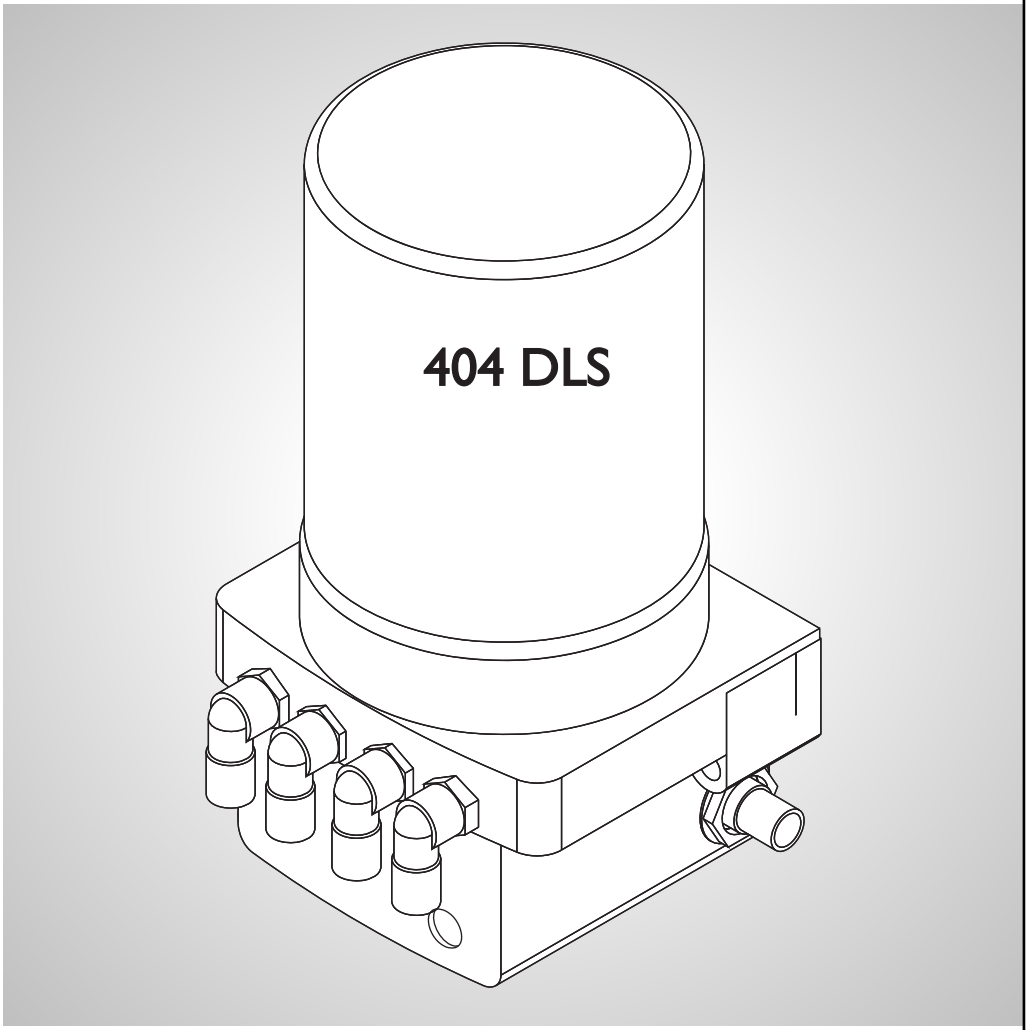
GÜDEL

OPERATING MANUAL

Automatic lubrication system FlexxPump 404DLS



Project / Order:	B1X.xxxxxxxxx-xxxx
Bill of materials:	09xxxxx
Serial number:	
Year of manufacture:	2019

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
10.0	10/28/2019	New: • Declaration of conformity for TriboServ ➲ Chapter , 🗎 133 Entire manual updated.
9.0	02/27/2019	Updated: • Type plate and location of type plate ➲ 🗎 26 • Maintenance tasks ➲ 🗎 71 • Interim times for PIN4 output signal ➲ 🗎 47 ➲ 🗎 49 ➲ 🗎 51 ➲ 🗎 53 • Recommended solution for software programming ➲ 🗎 44 • Recommissioning ➲ 🗎 97 New: • Overview of other applicable documentation ➲ Chapter 1.1, 🗎 12 • Reference to lubrication requirements ➲ Chapter 5.4, 🗎 43 • Reference to software modules ➲ Chapter 5.4, 🗎 43
8.0	07/27/2018	Updated: • Lubrication recommendation ➲ 🗎 55 • Checking the lubrication system ➲ 🗎 59 • Checking the automatic lubrication system ➲ 🗎 79 • Replacing the cartridge ➲ 🗎 72 • Maintenance table New: • Replacing the FlexxPump ➲ Chapter 7.3.4, 🗎 80

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Version	Date	Description
7.0	06/01/2018	Valid as of FlexxPump serial number 1601929 Updated: • Actuate ➲ Chapter 5.4, 🗎 43 • Lubrication recommendation ➲ 🗎 55 New: • Splitter ➲ 🗎 29 ➲ Chapter 4.2.3.1, 🗎 33
6.0	04/12/2018	Updated: • Lubrication check ➲ 🗎 59
5.0	12/12/2017	Updated: • Lubrication check ➲ 🗎 59
4.0	08/08/2017	Added: • Lubrication check ➲ 🗎 59
3.0	02/27/2017	Corrected: • Standards and guidelines of the Declaration of conformityDeclaration of conformity, declaration of incorporation
2.0	11/29/2016	Updated: • New signatures on Declaration of conformityDeclaration of conformity, declaration of incorporation • Entire manual updated
1.0	07/29/2016	Basic version

Table -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.

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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
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

Table 1-1 Other applicable documentation

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1.2 Purpose of the document

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

- Transport
- 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 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

Table 1-2 Explanation of symbols/abbreviations

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2 Safety

2.1 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.

2.1.1 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.

Operation

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

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2.1.2 Personnel qualifications

⚠ WARNING

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.

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2.1.2.1 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
- 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

2.1.2.2 Transport specialists

The transport specialist:

- is able to transport loads safely
- is able to use slings safely and properly
- is able to secure the load properly
- has experience in transportation

2.1.2.3 Fitters

The fitter:

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

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2.1.2.4 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

2.1.2.5 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

2.1.2.6 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:

- performing mechanical and electrical maintenance work in accordance with the manual
- performing mechanical and electrical service work in accordance with the manual
- cleaning the product
- replacing spare parts
- localizing and fixing malfunctions

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2.1.2.7 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:

- performing mechanical and electrical maintenance work in accordance with the manual
- cleaning the product
- replacing spare parts
- monitoring and instructing the cleaning staff in the safety zone during the cleaning process

2.1.2.8 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:

- performing mechanical and electrical service work in accordance with the manual
- replacing spare parts

2.1.2.9 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

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2.1.3 Disregarding safety regulations

⚠ DANGER

Disregarding safety regulations

Disregarding safety regulations can result in damage to property, severe or fatal injuries.

- Always comply with the safety regulations

Liability

Güdel shall not be held liable under any of the following circumstances:

- The installation regulations were disregarded
- Included protective equipment was not installed
- Included protective equipment was modified
- Included monitoring equipment was not installed
- Included monitoring equipment was modified
- The product was not used as intended
- The maintenance work was not performed in the specified intervals, or was carried out incorrectly.

2.1.4 Installation instructions

Protective measures

The operating company 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 system the operating company must check whether all the protective measures have been implemented. These must cover all hazards. This is the only way to ensure that application of the product conforms to CE regulations.

As stipulated by the Machinery Directive, the protective measures must:

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

Modifications

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

General rules for occupational safety

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

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2.2 Hazard symbols in the manual

2.2.1 Hazard warnings

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

⚠ DANGER

DANGER

DANGER refers to hazards with a high risk of severe physical injury or immediate fatality.

⚠ WARNING

WARNING

WARNING refers to hazards with a moderate risk of severe physical injury or potential fatality.

⚠ CAUTION

CAUTION

CAUTION refers to hazards with a slight risk of moderate physical injury.

NOTE

NOTE

NOTE refers to hazards that can lead to property damage.

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2.2.2 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 resulting from automatic startup
	Hazards due to falling axles
	Hazards due to environmental pollution
	Hazards due to dangerous electrical voltage

2.3 Fundamentals of safety

2.3.1 Product-specific hazards

⚠ CAUTION

Oil, greases

Oils and greases are harmful to the environment!

- 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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2.3.2 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 Intended use

The automatic lubrication system is designed exclusively for lubricating Güdel guideways and Güdel gear teeth. Be sure the hydraulic system is installed correctly ➲ 38

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.

3.1.2 Non-intended use

The product is not intended for:

- Lubrication of runners, bearing or other elements
- Operation in potentially explosive areas
- Lubrication of elements in or on automobiles
- Operation outside of the performance specifications provided by Güdel
- Operation outside of permissible temperature range
- Using lubricants with properties other than the ones specified

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

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.

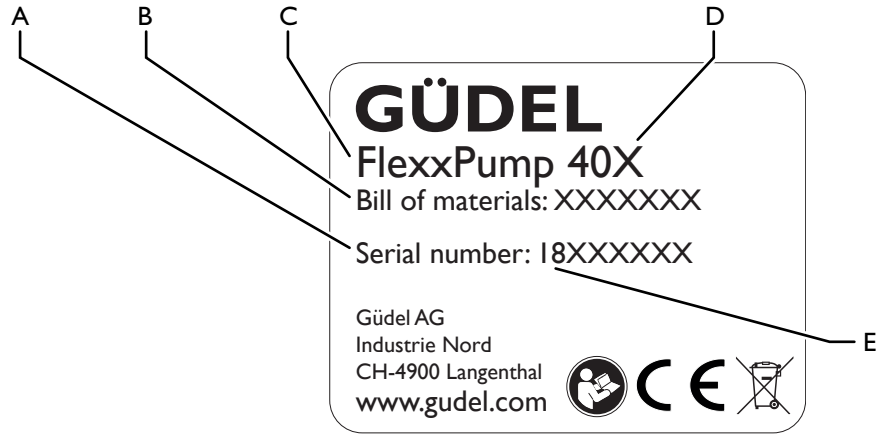

Fig. 3-1 *Type plate*

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.

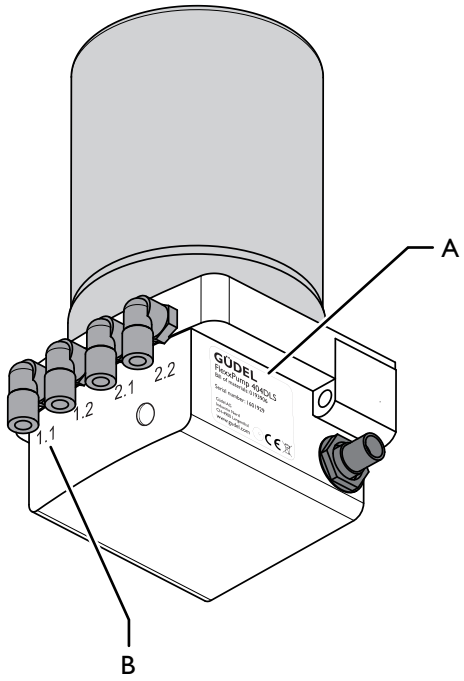

Fig. 3-2 *Position of the type plate*

A *Type plate*

B *Numbers of the hydraulic outputs*

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 404DLS

The FlexxPump 404DLS weighs approx. 1500 g and has the following dimensions:

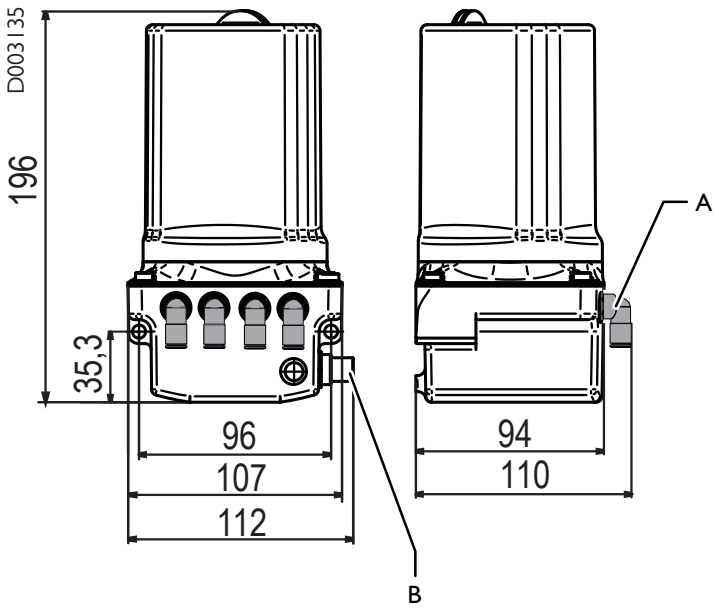

Fig. 3-3 *Dimensions and connections 404DLS*

A *Hydraulic outputs*

B *Connection plug M12x1*

Connections

Hydraulic:

- Four connections for hydraulic hoses with a diameter of 6/3 mm

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

- Control signals
- Operating voltage

Interfaces

The FlexxPump 404DLS features an integrated microprocessor. It is controlled via a programmable logic controller (PLC).

Operating voltage

Operating voltage	Operating power	Peak power I_{max}	Standby current	Peak output power
24 VDC	200 mA	350 mA	<20 mA	300 mA

Table 3-1 *Operating voltage*

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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	
Operation	-20 to +70 °C	Up to and at 85 %, condensation formation is not permissible
Storage	-10 to +40 °C	Up to 75 %

Table 3-2 *Temperature ranges: FlexxPump*

3.3.1.3 IP protection class

The product conforms to the protection class IP65.

3.3.1.4 Operating pressure

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

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 %

Table 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.

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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 cartridge contains 400 cm^3 of lubricant. The empty level is monitored by an integrated reed contact.

3.3.4 Shelf life of Güdel H1 lubricant

The date of filling of the lubricant 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:

- FlexxPump
- Splitters or Y-segments
- Hydraulic hoses
- Connecting cable, if necessary

More detailed information ➲ 38

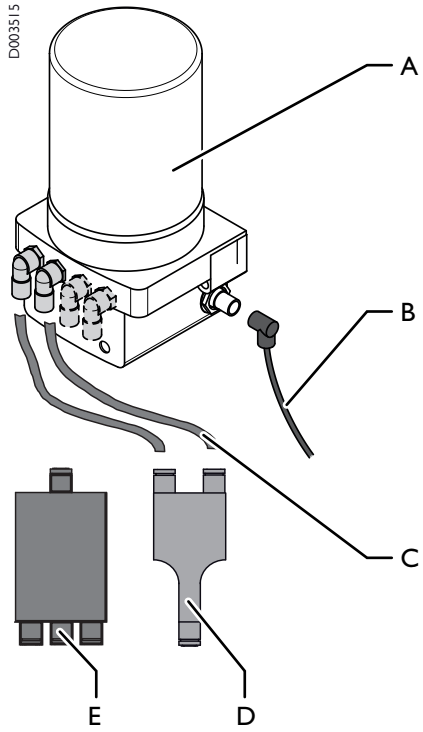

Fig. 4-1 *Design of FlexxPump lubrication system*

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

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4.1.1 Detailed design of FlexxPump 404DLS

The FlexxPump 404DLS consists of the following elements:

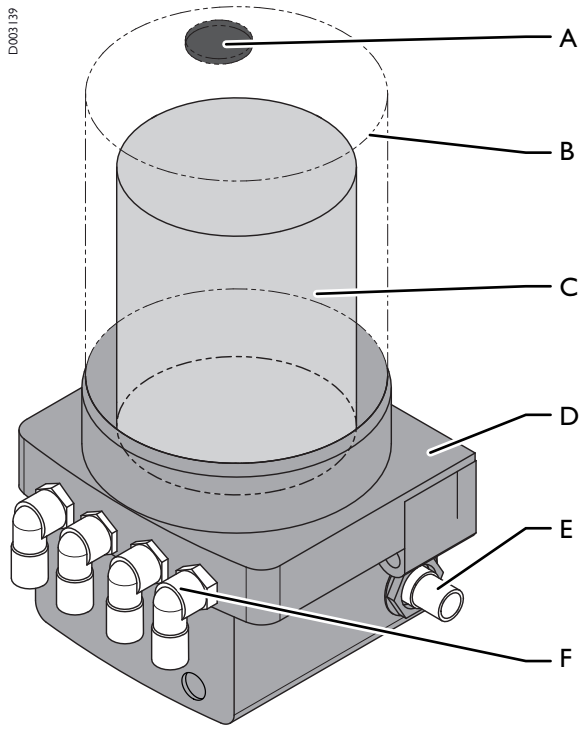

Fig. 4-2 *Detailed design of FlexxPump 404DLS*

A	*Vent locking mechanism*	*D*	*Casing*
B	*Covering*	*E*	*Connection plug for supply and control system*
C	*Cartridge*	*F*	*Hydraulic outputs*

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4.2 Function

4.2.1 Functional description

The automatic lubrication system is a lubrication system for Güdel components. The FlexxPump feeds the lubricant from the cartridge into the lines. Depending on the design, the lubricant is distributed through splitters, combined through Y-segments, or distributed directly to the lubrication area. Rack and pinions are lubricated by lubricating pinions; guideways are lubricated by lubricating elements.

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

4.2.2 FlexxPump

4.2.2.1 404DLS

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

4.2.3 Splitter

4.2.3.1 Function

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

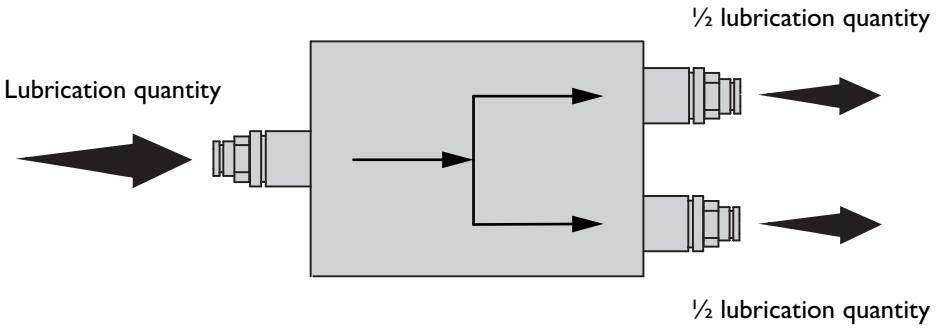

Fig. 4-3 *Function: Splitter, 2-fold*

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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!

