisions and hazard symbols at the product must be obeyed. The general safety provisions must be observed and complied with.

2.3.1 Safety and monitoring equipment

⚠ DANGER

Missing safety and monitoring equipment

Missing or changed safety and monitoring equipment could lead to serious or fatal injuries!

- Do not dismantle, bridge, or change any safety or monitoring equipment
- After commissioning, attach all safety and monitoring equipment correctly
- Ensure that the safety and monitoring equipment is closed during operation

You will find information on the separating safety and monitoring equipment in the documentation of the entire plant.

The operator is responsible for ensuring safe conditions in the vicinity of the product. In particular, he must ensure compliance with the general safety regulations, guidelines and standards. Before commissioning, the operator must check if all the safety measures have been met. They must cover all hazards. This is the only way to ensure that application of the product conforms to CE regulations.

According to the machinery directive, the safety and monitoring equipment must:

- Correspond to best practices
- Comply with the required safety category

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2.4 Personnel

The generally accepted occupational safety rules must be observed and implemented.

2.4.1 Personal safety equipment

The operator is responsible for providing specialists with personal safety equipment.

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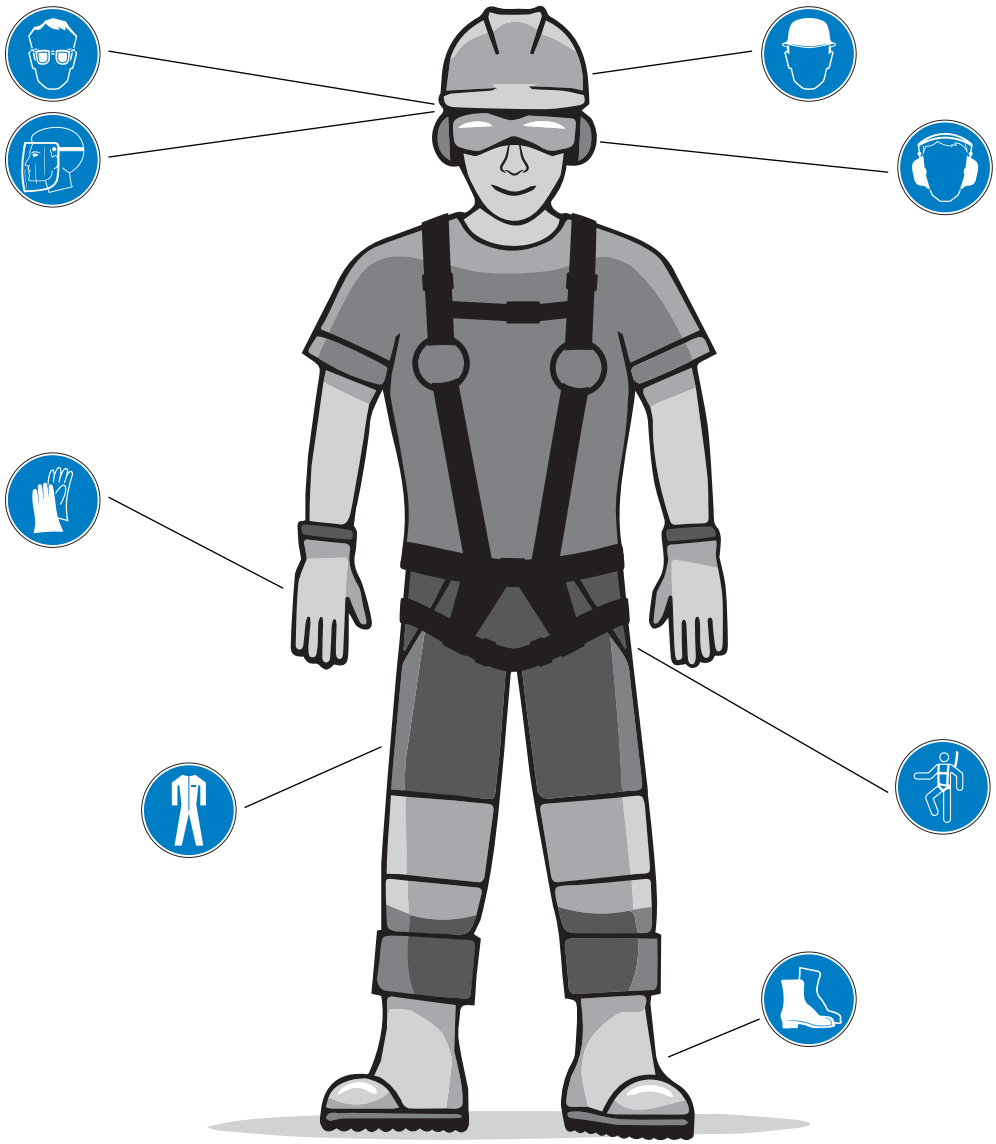

Fig. 2-1 *PSA (personal safety equipment)*

- *Always wear safety helmet*
- *Always wear protective goggles*
  Wear welding goggles during welding work
- *Wear hearing protection during operation and when working with compressed air*
- *Wear face protection when working with compressed air and hot oil*
- *Wear fall protection system when working from 2 m height.*
- *Always wear safety shoes*
- *Always wear protective clothing*
- *Wear safety gloves when dismantling hot parts and when working with lubricants and detergents*

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2.4.2 Personnel qualifications

⚠ DANGER

Lack of safety training

Incorrect behavior of untrained or insufficiently trained technicians can result in severe or fatal injuries!

Before technicians work on safety-related aspects of the product:

- Ensure that the technicians are trained with regard to safety
- Train and instruct the technicians specifically for their area of responsibility

Only appropriately trained and authorized technicians are allowed to work on the product.

Persons are authorized if:

- they are familiar with the relevant safety regulations for their area of responsibility
- they have read and understood this manual
- they meet the requirements for an area of responsibility
- they were assigned an area of responsibility by the operator

The technician is responsible to third parties in his area of responsibility.

During a training session or instruction, the technician may only work on the product under the supervision of an experienced manufacturer's technician.

2.4.2.1 Operating companies

The operating company is responsible for ensuring that:

- the product is used as intended
- the product is sufficiently lubricated at all times
- all safety aspects are complied with
- the product is put out of operation if the functioning of the safety equipment is not fully guaranteed
- the technician working on the product is appropriately trained
- the technician is provided with personal protective equipment
- the operating manual is available to the technician at the operation site of the product at all times

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- the technicians are kept up-to-date regarding best practice
- the technicians are informed about technical progress, modifications, and the like.
- the contracted cleaning staff only work under the supervision of a maintenance technician

2.4.2.2 Fitters

The fitter:

- has very good mechanical and/or electrical knowledge
- is flexible
- has assembly experience

2.4.2.3 Commissioning technicians

The commissioning technician:

- has good programming knowledge
- has mechanical and/or electrical knowledge
- is flexible

The commissioning technician is responsible for the following tasks:

- commissioning the product
- testing the functions of the product

2.4.2.4 Operators

The operator:

- was trained and instructed by the operating company or the manufacturer
- has very good knowledge of the user interface and the operating elements
- has process knowledge which is specifically geared to the product

The operator is responsible for the following tasks:

- switching the control system of the product on and off
- creating production readiness
- monitoring the production process
- localizing minor malfunctions

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2.4.2.5 Manufacturer's technicians

The manufacturer's technician:

- is employed on site at the premises of the manufacturer or representative
- has very good mechanical and/or electrical knowledge
- has good software knowledge
- has maintenance, service and repair experience
- has experience with Güdel products

The manufacturer's technician is responsible for the following tasks:

- carrying out mechanical and electrical maintenance work according to instructions
- carrying out mechanical and electrical repair work according to instructions
- cleaning the product
- replacing spare parts
- localizing and fixing malfunctions

2.4.2.6 Maintenance technicians

The maintenance technician:

- was trained by the operating company or the manufacturer
- has very good mechanical and/or electrical knowledge
- has software knowledge
- has maintenance experience
- bears responsibility for the safety of the cleaning staff

The maintenance technician is responsible for the following tasks:

- carrying out mechanical and electrical maintenance work according to instructions
- cleaning the product
- replacing spare parts
- monitoring and instructing the cleaning staff in the safety zone during the cleaning process

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2.4.2.7 Service technicians

The service technician:

- was trained by the operating company or the manufacturer
- has very good mechanical and/or electrical knowledge
- has software knowledge
- has service and repair experience
- is flexible

The service technician is responsible for the following tasks:

- carrying out mechanical and electrical repair work according to instructions
- replacing spare parts

2.4.2.8 Disposal specialists

The disposal specialist:

- is able to separate waste
- is familiar with the country-specific disposal regulations
- has experience in environmentally-friendly disposal
- works carefully and safely

2.5 Product-specific hazards

⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

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2.6 Material safety data sheets (MSDS)

Safety data sheets contain safety information about the materials. They are country-specific. Safety data sheets are issued, for example, for materials such as oils, greases, cleaning agents, etc. The operating company is responsible for obtaining safety data sheets for all materials used.

Safety data sheets can be obtained as follows:

- Suppliers of chemicals usually supply their substances together with safety data sheets
- Safety data sheets are available on the Internet.
  (Enter "msds" and the name of the material in a search engine. Safety information about the material will be displayed.)

Read the safety data sheets carefully. Follow all the instructions. We recommend that you store the safety data sheets for future reference.

The safety data sheet for Güdel H1 can be found in the download area of our company Web site http://www.gudel.com

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3 Product description

3.1 Use

3.1.1 Lifetime

The lifetime of the product is 20,000 operating hours.

3.1.2 Intended use

The system is designed exclusively for lubricating Güdel linear guideway and Güdel gear teeth. Be sure the hydraulic system is installed correctly ➲ 39

Any other or additional use is not considered to be use in the intended manner. The manufacturer assumes no liability for any resulting damage. All risks are borne solely by the user.

3.1.3 Non-intended use

The product is not intended:

- for lubrication of runners, bearings, or other elements
- for lubrication of elements in or on automobiles
- for operation in potentially explosive areas
- for operation outside the performance limits specified by Güdel
- for using lubricants with properties other than the ones specified

Any use other than the specified intended use will be considered improper use and is prohibited!

Do not make any modifications to the product.

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3.2 Product designation

3.2.1 Type plate

The product has a type plate.

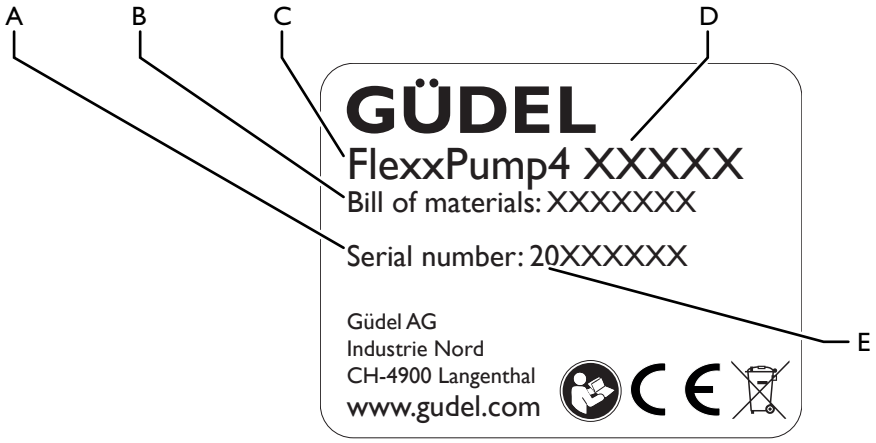

Fig. 3-1 *Type plate*

A	*Serial number*	*D*	*Pump type*
B	*Item number*	*E*	*Build year (the first two digits of the serial number)*
C	*Product name*		

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3.2.2 Position of the type plate

The type plate is attached to the right side of the casing. The hydraulic outputs are indicated by engraved numbers.

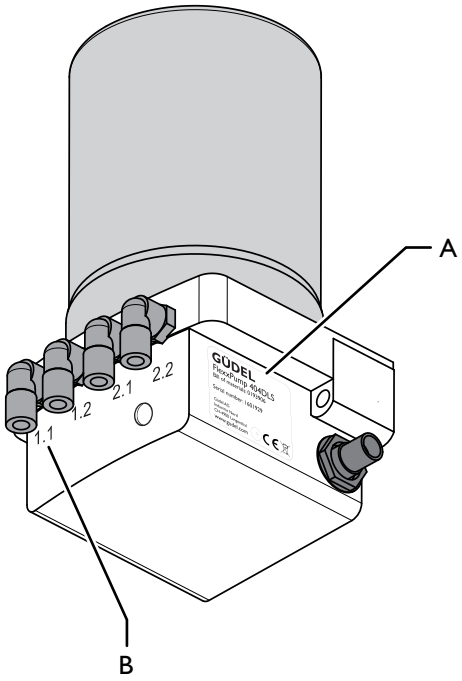

Fig. 3-2 *Position of the type plate*

A *Type plate*

B *Number of the hydraulic output*

3.3 Technical data

For specific information on the product, refer to the respective drawings as well as the documentation on the complete system.

Emission sound pressure level

The emission sound pressure level depends on the machine properties and the operating conditions. Generally the emissions sound pressure level L_{pA} is ≤ 80dB(A), measured at a distance of 1 m from the safety fence and 1.6 m above ground level. The measurement is performed according to the ISO 11202 standard. The measured value is time-averaged over a machine specific cycle and offset with correction factors for room and environment noise correction. The measured value contains measuring uncertainty of +/- 4dB(A) (accuracy grade 3) and applies for a single machine, measured separately.

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3.3.1 FlexxPump

3.3.1.1 Dimensions and connections FlexxPump4 D

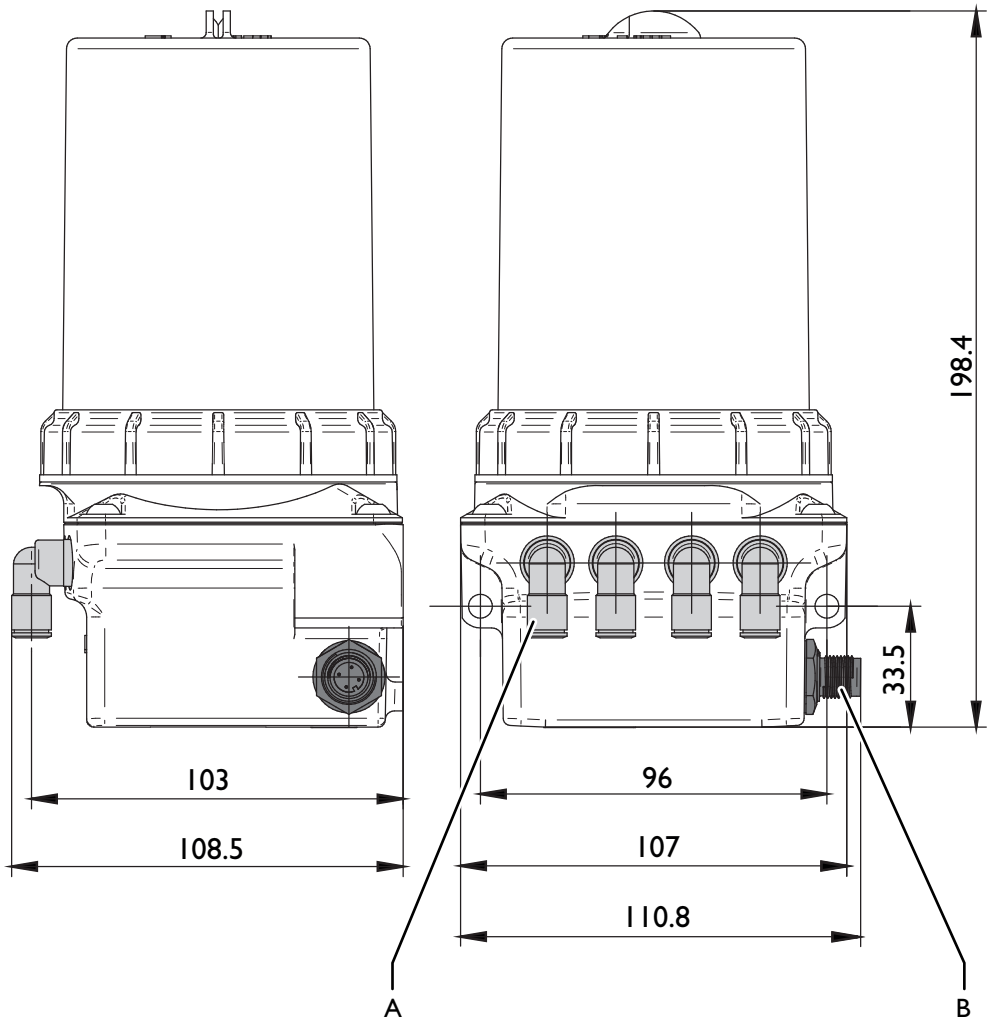

Fig. 3-3 *Dimensions and connections FlexxPump4 D*

A *Hydraulic output*

B *Connection plug M12x1*

Connections

Hydraulic:

- Four connections for lubrication lines with a diameter of 6/3 mm

Electric: The four-pole connection size M12x1 transmits the following signals:

- Control signals
- Operating voltage

Interfaces

The FlexxPump4 D features an integrated microprocessor. It is controlled via a programmable logic controller (PLC).

Operating voltage

Operating voltage	Peak power I_{max}	Standby current $I_{S-tandby}$
24 VDC	300 mA	<25 mA

Tab. 3-1 *Operating voltage*

3.3.1.2 Temperature ranges

The following temperature ranges and humidity apply:

Product life phase	Temperature range	Air humidity
Transport	-10 to +60 °C	
Standard operation*	-15 to +60 °C	Up to and at 85 %, condensation formation is not permissible
Bearing	+5 to +30 °C	Up to 75 %

Tab. 3-2 *Temperature ranges: FlexxPump*

*Application in a lower temperature range is possible upon consultation with Güdel.

3.3.1.3 IP protection class

The product conforms to the protection class IP54.

3.3.1.4 Operating pressure

The operating pressure is 70 bar and is monitored electronically by counter-pressure measurement.

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3.3.2 Splitter

3.3.2.1 Temperature ranges

The following temperature ranges and humidity apply:

Product life phase	Temperature range	Air humidity
Transport	-10 to +60 °C	
Operation	+10 to +80°C	Up to and at 85 %, condensation formation is not permissible
Storage	-10 to +40°C	Up to 75 %

Tab. 3-3 *Temperature ranges: Splitter*

3.3.2.2 Accuracy of the lubricant distribution

The accuracy of the lubricant distribution is ±10%. The accuracy is valid up to a pressure difference of less than 6 bar.

3.3.2.3 Minimum lubrication quantity

Splitters only function correctly if > 0.5 cm^3 of lubricant is produced at their input per lubrication cycle.

3.3.2.4 Maximum pressure

The maximum pressure at the input of splitters is 110 bar.

3.3.3 Lubricant amount

The lubricant cartridge contains 400 ml of lubricant. Running empty is monitored by integrated sensors.

3.3.4 Shelf life of Güdel H1 lubricant

The date of filling is shown on the lubricant cartridge. The Güdel H1 lubricant has a shelf life of two years from date of filling. This applies to sealed original containers stored under the required storage conditions.

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4 Design, function

4.1 Design

The product consists of the following components:
(Further information ➲ 39)

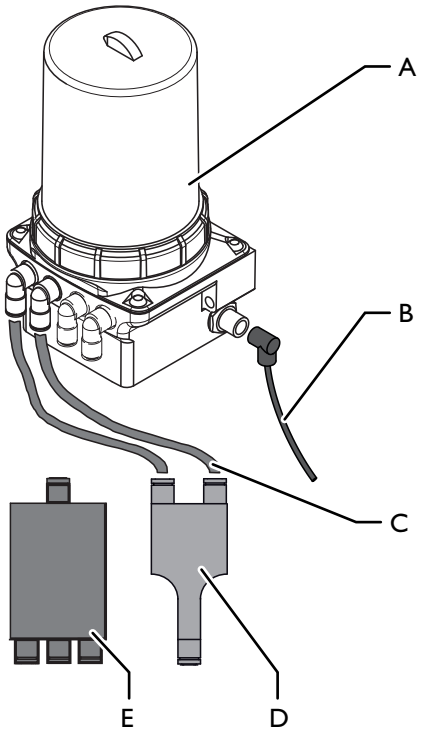

Fig. 4-1 *Design of FlexxPump lubrication system*

A	*FlexxPump*	*D*	*Y-segment (combines lubricants)*
B	*Connecting cable*	*E*	*Splitter (separates lubricants)*
C	*Lubrication line*		

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4.1.1 Detailed design of FlexxPump4 D

The product consists of the following components:

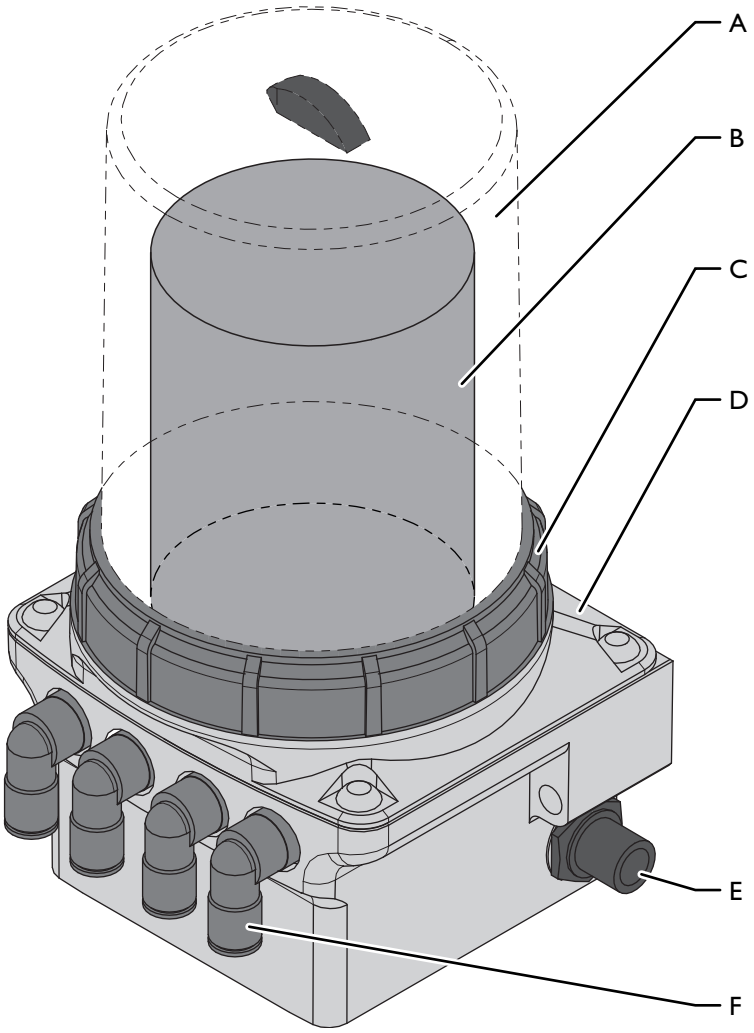

Fig. 4-2 *Detailed design of FlexxPump4 D*

A	*Covering*	*D*	*Casing*
B	*Lubricant cartridge*	*E*	*Connection plug for supply and control system*
C	*Union ring*	*F*	*Hydraulic output*

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4.2 Function

4.2.1 Functional description

The lubrication system serves to automatically lubricate Güdel components. The FlexxPump4 feeds the lubricant from the lubricant cartridge into the lubrication lines. Depending on the design, the lubricant is distributed through splitters, combined through Y-segments, or distributed directly to the lubrication areas. Rack and pinion are lubricated by the lubricating pinion The rail is lubricated by the lubricating element

The FlexxPump4 outputs a signal in case of overpressure, if the lubricant cartridge is empty, and for each piston stroke. This makes it possible to process such information further.