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

5.1.2 Personnel qualifications

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

5.2 Transport

Avoid strong impacts and shocks while transporting the automatic lubrication system.

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5.3 Installing

5.3.1 Prerequisites

Dispose of the packaging in accordance with the local waste regulations.
➲ 99

Checking the delivery

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

Interfaces

Check whether the necessary interfaces exist and are functional. Order information on the connecting cable ➲ Chapter 11, 103.
The following interfaces are needed:

Interface	404DLS
Lubricating pinion for gear teeth and Lubricating element for guideway rail	X
Connecting cable M12x1, 4-pole with the corresponding length	X
PLC	X

Table 5-1 *Interfaces*

Installation site

The following prerequisites are made for the assembly site:

- Level surface that is at least 107 mm long and 45 mm wide
- Sufficiently rigid
- In order to minimize condensation, the device must not be subjected to direct sunlight and/or radiation heat

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5.3.2 Installing the FlexxPump

The installation position of the FlexxPump is not important.

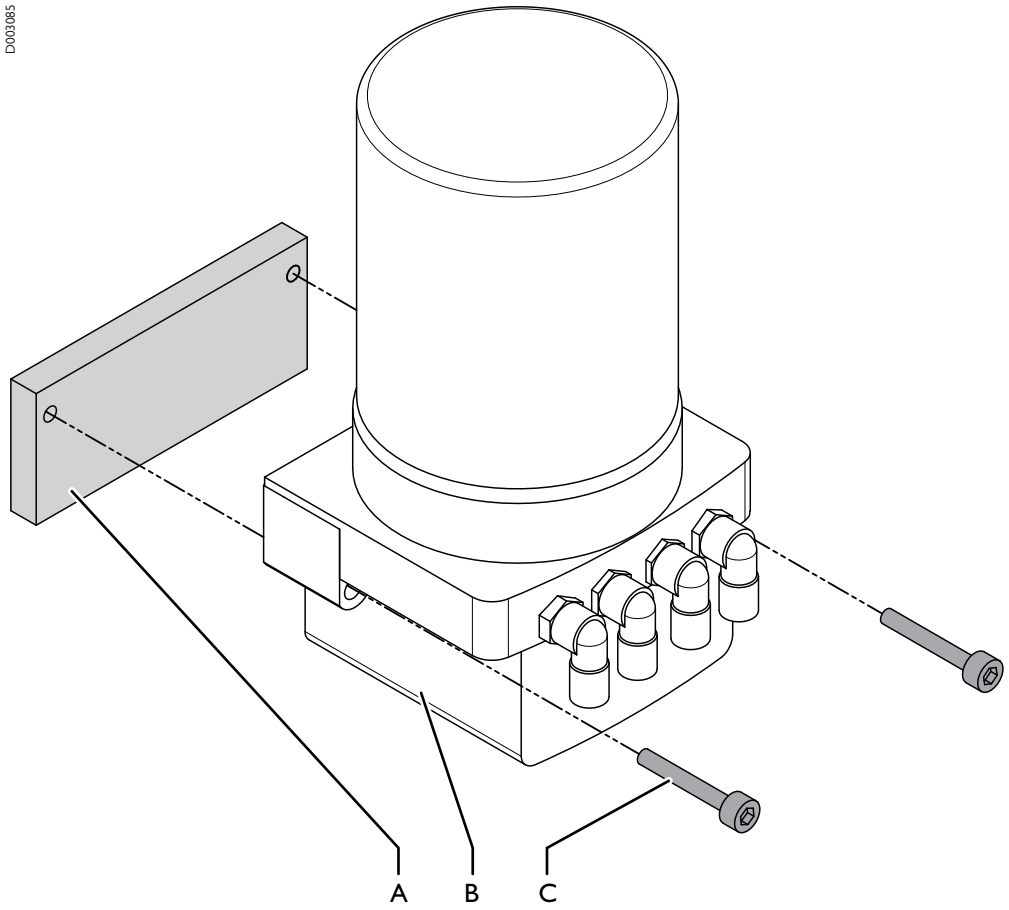

Fig. 5-1 *Installing the FlexxPump*

- *A* *Assembly site*
- *B* *FlexxPump*
- *C* *Screw*

Assemble the FlexxPump as follows:

1 Mount FlexxPump with two screws M6 L_{min} = 40 mm (tightening torque 5 Nm)

The FlexxPump is assembled.

5.3.3 Connect hydraulics

5.3.3.1 404DLS 3-fold

System with 3 lubrication points

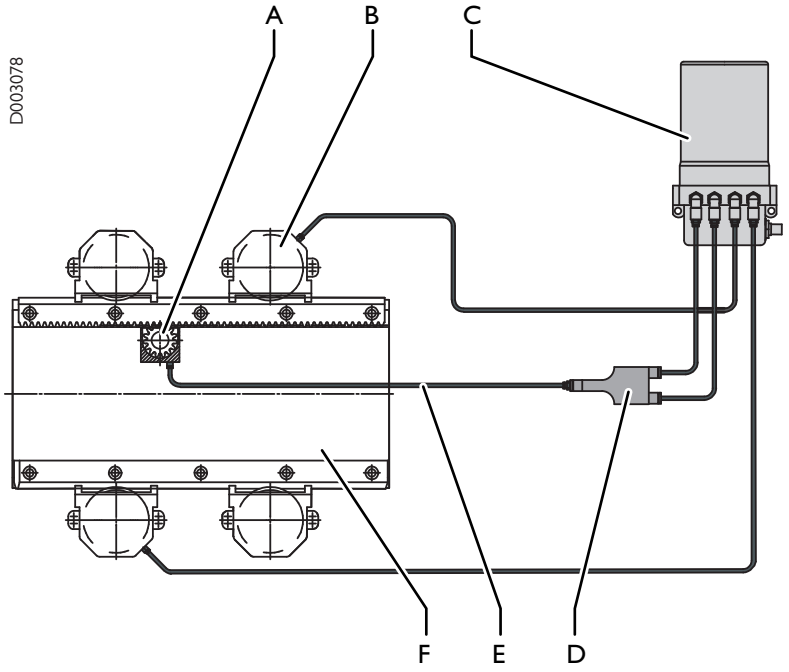

Fig. 5-2 *Design 404DLS 3-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*D*	*Y-segment*
B	*Lubricating element (not included in the scope of delivery)*	*E*	*Hydraulic hose diameter of 6/3 mm*
C	*FlexxPump 404DLS*	*F*	*1st axle (not included in the scope of delivery)*

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5.3.3.2 404DLS 6-fold

System with 6 lubrication points

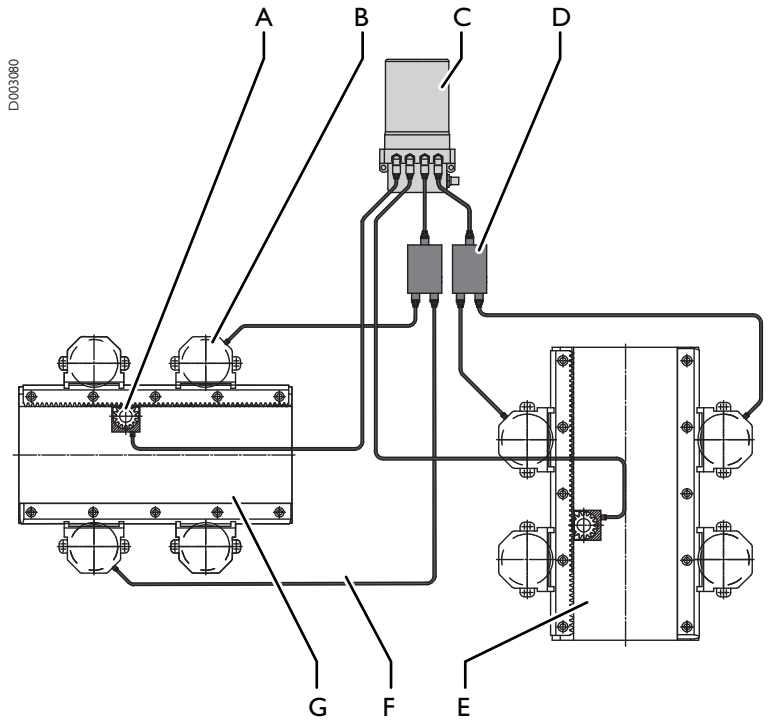

Fig. 5-3 *Design 404DLS 6-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*E*	*2nd axle (not included in the scope of delivery)*
B	*Lubricating element for guideway rails (not included in the scope of delivery)*	*F*	*Hydraulic hose diameter of 6/3 mm*
C	*FlexxPump 404DLS*	*G*	*1st axle (not included in the scope of delivery)*
D	*2x splitter*		

5.3.3.3 404DLS 10-fold

System with 10 lubrication points

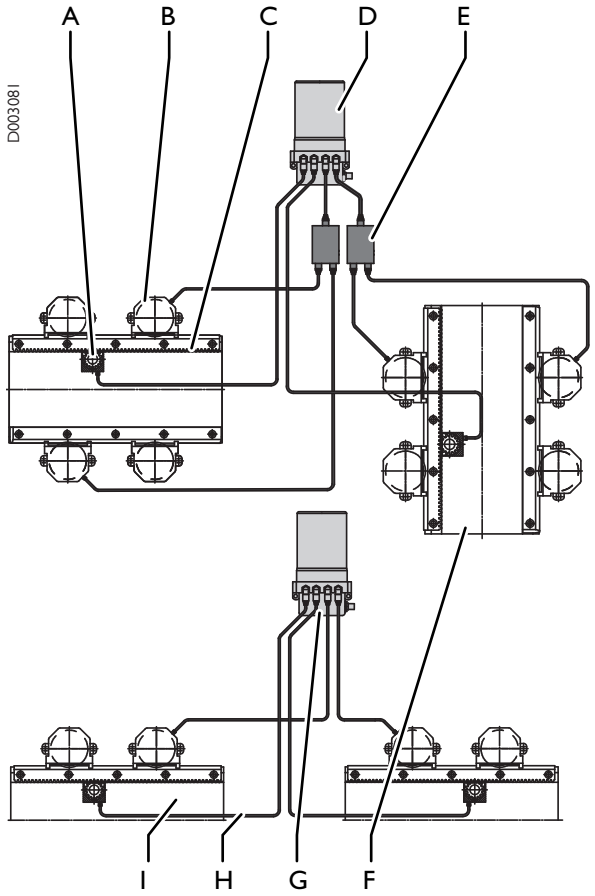

Fig. 5-4 *Design 404DLS 10-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*F*	*2nd axle (not included in the scope of delivery)*
B	*Lubricating element for guideway rails (not included in the scope of delivery)*	*G*	*2nd FlexxPump 404DLS*
C	*1st axle (not included in the scope of delivery)*	*H*	*Hydraulic hose diameter of 6/3 mm*
D	*1st FlexxPump 404DLS*	*I*	*3rd axle (not included in the scope of delivery)*
E	*2x splitter*		

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5.3.4 Connecting electrical equipment

⚠ WARNING

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.

NOTE

Material damage

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

- Do not close any hydraulic outputs

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5.3.4.1 Connecting the 404DLS

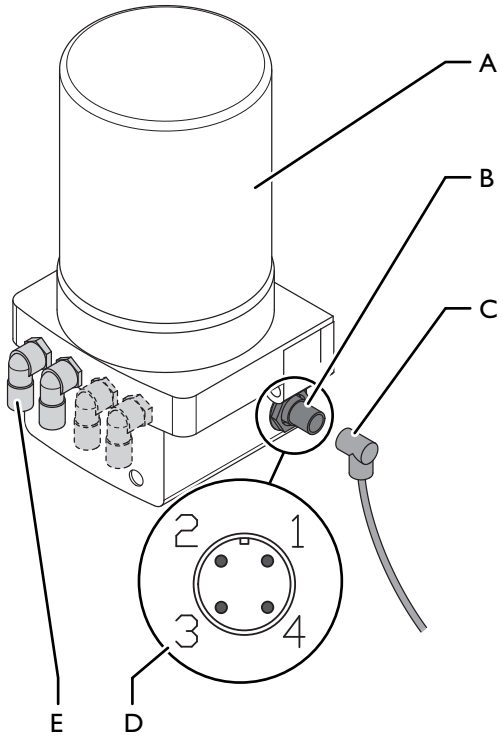

Fig. 5-5 *Connecting the 404DLS*

A	*FlexxPump 404DLS*	*D*	*Connector pin assignment*
B	*Connection plug for connecting cable*	*E*	*Hydraulic outputs*
C	*Socket of connecting cable*		

Connect the product as follows:

1 Connect the hydraulic hoses ➲ 🗎 38

2 Screw the connecting cable to the connecting plug

3 Connecting cable

3.1 PIN 1: Input voltage 24 V DC, color: brown

3.2 PIN 2: Control of the individual pump outputs, color: white

3.3 PIN 3: Mass (GND), 0V, color: blue

3.4 PIN 4: Output signal, color: black

The product is connected

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5.4 Actuate

The document "Requirements to the Lubrication Control of the FlexxPump 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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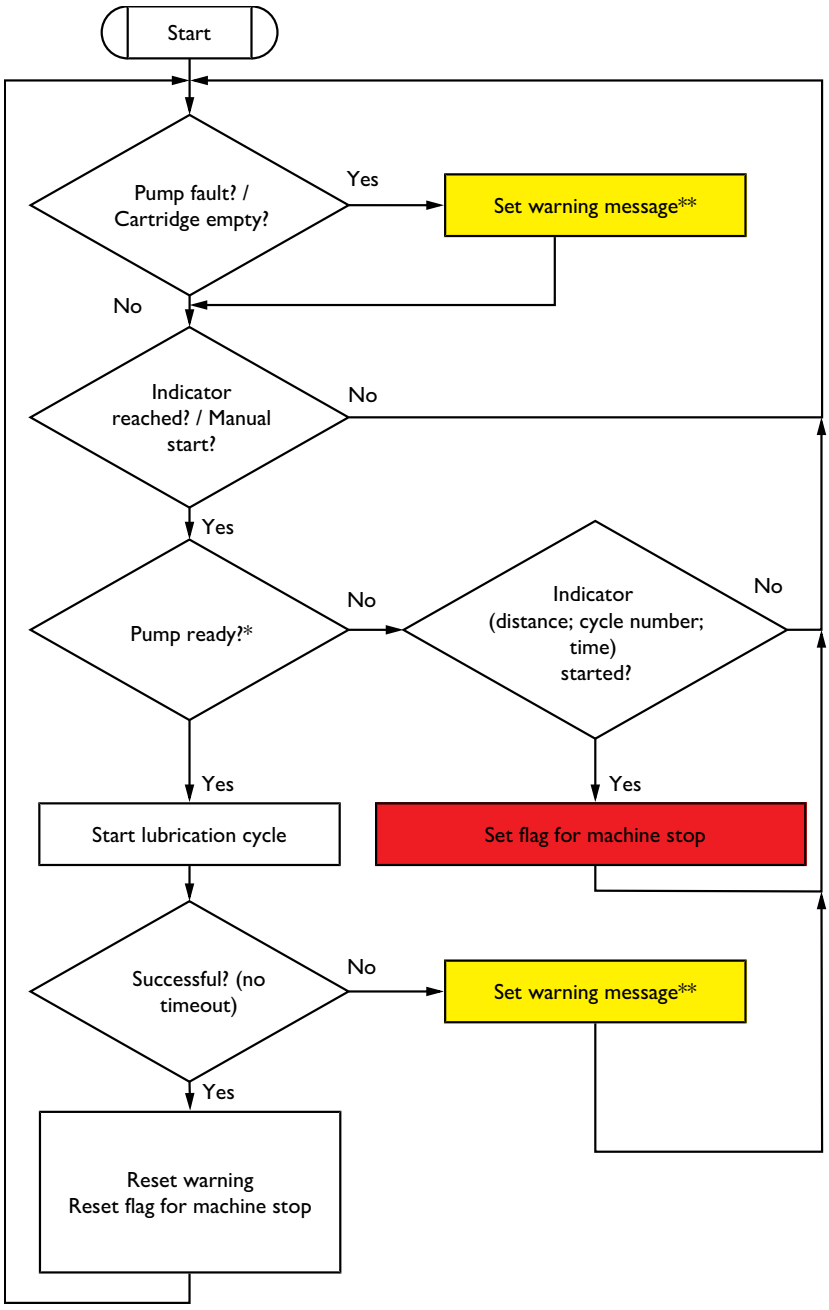
5.4.1 Suggested solution: Programming software



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

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

Fig. 5-6 *Automatic lubrication system flowchart*

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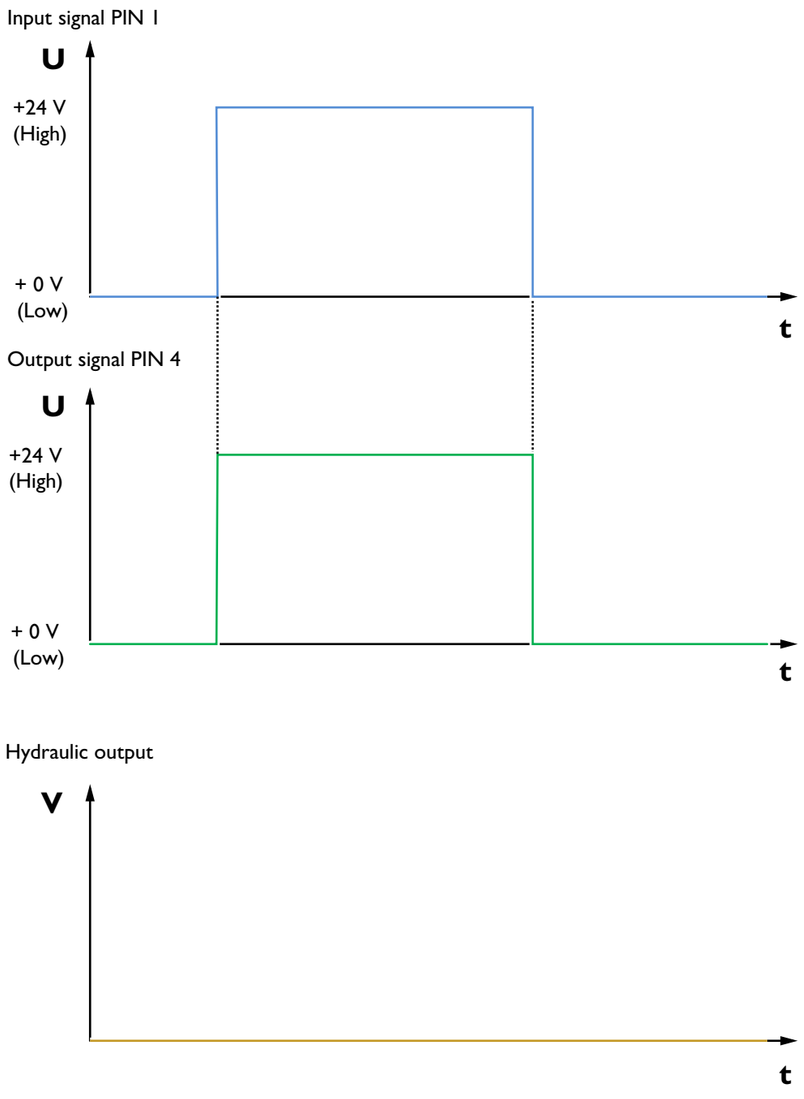
5.4.2 Connecting FlexxPump to power supply



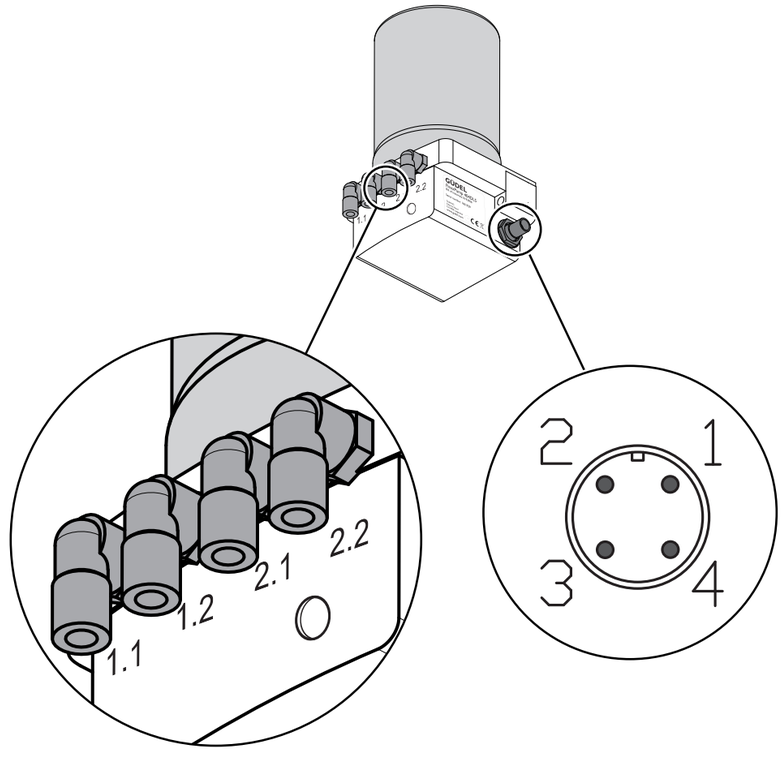


Fig. 5-7 *Switching time diagram: Connecting FlexxPump to power supply*

The FlexxPump is switched on as long as a constant voltage of 24 V DC is applied at PIN 1. Saved information is not lost when the FlexxPump is off. The output signal on PIN 4 is High (20...30V) during normal operation. For regular lubricant dispensing, the FlexxPump must 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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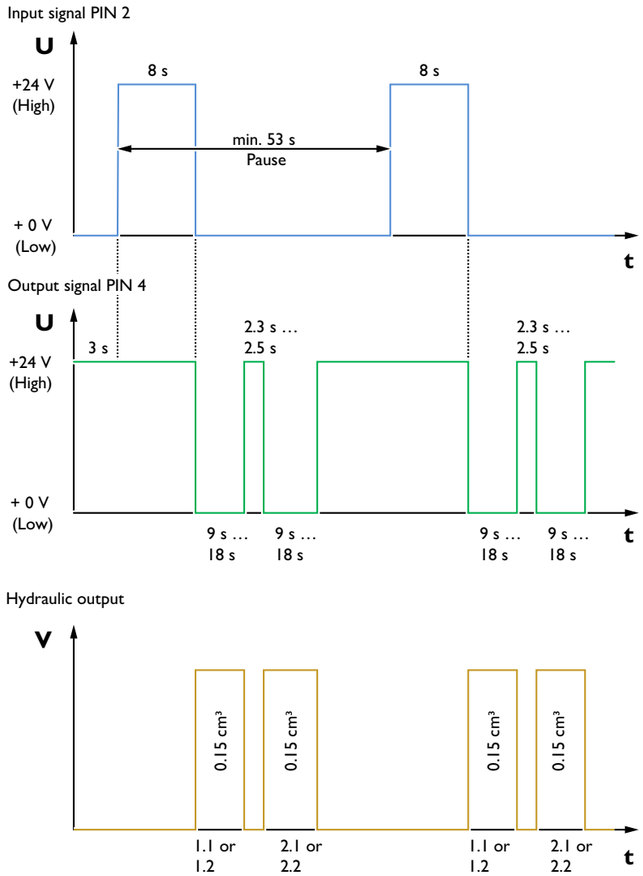
5.4.3 Lubrication

The following signal to PIN 2 results of 0.15 cm^3 of lubricant being dispensed to each of the four hydraulic outputs:

Accuracy of the impulses (High) on PIN 2: +/- 0.2s or +/- 10%!



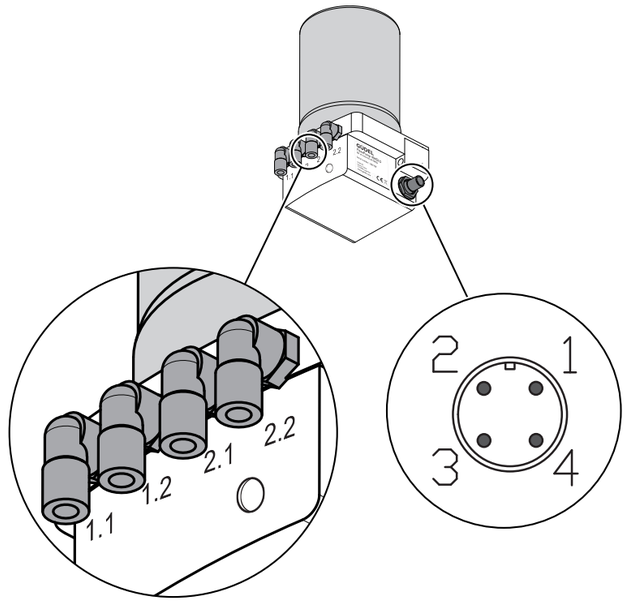


Fig. 5-8 *Switching time diagram: Normal case*

At the displayed signal on PIN 2, each of the four hydraulic outputs dispense 0.15 cm^3 of lubricant. Start of the dispensing = 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, 0.15 cm^3 of lubricant is pumped into the respective hydraulic output. The output signal at PIN 4 is High (+20...30V) during normal operation. During an actual motor run of the FlexxPump, the signal switches to Low (+0V). Normally this takes between approx. 9 and 18 seconds, depending on the length of the hydraulic hoses and the viscosity of the lubricant. The signal then switches back to High (+24V).

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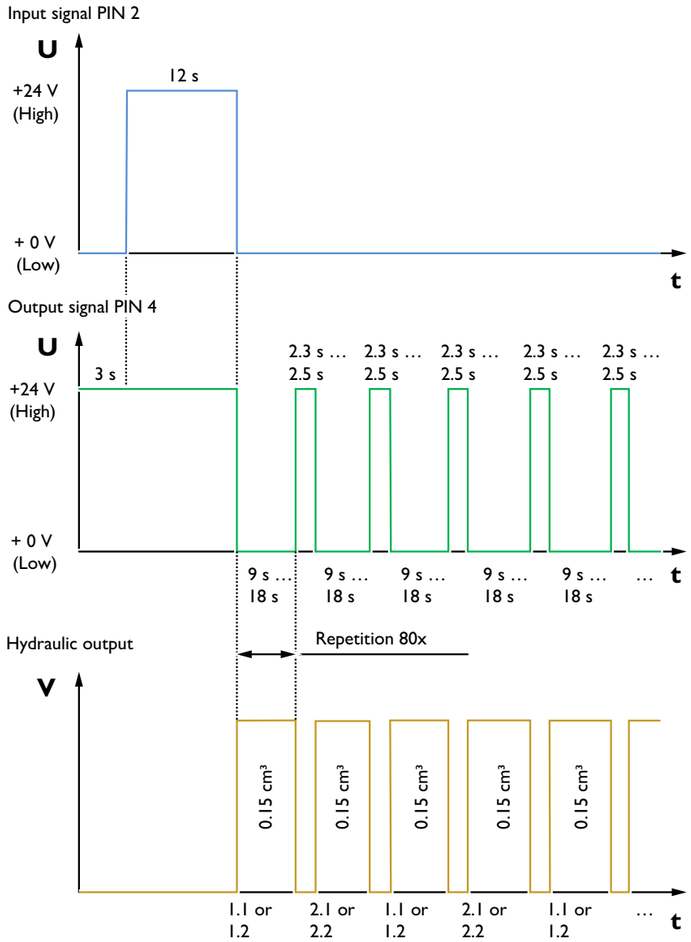
5.4.4 Filling hydraulic lines / venting the FlexxPump

The following signal on PIN 2 causes 20 x 0.15 cm^3 of lubricant to be dispensed at each of the four hydraulic outputs:

Accuracy of the impulses (High) on PIN 2: +/- 0.2s or +/- 10%!



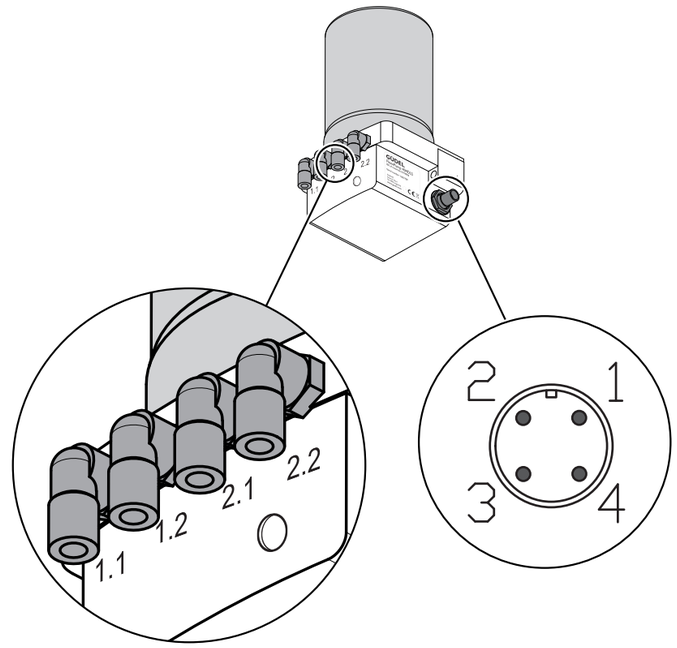


Fig. 5-9 *Switching time diagram: Filling hydraulic lines / venting the FlexxPump*

The filling process starts with the displayed signal on PIN 2. The filling process takes a maximum of 1600 seconds. The filling process is continued after the FlexxPump is switched on if it was interrupted by switching off the FlexxPump. The output signal at PIN 4 is High (+20...30V) during normal operation. During an actual motor run of the FlexxPump, the signal switches to Low (+0V). Normally this takes between approx. 9 and 18 seconds, depending on the length of the hydraulic hoses and the viscosity of the lubricant. The signal then switches back to High (+24V).

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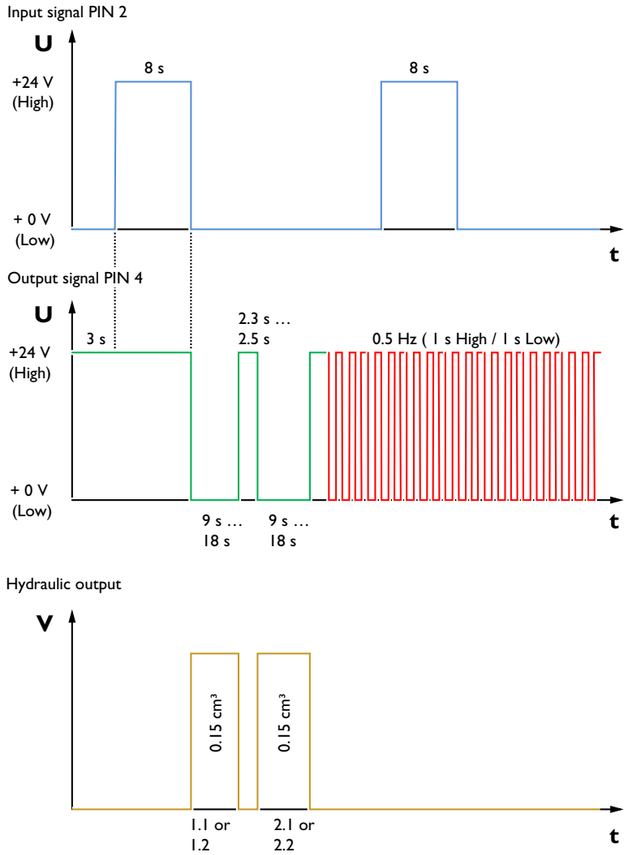
5.4.5 Error message: Empty

The FlexxPump issues the following signal on PIN 4 if the lubricant cartridge is empty:



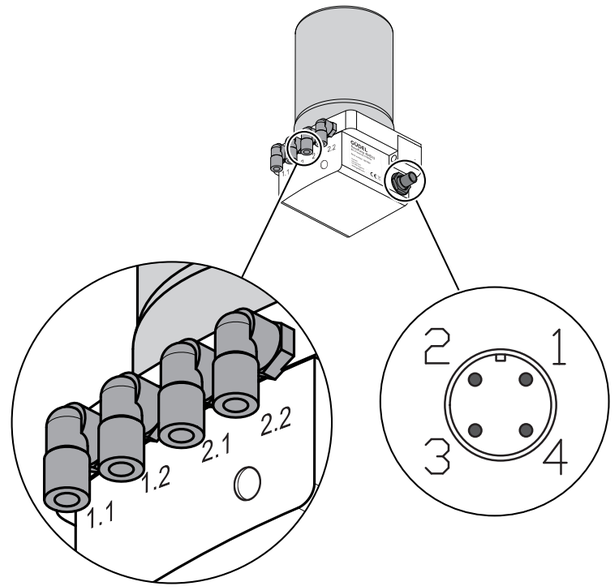


Fig. 5-10 *Switching time diagram: Error message: Empty*

If the cartridge is empty, the FlexxPump issues a change signal (rectangular pulse) on PIN 4 between High and Low with a frequency of 0.5 Hz. The output signal at PIN 4 is High (+20...30V) during normal operation. During an actual motor run of the FlexxPump, the signal switches to Low (+0V). Normally this takes between approx. 9 and 18 seconds, depending on the length of the hydraulic hoses 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 cartridge.

Malfunction	Cause	Measure
Lubrication system does not lubricate	Cartridge missing/empty or air in FlexxPump; pump function stopped	Insert new cartridge or vent FlexxPump; the pump continues running without change

Table 5-2 *Malfunctions / Troubleshooting*

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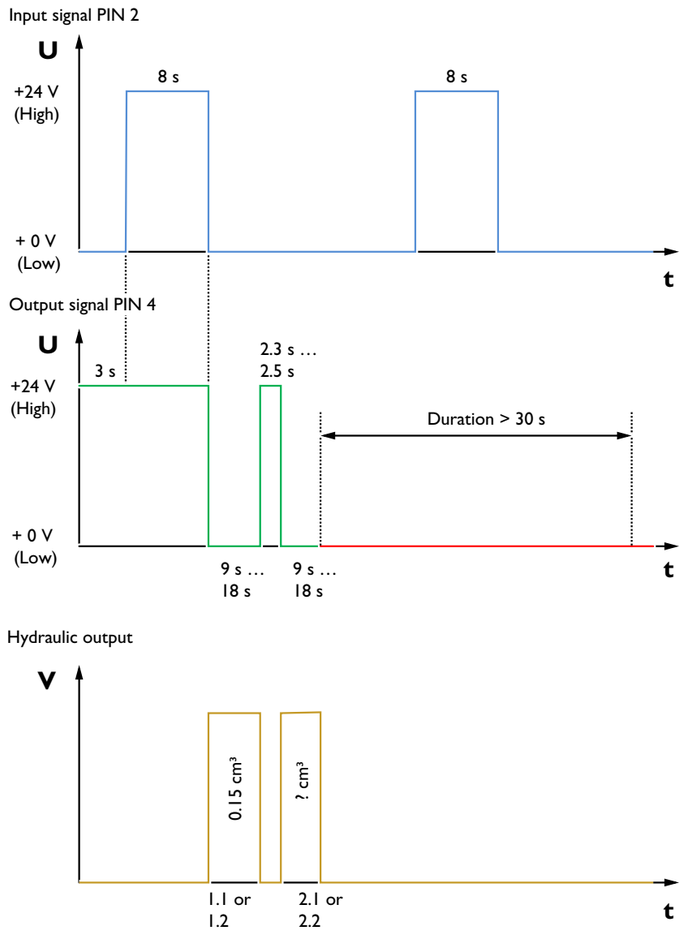
5.4.6 Error message: General

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

- counterpressure in the hydraulic lines is too high
- destroyed electronic component on PIN 4 due to electrical overcurrent
- internal error in the FlexxPump

If a general error message is active, the FlexxPump issues the following signal on PIN 4:



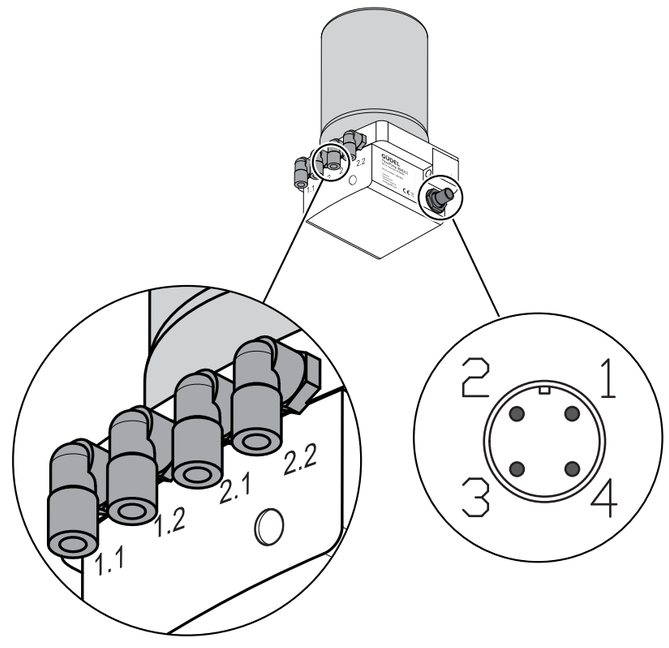


Fig. 5-11 *Switching time diagram: Error message: General information*

For blocked hydraulic lines or other errors, the FlexxPump issues a Low (+0V) signal on PIN 4 lasting more than 30 seconds. The output signal at PIN 4 is High (+20...30V) during normal operation. During an actual motor run of the FlexxPump, the signal switches to Low (+0V). Normally this takes between approx. 9 and 18 seconds, depending on the length of the hydraulic hoses and the viscosity of the lubricant. Afterwards, the signal switches back to High.