4.2.2 FlexxPump

A PLC (not included in the scope of delivery) feeds and controls the product. All signals are transmitted to the PLC.

4.2.3 Splitter

The quantity of lubricant at the input is distributed evenly between the outputs. The splitter only works in the direction of the arrow.

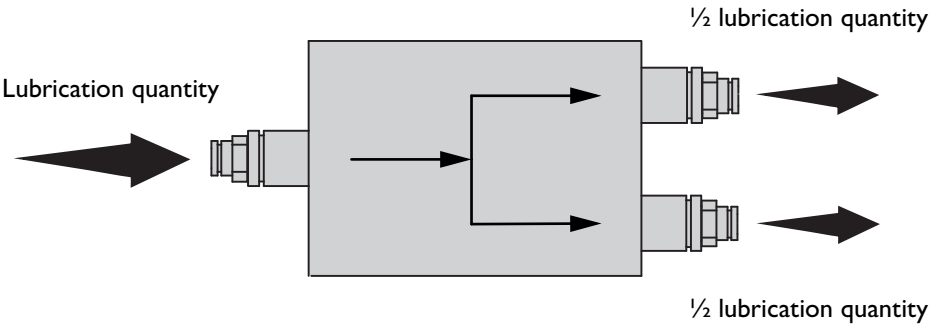

Fig. 4-3 *Function: Splitter, 2-fold*

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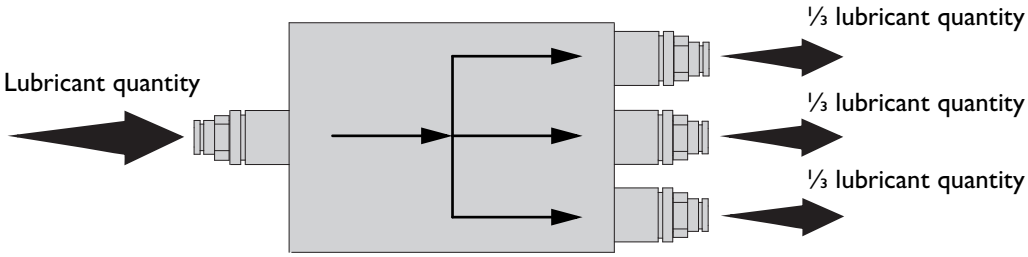

Fig. 4-4 *Function: Splitter, 3-fold*

4.2.4 Y-segment

The quantity of the lubricant at the inputs is combined at the output. The Y-segment only works in the direction of the arrow.

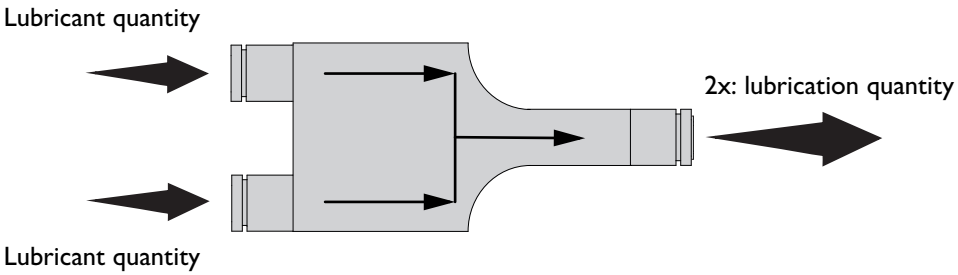

Fig. 4-5 *Function: Y-segment*

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5 Commissioning

5.1 Introduction

5.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 🗎 15
It concerns your personal safety!

⚠ DANGER

Missing safety and monitoring equipment

Missing or changed safety and monitoring equipment could lead to serious or fatal injuries!

- Do not dismantle, bridge, or change any safety or monitoring equipment
- After commissioning, attach all safety and monitoring equipment correctly
- Ensure that the safety and monitoring equipment is closed during operation

⚠ DANGER

Hazardous voltage

The product contains components that are energized with hazardous voltages. Touching these components will cause an electric shock. Electric shocks can be fatal!

Before working in the danger area:

- Switch off the superordinate main power supply
- Secure the superordinate power supply against being switched on again (main switch of complete system)
- Ground the equipment

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⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

NOTE

Improper transport

Improper handling of the crates can lead to transport damage!

- Do not tip over the crates
- Avoid heavy vibrations and shocks
- Observe the symbols on the packaging

5.1.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to commission the product.

5.2 Intermediate storage

Observe the storage conditions if the product needs to be stored for a certain amount of time before assembly. ➲ 🗎 107

5.3 Transport

Avoid strong impacts and shocks while transporting the lubrication system.

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5.4 Installing

5.4.1 Prerequisites

Dispose of the packaging in accordance with the local waste regulations.
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Checking the delivery

Check the content of the delivery by comparing it with the accompanying documents. Check the product for damage. Report transport damage promptly.

Interfaces

Check whether the necessary interfaces exist and are functional.
The following interfaces are needed:

- Lubricating pinion (lubricating the pinion and rack)
- Lubricating element (lubricating the rail)
- Connecting cable M12x1, 4-pole in the appropriate length
  (order information on the connecting cable ➲ Chapter 11, 117)
- PLC

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5.4.2 Installing the lubricant pump

The installation position of the lubrication system is not important.

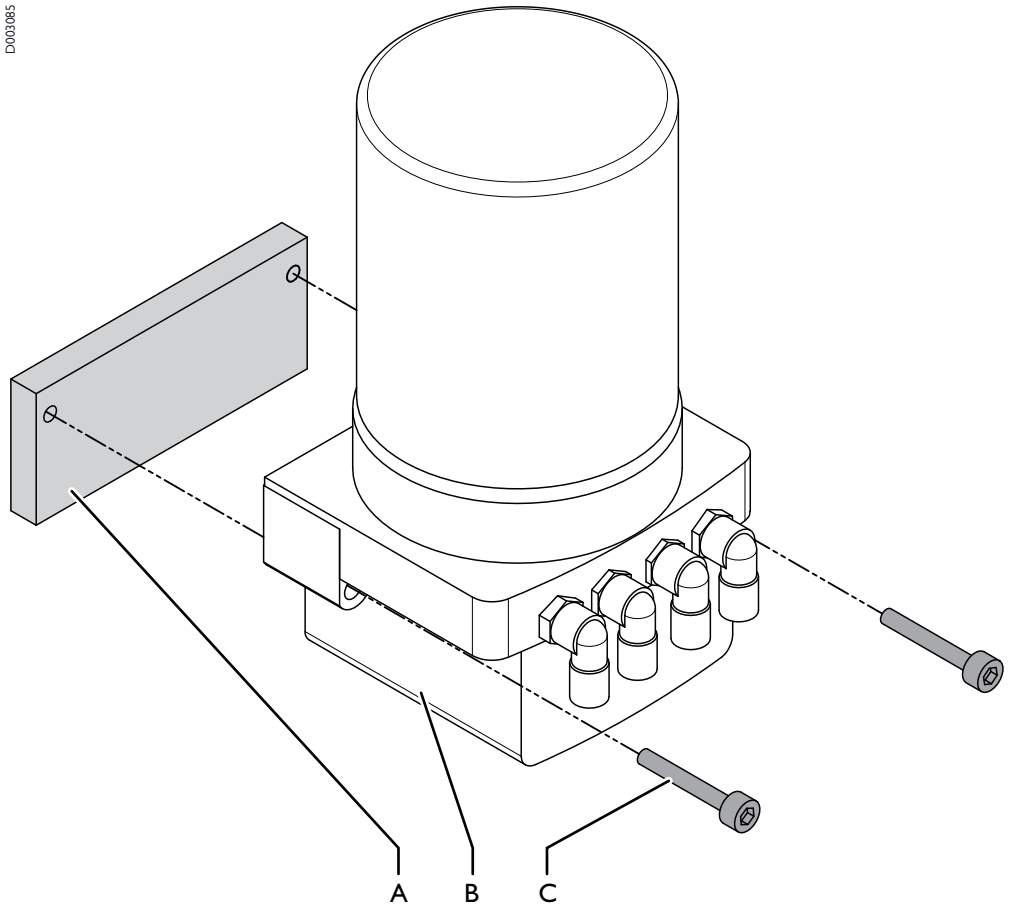

Fig. 5-1 *Installing the lubricant pump*

- *A* *Installation site*
- *B* *Lubricant pump*
- *C* *Screw*

Install the lubricant pump as follows:

1 Mount lubricant pump with two screws M6 L = 35 mm

The lubricant pump has been assembled.

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5.4.3 Connect hydraulics

NOTE

Material damage

Closing hydraulic outputs creates an overpressure. The overpressure can cause damage to the product.

- Do not close any hydraulic outputs

5.4.3.1 FlexxPump4 D 3-fold

Lubrication system with 3 lubrication points

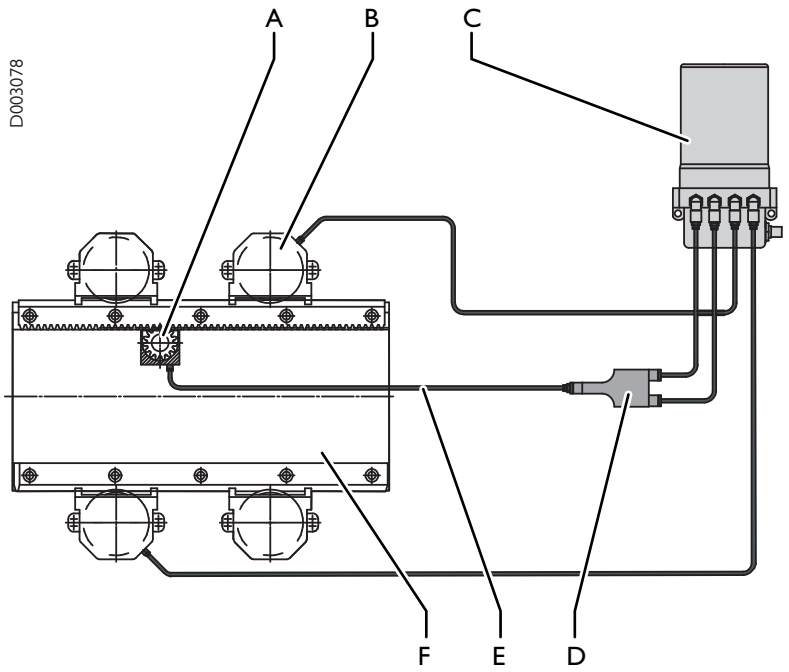

Fig. 5-2 *Design FlexxPump4 D 3-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*D*	*Y-segment*
B	*Lubricating element (not included in the scope of delivery)*	*E*	*Lubrication line hose diameter of 6/3 mm*
C	*FlexxPump4 D*	*F*	*1. Axis (not included in the scope of delivery)*

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5.4.3.2 FlexxPump4 D 6-fold

Lubrication system with 6 lubrication points

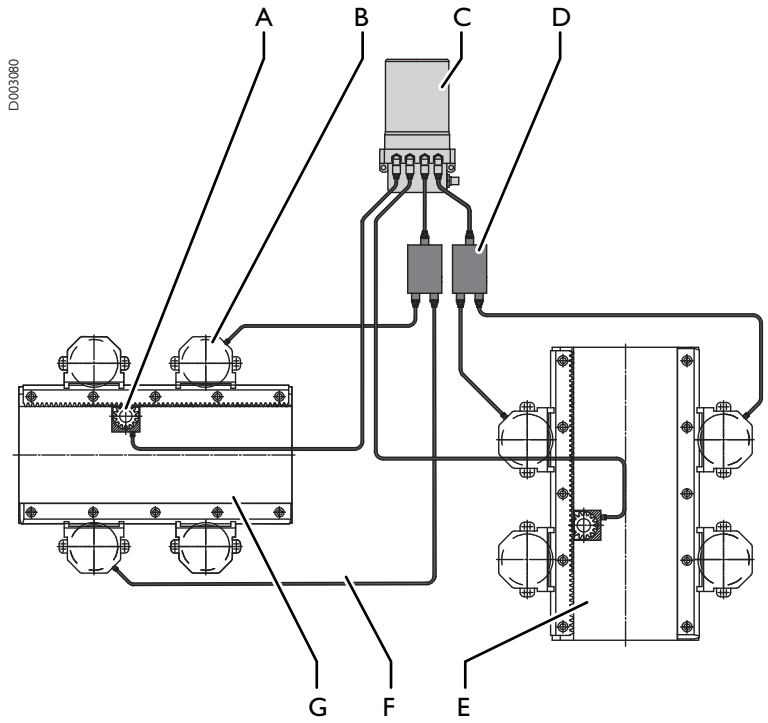

Fig. 5-3 *Design FlexxPump4 D 6-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*E*	*2. Axis (not included in the scope of delivery)*
B	*Lubricating element (not included in the scope of delivery)*	*F*	*Lubrication line hose diameter of 6/3 mm*
C	*FlexxPump4 D*	*G*	*1. Axis (not included in the scope of delivery)*
D	*Splitter*		

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5.4.3.3 FlexxPump4 D 9-fold

Lubrication system with 9 lubrication points

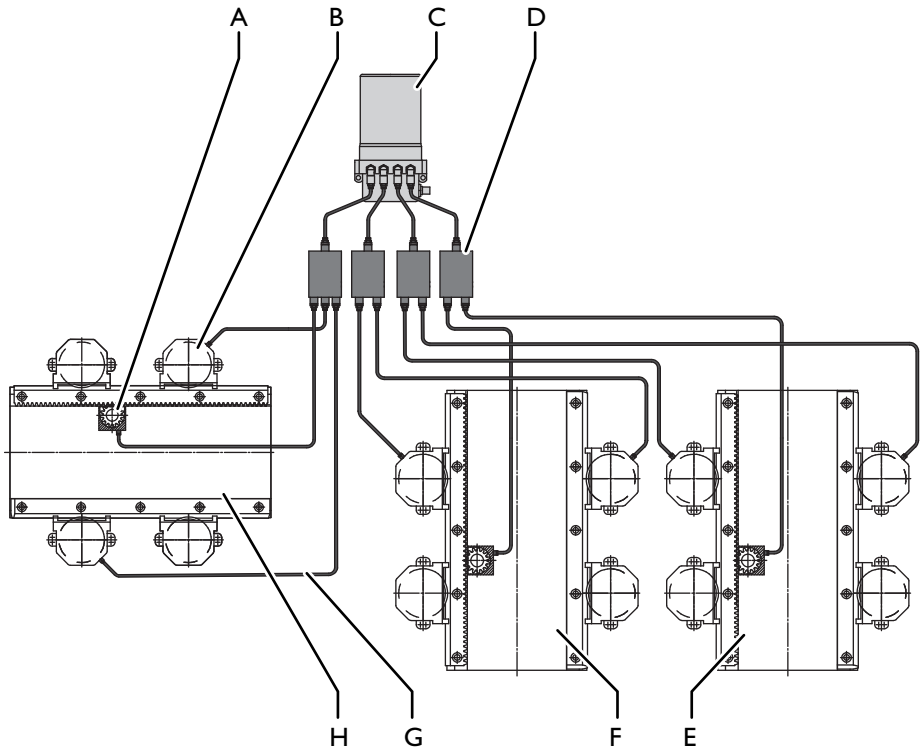

Fig. 5-4 *Design FlexxPump4 D 9-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*E*	*3. Axis (not included in the scope of delivery)*
B	*Lubricating element (not included in the scope of delivery)*	*F*	*2. Axis (not included in the scope of delivery)*
C	*FlexxPump4 D*	*G*	*Lubrication line hose diameter of 6/3 mm*
D	*Splitter*	*H*	*1. Axis (not included in the scope of delivery)*

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5.4.3.4 FlexxPump4 D 10-fold

Lubrication system with 10 lubrication points

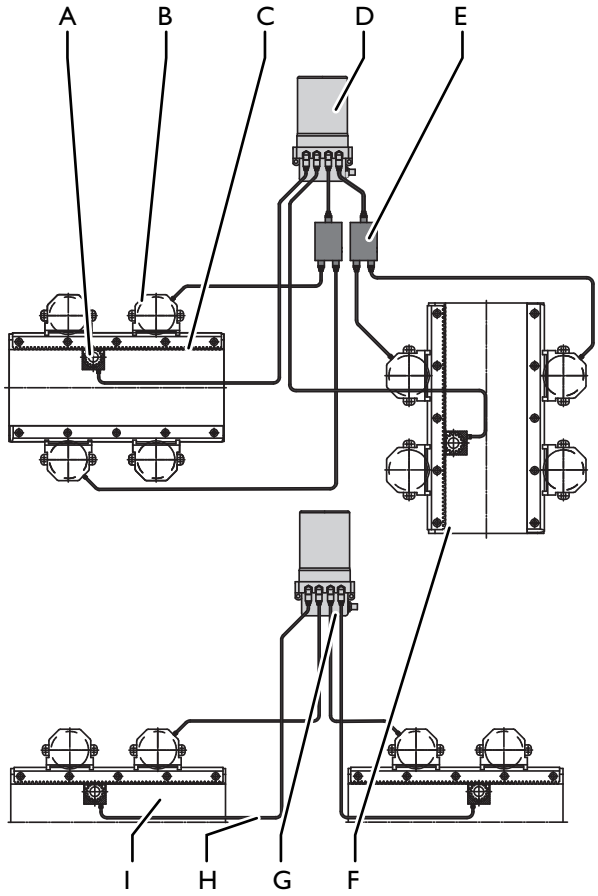

Fig. 5-5 *Design FlexxPump4 D 10-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*F*	*2. Axis (not included in the scope of delivery)*
B	*Lubricating element (not included in the scope of delivery)*	*G*	*2. FlexxPump4 D*
C	*1. Axis (not included in the scope of delivery)*	*H*	*Lubrication line hose diameter of 6/3 mm*
D	*1. FlexxPump4 D*	*I*	*3. Axis (not included in the scope of delivery)*
E	*Splitter*		

5.4.4 Connecting electrical equipment

⚠ DANGER

Faulty cabling

The available mains voltage (supply voltage) has to match the specifications on the rating plate. A faultily connected product can cause material damage, or serious or even fatal injuries.

- Check the deviation of the electrical circuit.
- Use only fuses with specified amperage.
- Wire the plug according to the diagram.
- Replace the damaged electric cable or plugs promptly
- Have electricians carry out the electric connection tasks

5.4.4.1 Connecting

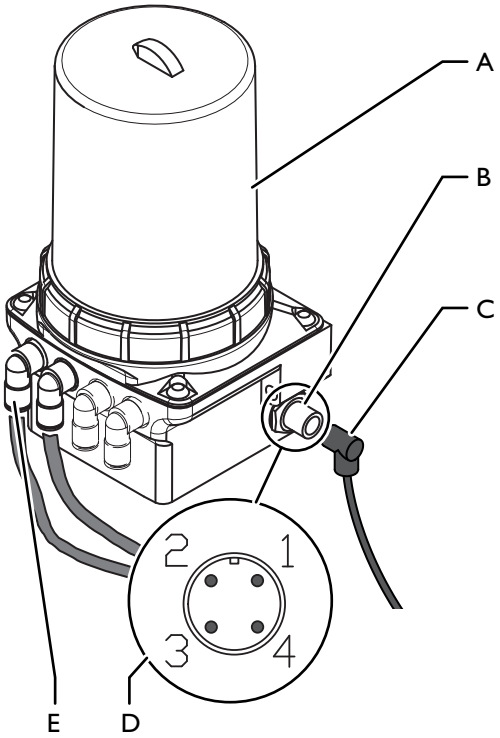

Fig. 5-6 *Connecting*

A	*FlexxPump4 D*	*D*	*Connector pin assignment*
B	*Connection plug*	*E*	*Hydraulic output*
C	*PLC connecting cable*		

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PIN	Assignment	Color
1	Input voltage 24VDC	brown
2	Input signal of the CLS	white
3	Ground (GND), 0V	blue
4	Output signal to the CLS	black

Tab. 5-1 *Connector pin assignment*

Connect the product as follows:

Prerequisite: The hydraulics is connected

1 Connect the PLC connecting cable to the connection plug

The product is connected

5.5 Actuate

The document "Requirements to the Lubrication Control of the FlexxPump4 D424A / 404DLS" provides detailed, non-binding recommendations from Güdel for integration into the overall system. The document can be found in the download area of our company website http://www.gudel.com.