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Malfunction	Cause	Measure
Lubrication system does not lubricate	The measured counterpressure was too high three times in a row. Hydraulic connections or hoses may be blocked, hoses too long, and/or lubricant too stiff/hard. Pump function has been stopped.	Remove cause of the counterpressure, switch off the power supply to the FlexxPump and switch it on again. The fault is set to zero. The FlexxPump starts up again.
Lubrication system does not lubricate	Various causes	• Switch off the power supply to the FlexxPump and switch it on again. This does not delete the data memory. • Contact the service department if the problem reoccurs

Table 5-3 *Malfunctions / Troubleshooting*

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5.4.7 Lubrication recommendation

5.4.7.1 General information

NOTE

Lubricating film missing

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

- Ensure that there is always a lubricating film on guideways 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 guideways, 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 system
- 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. ➲ 38

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5.4.7.2 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 pumps and the installed splitters.

Size	Average lubricant requirement per lubrication point (U)
1-5	0.30 cm^3 / 100 km
6-7	0.40 cm^3 / 100 km

Table 5-4 *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 1-5	Sizes 6-7
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
4 lubrication points (e.g. X-axis FP)	1.2 cm^3 / 100 km	1.6 cm^3 / 100 km

Table 5-5 *Recommended lubrication quantity (P_t)*

5.4.7.3 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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5.4.7.4 Calculation formulas

The emptying time of cartridge P1 needs to be determined. With multiple axles per FlexxPump, 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 system 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 cartridge (P1)	Cartridge volume / (P x 30)	months

Table 5-6 *Calculation formulas: Emptying time of the 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

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5.5 Initial commissioning

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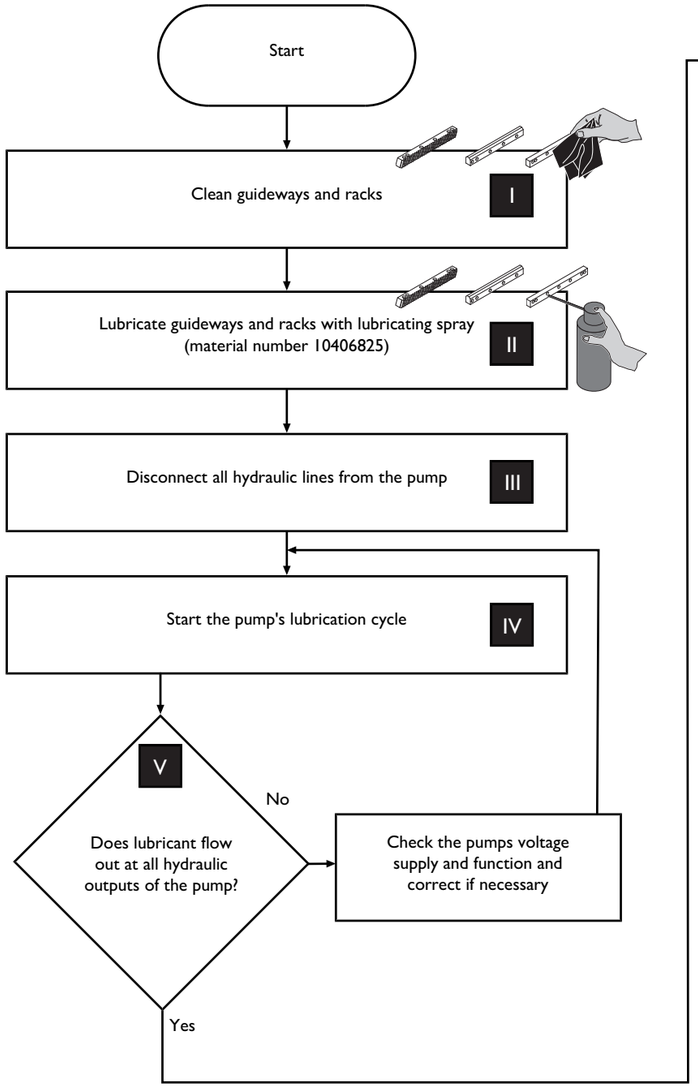
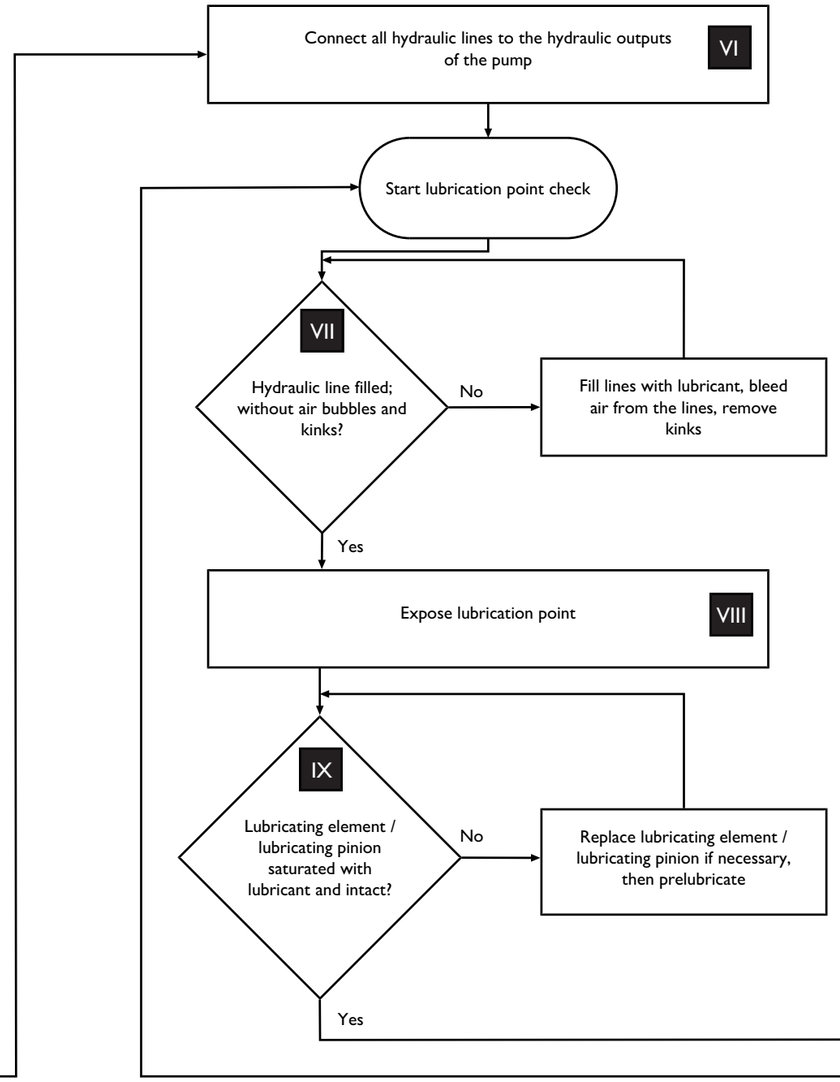
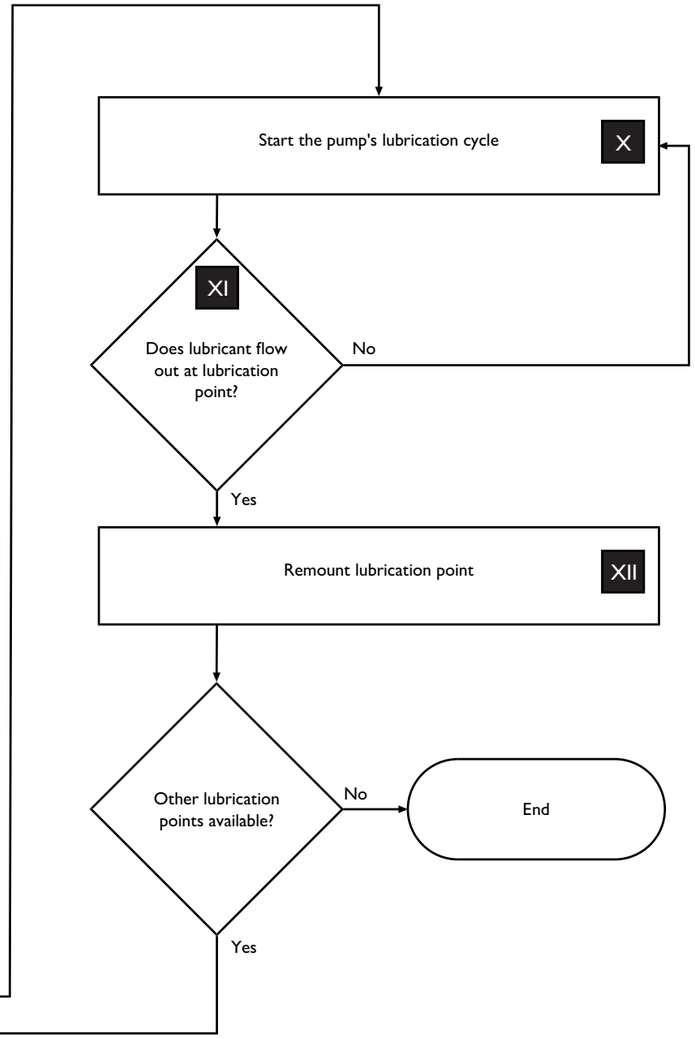
5.5.1 Checking the lubrication system







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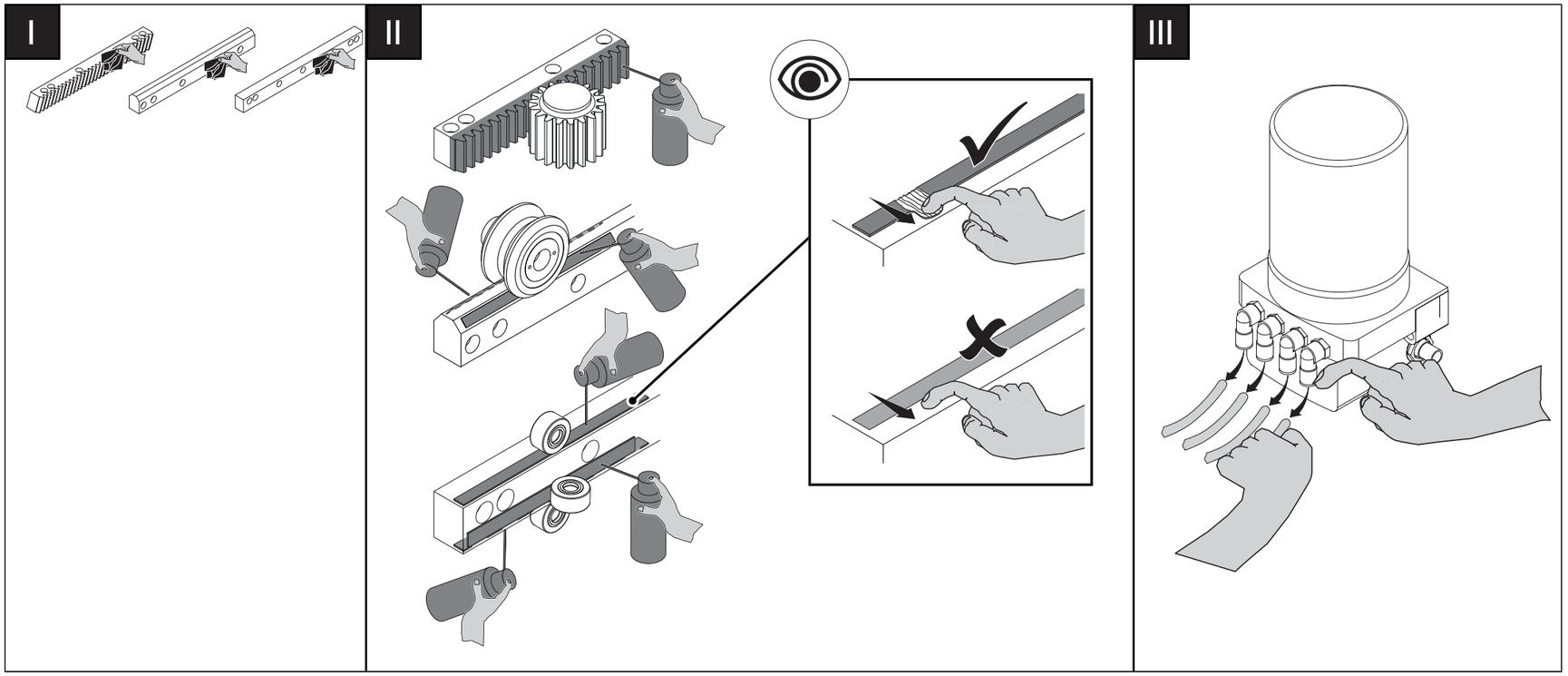
- In case of downtimes of 1 to 4 weeks before commissioning, as a minimum check the lubricating film on guideways and racks (II) and the hydraulic lines for air bubbles and kinks (VII). If necessary, carry out a check of the complete lubrication system.
- As operator, check the lubrication system during initial commissioning, after downtimes of more than 4 weeks, if there is no lubricating film and after the cartridge or pump of the lubrication system has been replaced.
  The operator is always responsible for adequate and properly functioning lubrication.



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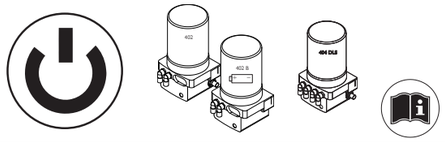
IV



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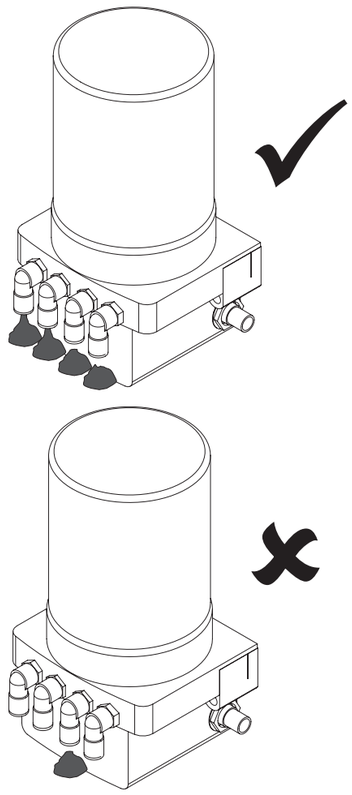

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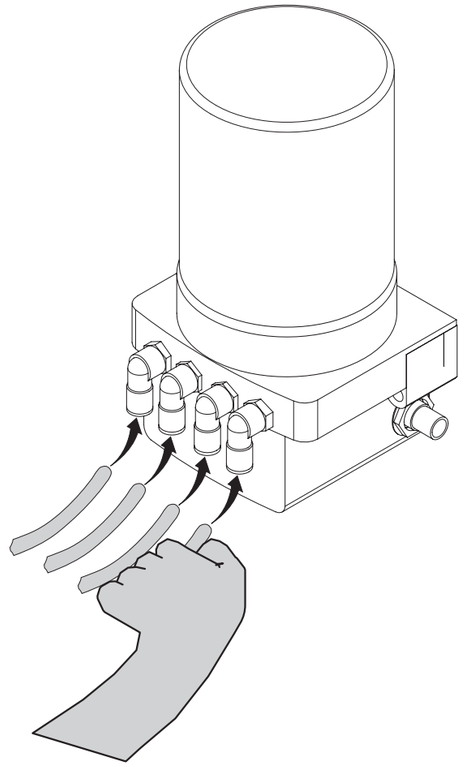
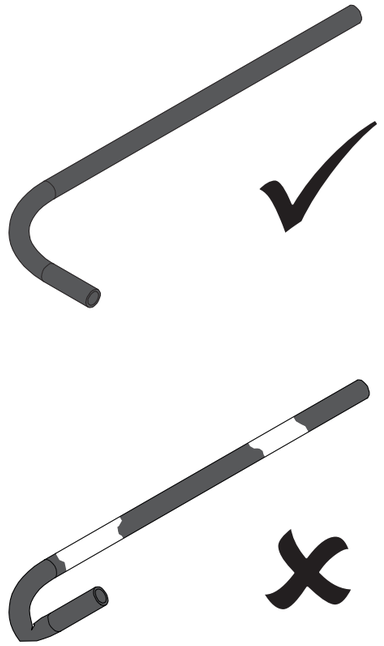


VII



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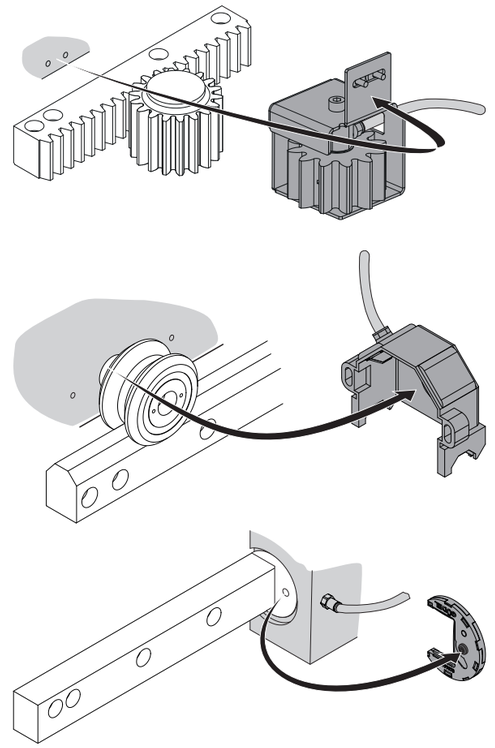