Güdel provides software modules for the standard control systems without obligation. The software modules can be found in the download area of our company website http://www.gudel.com

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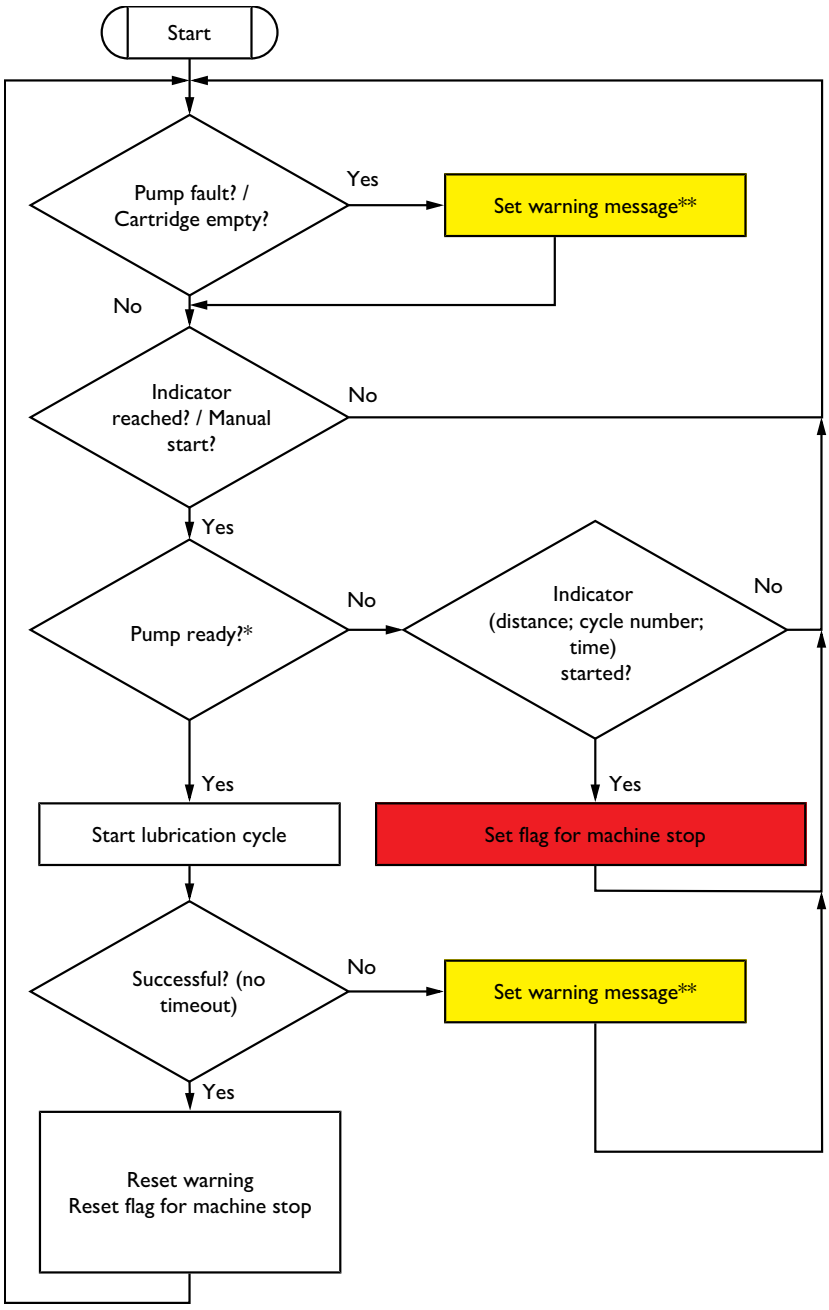
5.5.1 Suggested solution: Programming software



* = No fault (5 s input) AND not empty AND lubrication cycle not started

** = Reset corresponding warning message as soon as OK again

Fig. 5-7 *Flow diagram Programming software*

5.5.2 Input signals and external control system

Signal length [s] (PIN 2)	Designation	Function
8 high	Signal 8 seconds	Lubricating
12 high	Signal 12 seconds	Filling lubrication lines / Venting FlexxPump
14 high	Signal 14 seconds	Reset the error

Tab. 5-2 *Input signals and external control system*

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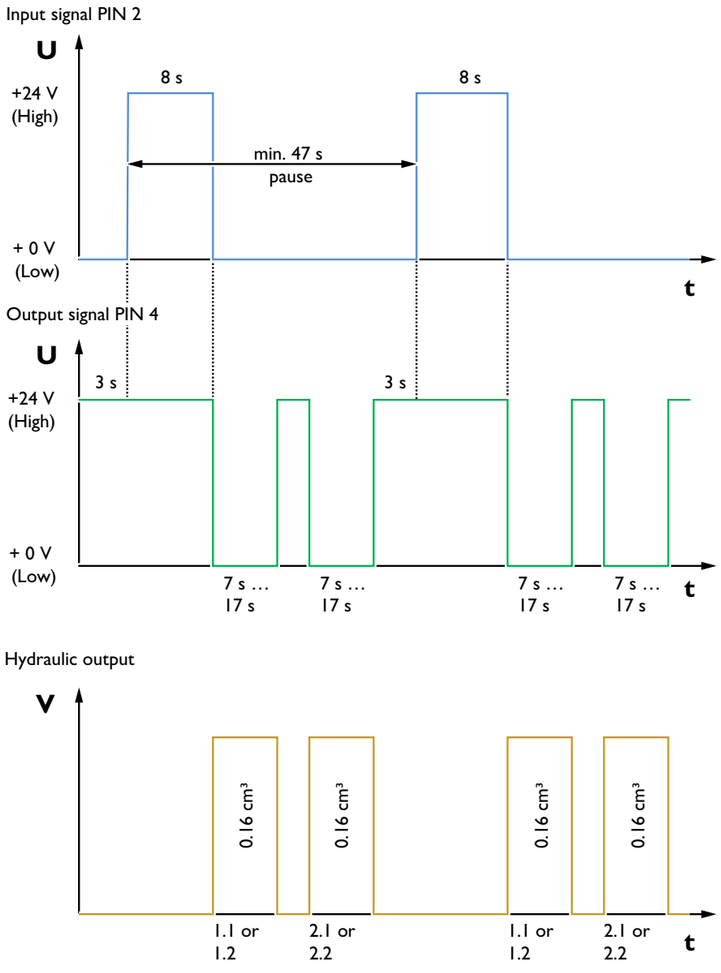
5.5.2.1 Lubrication

The following signal on PIN 2 causes the output of 0.16 cm^3 lubricant at each of the four hydraulic outputs:

Accuracy of the impulses (High) on PIN 2: +/- 0.1 s!



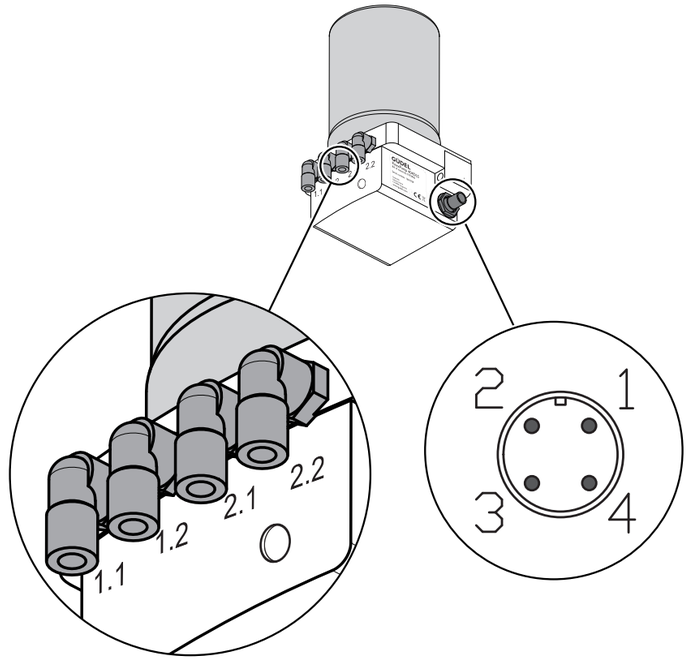


Fig. 5-8 *Switching time diagram: Lubrication (normal case)*

At the displayed signal on PIN 2, all four hydraulic outputs dispense 0.16 cm^3 lubricant. Start of the discharge = output 1.1 or 1.2, then output 2.1 or 2.2. Each hydraulic output is filled with lubricant by its respective piston. Each piston carries out a lubrication stroke. Per lubrication stroke, 0.16 cm^3 lubricant is discharged in the respective hydraulic output. The output signal on PIN 4 is High (20...30 V) during normal operation. During an actual motor run of the lubricating system, the signal switches to Low (+0 V). Usually this takes between about 7 and 17 seconds, depending on the length of the lubrication lines and the viscosity of the lubricant. The signal then switches back to High (+24 V).

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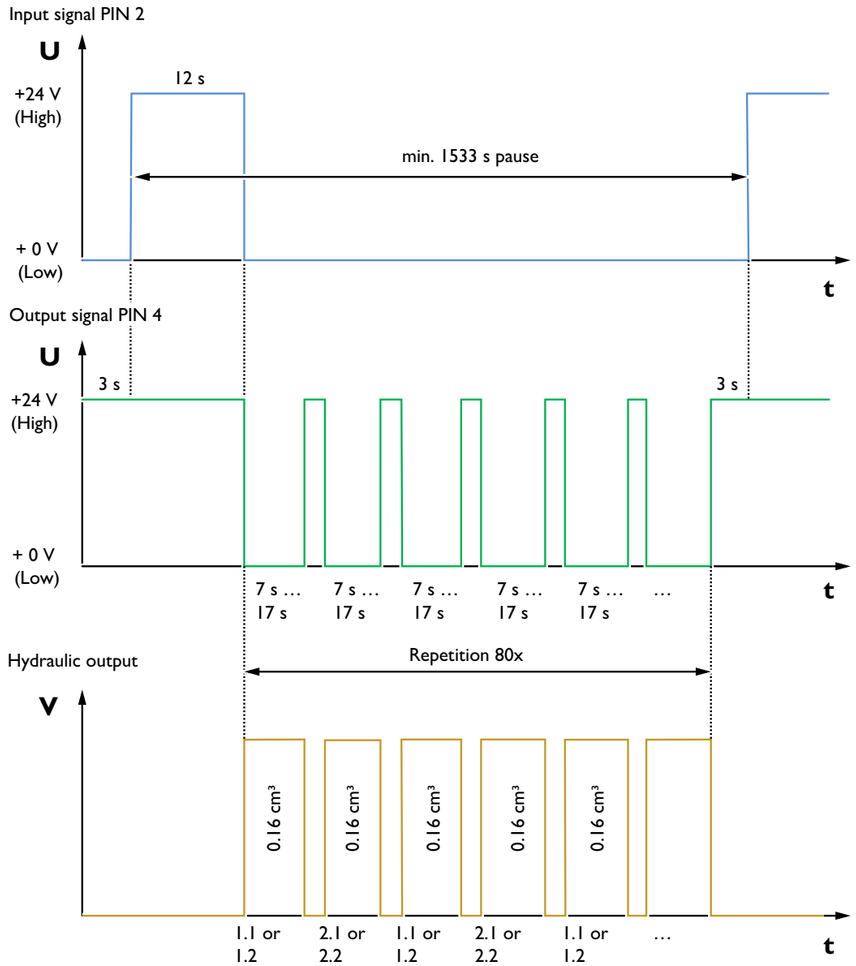
5.5.2.2 Filling lubrication lines / Venting FlexxPump4 D

The following signal on PIN 2 causes the output of 40 x 0.16 cm^3 lubricant at each of the four hydraulic outputs:

Accuracy of the impulses (High) on PIN 2: +/- 0.1 s!



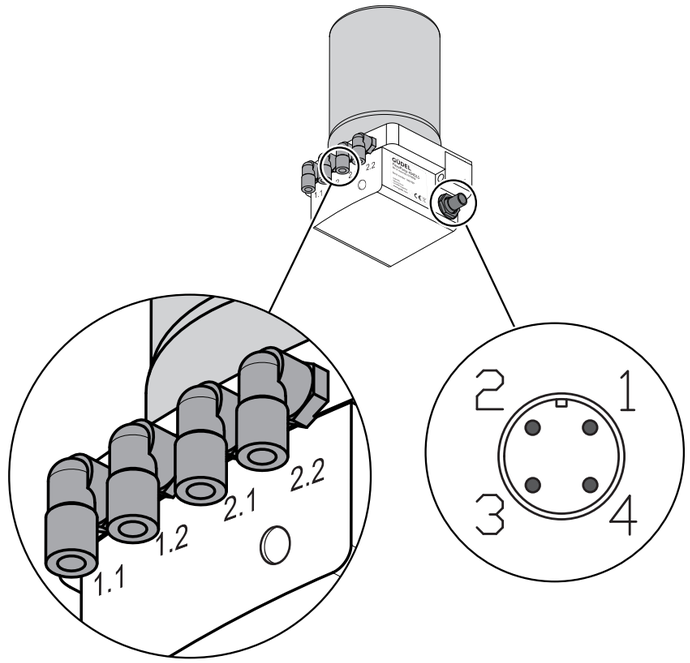


Fig. 5-9 *Switching time diagram: Filling lubrication lines / Venting FlexxPump4 D*

The filling process starts with the displayed signal on PIN 2. The filling process takes at least 1533 seconds. The filling process has to be restarted after the lubrication system is switched on if it was interrupted by the switching off of the lubrication system. The output signal on PIN 4 is High (20...30 V) during normal operation. During an actual motor run of the lubricating system, the signal switches to Low (+0 V). Usually this takes between about 7 and 17 seconds, depending on the length of the lubrication lines and the viscosity of the lubricant. The signal then switches back to High (+24 V).

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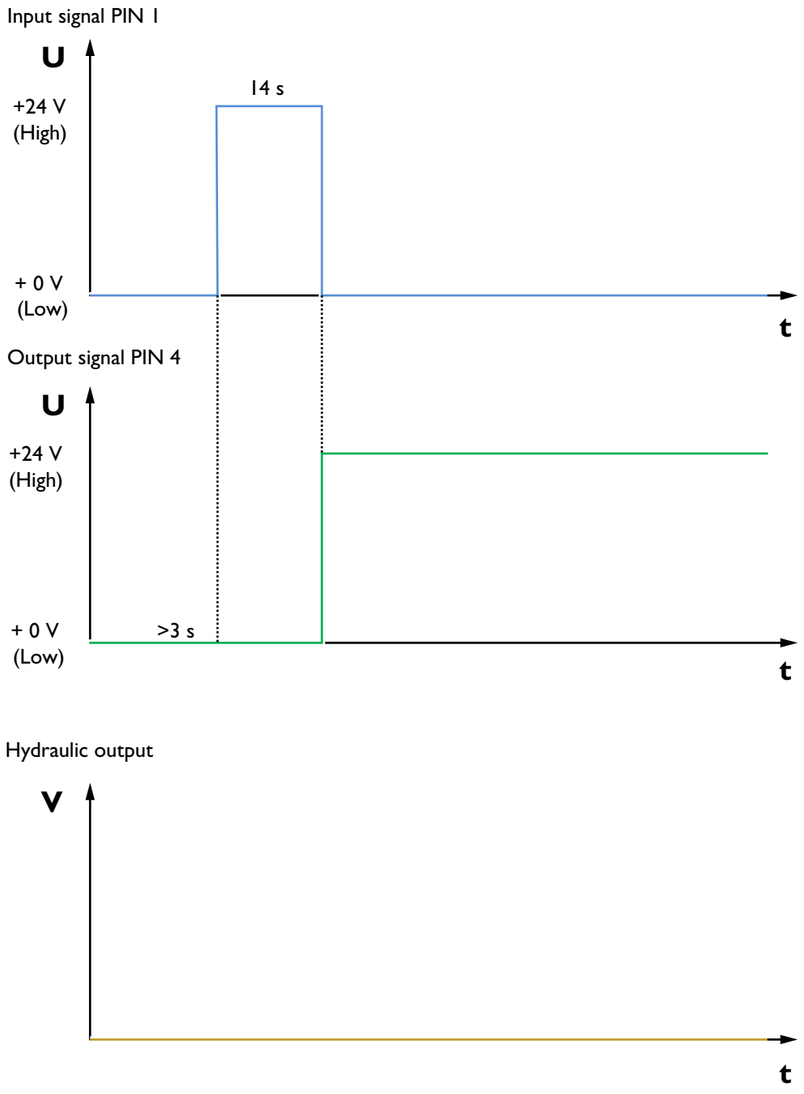
5.5.2.3 Reset the error

The following signal on PIN 2 causes the reset of general errors:



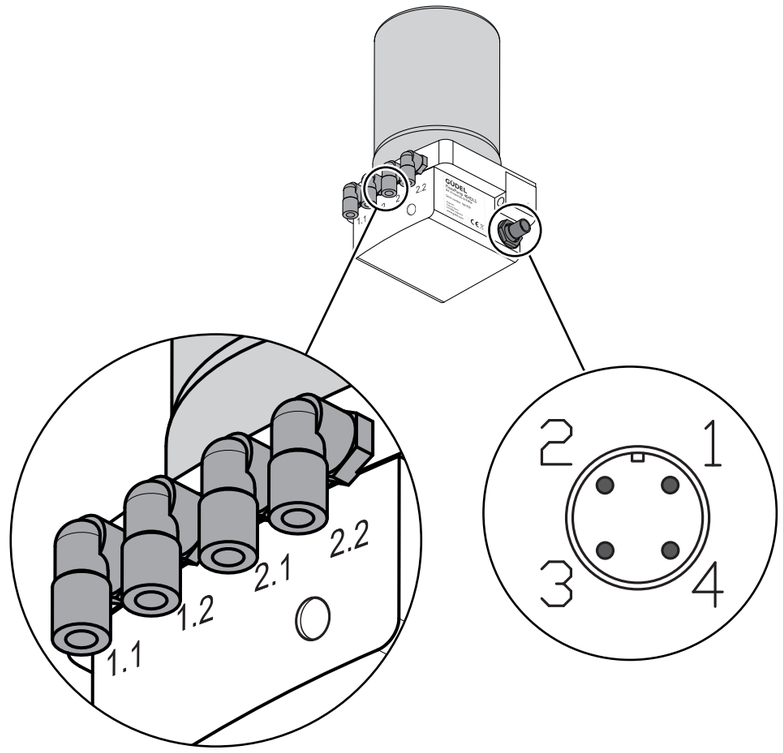


Fig. 5-10 *Switching time diagram: Reset the error*

For general errors, the lubrication system issues a Low (+0 V) signal on PIN 4 lasting more than 3 seconds. The output signal on PIN 4 is High (20...30V) during normal operation. During an actual motor run of the lubricating system, the signal switches to Low (+0 V). Normally this takes between about 7 and 17 seconds, depending on the length of the lubrication lines and the viscosity of the lubricant. Afterwards, the signal switches back to High.

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5.5.3 Output signals and external control system

Function	Output signal (PIN 4)
switched off	low, permanent
switched on	high, permanent
Input signal receiving	high, permanent
Dispensing process	low, 10…18 s
Empty status, lubricant cartridge	0.5 Hz rectangular signal, permanent
General error	low, permanent

Tab. 5-3 *Output signals and external control system*

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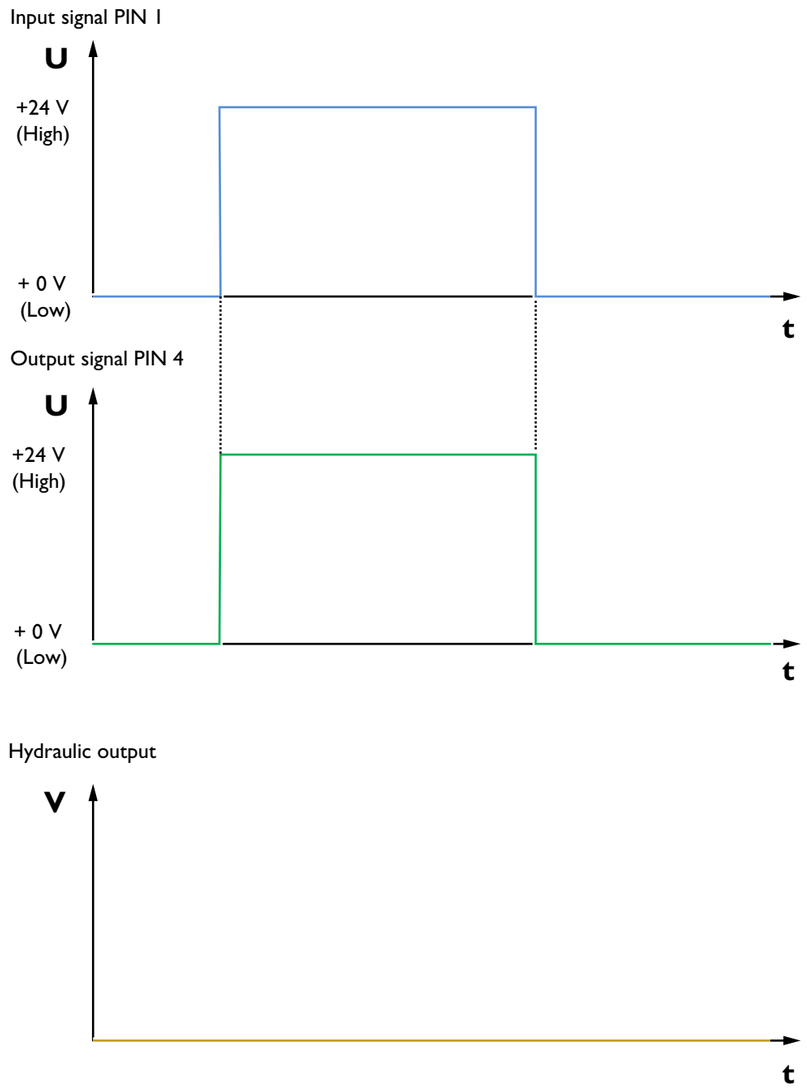
5.5.3.1 Switching on and off



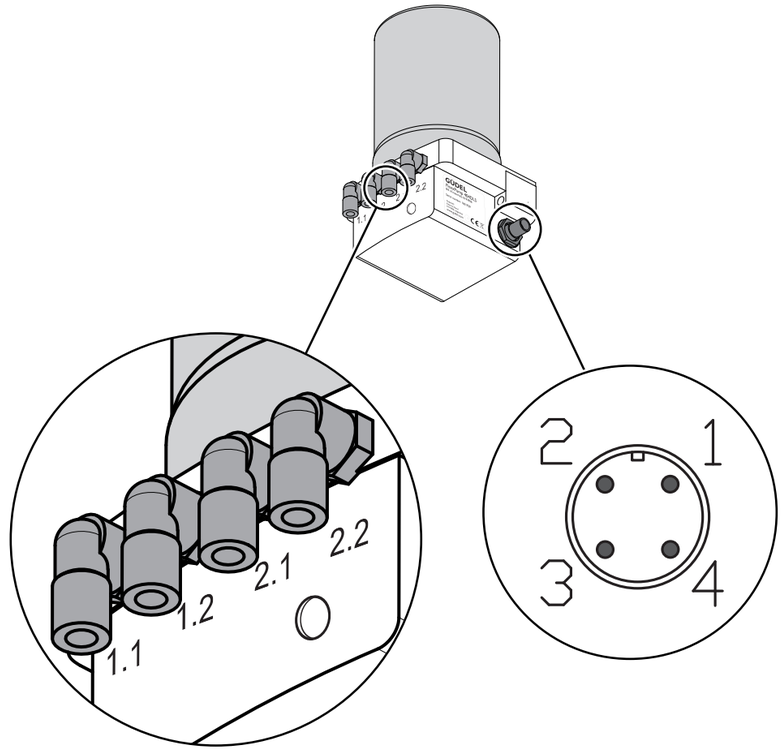


Fig. 5-11 Switching time diagram: Switching on and off

The lubrication system is switched on as long as a constant voltage of +24 V DC is applied at PIN 1. Saved information is lost when the lubrications system is switched off. The output signal on PIN 4 is High (20...30V) during normal operation. For regular lubricant application, the lubrication system needs to be controlled by a PLC. A pulse rhythm needs to be sent for every lubrication cycle, by means of a control signal from the PLC.