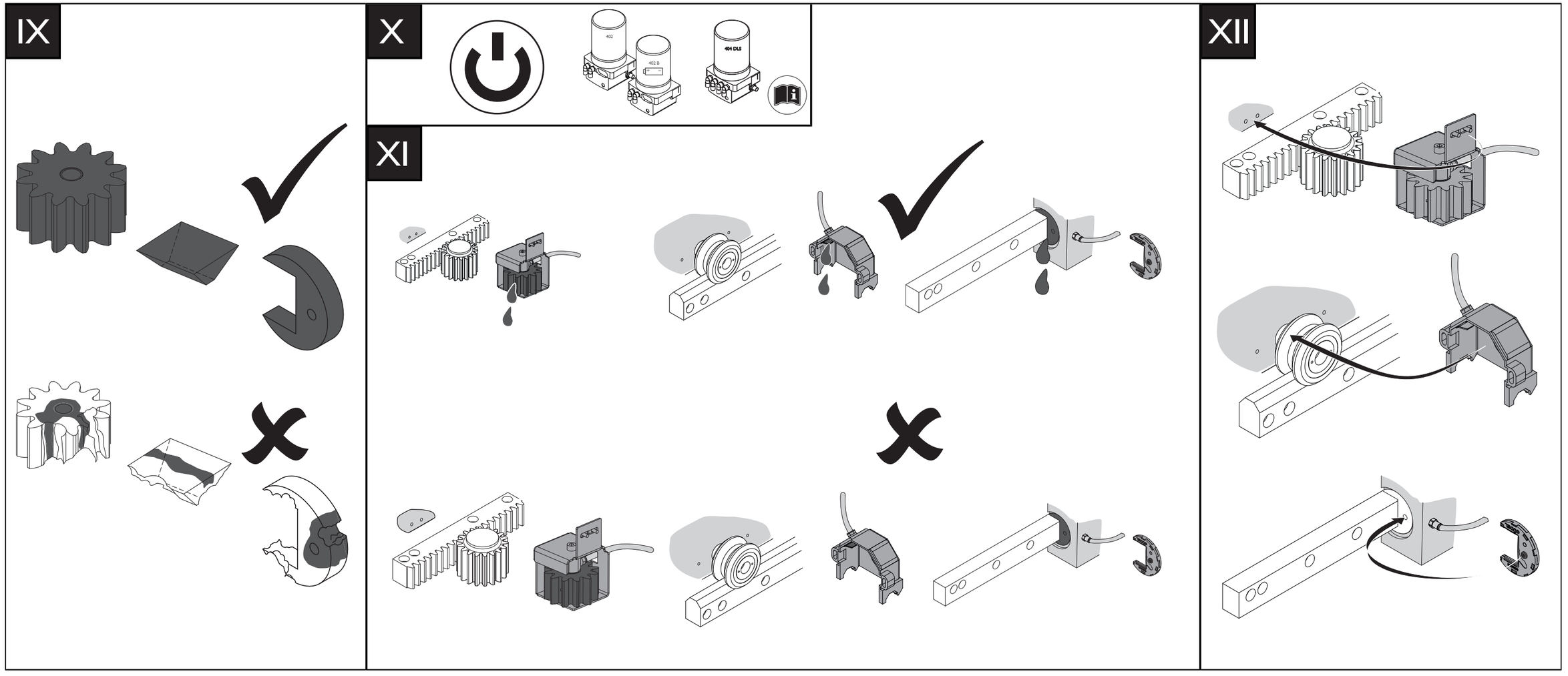

Lubrication ex works	Specification	Lubrication quantity
Elkalub FLC 8 H1	Cannot be determined	Running surfaces of the roller and pinion need to be covered completely by a lubricating film

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

Table 5-7 *Lubricants, Cleaning agents: Prelubricate guideways 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

⚠ WARNING

Training of operating personnel

Incorrect behavior of untrained, or insufficiently trained, operating personnel can lead to severe injury or damage to property!

Before the operating personnel begin working with the product:

- Train and instruct the operating personnel
- Point out dangers in the work area to the operating personnel
- Check the qualifications of operating personnel before approving them
- Keep the operating personnel up-to-date in regard to best practices. Also inform them about technical progress, modifications, etc.

⇨ If these measures are not complied with, you alone as the operating company are liable for damages that may result!

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6.3 Safety

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

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

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7 Maintenance

7.1 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. ➲ 🗎 105

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!

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

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)	Automatic lubrication system: Pump, lines, other components
	Prelubricate guideways and racks

This table does not purport to be exhaustive.

Table 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

Automatic lubrication system

The following lubrication systems and lubricants are provided for the automatic lubrication of the product:

Fig. 7-1 *Automatic lubrication system FlexxPump*

Lubrication ex works	Specification	Lubrication quantity	Location of application	Category
Güdel H1 NSF no.146621	cannot be found		Automatic lubrication system FlexxPump	oil

Table 7-2 *Lubricants: Automatic lubrication system FlexxPump*

Fig. 7-2 *Automatic lubrication system FlexxPump*

Lubrication ex works	Specification	Lubrication quantity	Location of application	Category
Elkalub FLC 8 H1	Cannot be determined		Automatic lubrication system FlexxPump: Prelubricate guideways and racks	Oil

Table 7-3 *Lubricants: Automatic lubrication system FlexxPump: Prelubricate guideways and racks*

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7.2.2.2 Lubricant table

Lubrication ex works	Specification	Lubrication quantity	Location of application	Category
Elkalub FLC 8 H1	Cannot be determined		Automatic lubrication system FlexxPump: Prelubricate guideways and racks	Oil
Güdel H1 NSF no.146621	cannot be found		Automatic lubrication system FlexxPump	oil

This table does not purport to be exhaustive.

Table 7-4 *Lubricant table*

7.3 Maintenance tasks

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7.3.1 Replacing the cartridge

Replace the cartridge if the malfunction message "Empty" appears.

Switch on or off pump type 404DLS via PLC.

⚠ CAUTION

Residual amounts in empty cartridges

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

- Dispose of the cartridge in an environmentally friendly manner ➲ 99

⚠ CAUTION

Danger from spring tension

The covering contains a spring with tension. The covering jumps up when opened. This can lead to minor injuries!

Make sure that no extremities are in the danger area. Carefully remove the covering.

Use only original Güdel cartridges. Never refill the cartridges.

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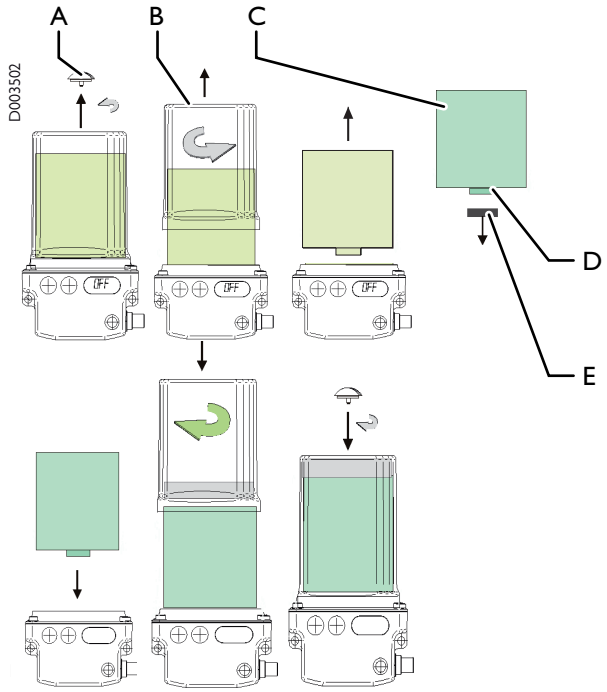

Fig. 7-3 *Replacing cartridge*

A	*Vent locking mechanism*	*D*	*O-ring*
B	*Covering*	*E*	*Retaining cover*
C	*Cartridge*		

Lubrication ex works	Specification	Lubrication quantity
➲ Chapter 7.2.2.1, 69	➲ Chapter 7.2.2.1, 69	400 cm³

Table 7-5 *Lubricants: Automatic lubrication system FlexxPump*

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Replace the cartridge as follows:

1 Remove the vent locking mechanism in the direction of the arrow
2 Switch off FlexxPump
3 Remove the covering by turning in the direction of the arrow
4 Remove empty cartridge
5 Remove the retaining cover from the new cartridge
6 Lubricate the O-ring slightly
7 Insert new cartridge (make sure the cartridge fits in properly)
8 Put on the covering and turn hand-tight in the direction of the arrow
9 Switch on the FlexxPump
10 Insert vent locking mechanism and secure
11 Check the lubrication system ➲ 75

The cartridge is replaced.

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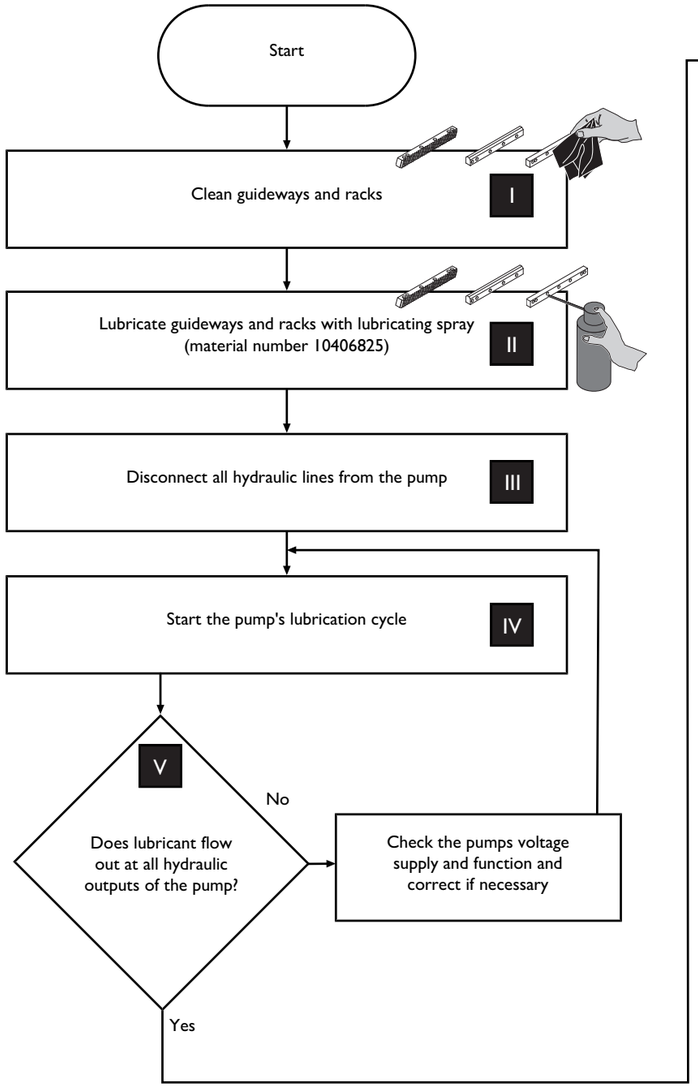
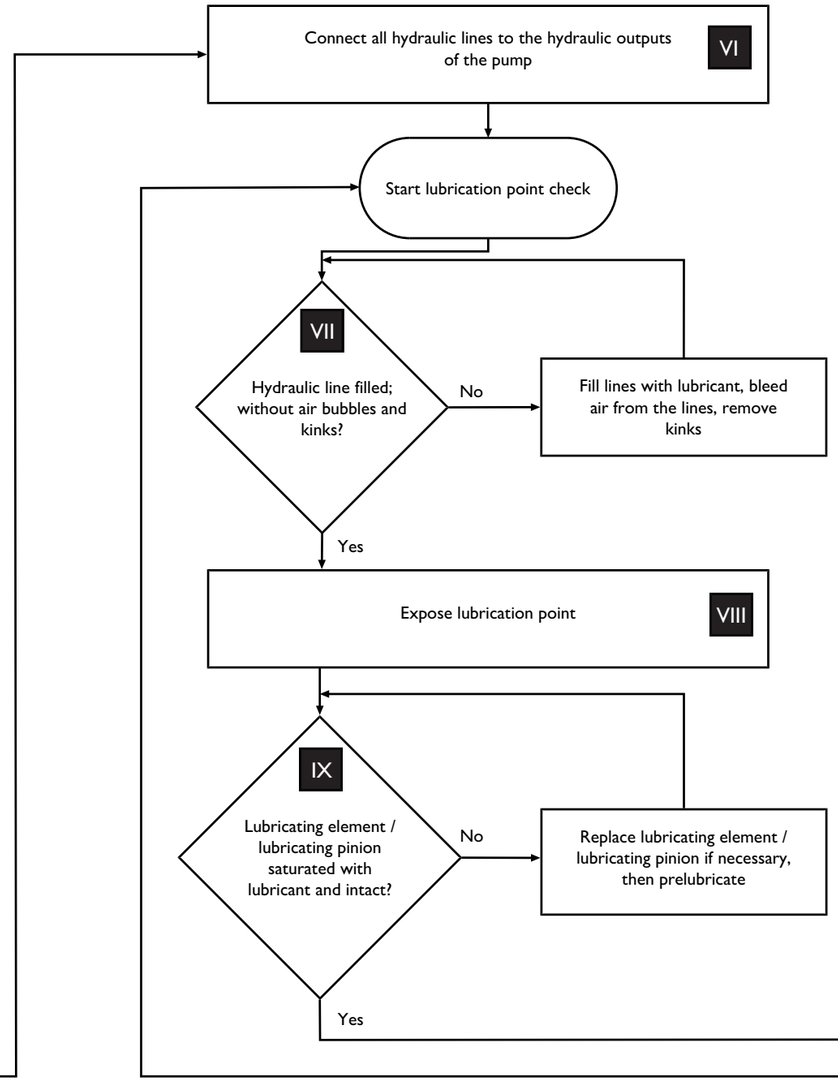
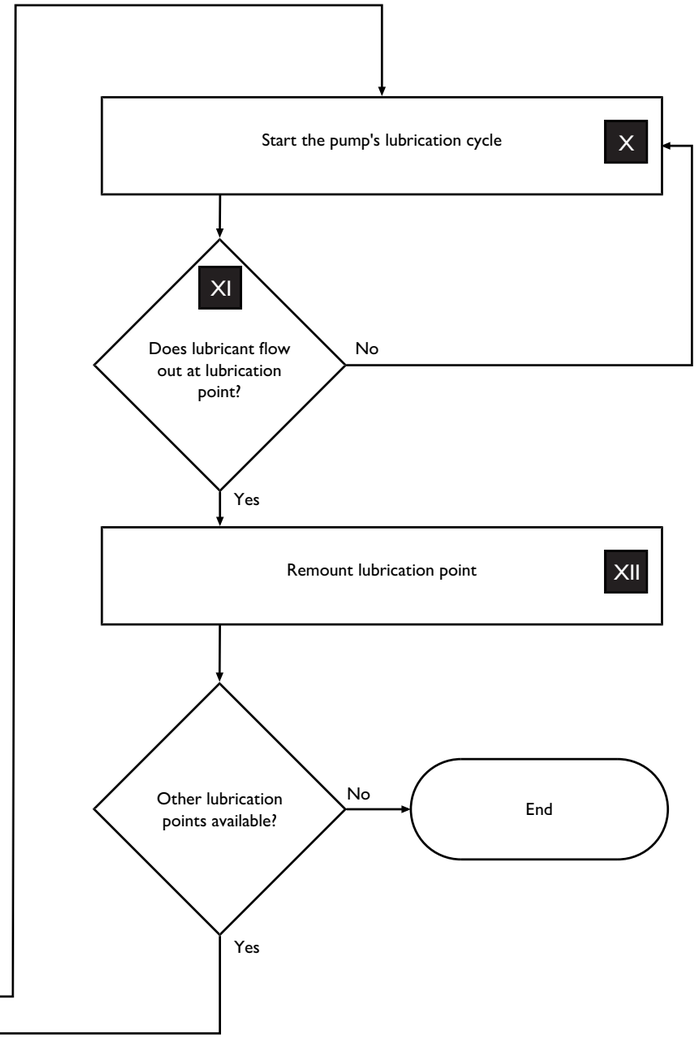
7.3.2 Checking the lubrication system







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- In case of downtimes of 1 to 4 weeks before commissioning, as a minimum check the lubricating film on guideways and racks (II) and the hydraulic lines for air bubbles and kinks (VII). If necessary, carry out a check of the complete lubrication system.
- As operator, check the lubrication system during initial commissioning, after downtimes of more than 4 weeks, if there is no lubricating film and after the cartridge or pump of the lubrication system has been replaced.
  The operator is always responsible for adequate and properly functioning lubrication.