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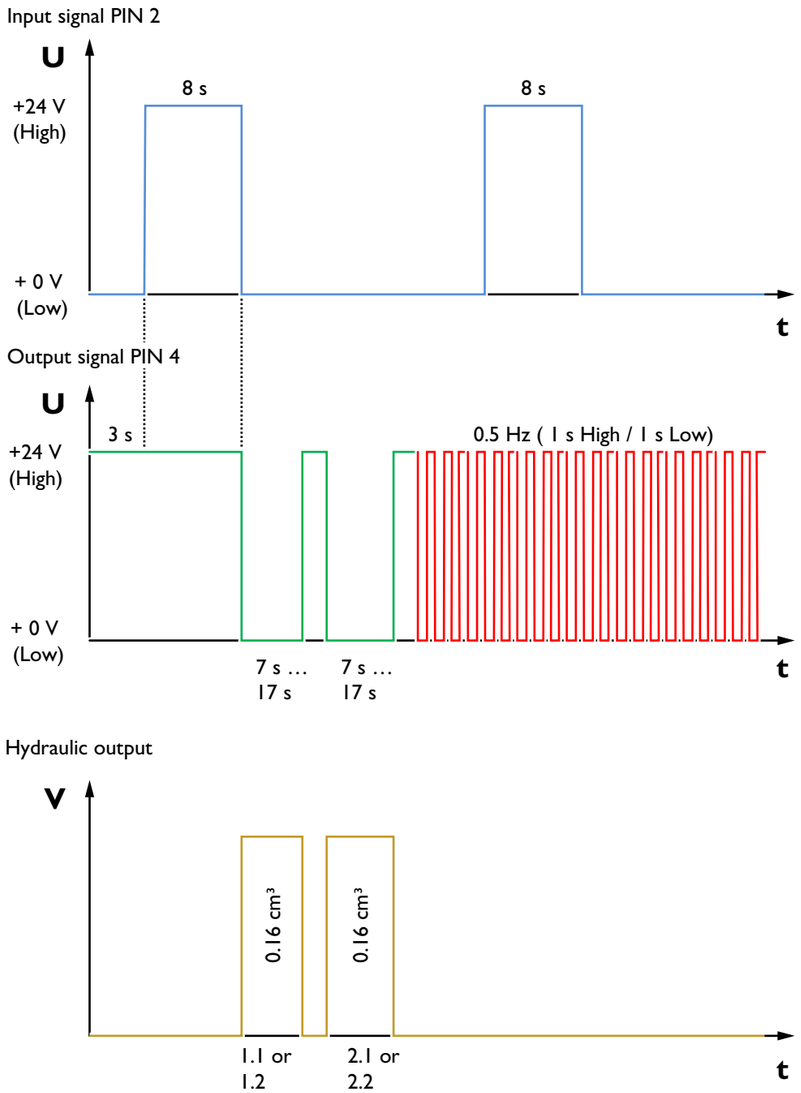
5.5.3.2 Empty

If the lubricant cartridge is empty, the lubrication system issues the following signal on PIN 4:



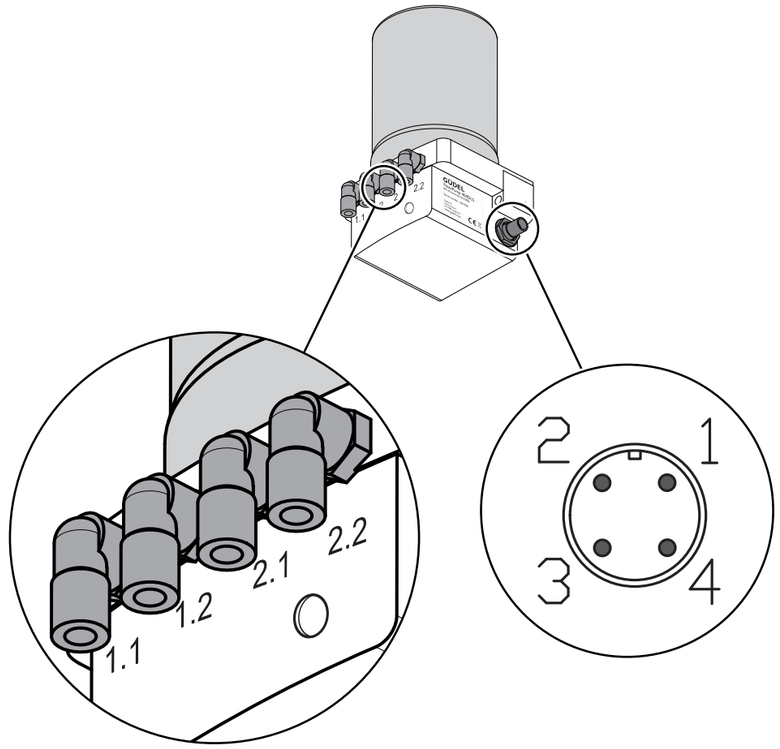


Fig. 5-12 *Switching time diagram: Empty*

If the lubricant cartridge is empty, the lubrication system puts out a change signal (rectangular pulse) on PIN 4 between High and Low with a frequency of 0.5 Hz. The output signal on PIN 4 is High (20...30V) during normal operation. During an actual motor run of the lubricating system, the signal switches to Low (+0 V). Normally this takes between about 7 and 17 seconds, depending on the length of the lubrication lines and the viscosity of the lubricant. Afterwards, the signal switches back to High. You can use the signal change during motor run to calculate the emptying time of the lubricant cartridge.

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Malfunction	Cause	Measure
Lubrication system does not lubricate (Pump function has been stopped.)	• Lubricant cartridge missing • Lubricant cartridge empty • Air in the lubrication system	• Insert new lubricant cartridge • Vent the lubrication system The lubrication system continues running without change

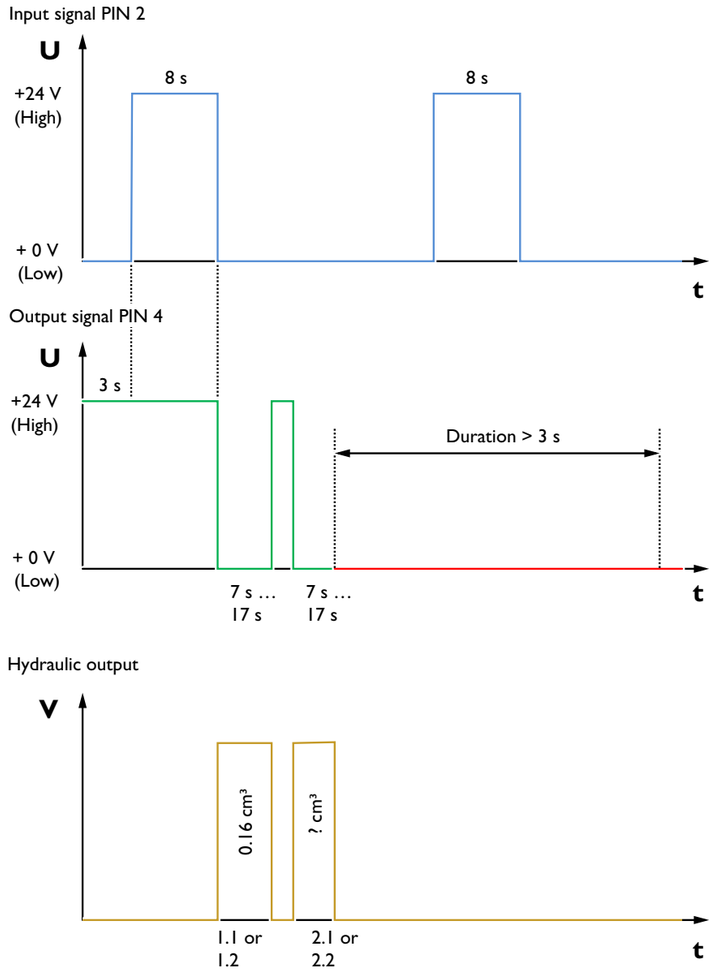
Tab. 5-4 *Malfunctions / Troubleshooting*

5.5.3.3 General error

The following causes may lead to a general error (the list is not exhaustive):

- Overpressure in the lubrication line
- the voltage supply does nit lie within the specified parameters (undervoltage/overvoltage)
- Internal fault in the lubrication system

If there is a general error, the lubrication system issues the following signal on PIN 4:



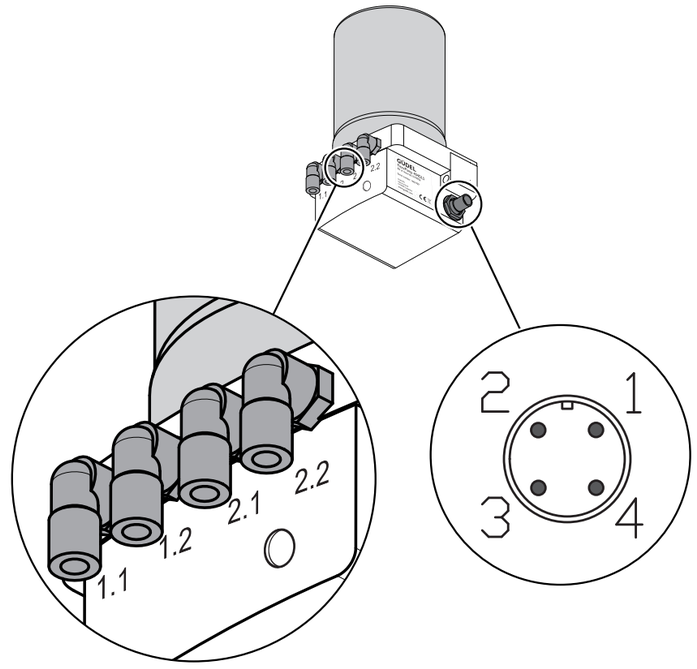


Fig. 5-13 *Switching time diagram: General error*

For general errors, the lubrication system issues a Low (+0 V) signal on PIN 4 lasting more than 3 seconds. The output signal on PIN 4 is High (20...30 V) during normal operation. During an actual motor run of the lubricating system, the signal switches to Low (+0 V). Normally this takes between about 7 and 17 seconds, depending on the length of the lubrication lines and the viscosity of the lubricant. Afterwards, the signal switches back to High.

Malfunction	Cause	Measure
Lubrication system does not lubricate (Pump function has been stopped.)	Overpressure	• Check lubrication lines • Rectify causes (defective lubrication line, hardened lubricant, etc.) • Reset the error ➲ Chapter 5.5.2.3, 🗎 51
Lubrication system does not lubricate (Pump function has been stopped.)	Undervoltage or overvoltage	• Switch off lubrication system • Check supply voltage and compare with specified parameters • Replace defective electronic components • Switch on lubrication system • Reset the error ➲ Chapter 5.5.2.3, 🗎 51
Lubrication system does not lubricate (Pump function has been stopped.)	Internal error	Disassemble entire lubrication system with screwed on lubricant cartridge and send back to Güdel along with a comprehensive fault description.

Tab. 5-5 *Malfunctions / Troubleshooting*

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5.5.4 Lubrication recommendation

5.5.4.1 General information

NOTE

Lubricating film missing

A missing lubricating film on rails and racks leads to damage to the product. This results in operational failure.

- Ensure that there is always a lubricating film on rails and racks during operation
- Perform the described tasks at the specified times
- Perform lubrication work at the latest when the first signs of tribocorrosion (reddish discoloration of the track) are visible
- Adjust lubrication interval if necessary

The running surfaces of rails, racks as well as the drive pinions need to be lubricated. A precise recommendation on the lubrication quantity needed cannot be made, because that depends on various factors. The calculations listed here are based on empirical values and lead to reference values. The lubrication quantity needs to be checked regularly and needs to be adapted if necessary.

The following non-conclusive factors determine the lubrication quantity:

- Kilometers traveled by the axle
- Degree of contamination of the axle
- Power-on time of the entire plant
- Ambient temperature
- Number of lubrication points
- Elements used in the lubrication system

Güdel recommends to program the HMI user interface so that the operator of the entire system can adjust the lubrication quantity to the operating conditions. The operator is always responsible for adequate and properly functioning lubrication.

These recommendations are valid exclusively for systems that are connected according to the Güdel standard. ➲ 39

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5.5.4.2 Basics

Average lubricant requirement at a lubrication point (U)

The following lubricant quantities should be dispensed at least per lubrication point. These are empirical values from Güdel. These values can be met only approximatively due to the number of outputs of the lubricant pump and the installed splitters.

Size	Average lubricant requirement per lubrication point (U)
1-4	0.3 cm^3 / 100 km
5-7	0.4 cm^3 / 100 km

Tab. 5-6 *Average lubricant requirement per lubrication point (U)*

Recommended lubrication quantity (P_t)

The recommended lubrication quantity P_t can be found in the following table.

System	Size 1-4	Size 5-7
3 lubrication points (e.g. EP, TMF, TMO)	0.9 cm^3 / 100 km	1.2 cm^3 / 100 km
6 lubrication points (e.g. ZP)	1.8 cm^3 / 100 km	2.4 cm^3 / 100 km
9 lubrication points (e.g. CP, ZP H-loader)	2.7 cm^3 / 100 km	3.6 cm^3 / 100 km
10 lubrication points (e.g. FP)	3.0 cm^3 / 100 km	4.0 cm^3 / 100 km

Tab. 5-7 *Recommended lubrication quantity (P_t)*

5.5.4.3 Minimum lubrication quantity

Splitters only function correctly if > 0.5 cm^3 of lubricant is produced at their input per lubrication cycle.

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5.5.4.4 Calculation formulas

Basically the emptying time of lubricant cartridge P1 needs to be determined. With multiple axles per lubrication system, the axle most traveled needs to be taken into consideration for the calculation (on linear gantries, this is typically the Y-axis).

The following specifications of your application are needed:

- Average velocity of the axle (vm) in m/s
- Operation time (t) of the plant per day in hours
- Power-on time (POT) in %

The following values need to be calculated for P1:

Value	Formula	Unit
Running performance of the axle per day (V)	vm x t x POT x 0.036	km/day
Recommended lubrication quantity per day (P)	(V x P_t)/ 100	cm^3/day
Emptying time of lubricant cartridge (P1)	Cartridge volume / (P x 30)	months

Tab. 5-8 *Calculation formulas: Emptying time of the lubricant cartridge (P1)*

The lubrication quantity calculator will help you determine the corresponding settings and lubrication quantities for your application. The lubrication quantity calculator can be found in the download area of our company website http://www.gudel.com

5.6 Initial commissioning

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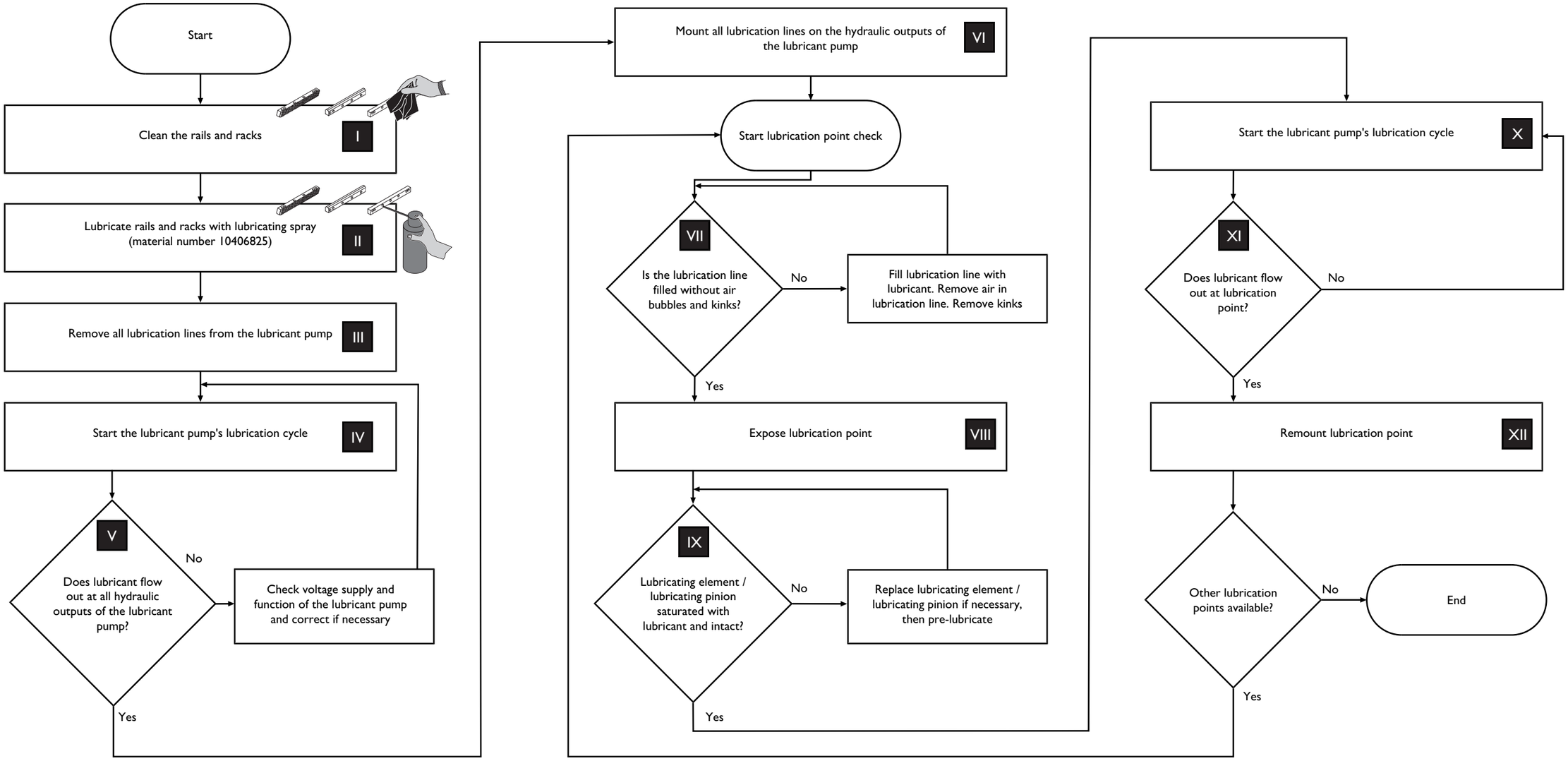
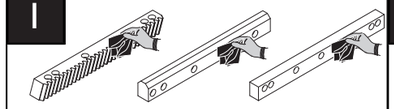
5.6.1 Checking the lubrication system

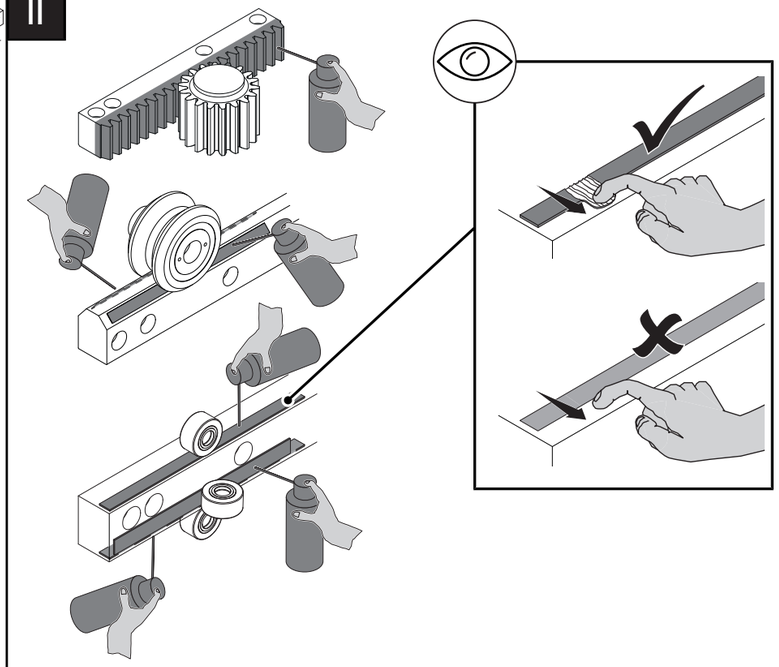


- After cleaning work or during standstill times of 1 to 4 weeks, check the lubricant film on the rails and racks (II) and the lubrication lines for air bubbles and kinks (VII) before commissioning. If necessary, carry out a check of the complete lubrication system.
- As operator, check the lubrication system during initial commissioning, after standstill times of more than 4 weeks, if lubricant film is not present, and after the lubricant cartridge or the lubricant pump of the lubrication system has been replaced.
  The operator is always responsible for adequate and properly functioning lubrication.

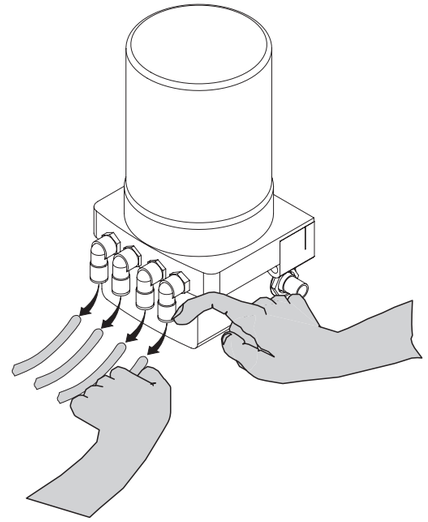
I



II



III



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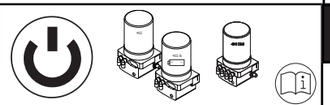
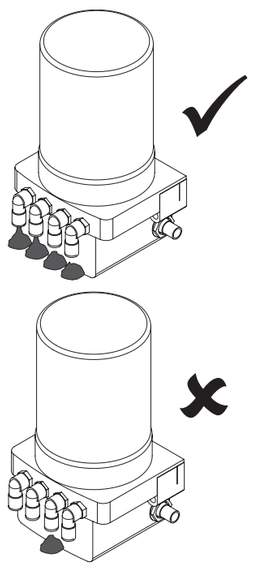
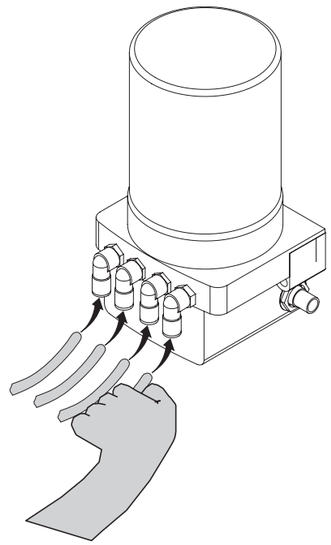


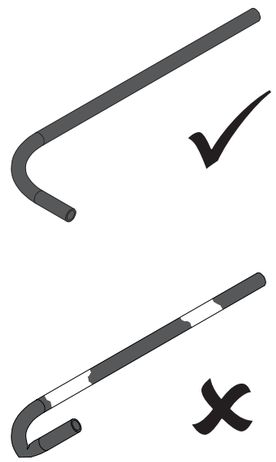
V



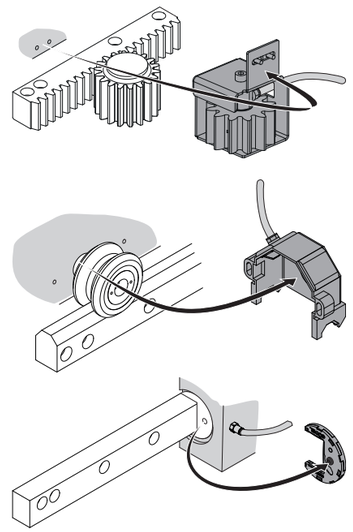
VI



VII



VIII



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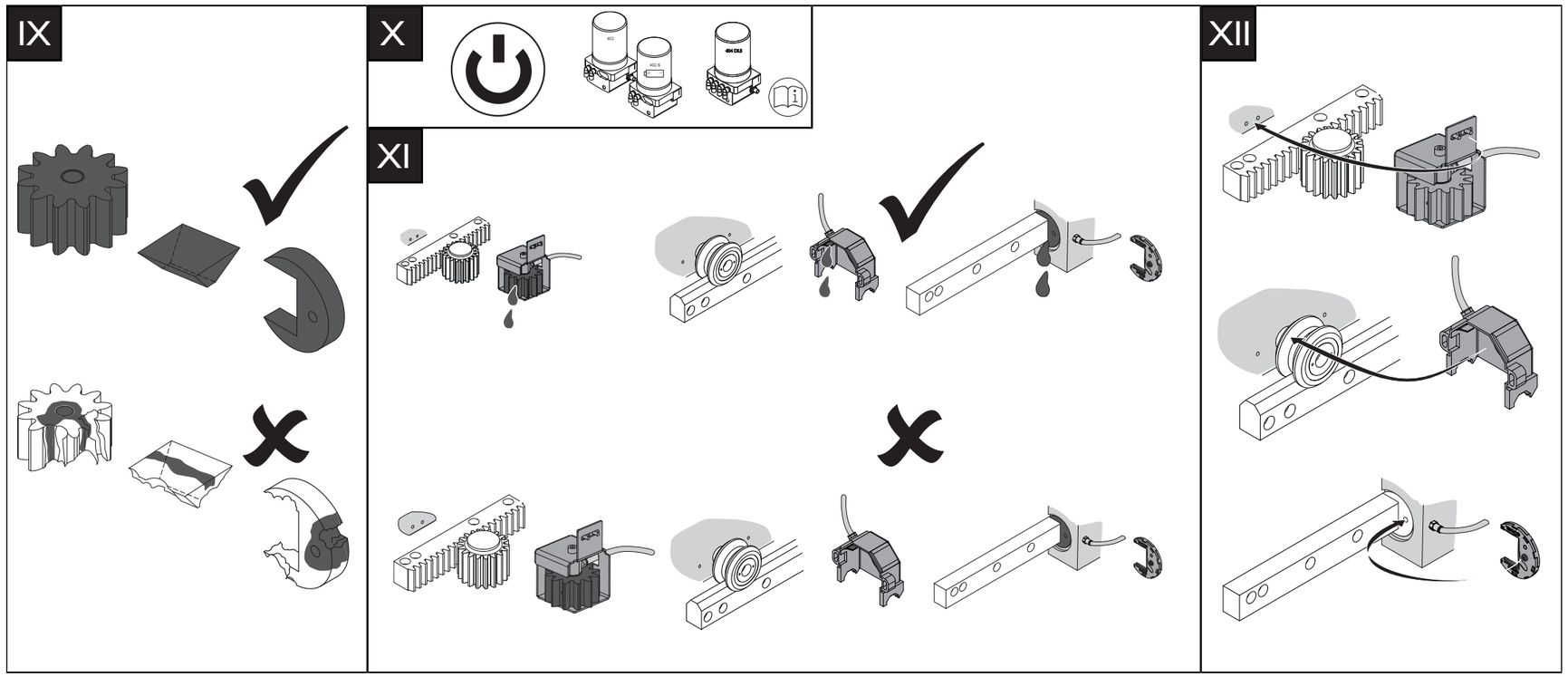

Lubrication ex works	Specifications	Lubricant quantity
Elkalub FLC 8 H1	Cannot be determined	Running surfaces of the roller and pinion need to be covered completely by a lubricating film

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Tab. 5-9 *Lubricant, Cleaning agents: Pre-lubricating rails and racks*

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Check the connections of the hydraulic system before starting up the product.

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6 Operation

6.1 General

Only operate the product after observing the installation instructions.

For information on operating the product, refer to the appropriate chapter of the documentation for the complete system.

6.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

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7 Maintenance

7.1 Introduction

Maintenance tasks

The listed tasks have to be carried out at the prescribed time intervals. If they are not carried out at the specified intervals or improperly, all warranty is voided. Observing these obligations is a significant condition so that the product performing without malfunction as well as its long service life.

Work sequences

Perform the work sequences in the order described. Perform the described tasks at the specified times. This ensures a long service life for your product.

Original spare parts

Only use original spare parts. ➲ 119

Tightening torques

Unless otherwise indicated, adhere to the tightening torques of Güdel.
➲ Chapter 13, 128

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7.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 15
It concerns your personal safety!

⚠ DANGER

Hazardous voltage

The product contains components that are energized with hazardous voltages. Touching these components will cause an electric shock. Electric shocks can be fatal!

Before working in the danger area:

- Switch off the superordinate main power supply
- Secure the superordinate power supply against being switched on again (main switch of complete system)
- Ground the equipment

⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

7.1.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

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7.2 Consumables and auxiliary agents

7.2.1 Cleaning agents

Use a soft rag or cloth for cleaning tasks. Only use permissible cleaning agents.

7.2.1.1 Table of cleaning agents

Cleaning agents	Location of application
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)	Lubrication system: Lubrication pump, lubrication lines, other components
	Pre-lubricating rails and racks
	Rails and racks

This table does not purport to be exhaustive.

Tab. 7-1 *Table of cleaning agents*

7.2.2 Lubricants

NOTE

Unsuitable lubricants

Using unsuitable lubricants can cause damage to the machine!

- Only use the lubricants listed
- If uncertain, please contact our service departments

For more information on the lubricants, refer to the tables below. For further information, refer to the chapter "Maintenance tasks" and the respective third party documentation.

Special Güdel lubricants

If special lubricants have been delivered ex-works at the request of the customer, you can find the relevant specifications in the spare parts list.

Alternative manufacturers

The following tables show the specifications of the lubricants. Please inform your manufacturer accordingly. They will then suggest an alternative from their product range.

Low temperatures / food grade

Observe the application range limits of lubricants according to the safety data sheet.

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7.2.2.1 Lubrication

Standard

The following lubricants are intended for use in the lubrication system:

Fig. 7-1 *Lubrication system FlexxPump*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Güdel H1 NSF no. 146621	Cannot be determined		Lubrication system FlexxPump	Oil

Tab. 7-2 *Lubricant: Lubrication system FlexxPump*

Fig. 7-2 *Pre-lubricating rails and racks*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Elkalub FLC 8 H1	Cannot be determined		Lubrication system FlexxPump: Pre-lubricating rails and racks	Oil

Tab. 7-3 *Lubricant: Lubrication system FlexxPump: Pre-lubricating rails and racks*

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Temperature range 0°C to +5°C

The following lubricants are intended for use in the lubrication system at a temperature range 0°C to +5°C:

Fig. 7-3 *Lubrication system FlexxPump*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Rivolta F.L.500	Cannot be determined		Lubrication system FlexxPump	Oil

Tab. 7-4 *Lubricant: Lubrication system FlexxPump*

Temperature range -30°C to -20°C

The following lubricants are intended for use in the lubrication system at a temperature range -30°C to -20°C:

Fig. 7-4 *Lubrication system FlexxPump*

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Rivolta F.L.125	Cannot be determined		Lubrication system FlexxPump	Oil

Tab. 7-5 *Lubricant: Lubrication system FlexxPump*

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7.2.2.2 Lubricant table

Lubrication ex works	Specifications	Lubricant quantity	Location of application	Category
Elkalub FLC 8 H1	Cannot be determined		Lubrication system FlexxPump: Pre-lubricating rails and racks	Oil
Güdel H1 NSF no. 146621	Cannot be determined		Lubrication system FlexxPump	Oil
Rivolta F.L.125	Cannot be determined		Lubrication system FlexxPump	Oil
Rivolta F.L.500	Cannot be determined		Lubrication system FlexxPump	Oil

This table does not purport to be exhaustive.

Tab. 7-6 *Lubricant table*

7.3 Maintenance tasks

7.3.1 Maintenance intervals

The product is subject to natural wear and tear. It wears out, which can cause unscheduled downtimes of your system. Güdel defines the service life and maintenance intervals of the product to ensure safe, uninterrupted operation.

Operating hours

Güdel always uses Power On as the operating time for the maintenance interval indicators. Power On shows the duration in which the drives are located in the control system.

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Duty cycle

The maintenance intervals refer to the effective operating hours of the product at a duty cycle (ED) of 100%. The duty cycle always refers to the entire process. This means that the duty cycle of specific axes cannot be considered individually.

Duty cycle				
100%	80%	60%	40%	20%
2000	2,500	3,300	5,000	10,000
6,000	7,500	10,000	15,000	30,000
10,000	12,500	16,500	25,000	50,000
20,000	25,000	33,000	50,000	100,000

Tab. 7-7 *Conversion table: Operating hours at the respective duty cycle*

Operating conditions

Normal operating conditions are assumed, which correspond to the parameters defined by Güdel when designing the product. If they are rougher than assumed, products may fail earlier. Adjust the maintenance intervals to your operating conditions if necessary.

With prudent operation you can protect your product. Observe the permissible performance limits of the product.
Avoid, in particular:

- Operation near or above the permissible performance limits
- High acceleration and resulting vibrations and operating forces
- Abrasive and/or corrosive environmental conditions
- Long duty cycles
- Always the same axis positions under high load

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Exclusion of gaskets and bearings

The maintenance interval specifications apply without gaskets and bearing. Gaskets are subject to special wear and are not considered. In the case of gearboxes, the bearings are also excluded.

The definition is based on 5/7 working days per week.

Operating hours	1-shift operation	2-shift operation	3-shift operation
150	every 4 weeks	every 2 weeks	weekly
2,000	yearly	every 6 months	every 4 months
6,000	every 3 years	every 1.5 years	yearly
10,000	every 5 years	every 2.5 years	every 20 months
20,000	every 10 years	every 5 years	every 3.3 years

Tab. 7-8 *Maintenance intervals in shift operation (5 days a week)*

Operating hours	1-shift operation	2-shift operation	3-shift operation
150	every 18 days	every 9 days	every 6 days
2,000	every 9 months	every 4.5 months	every 3 months
6,000	every 2.5 years	every 15 months	every 10 months
10,000	every 4 years	every 2 years	every 16 months
20,000	every 7.75 years	every 3.8 years	every 2.5 years

Tab. 7-9 *Maintenance intervals in shift operation (7 days a week)*

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7.3.2 Maintenance tasks after 2,200 hours

7.3.2.1 Replacing lubricant cartridge

Replace the lubricant cartridge if the malfunction message E1 (Empty) appears.

⚠ DANGER

Residual amounts in empty lubricant cartridges

Empty lubricant cartridges contain lubricant residues. Oils and greases are harmful to the environment!

- Dispose of the lubricant cartridge in an environmentally friendly manner

Replace the component every 2,000 operating hours or after 1 year at the latest.

Use only original Güdel lubricant cartridges Never refill the lubricant cartridges!

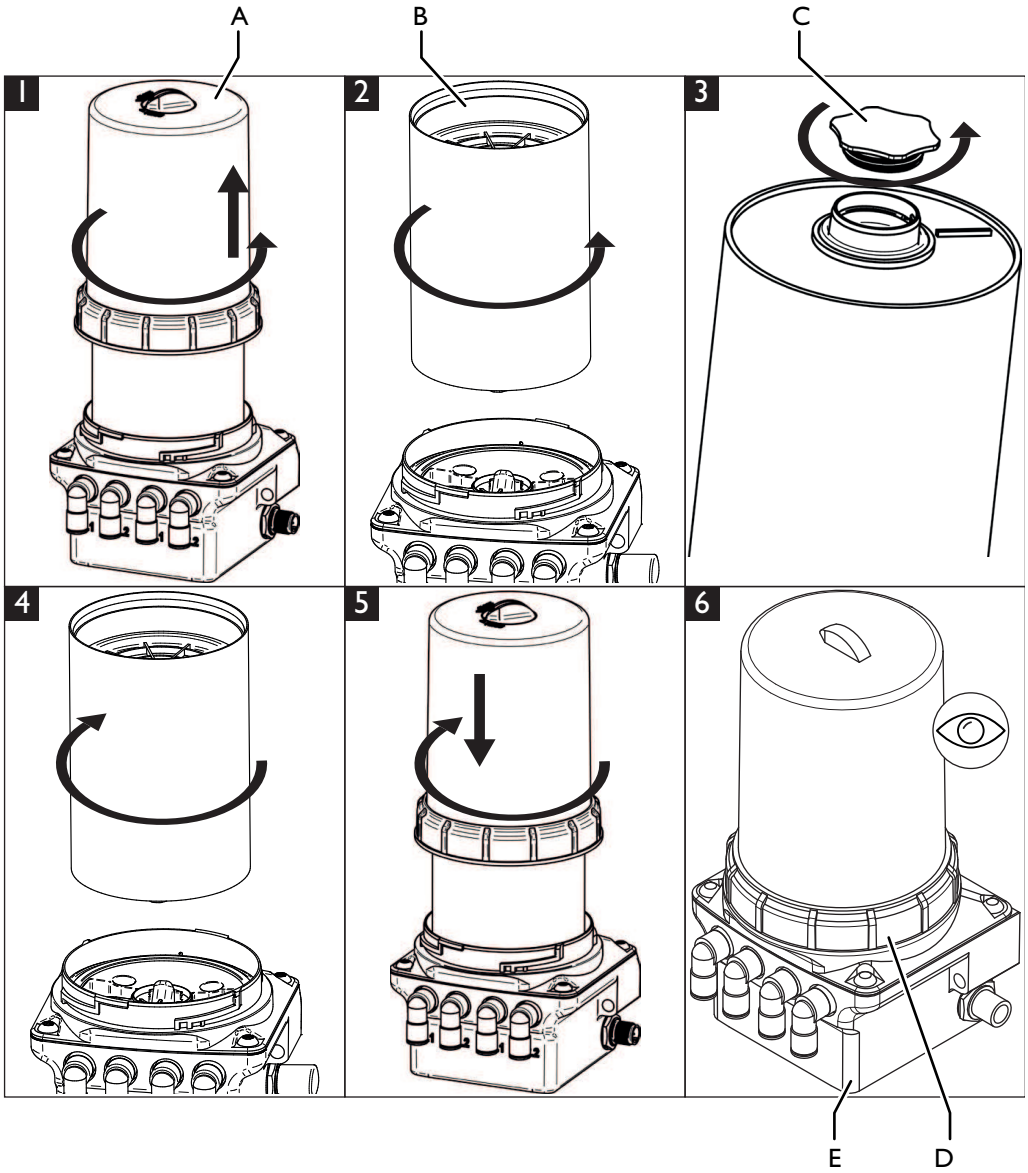

Fig. 7-5 *Replace lubricant cartridge*

A	*Covering*	*D*	*Union ring*
B	*Lubricant cartridge*	*E*	*Casing*
C	*Cover*		

Lubrication ex works	Specifications	Lubricant quantity
➲ Chapter 7.2.2.1, 74	➲ Chapter 7.2.2.1, 74	400 ml

Tab. 7-10 *Lubricant: Lubrication system FlexxPump*

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Replace the lubricant cartridge as follows:

Prerequisite: The lubrication system is switched off

1. Turn the cover by the union ring in the direction of the arrow and remove it
2. Turn the empty lubricant cartridge in the direction of the arrow and remove it
3. Turn the cover lid of the new lubricant cartridge in the direction of the arrow and remove it
4. Turn the new lubricant cartridge in the direction of the arrow by 2 full rotations
   (Label of the lubricant cartridge has to be aligned with the front of the lubrication system.)
5. Insert the union ring of the cover into the housing and turn tight in direction of the arrow
6. Check the lubrication system ➲ 83

The lubricant cartridge has been replaced.

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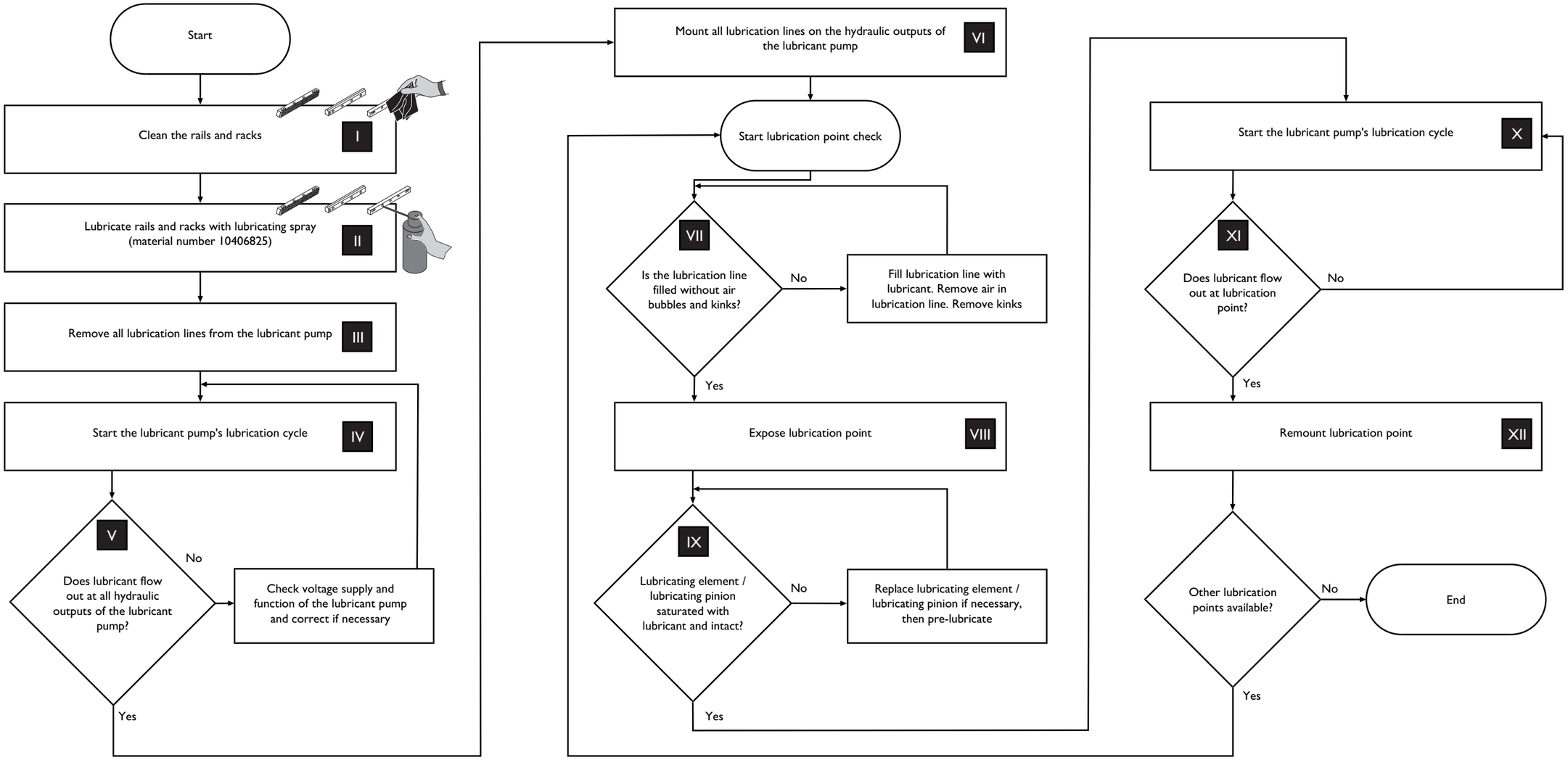
7.3.2.2 Checking the lubrication system



- After cleaning work or during standstill times of 1 to 4 weeks, check the lubricant film on the rails and racks (II) and the lubrication lines for air bubbles and kinks (VII) before commissioning. If necessary, carry out a check of the complete lubrication system.
- As operator, check the lubrication system during initial commissioning, after standstill times of more than 4 weeks, if lubricant film is not present, and after the lubricant cartridge or the lubricant pump of the lubrication system has been replaced.
  The operator is always responsible for adequate and properly functioning lubrication.