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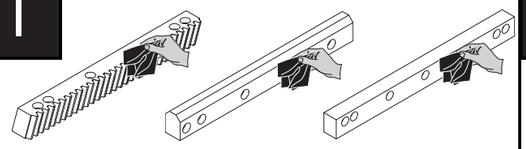

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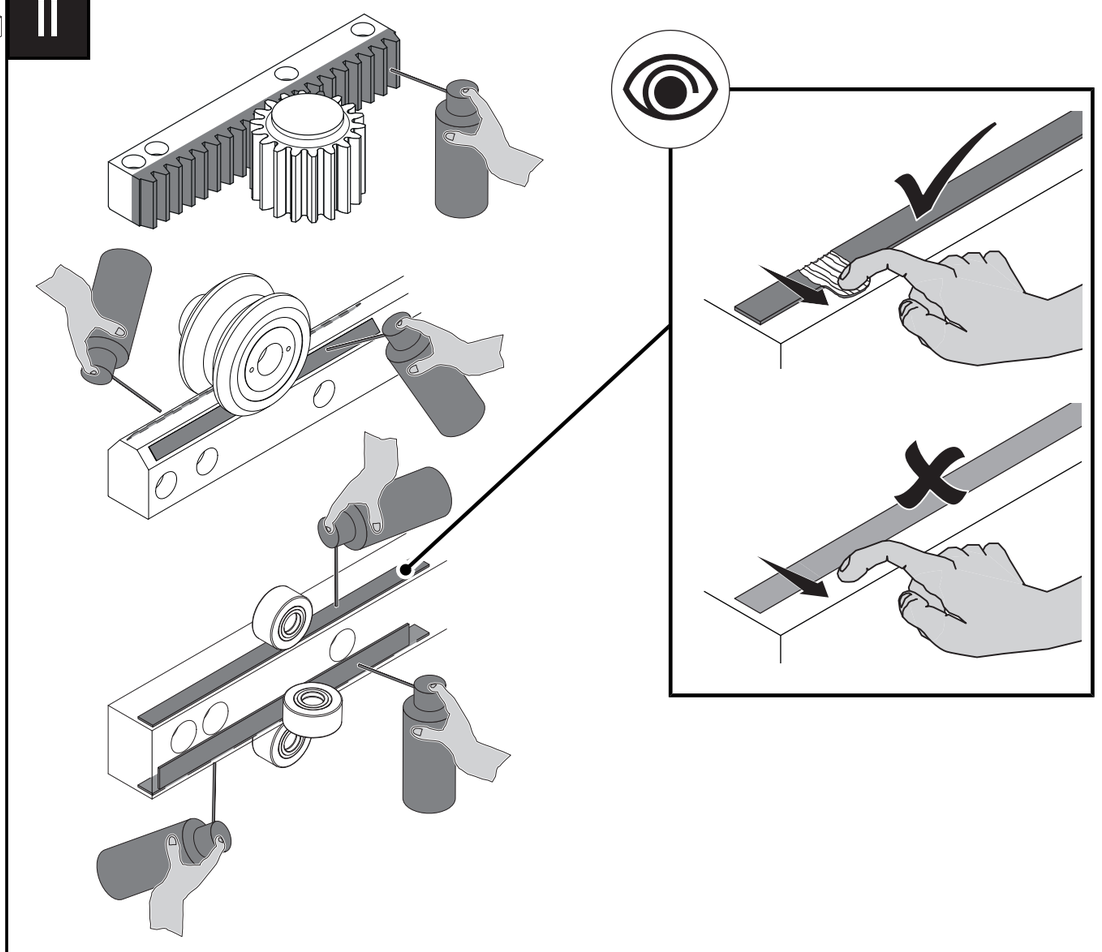

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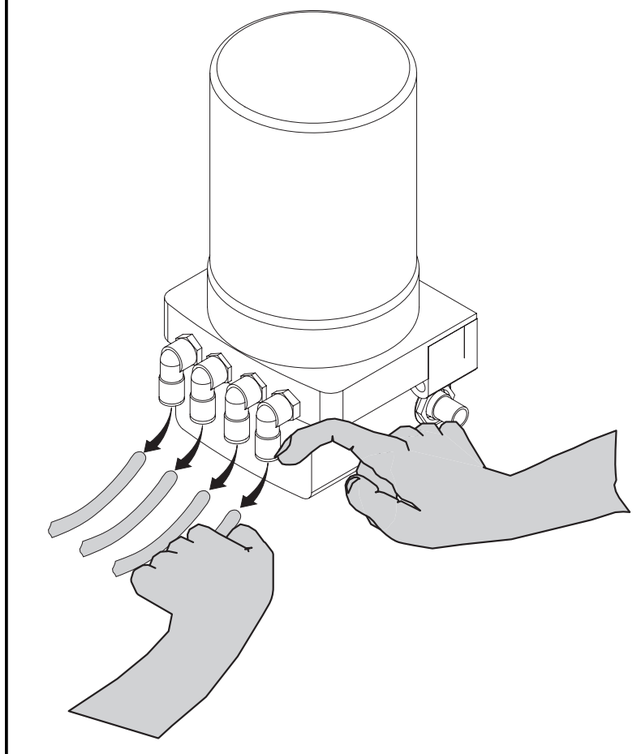

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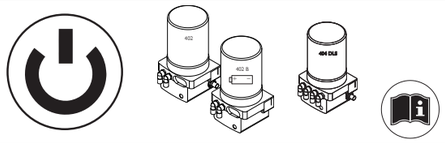

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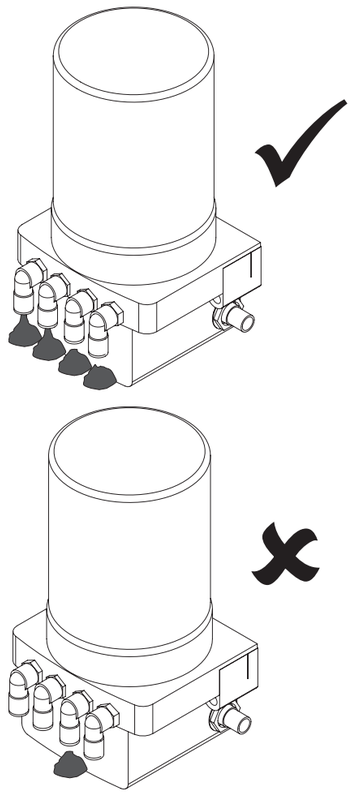

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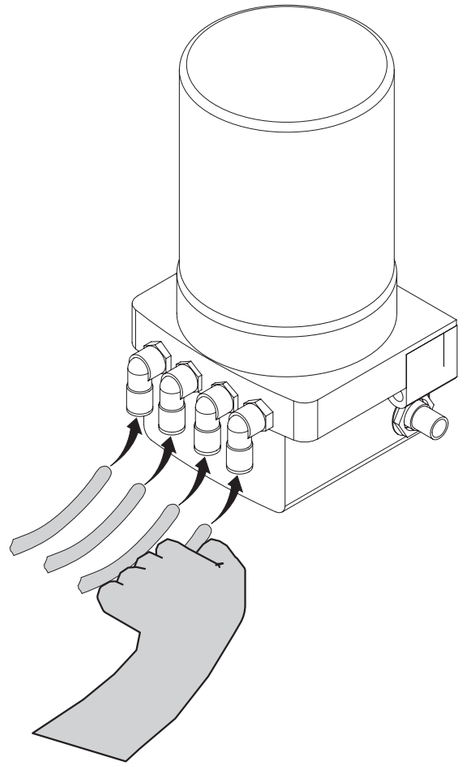

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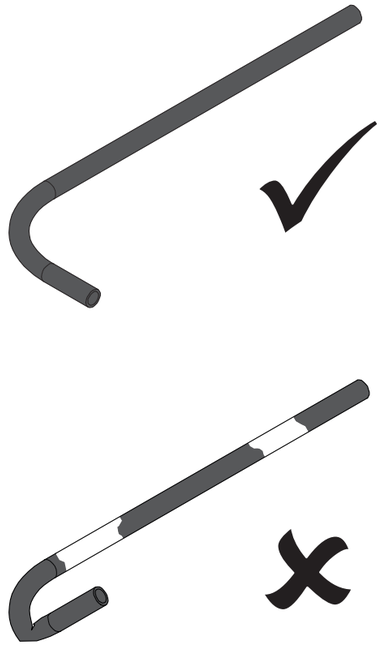

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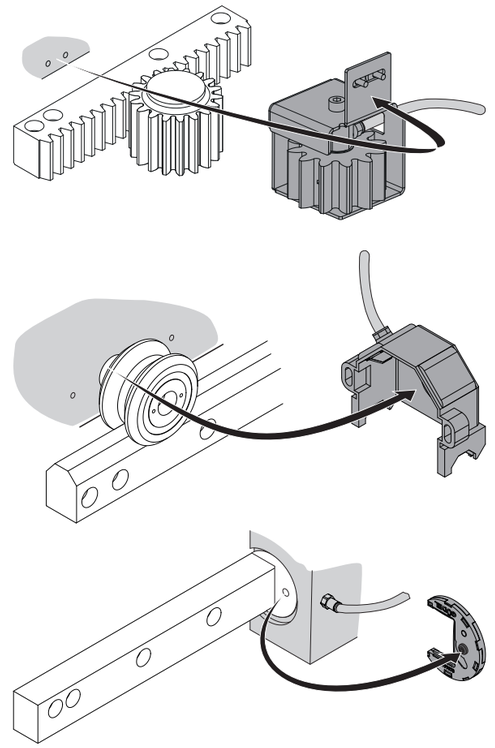

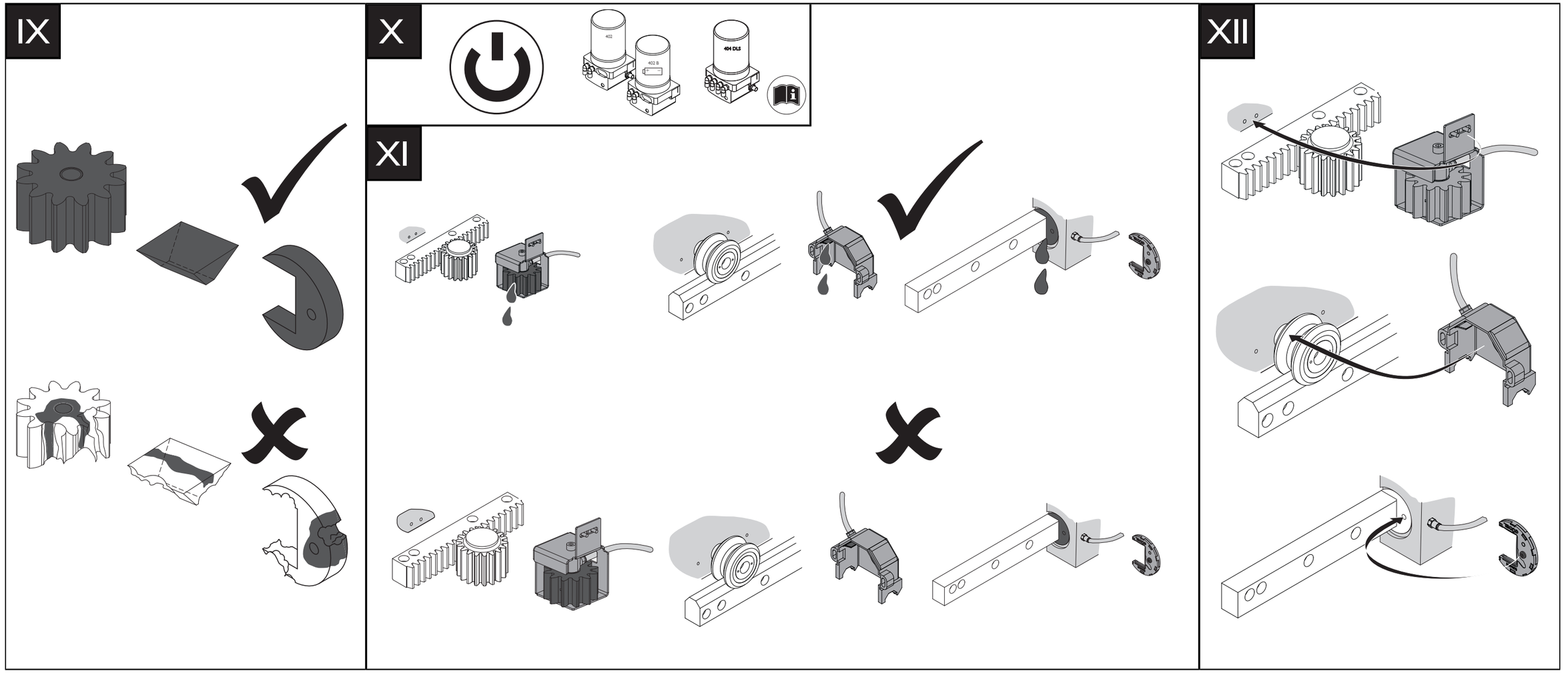

Lubrication ex works	Specification	Lubrication quantity
Elkalub FLC 8 H1	Cannot be determined	Running surfaces of the roller and pinion need to be covered completely by a lubricating film

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

Table 7-6 *Lubricants, Cleaning agents: Prelubricate guideways and racks*

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7.3.3 Checking automatic lubrication system

Fig. 7-4 *Inspect automatic lubrication system*

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

Table 7-7 *Cleaning agents: Automatic lubrication system: Pump, lines, other components*

Check the automatic lubrication system in accordance with the following table.

Inspection point	Description	Measures
Contamination	Check the components for contamination: • Pump • Lines • other components	Immediately clean away any contamination
Loss of lubricant	Check system and its surroundings for traces: • Puddles of oil and oil spills on the floor or in the drip sheets • Leaks, torn or pinched lines	• Remove puddles of oil and oil spills on the floor or in the drip sheets • Replace defective and pinched lines
Function	Check function	Replace defective components immediately

Table 7-8 *Inspection table*

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NOTE

Lubricating film missing

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

- Ensure that there is always a lubricating film on guideways 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

7.3.4 Replacing the FlexxPump

7.3.4.1 Disassembling the FlexxPump

Disassemble the FlexxPump 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 hydraulic lines from the hydraulic outputs

4 Loosen the screws

5 Remove FlexxPump

The FlexxPump has been removed.

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7.3.4.2 Installing the FlexxPump

The installation position of the FlexxPump is not important.

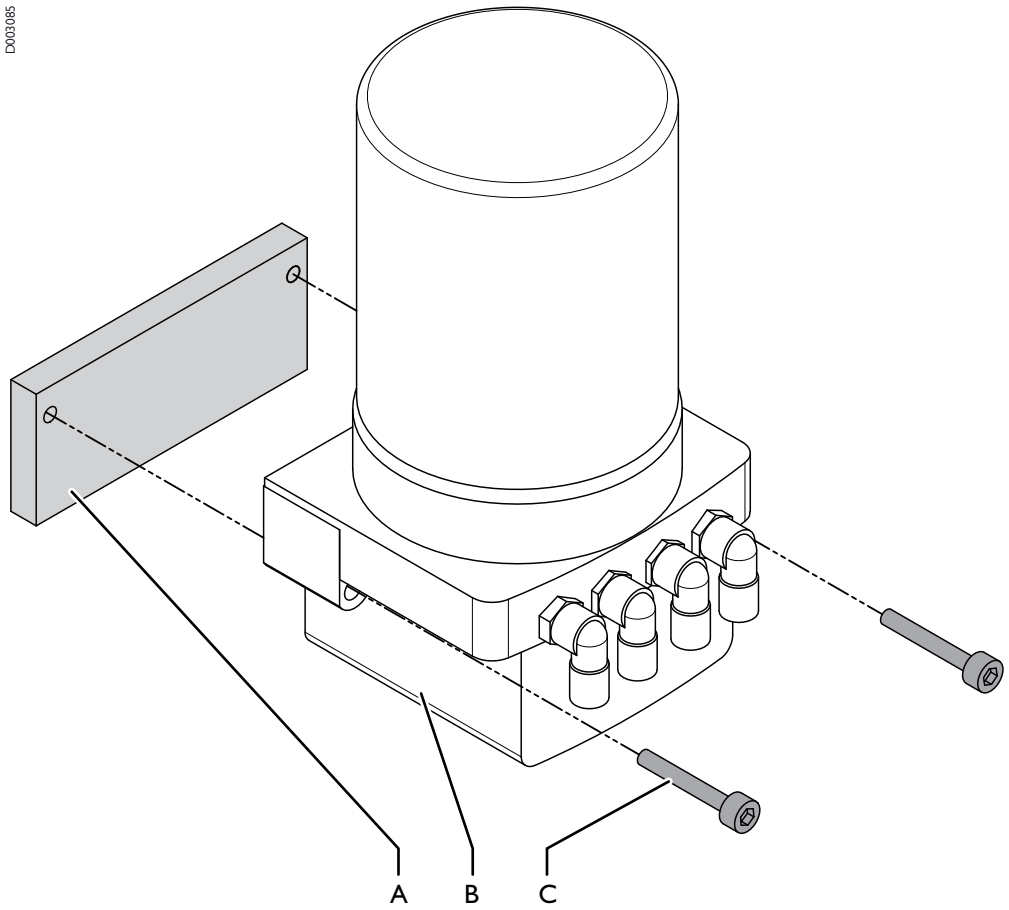

Fig. 7-5 *Installing the FlexxPump*

- *A* *Assembly site*
- *B* *FlexxPump*
- *C* *Screw*

Assemble the FlexxPump as follows:

1 Mount FlexxPump with two screws M6 L_{min} = 40 mm (tightening torque 5 Nm)

The FlexxPump is assembled.