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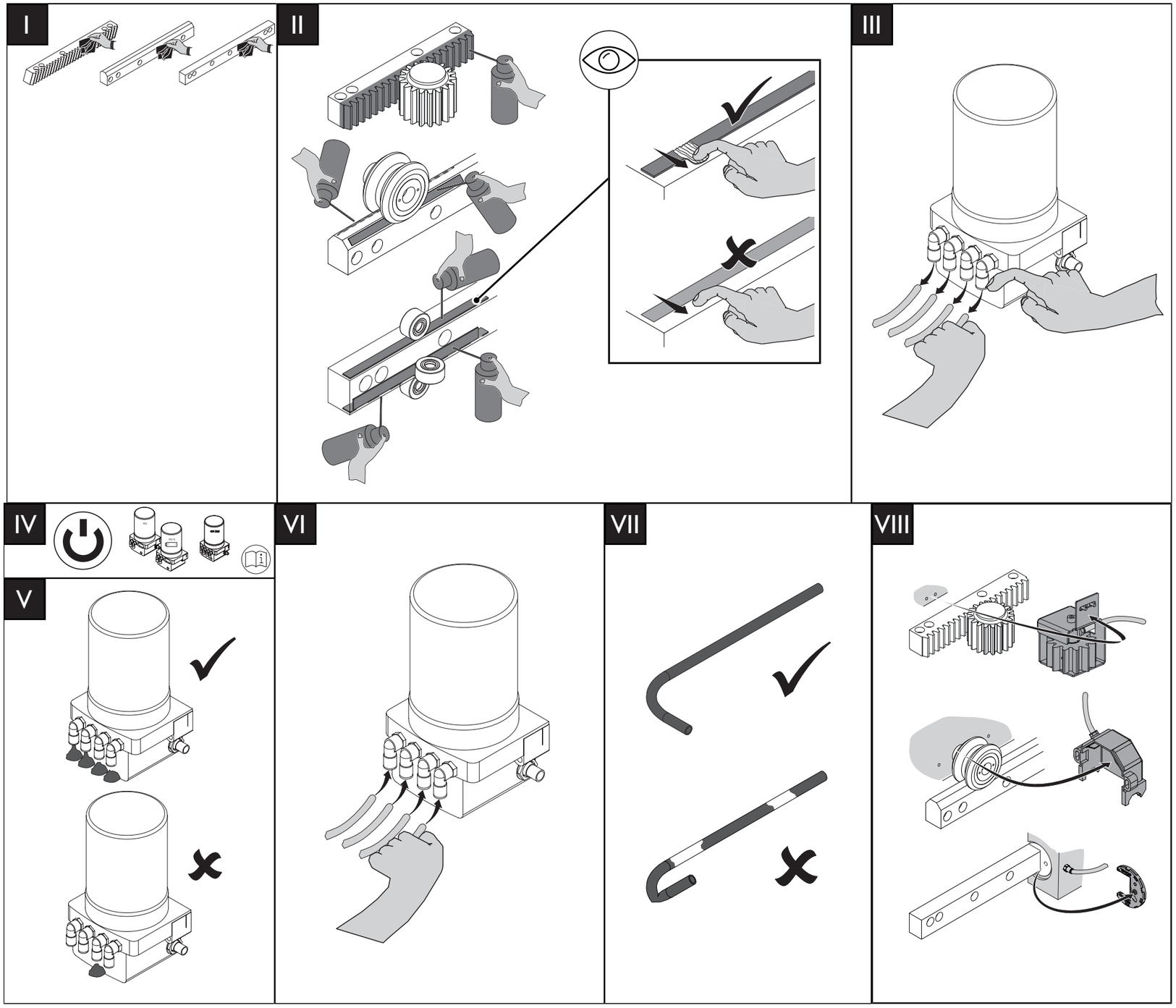

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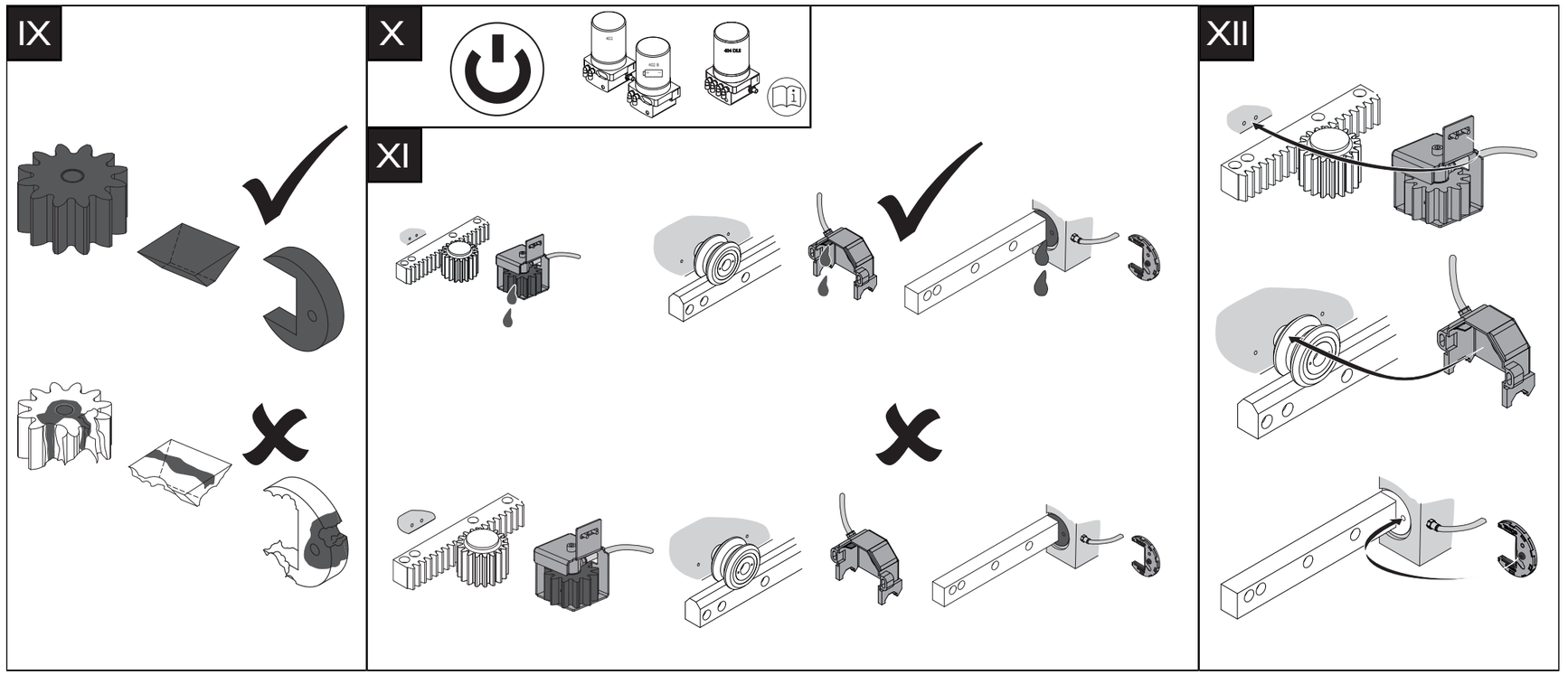

Lubrication ex works	Specifications	Lubricant quantity
Elkalub FLC 8 H1	Cannot be determined	Running surfaces of the roller and pinion need to be covered completely by a lubricating film

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Tab. 7-11 *Lubricant, Cleaning agents: Pre-lubricating rails and racks*

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7.3.3 Maintenance tasks after 10,000 hours

7.3.3.1 Cleaning and checking lubrication system

Fig. 7-6 *Cleaning and checking lubrication system*

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Tab. 7-12 *Cleaning agents: Lubrication system: Lubrication pump, lubrication lines, other components*

Check the lubrication system according to the following table.

Inspection point	Description	Measures
Contamination	Check the components for contamination: • Lubricant pump • Lubrication lines • Other components	Immediately clean away any contamination
Loss of lubricant	Check lubrication system and its surroundings for traces: • Puddles of lubricants and lubricant traces on the floor or in the drip sheets • Leaks or ripped out lubrication lines	• Remove puddles of lubricants and lubricant traces on the floor or in the drip sheets • Replace leaks of ripped out lubrication lines

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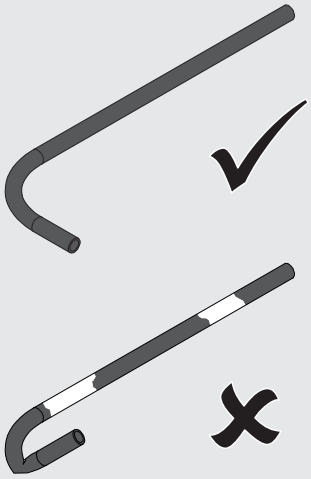
Inspection point	Description	Measures
Lubrication lines	Check lubrication lines for kinks and air pockets 	Remove kinks and air pockets immediately
Function	Check function	Replace defective components immediately

Tab. 7-13 *Inspection table*

NOTE

Lubricating film missing

A missing lubricating film on rails and racks leads to damage to the product. This results in operational failure.

- Ensure that there is always a lubricating film on rails and racks during operation
- Perform the described tasks at the specified times
- Perform lubrication work at the latest when the first signs of tribocorrosion (reddish discoloration of the track) are visible
- Adjust lubrication interval if necessary

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7.3.4 Maintenance tasks after 20,000 hours

7.3.4.1 Replacing the lubricant pump

Removing the lubricant pump

Remove the lubricant pump as follows:

1. Switch off the system and secure it with a padlock against being switched on again
2. Remove connecting cable
3. Disconnect the lubrication lines from the hydraulic outputs
4. Loosen the screws
5. Remove the lubricant pump

The lubricant pump has been removed.

Replacing the lubricant pump

Replace the lubricant pump as follows:

1. Replace the lubricant pump
2. Replace the connection cable
3. Replace the lubrication line

The lubricant pump has been replaced.

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Installing the lubricant pump

The installation position of the lubrication system is not important.

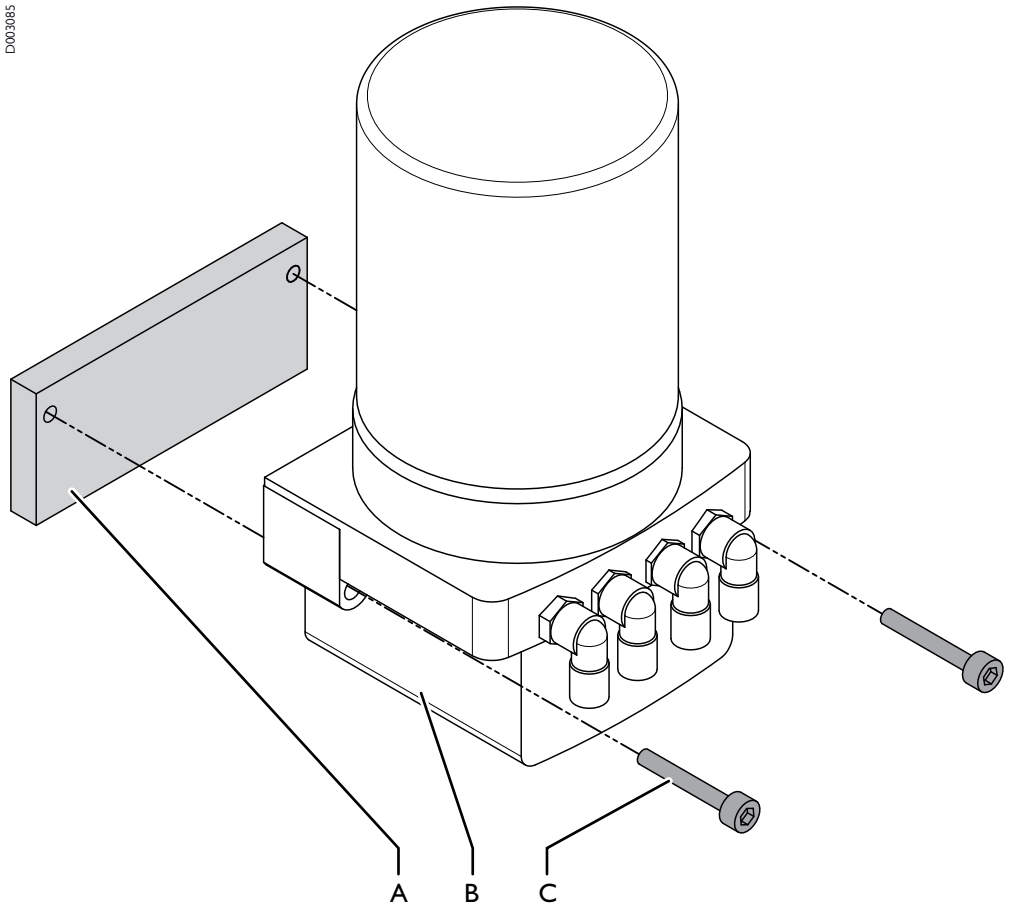

Fig. 7-7 *Installing the lubricant pump*

- *A* *Installation site*
- *B* *Lubricant pump*
- *C* *Screw*

Install the lubricant pump as follows:

1 Mount lubricant pump with two screws M6 L = 35 mm

The lubricant pump has been assembled.

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Connect hydraulics

NOTE

Material damage

Closing hydraulic outputs creates an overpressure. The overpressure can cause damage to the product.

- Do not close any hydraulic outputs

FlexxPump4 D 3-fold

Lubrication system with 3 lubrication points

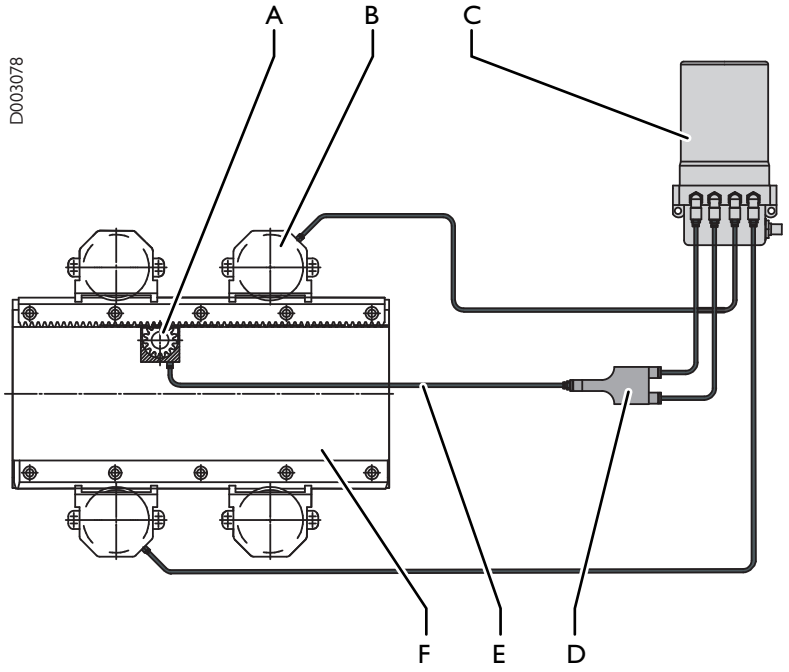

Fig. 7-8 *Design FlexxPump4 D 3-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*D*	*Y-segment*
B	*Lubricating element (not included in the scope of delivery)*	*E*	*Lubrication line hose diameter of 6/3 mm*
C	*FlexxPump4 D*	*F*	*1. Axis (not included in the scope of delivery)*

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FlexxPump4 D 6-fold

Lubrication system with 6 lubrication points

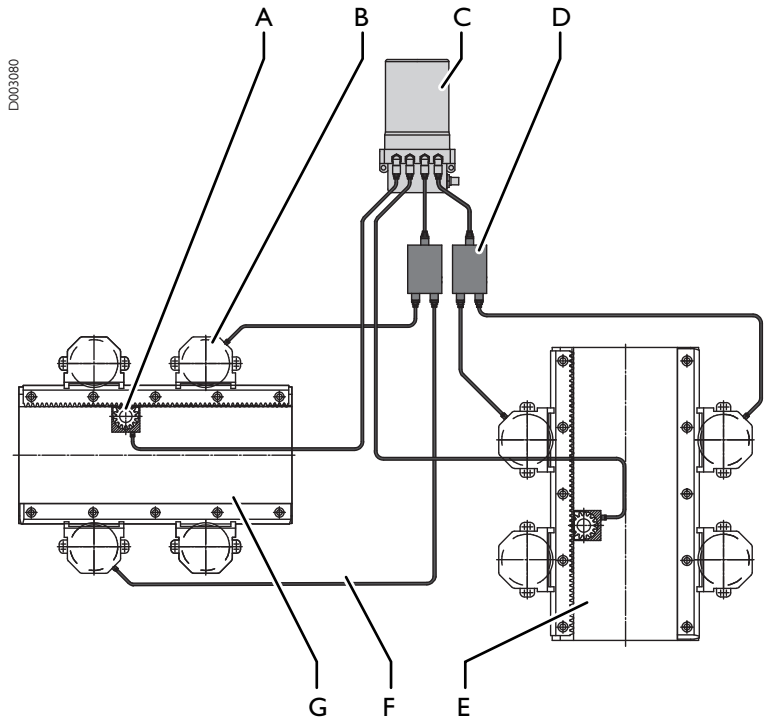

Fig. 7-9 *Design FlexxPump4 D 6-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*E*	*2. Axis (not included in the scope of delivery)*
B	*Lubricating element (not included in the scope of delivery)*	*F*	*Lubrication line hose diameter of 6/3 mm*
C	*FlexxPump4 D*	*G*	*1. Axis (not included in the scope of delivery)*
D	*Splitter*		

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FlexxPump4 D 9-fold

Lubrication system with 9 lubrication points

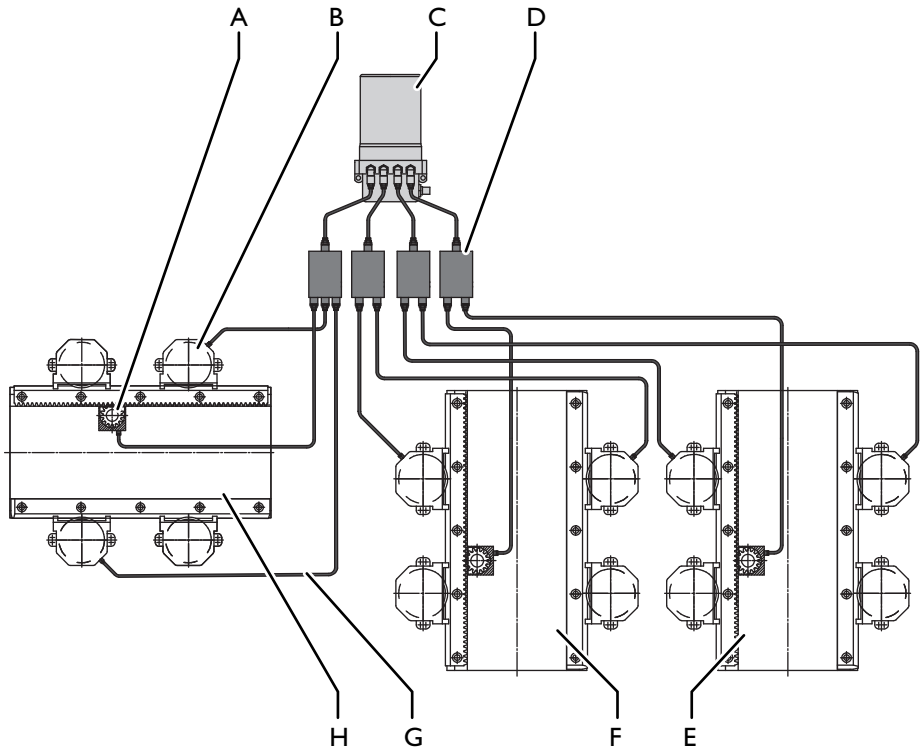

Fig. 7-10 *Design FlexxPump4 D 9-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*E*	*3. Axis (not included in the scope of delivery)*
B	*Lubricating element (not included in the scope of delivery)*	*F*	*2. Axis (not included in the scope of delivery)*
C	*FlexxPump4 D*	*G*	*Lubrication line hose diameter of 6/3 mm*
D	*Splitter*	*H*	*1. Axis (not included in the scope of delivery)*

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FlexxPump4 D 10-fold

Lubrication system with 10 lubrication points

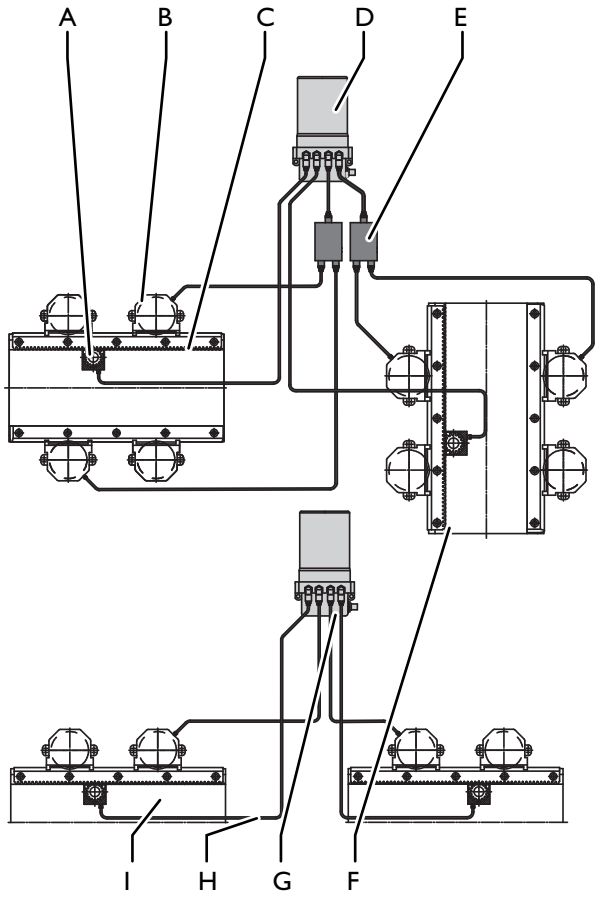

Fig. 7-11 *Design FlexxPump4 D 10-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*F*	*2. Axis (not included in the scope of delivery)*
B	*Lubricating element (not included in the scope of delivery)*	*G*	*2. FlexxPump4 D*
C	*1. Axis (not included in the scope of delivery)*	*H*	*Lubrication line hose diameter of 6/3 mm*
D	*1. FlexxPump4 D*	*I*	*3. Axis (not included in the scope of delivery)*
E	*Splitter*		

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Connecting electrical equipment

⚠ DANGER

Faulty cabling

The available mains voltage (supply voltage) has to match the specifications on the rating plate. A faultily connected product can cause material damage, or serious or even fatal injuries.