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7.3.4.3 Connect hydraulics

404DLS 3-fold

System with 3 lubrication points

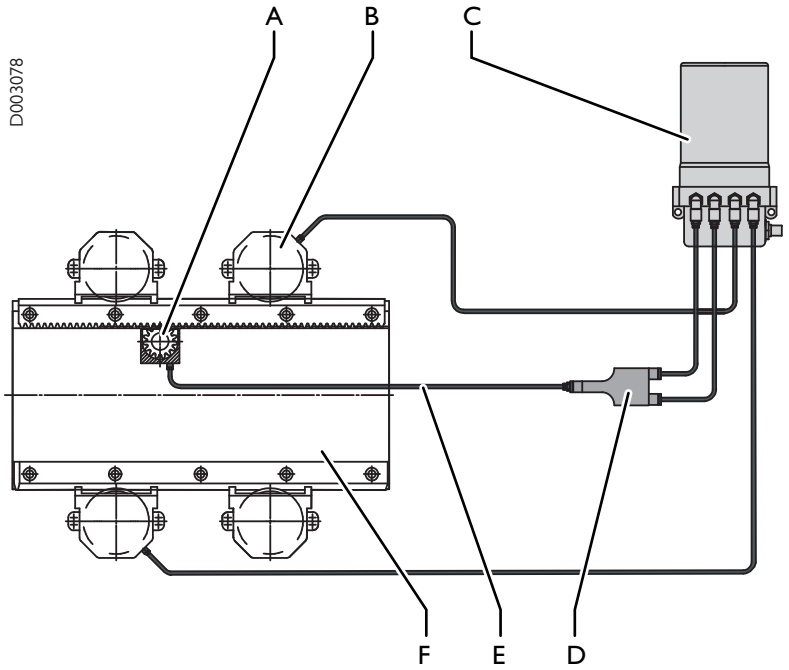

Fig. 7-6 *Design 404DLS 3-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*D*	*Y-segment*
B	*Lubricating element (not included in the scope of delivery)*	*E*	*Hydraulic hose diameter of 6/3 mm*
C	*FlexxPump 404DLS*	*F*	*1st axle (not included in the scope of delivery)*

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404DLS 6-fold

System with 6 lubrication points

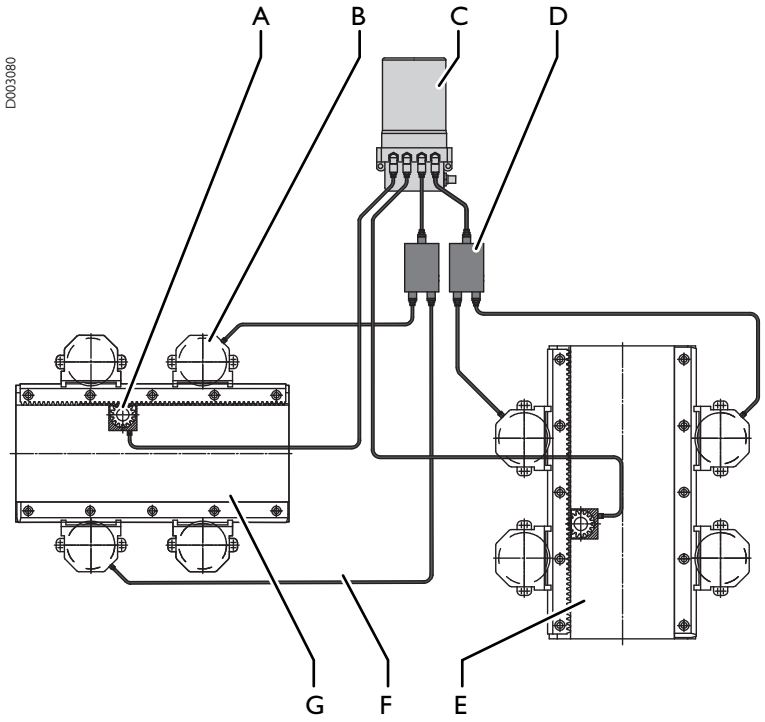

Fig. 7-7 *Design 404DLS 6-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*E*	*2nd axle (not included in the scope of delivery)*
B	*Lubricating element for guideway rails (not included in the scope of delivery)*	*F*	*Hydraulic hose diameter of 6/3 mm*
C	*FlexxPump 404DLS*	*G*	*1st axle (not included in the scope of delivery)*
D	*2x splitter*		

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404DLS 10-fold

System with 10 lubrication points

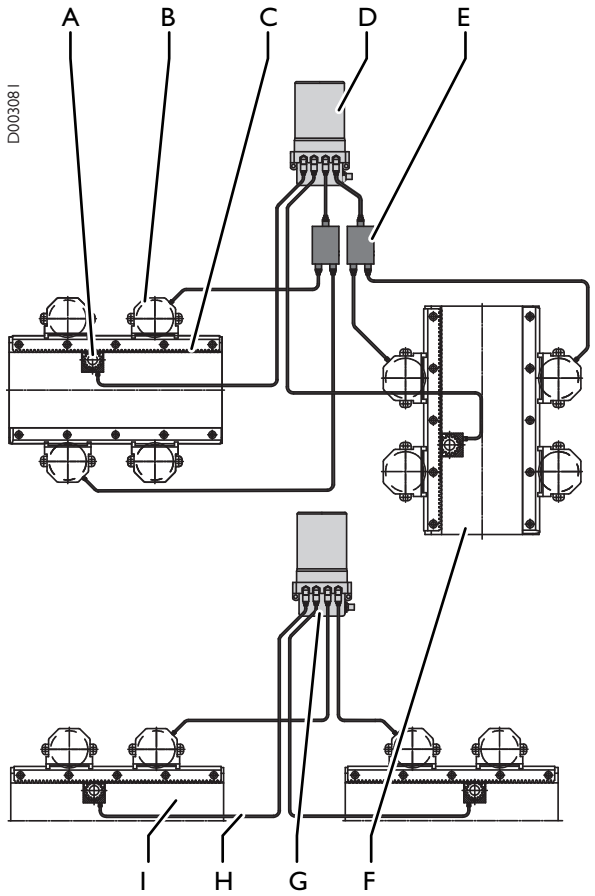

Fig. 7-8 *Design 404DLS 10-fold*

A	*Lubricating pinion (not included in the scope of delivery)*	*F*	*2nd axle (not included in the scope of delivery)*
B	*Lubricating element for guideway rails (not included in the scope of delivery)*	*G*	*2nd FlexxPump 404DLS*
C	*1st axle (not included in the scope of delivery)*	*H*	*Hydraulic hose diameter of 6/3 mm*
D	*1st FlexxPump 404DLS*	*I*	*3rd axle (not included in the scope of delivery)*
E	*2x splitter*		

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7.3.4.4 Connecting electrical equipment

⚠ WARNING

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.

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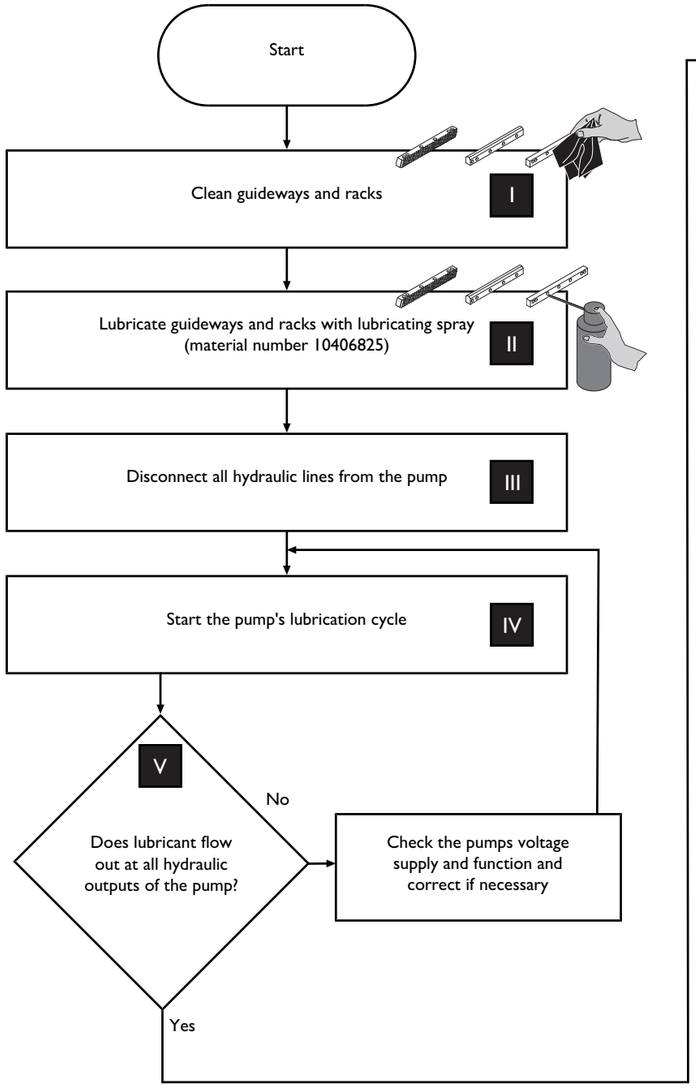
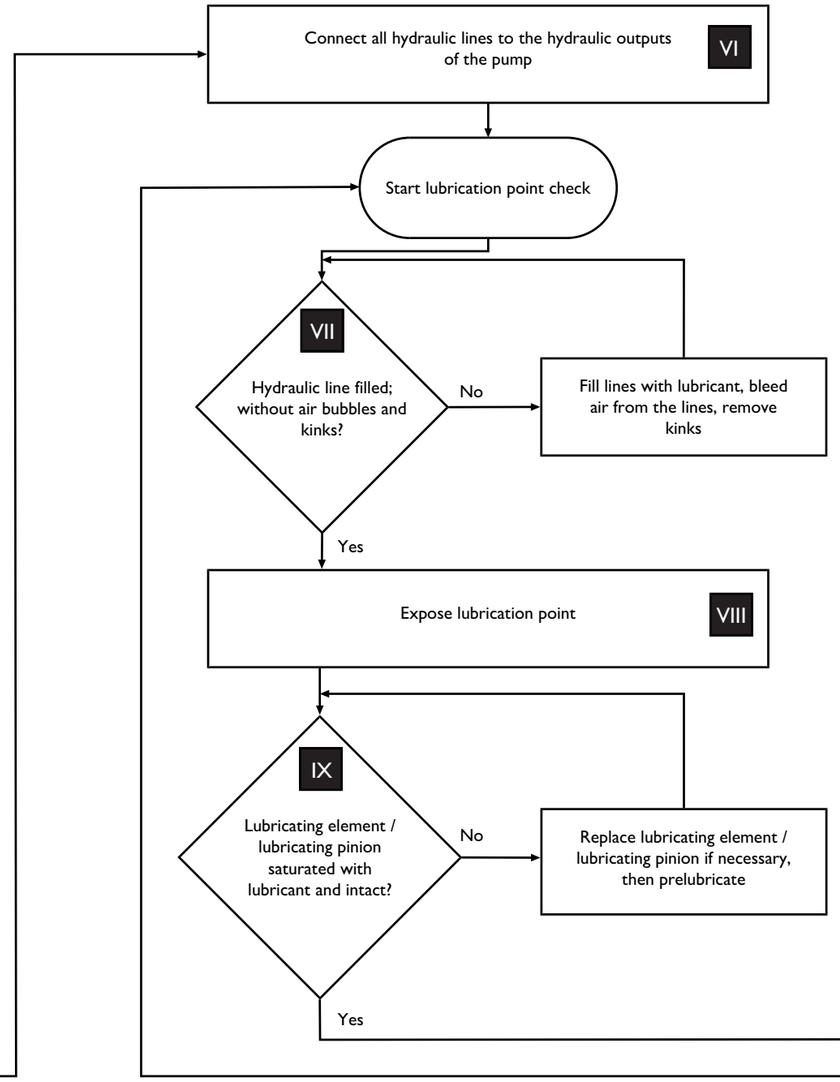
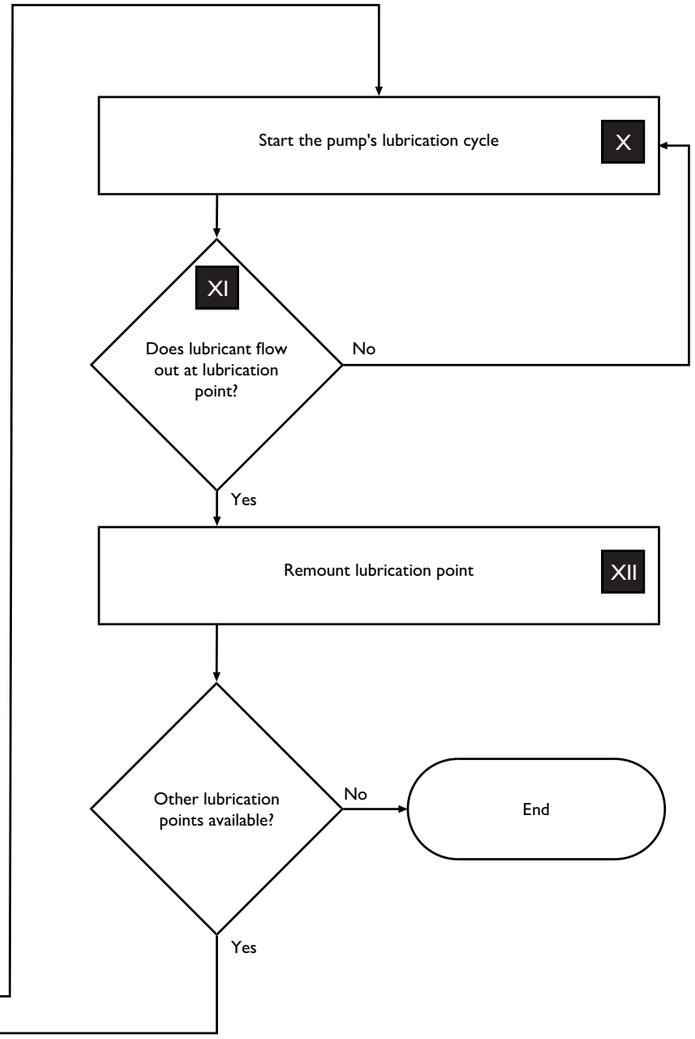
7.3.4.5 Checking the lubrication system







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- In case of downtimes of 1 to 4 weeks before commissioning, as a minimum check the lubricating film on guideways and racks (II) and the hydraulic lines for air bubbles and kinks (VII). If necessary, carry out a check of the complete lubrication system.
- As operator, check the lubrication system during initial commissioning, after downtimes of more than 4 weeks, if there is no lubricating film and after the cartridge or pump of the lubrication system has been replaced.
  The operator is always responsible for adequate and properly functioning lubrication.

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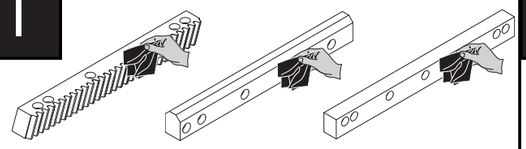

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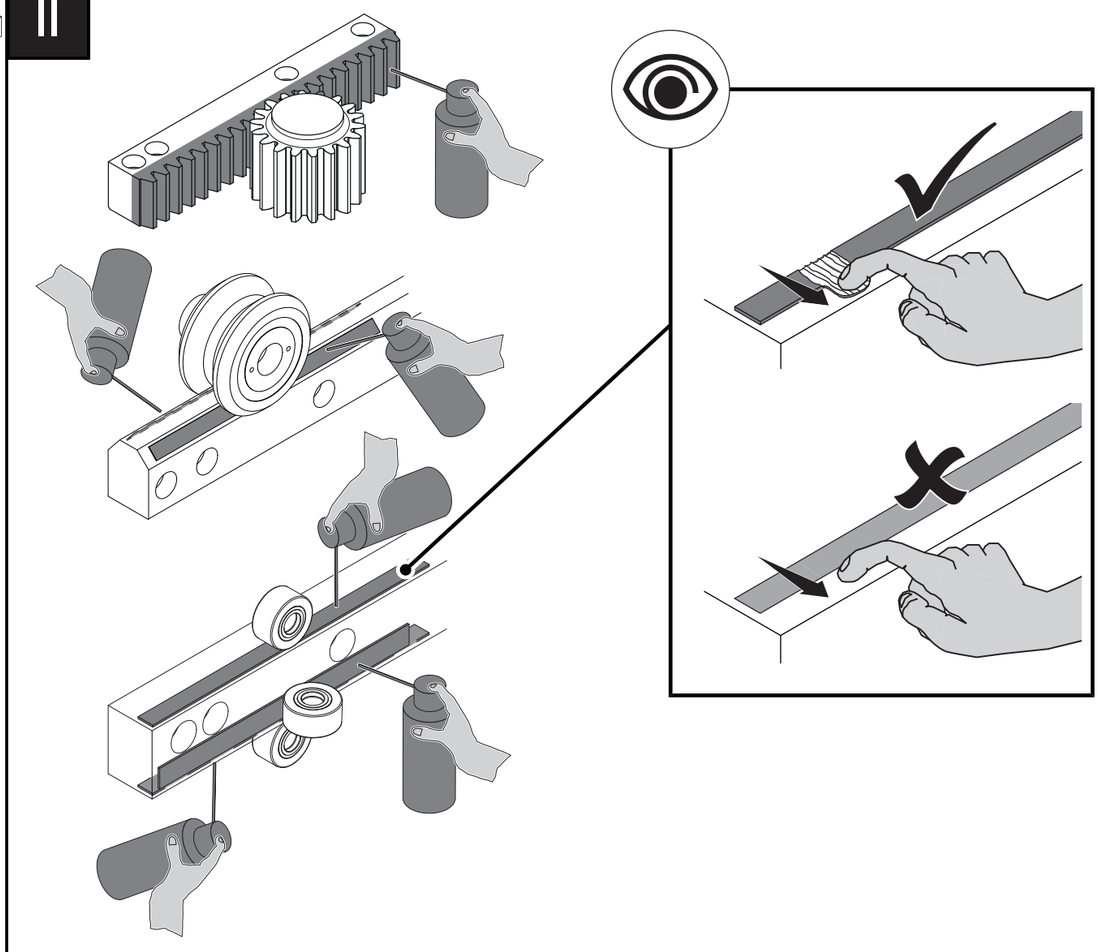

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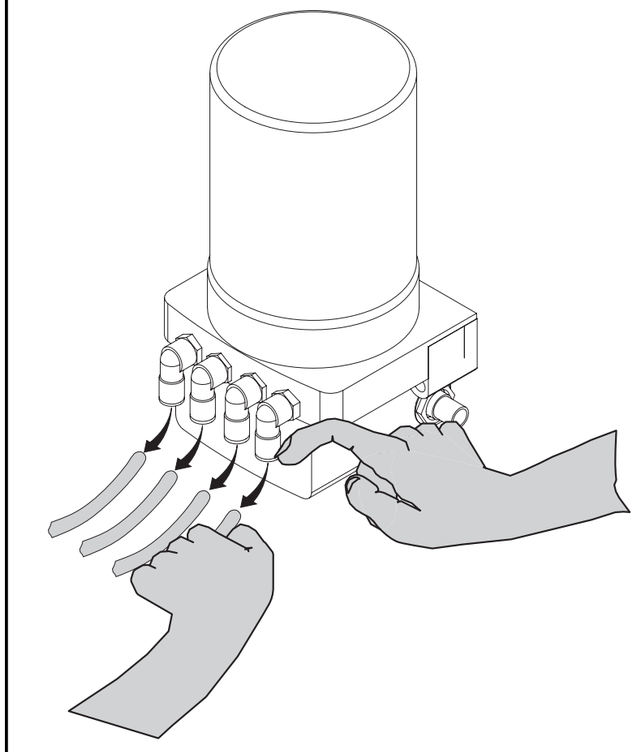

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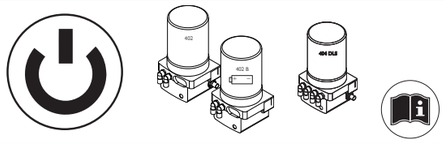

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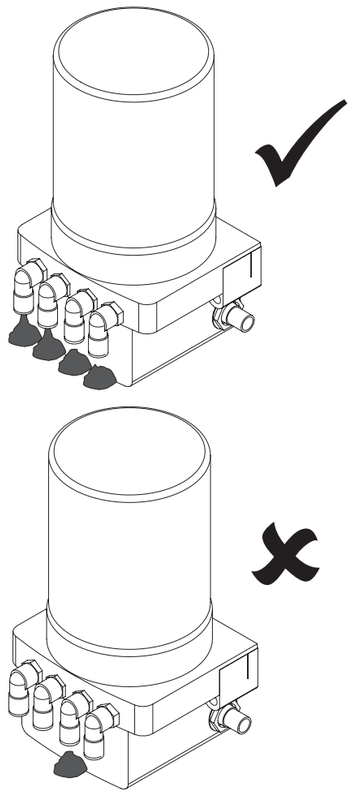