- Check the deviation of the electrical circuit.
- Use only fuses with specified amperage.
- Wire the plug according to the diagram.
- Replace the damaged electric cable or plugs promptly
- Have electricians carry out the electric connection tasks

Connecting

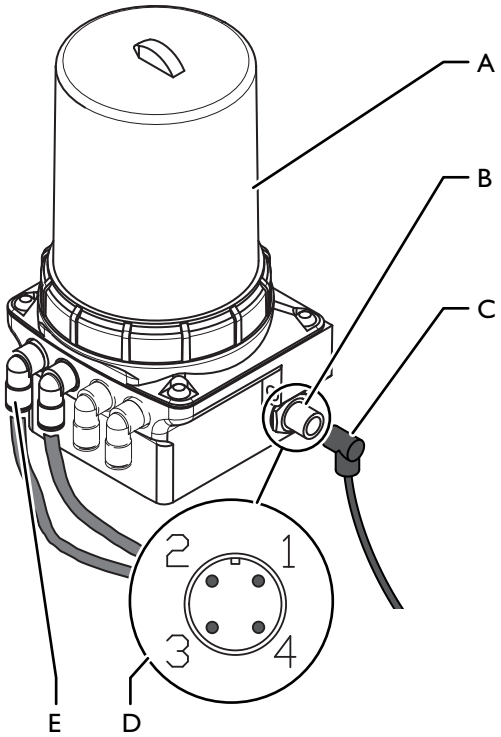

Fig. 7-12 *Connecting*

A	*FlexxPump4 D*	*D*	*Connector pin assignment*
B	*Connection plug*	*E*	*Hydraulic output*
C	*PLC connecting cable*		

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PIN	Assignment	Color
1	Input voltage 24VDC	brown
2	Input signal of the CLS	white
3	Ground (GND), 0V	blue
4	Output signal to the CLS	black

Tab. 7-14 *Connector pin assignment*

Connect the product as follows:

Prerequisite: The hydraulics is connected

1 Connect the PLC connecting cable to the connection plug

The product is connected

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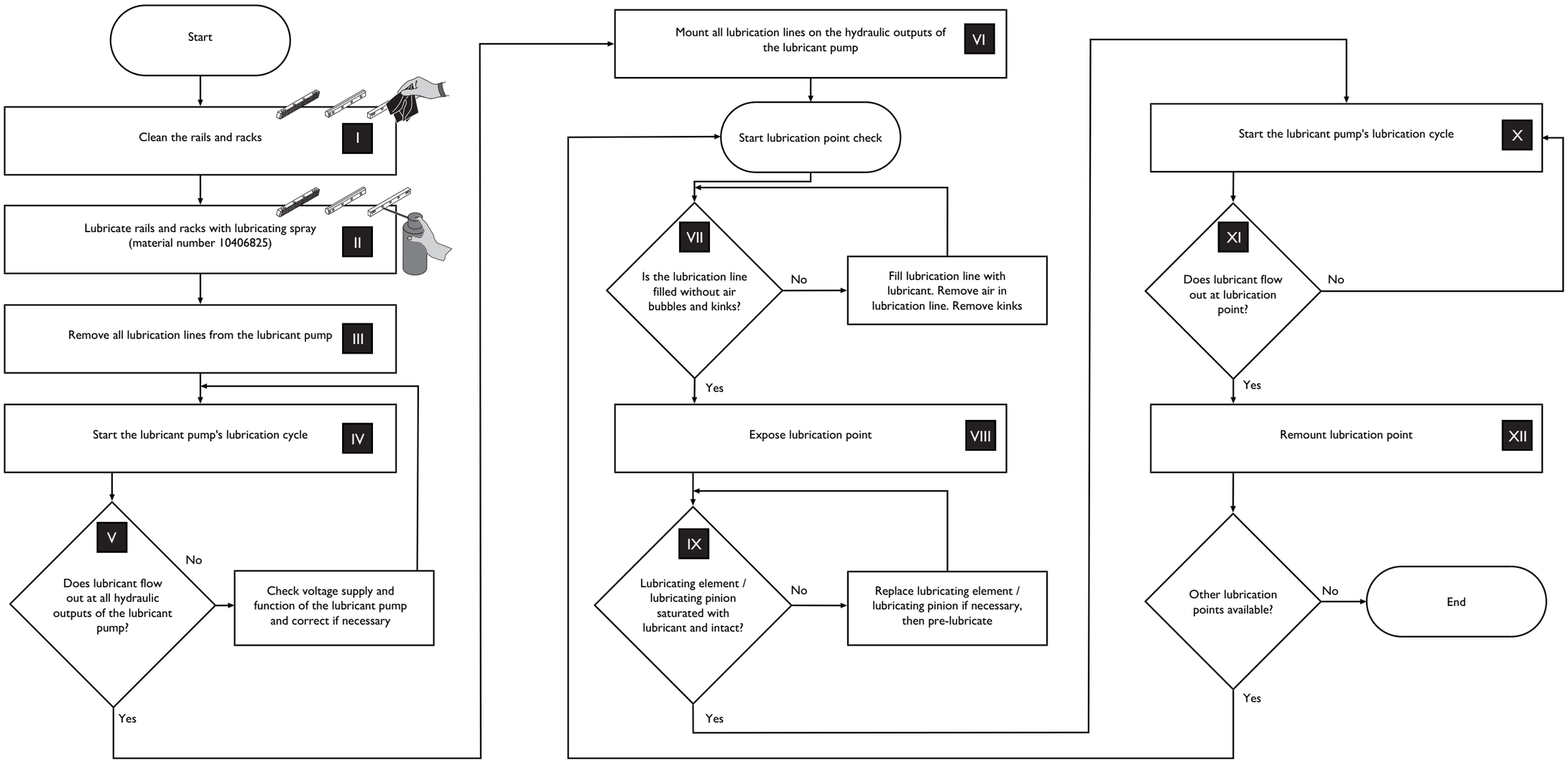
Checking the lubrication system



- After cleaning work or during standstill times of 1 to 4 weeks, check the lubricant film on the rails and racks (II) and the lubrication lines for air bubbles and kinks (VII) before commissioning. If necessary, carry out a check of the complete lubrication system.
- As operator, check the lubrication system during initial commissioning, after standstill times of more than 4 weeks, if lubricant film is not present, and after the lubricant cartridge or the lubricant pump of the lubrication system has been replaced.
  The operator is always responsible for adequate and properly functioning lubrication.

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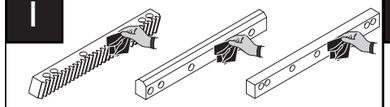
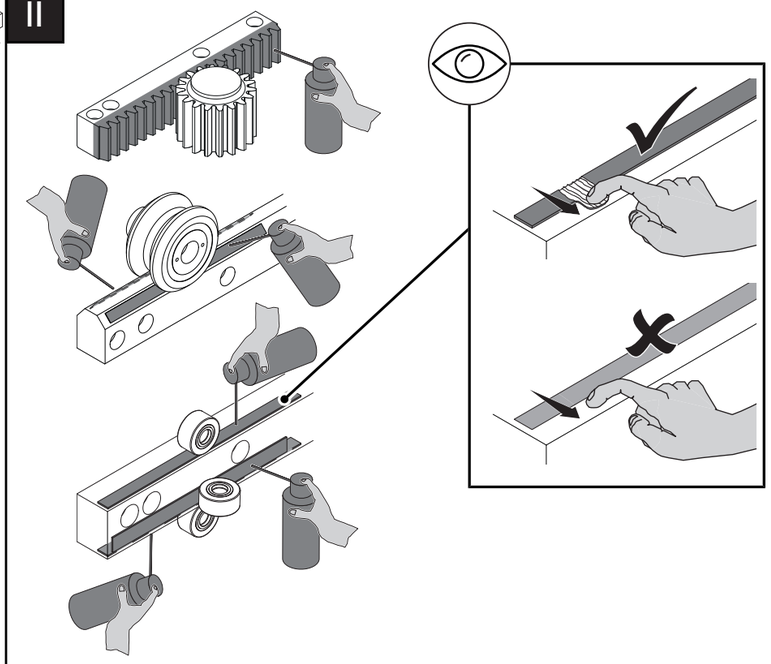
I



II



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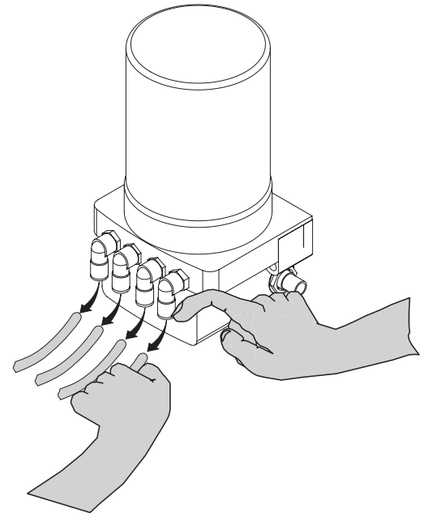

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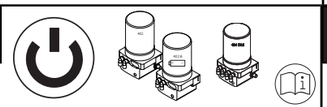

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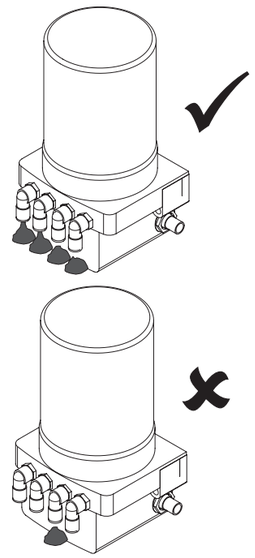

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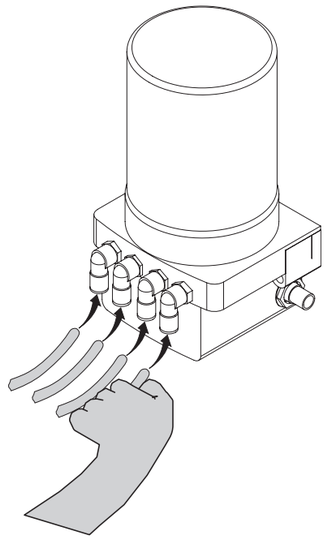

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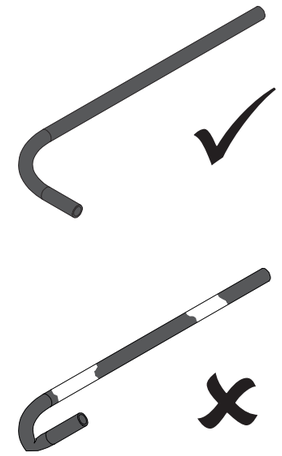

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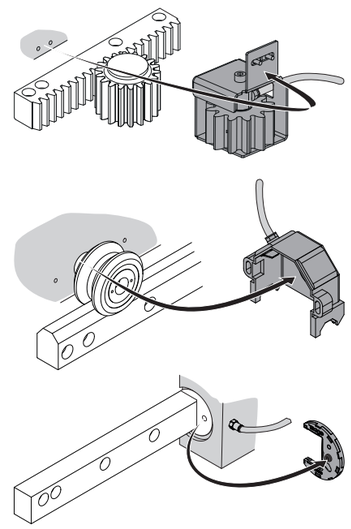

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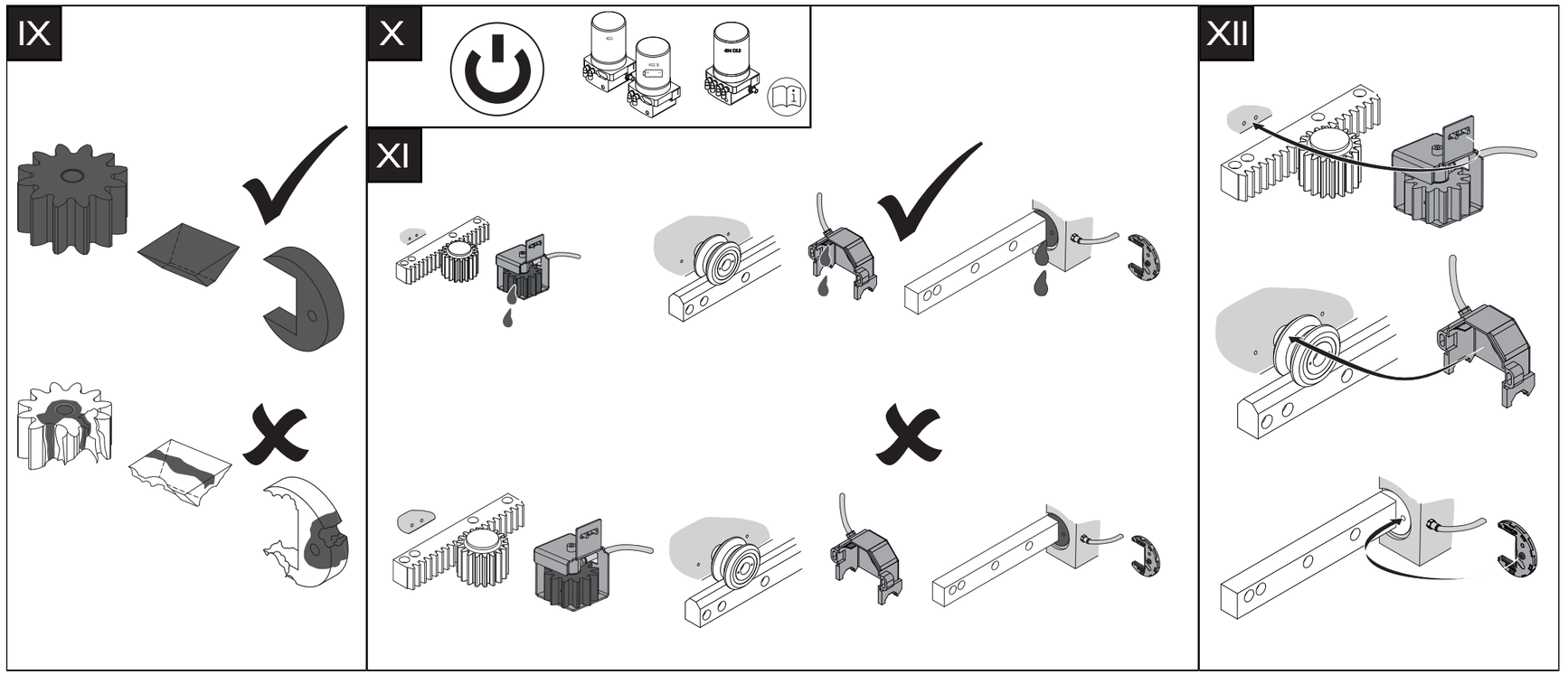

Lubrication ex works	Specifications	Lubricant quantity
Elkalub FLC 8 H1	Cannot be determined	Running surfaces of the roller and pinion need to be covered completely by a lubricating film

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Tab. 7-15 *Lubricant, Cleaning agents: Pre-lubricating rails and racks*

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7.4 Maintenance table

Maintenance work	Maintenance cycle [h]	Duration [min]	Target group	Lubricant Cleaning agents	Further information
Replacing lubricant cartridge	2000	3	Maintenance technicians The manufacturer's technicians Service technicians	Güdel H1 NSF no. 146621Rivolta F.L.500Rivolta F.L.125	➲ Chapter 7.3.2.1, 🗎 79
Checking the lubrication system		6	Service technicians Maintenance technicians The manufacturer's technicians	Elkalub FLC 8 H1; mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)	➲ Chapter 7.3.2.2, 🗎 83
Cleaning and checking lubrication system	10,000	12	Service technicians The manufacturer's technicians Maintenance technicians	mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)	➲ Chapter 7.3.3.1, 🗎 87
Replacing the lubricant pump	20,000	15	Service technicians Maintenance technicians The manufacturer's technicians		➲ Chapter 7.3.4.1, 🗎 89

This table does not purport to be exhaustive.

Tab. 7-16 Maintenance table

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7.5 Feedback on the instructions

Your feedback helps us to keep improving these instructions. Thank you!

mailto: docufeedback@ch.gudel.com

Please provide the following information with your feedback:

- Identification number of the instructions
- Product, type
- Project number, order number
- Material number / serial number
- Year of manufacture
- Location of the product (country, ambient conditions, etc.)
- Photos, comments, feedback with clear reference to the section in the instructions
- Your contact data for clarifications if necessary

You can find most of the information on the type plate or the title page of the instructions. The identification number of the instructions is given on each page, as shown here:

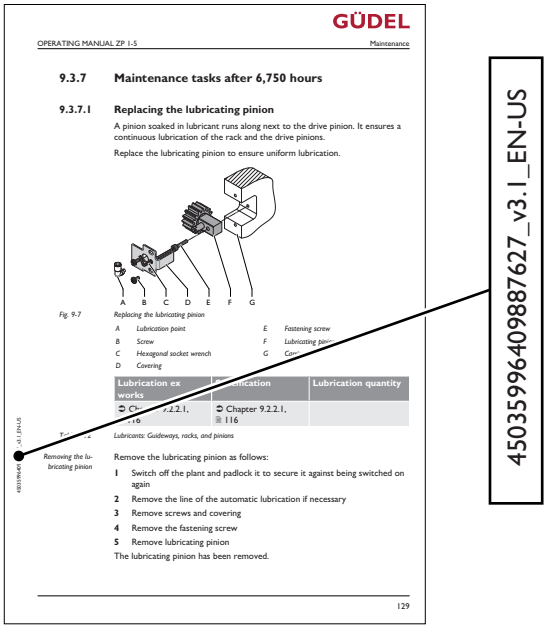

Fig. 7-13 *Identification number of the instructions*

8 Repairs

8.1 Introduction

Work sequences

Perform the work sequences in the order described. Perform the described tasks at the specified times. This ensures a long service life for your product.

Original spare parts

Only use original spare parts. ➲ 119

Tightening torques

Unless otherwise indicated, adhere to the tightening torques of Güdel.
➲ Chapter 13, 128

8.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 15
It concerns your personal safety!

⚠ DANGER

Hazardous voltage

The product contains components that are energized with hazardous voltages. Touching these components will cause an electric shock. Electric shocks can be fatal!

Before working in the danger area:

- Switch off the superordinate main power supply
- Secure the superordinate power supply against being switched on again (main switch of complete system)
- Ground the equipment

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⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

8.1.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

8.2 Repairs

Always replace the complete lubrication system if it is defective; the splitters, the Y-segments, the lubrication lines or the connection cable with new ones. Send the complete lubrication system to Güdel for repairs.

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8.3 Malfunctions / Troubleshooting

Malfunction	Cause	Measure
Lubrication system does not lubricate (Pump function has been stopped.)	Overpressure	• Check lubrication lines • Rectify causes (defective lubrication line, hardened lubricant, etc.) • Reset the error ➲ Chapter 5.5.2.3, 51
Lubrication system does not lubricate (Pump function has been stopped.)	Undervoltage or overvoltage	• Switch off lubrication system • Check supply voltage and compare with specified parameters • Replace defective electronic components • Switch on lubrication system • Reset the error ➲ Chapter 5.5.2.3, 51
Lubrication system does not lubricate (Pump function has been stopped.)	Internal error	Disassemble entire lubrication system with screwed on lubricant cartridge and send back to Güdel along with a comprehensive fault description.
Lubrication system does not lubricate (Pump function has been stopped.)	• Lubricant cartridge missing • Lubricant cartridge empty • Air in the lubrication system	• Insert new lubricant cartridge • Vent the lubrication system The lubrication system continues running without change

Tab. 8-1 Malfunctions / Troubleshooting

9 Decommissioning, storage

9.1 Introduction

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 15
It concerns your personal safety!

9.1.1 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

9.2 Storage conditions

⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

Room

Store the product in a dry location. For information on the required space and the floor capacity, refer to the layout. Use a covering to protect the product against dust and dirt.

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Temperature The ambient temperature must remain between -10 and +40 °C. Make sure that the product is not subjected to great temperature fluctuations.

Air humidity The air humidity must be below 75%.

9.3 Decommissioning

9.3.1 Shutdown

Do not empty the lubrication lines and the gearbox when shutting down the product.

To shut down the product, proceed as follows:

1 Switch off lubrication system
2 Remove lubrication cartridge
3 Remove connecting cable
4 Disconnect the lubrication lines from the hydraulic outputs

The product has been shut down

9.3.2 Cleaning, rust-proofing

Clean away any dirt and dust from the product. Clean the product thoroughly. Dispose of any cloths soaked in oil or grease in an environmentally friendly manner. ➲ 113
Apply corrosion protection to all bright parts.

9.3.3 Identification

Label the product with the following data:

- Date of decommissioning
- Internal machine number/name
- Additional data as per internal guidelines

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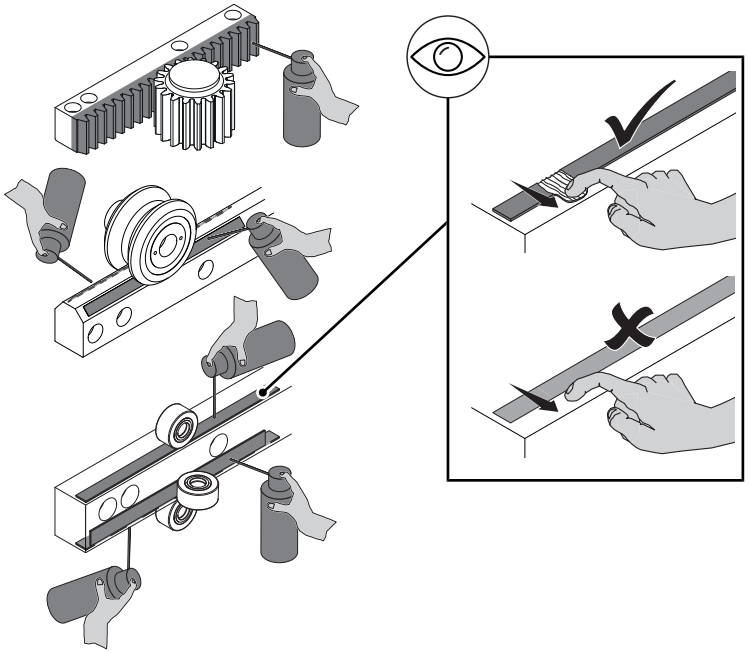
9.4 Recommissioning

For recommissioning, follow the steps described for commissioning.

After cleaning work on the product or a downtime of one to four weeks, carry out the following jobs:

- Check the lubrication system ➲ 87

- Check lubrication film on rails and racks and pre-lubricate if necessary



If the machine downtime is longer than four weeks, carry out the following jobs:

- Pre-lubricate rails and racks ➲ 111

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9.4.1.1 Cleaning the rails and racks

⚠ DANGER

Moving the axis

The work requires moving the axis. This can lead to severe or fatal injuries!

- Ensure that no persons are in the danger area while the axis is moving

⚠ CAUTION

Risk of injury

There is a risk of cuts and crushing in the area of the gearbox, pinion, and racks.

- Wear appropriate protective clothing

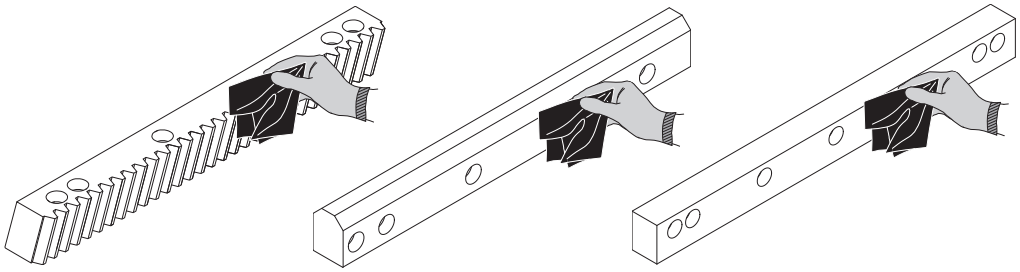

Fig. 9-1 *Cleaning rails and racks*

Cleaning agents
mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)

Tab. 9-1 *Cleaning agents: Rails and racks*

Clean the rails and racks as follows:

1 Switch off the system and secure it with a padlock against being switched on again

2 Clean the rails and racks thoroughly

The rails and racks have been cleaned.

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9.4.1.2 Pre-lubricating rails and racks

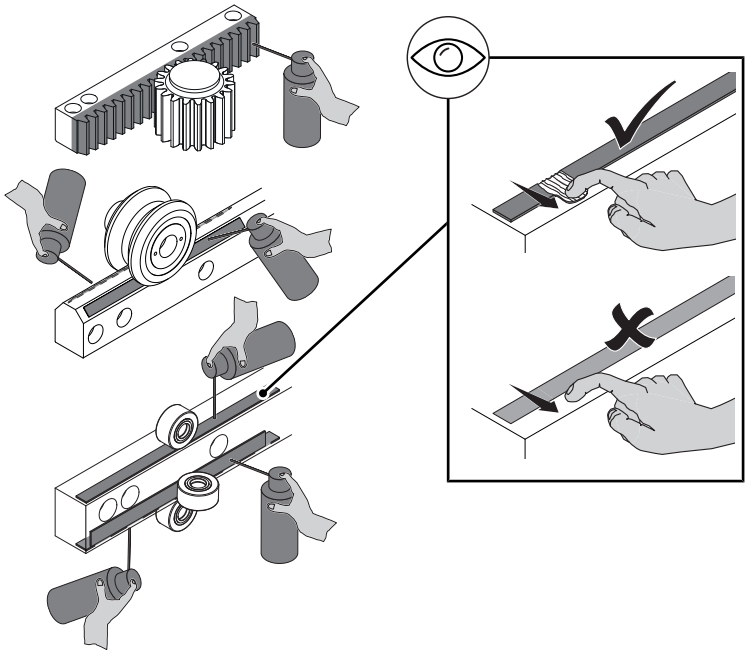


Fig. 9-2 *Pre-lubricating rails and racks*

Lubrication ex works	Specifications	Lubricant quantity
➲ Chapter 7.2.2.1, 74	➲ Chapter 7.2.2.1, 74	

Tab. 9-2 *Lubricant: Rails, racks, and pinions*

Pre-lubricate the rails and racks as follows:

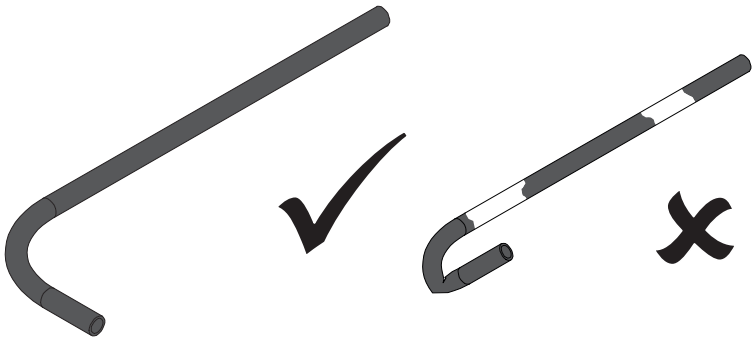
Prerequisite: The rails and racks have been cleaned.

1 Switch off the system and secure it with a padlock against being switched on again

2 Pre-lubricate rails and racks according to illustration

The rails and racks have been pre-lubricated.

- Check hydraulic lines for air pockets and kinks



- Check lubrication system according to separate documentation on lubrication system

If the machine downtime is longer than one year, carry out the following tasks:

- Rinse the lubrication lines with fresh lubricant
- Replace the lubricating elements and lubricating pinion
- Replace lubricant cartridge

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10 Disposal

10.1 Introduction

Observe the following during disposal:

- Adhere to the country-specific regulations
- Separate the material groups
- Dispose of the materials in an environmentally friendly way
- Recycle waste if possible

10.1.1 Safety

Only perform the tasks described in this chapter after you have read and understood the chapter "Safety". ➲ 15
It concerns your personal safety!

⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

10.1.2 Personnel qualifications

Only appropriately trained and authorized technicians are allowed to work on the product.

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10.2 Disposal

Your product consists of the following items:

- Packaging
  - Contaminated materials / auxiliary agents (oil paper)
  - Wood
  - Plastic (film)
- Consumable
  - Lubricants (oils / greases)
  - Batteries
- Base unit
  - Metals (steel/aluminum)
  - Plastics (thermoplasts/duroplasts)
  - Contaminated materials / auxiliary agents (felt / cleaning cloths)
  - Electric material (electric cables)

10.3 Waste management compliant assemblies

10.3.1 Disassembly

⚠ DANGER

Hazardous voltage

The product contains components that are energized with hazardous voltages. Touching these components will cause an electric shock. Electric shocks can be fatal!

Before working in the danger area:

- Switch off the superordinate main power supply
- Secure the superordinate power supply against being switched on again (main switch of complete system)
- Ground the equipment

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⚠ DANGER

Leaking fluids

Oils, greases and other operating consumables may leak during the entire service life of the product. These leaking liquids are harmful to the environment!

- Observe the specified maintenance intervals and service intervals
- When anchoring the product, ensure that the boreholes are drilled correctly
- The oils and greases must not get into the drinking water supply. Take appropriate measures
- Observe the country-specific safety data sheets
- Oils and greases must be disposed of as hazardous waste, even if the total quantity is small

Disassemble the product as follows:

Prerequisite: Prior to disassembly, shut down the product

1 Remove connecting elements (electric cables / lines / energy chains)

2 Disassemble assemblies

3 Dismantle components and separate different materials

The product has now been disassembled.

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10.3.2 Material groups

Dispose of the material groups in accordance with the following table:

Material	Disposal method
Contaminated materials / auxiliary agents	Hazardous waste
Wood	Municipal waste
Plastic	Collecting point or municipal waste
Lubricant	Collecting point disposal in accordance with the safety data sheets ➲ 24
Batteries	Battery collection
Metals	Scrap metal collection
Electrical material	Electrical waste

Tab. 10-1 *Disposal: material groups*

10.4 Disposal facilities, authorities

The disposal facilities and authorities differ from country to country. Observe the local laws and regulations concerning disposal.

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11 Accessories

11.1 PLC connecting cable

The following M12 connecting cables are permitted for the product:

Material number	Designation
	Round plug connector M12 4-pin prefitted LED
0200513	Length 1 m
0152900	Length 2 m
0200515	Length 5 m
0200516	Length 10 m
0200517	Length 20 m

Tab. 11-1 *PLC connecting cable*

The PLC connecting cables are equipped with three colored LEDs:

LED color	Meaning
Green	Voltage on PIN 1
Yellow	Signal on PIN 4
White	Signal on PIN 2

Tab. 11-2 *PLC connecting cable: Meaning of the LED color*

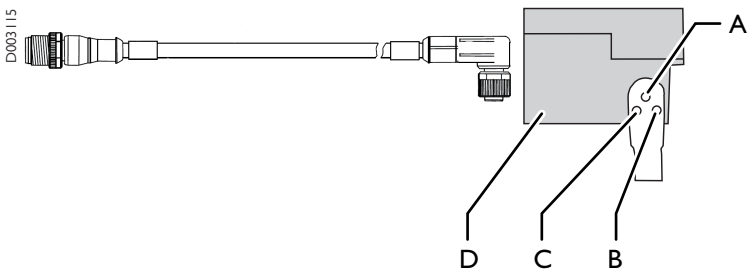

Fig. 11-1 *PLC connecting cable*

A *LED white*
B *LED green*
C *LED yellow*
D *FlexxPump*

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12 Spare parts supply

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12.1 Service departments

Have the following information available for service inquiries:

- Product, type (as per type plate)
- Project number, order number (as per type plate)
- Serial number (as per type plate)
- Material number (as per type plate)
- Location of the system
- Contact person at the operating company
- Description of the issue
- Drawing number (if applicable)

Regular inquiries

If you have questions relating to service, please use the service form at www.gudel.com or contact the responsible service department:

For all other countries not included in the following list, please contact the service department in Switzerland.

Customer with special agreements should contact the service department specified in the contract.

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Americas

Country	Relevant service department	Phone	E-mail
Brazil	Güdel Lineartec Comércio de Automção Ltda. Rua Américo Brasiliense n° 2170, cj. 506 Chácara Santo Antonio CEP 04715-005 São Paulo Brazil	+55 11 99590 8223	info@br.gudel.com
Argentina Mexico	Güdel TSC S.A. de C.V. Gustavo M. Garcia 308 Col. Buenos Aires N.L. 64800 Monterrey Mexico	+52 81 8374 2500 107	service@mx.gudel.com
Canada United States	Güdel Inc. 4881 Runway Blvd. Ann Arbor, Michigan 48108 United States	+1 855 483 3587	service@us.gudel.com

Tab. 12-1 *Service departments Americas*

Asia

Country	Relevant service department	Phone	E-mail
China	Güdel International Trading Co. Ltd. Block A, 8 Floor, C2 BLDG, No. 1599 New Jin Qiao Road Pudong 201206 Shanghai China	+86 21 5055 0012	info@cn.gudel.com
China press automation	Güdel Jier Automation Ltd. A Zone 16th Floor JIER Building 21th Xinxi Road 250022 Jinan China	+86 531 81 61 6465	service@gudeljier.com
India	Güdel India Pvt. Ltd. Gat No. 458/459 Mauje Kasar Amboli Pirangut, Tal. Mulshi 412 111 Pune India	+91 20 679 10200	service@in.gudel.com

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Country	Relevant service department	Phone	E-mail
Korea	Güdel Lineartec Inc. 11-22 Songdo-dong Yeonsu-Ku Post no. 406-840 Incheon City South Korea	+82 32 858 05 41	gkr.service@gudel.co.kr
Taiwan, China	Güdel Lineartec Co. Ltd. No. 99, An-Chai 8th St. Hsin-Chu Industrial Park TW-Hu-Ko 30373 Hsin-Chu Taiwan, China	+88 635 97 8808	info@tw.gudel.com
Thailand	Güdel Lineartec Co. Ltd. 19/28 Private Ville Hua Mak Road Hua Mak Bang Kapi 10240 Bangkok Thailand	+66 2 374 0709	service@th.gudel.com

Tab. 12-2 *Service departments in Asia*

Europe

Country	Relevant service department	Phone	E-mail
Denmark	Güdel AG Gaswerkstrasse 26 Industrie Nord 4900 Langenthal Switzerland	+41 62 916 91 70	service@ch.gudel.com
Finland			
Greece			
Norway			
Sweden			
Switzerland			
Turkey			

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Country	Relevant service department	Phone	E-mail
Bosnia and Herzegovina	Güdel GmbH Schöneringer Strasse 48 4073 Wilhering Austria	+43 7226 20690 0	service@at.gudel.com
Croatia			
Austria			
Romania			
Serbia			
Slovenia			
Hungary			
Slovakia	Güdel a.s. Holandská 4 63900 Brno Czech Republic	+420 602 309 593	info@cz.gudel.com
Czech Republic			
Portugal	Güdel Spain C/Sant Francesc, 4 1º 12ª 08290 Cerdanyola del Vallés Spain	+34 644 347 058	info@es.gudel.com
Spain			
France	Güdel SAS Tour de l'Europe 213 3 Bd de l'Europe 68100 Mulhouse France	+33 1 6989 80 16	info@fr.gudel.com
Germany	Güdel Germany GmbH Industriepark 107 74706 Osterburken Germany	+49 6291 6446 792	service@de.gudel.com
Germany intralogistics	Güdel Intralogistics GmbH Gewerbegebiet Salzhub 11 83737 Irschenberg Germany	+49 8062 7075 0	service-intralogistics@de.gudel.com

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Country	Relevant service department	Phone	E-mail
Italy	Güdel S.r.l. Via per Cernusco, 7 20060 Bussero (Mi) Italy	+39 02 92 17 021	info@it.gudel.com
Belgium Luxembourg The Netherlands	Güdel Benelux Eertmansweg 30 7595 PA Weerselo The Netherlands	+31 541 66 22 50	info@nl.gudel.com
Estonia Latvia Lithuania Poland Ukraine	Gudel Sp. z o.o. ul. Legionów 26/28 43-300 Bielsko-Biała Poland	+48 33 819 01 25	serwis@pl.gudel.com
Russia Belarus	Gudel Russia Yubileynaya 40 Office 1902 445057 Togliatti Russia	+7 848 273 5544	info@ru.gudel.com
Ireland United Kingdom	Güdel Lineartec (U.K.) Ltd. Unit 5 Wickmans Drive, Banner Lane Coventry CV4 9XA West Midlands United Kingdom	+44 24 7669 5444	service@uk.gudel.com

Tab. 12-3 *Service departments in Europe*

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All other countries

Country	Relevant service department	Phone	E-mail
All other countries	Güdel AG Gaswerkstrasse 26 Industrie Nord 4900 Langenthal Switzerland	+41 62 916 91 70	service@ch.gudel.com

Tab. 12-4 *Service departments for all other countries*

Inquiries outside of business hours

If you have service inquiries outside of business hours, please contact the following service departments:

Europe	Güdel AG Gaswerkstrasse 26 Industrie Nord 4900 Langenthal Switzerland	+41 62 916 91 70	service@ch.gudel.com
Americas	Güdel Inc. 4881 Runway Blvd. Ann Arbor, Michigan 48108 United States	+1 855 483 3587	service@us.gudel.com

Tab. 12-5 *Service departments outside of business hours*

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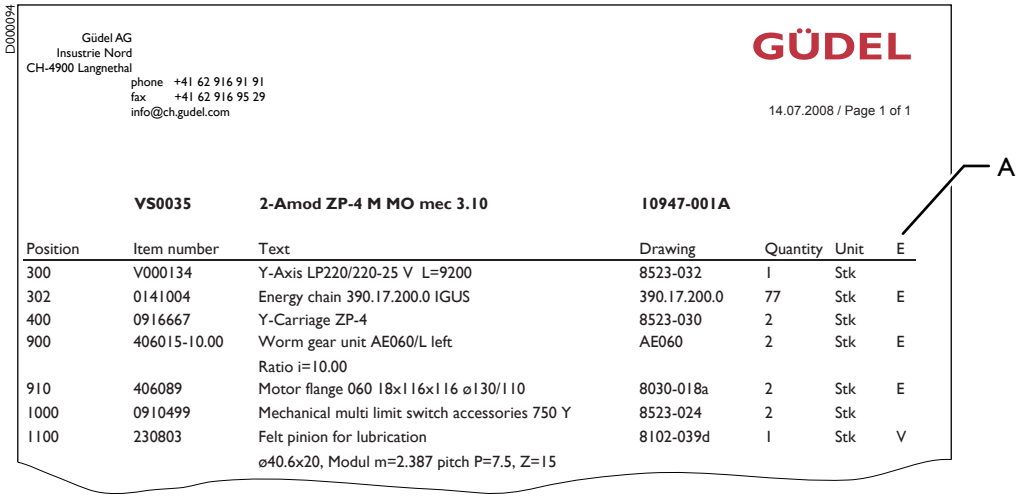
12.2 Explanations regarding the spare parts list

12.2.1 Spare parts and wear items list

The replacement and wear items list contains the parts of your product. The replacement parts and wear items are indicated as described in the explanation of symbols.



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A

VS0035 **2-Amod ZP-4 M MO mec 3.10** **10947-001A**

Position	Item number	Text	Drawing	Quantity	Unit	E
300	V000134	Y-Axis LP220/220-25 V L=9200	8523-032	1	Stk	
302	0141004	Energy chain 390.17.200.0 IGUS	390.17.200.0	77	Stk	E
400	0916667	Y-Carriage ZP-4	8523-030	2	Stk	
900	406015-10.00	Worm gear unit AE060/L left Ratio i=10.00	AE060	2	Stk	E
910	406089	Motor flange 060 18x116x116 ø130/110	8030-018a	2	Stk	E
1000	0910499	Mechanical multi limit switch accessories 750 Y	8523-024	2	Stk	
1100	230803	Felt pinion for lubrication ø40.6x20, Modul m=2.387 pitch P=7.5, Z=15	8102-039d	1	Stk	V

Fig. 12-1 *Explanation of symbols*

A *Spare part status*

Spare part status (column E): E = Spare part
V = Wear item

12.2.2 Position drawings

The positions of the spare parts can be seen on the drawings. These are standard drawings. Individual positions or images might differ from your product.

13 Torque tables

13.1 Tightening torques for screws

NOTE

Vibrations

Screws without screw lock can come loose.

- Secure screw connections on moving parts with Loctite medium strength 243.
- Apply the adhesive on the nut thread, not on the screw!

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13.1.1 Zinc plated screws

Unless otherwise specified, the following tightening torques apply for zinc-plated screws lubricated with Molykote (MoS2) grease or secured with Loctite 243:

Thread size	Tightening torque [Nm]		
	8.8	10.9	12.9
M3	1.1	1.58	1.9
M4	2.6	3.9	4.5
M5	5.2	7.6	8.9
M6	9	13.2	15.4
M8	21.6	31.8	37.2
M10	43	63	73
M12	73	108	126
M14	117	172	201
M16	180	264	309
M20	363	517	605
M22	495	704	824
M24	625	890	1041
M27	915	1304	1526
M30	1246	1775	2077
M36	2164	3082	3607

Tab. 13-1 *Torque table for zinc-plated screws lubricated with Molykote (MoS2) grease*

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Illustrations

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Appendix

The appendix of this operating manual contains the following documents:

- Layout
- Spare parts lists
- Declaration of conformity for TriboServ

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Layout

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Spare parts lists

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Declaration of conformity for TriboServ

See also

Declaration of conformity for TriboServ [▶ 149]

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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
Gelthari-Ring 3
D-97505 Geldersheim

Geldersheim, 31.01.2020

Dr.-Ing. Michael Weigand, General Manager

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