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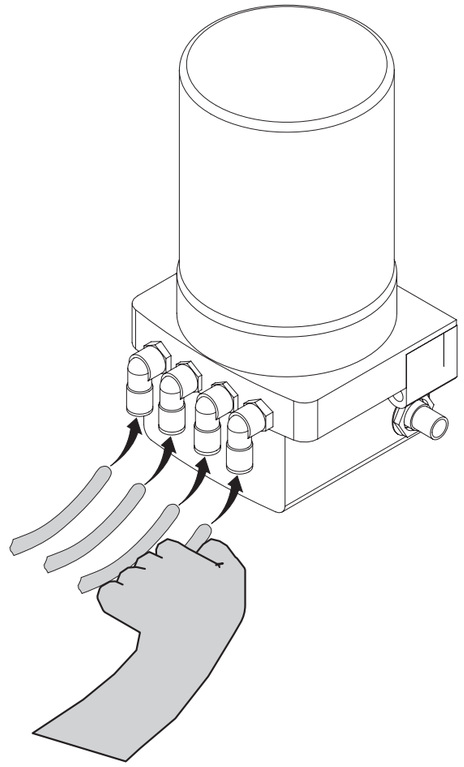

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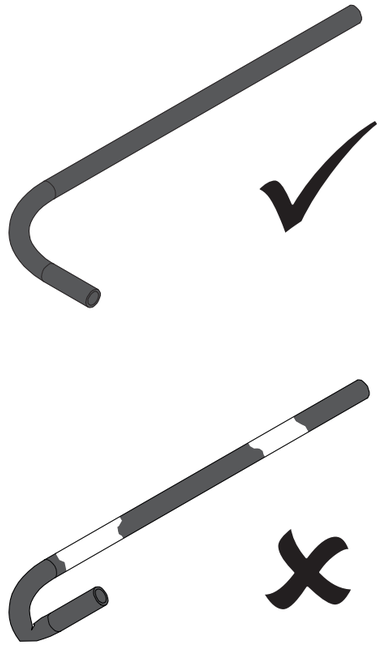

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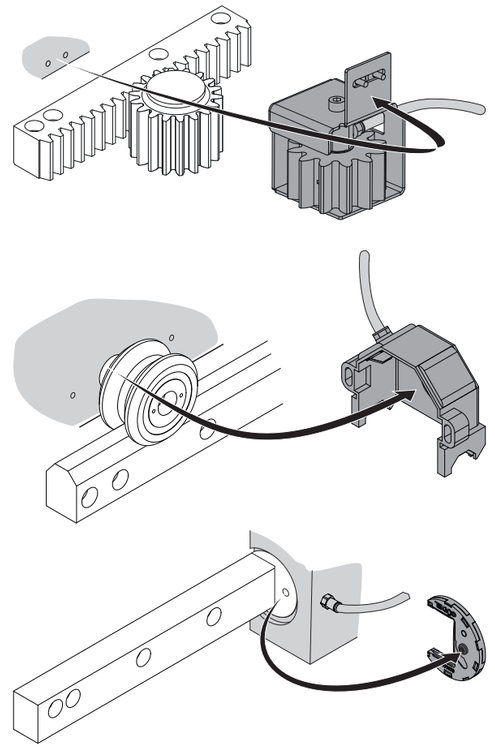

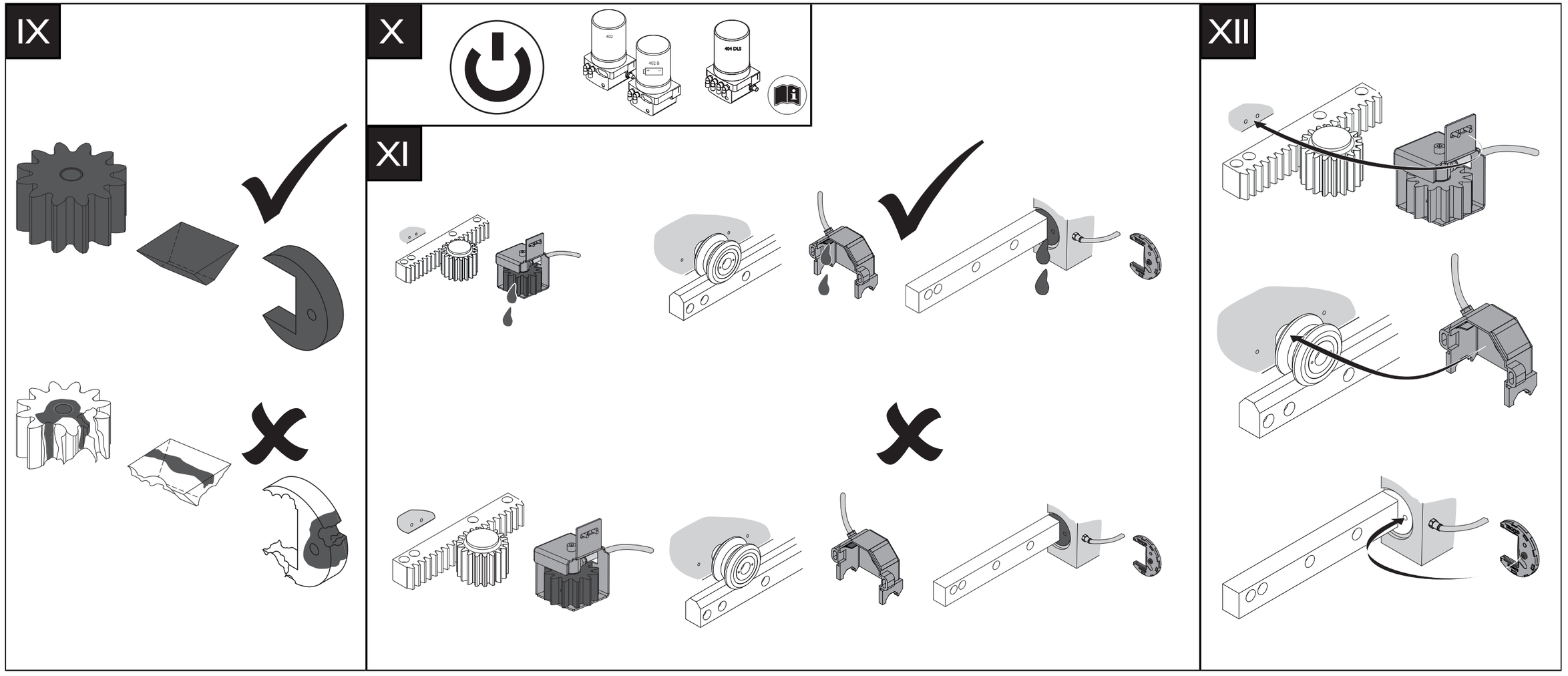

Lubrication ex works	Specification	Lubrication quantity
Elkalub FLC 8 H1	Cannot be determined	Running surfaces of the roller and pinion need to be covered completely by a lubricating film

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

Table 7-9 *Lubricants, Cleaning agents: Prelubricate guideways and racks*

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7.4 Maintenance table

Maintenance work	Maintenance cycle [h]	Duration [min]	Target readership	Lubricants Cleaning agents	Further information
Replacing the cartridge	2,250	10	The manufacturer's technicians Maintenance technicians	Güdel H1 NSF no.146621	➲ Chapter 7.3.1, 🗎 72
Checking the lubrication system			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, 🗎 75
Checking automatic lubrication system	11,250		The manufacturer's technicians Maintenance technicians	mild universal cleaner free from aromatic compounds (e.g. Motorex OPAL 5000)	➲ Chapter 7.3.3, 🗎 79
Replacing the FlexxPump	22,500		Service technicians Maintenance technicians The manufacturer's technicians		➲ Chapter 7.3.4, 🗎 80

This table does not purport to be exhaustive.

Table 7-10 Maintenance table

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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. ➲ 🗎 105

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!

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

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 FlexxPump, splitter, Y-segments, or hoses with new ones in case of defects. Send the defective FlexxPump back to Güdel for repairs.

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8.3 Malfunctions / Troubleshooting

Malfunction	Cause	Measure
Lubrication system does not lubricate	Cartridge missing/ empty or air in FlexxPump; pump function stopped	Insert new cartridge or vent FlexxPump; the pump continues running without change
Lubrication system does not lubricate	The measured counterpressure was too high three times in a row. Hydraulic connections or hoses may be blocked, hoses too long, and/ or lubricant too stiff/ hard. Pump function has been stopped.	Remove cause of the counterpressure, switch off the power supply to the FlexxPump and switch it on again. The fault is set to zero. The FlexxPump starts up again.
Lubrication system does not lubricate	Various causes	• Switch off the power supply to the FlexxPump and switch it on again. This does not delete the data memory. • Contact the service department if the problem reoccurs

Table 8-1 Malfunctions / Troubleshooting

8.4 Service departments

If you have questions, please contact the service departments. ➲ 107

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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

⚠ CAUTION

Leaking fluids

During storage, substances that are hazardous to the environment can leak!

- Hazardous substances must be prevented from entering 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.

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%.

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9.3 Decommissioning

9.3.1 Shutdown

⚠ WARNING

Falling axes, workpieces

Falling axes or workpieces can cause physical damage, serious or fatal injuries!

- Set down any workpieces before working in the danger area
- Never enter the area below suspended axes and workpieces
- Secure suspended axes using the stipulated equipment
- Check the belts of the telescope axes for signs of breakage and tears

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 FlexxPump

2 Remove cartridge

3 Cut the power supply

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. ➲ 99
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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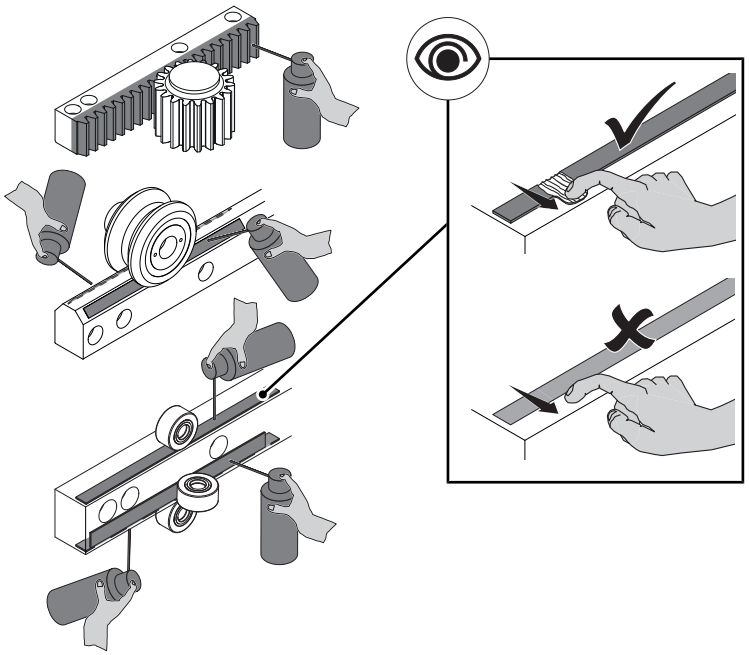
9.4 Recommissioning

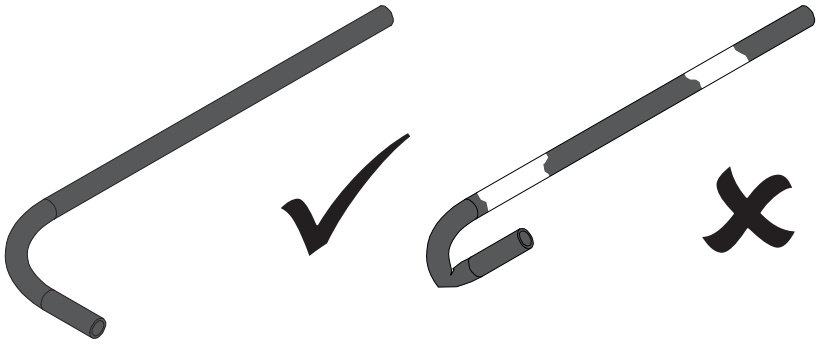
For recommissioning, follow the steps described for commissioning.

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

- Check the lubricating film on guideways and racks



- Check hydraulic lines for air pockets and kinks



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

- Prelubricate guideways and racks
- Checking the 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 cartridge
- Check the gaskets and replace if necessary

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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!

⚠ WARNING

Automatic startup

During work on the product, there is danger of the machine starting up automatically. This can lead to severe or fatal injuries!

Before working in the danger area:

- Secure vertical axes (if equipped) against falling.
- Switch off the superordinate main power supply. Secure it against being switched on again (main switch for the complete system)
- Before switching on the system again, make sure that no one is in the danger area

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 units:

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

10.3 Waste management compliant assemblies

10.3.1 Disassembly

⚠ CAUTION

Oil, greases

Oils and greases are harmful to the environment!

- 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 the connecting elements (cables / energy chains)

2 Disassemble assemblies

3 Disassembly the assemblies and separate the 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
Lubricants	Collecting point disposal in accordance with the safety data sheets ➲ 23
Batteries	Battery collection
Metals	Scrap metal collection
Electrical material	Electrical waste

Table 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 cables are permitted for the product FlexxPump 402 / 404DLS:

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

Table 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

Table 11-2 PLC connecting cable: Meaning of the LED color

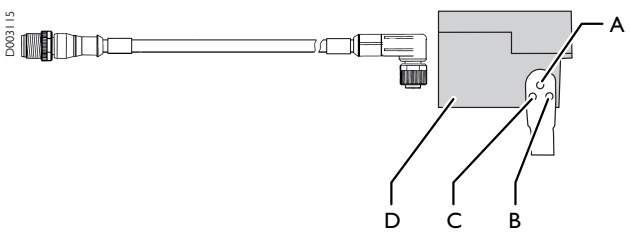

Fig. 11-1 PLC connecting cable

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.

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

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Country	Relevant service department	Phone	E-mail
Canada	Güdel Inc. 4881 Runway Blvd. Ann Arbor, Michigan 48108 United States	+1 734 214 0000	service@us.gudel.com
United States			

Table 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
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	Güdel Lineartec Co. Ltd. No. 99, An-Chai 8th St. Hsin-Chu Industrial Park TW-Hu-Ko 30373 Hsin-Chu Taiwan	+88 635 97 8808	info@tw.gudel.com

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Country	Relevant service department	Phone	E-mail
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

Table 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			
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			

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Country	Relevant service department	Phone	E-mail
Portugal Spain	Güdel Spain Avinguda de Catalunya 49B 1º 3ª 08290 Cerdanyola del Vallés Spain	+34 644 347 058	info@es.gudel.com
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
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

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Country	Relevant service department	Phone	E-mail
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

Table 12-3 *Service departments in Europe*

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

Table 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	+1 734 214 0000	service@us.gudel.com

Table 12-5 *Service departments outside of business hours*

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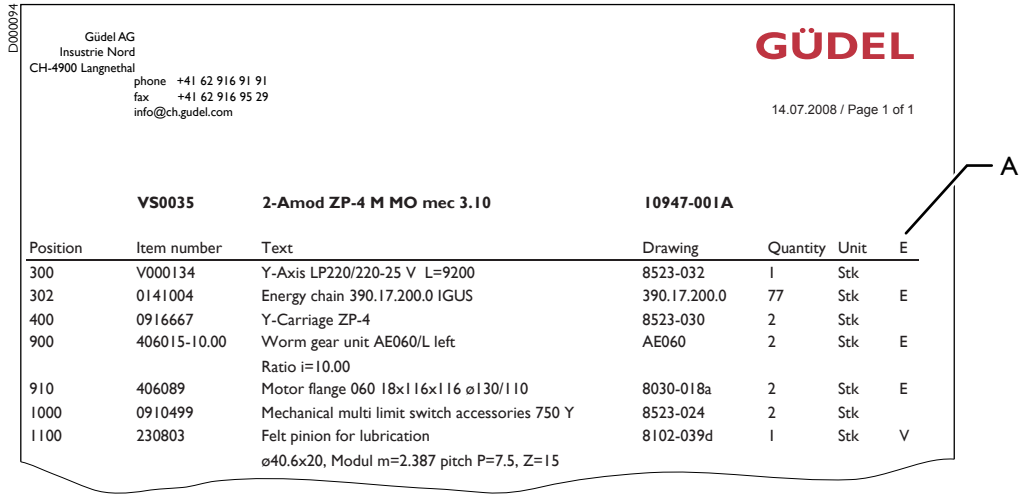
12.2 Explanations regarding the spare parts list

12.2.1 Parts list

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



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Insustrie Nord
CH-4900 Langnethal
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fax +41 62 916 95 29
info@ch.gudel.com

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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

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

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13.1.2 Black screws

Unless otherwise specified, the following tightening torques apply for black oiled and non-lubricated screws, or screws secured with Loctite 243:

Thread size	Tightening torque [Nm]		
	8.8	10.9	12.9
M4	3	4.6	5.1
M5	5.9	8.6	10
M6	10.1	14.9	17.4
M8	24.6	36.1	42.2
M10	48	71	83
M12	84	123	144
M14	133	195	229
M16	206	302	354
M20	415	592	692
M22	567	804	945
M24	714	1017	1190
M27	1050	1496	1750
M30	1420	2033	2380
M36	2482	3535	4136

Table 13-2 *Torque table for black oiled and non-lubricated screws*

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13.1.3 Stainless steel screws

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

Thread size	Tightening torque [Nm]		
	50	70	80
M3	0.37	0.8	1.1
M4	0.86	1.85	2.4
M5	1.6	3.6	4.8
M6	2.9	6.3	8.4
M8	7.1	15.2	20.3
M10	14	30	39
M12	24	51	68
M14	38	82	109
M16	58	126	168
M20	115	247	330
M22	157	337	450
M24	198	426	568
M27	292	—	—
M30	397	—	—
M36	690	—	—

Table 13-3 *Torque table for stainless steel 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 [▶ 135]

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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,
declare that the following lubricating systems

FlexxPump 401 DLS, 402 DLS, 403 DLS, 404 DLS, 422 DLS
as well as **FlexxPump 401 DLSA, 402 DLSA, 403 DLSA, 404 DLSA, 422 DLSA**

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 Safety of machinery

according the EG directive on Electromagnetic Compatibility 2004/108/EG

The manufacturer herewith declares that the following lubricating systems

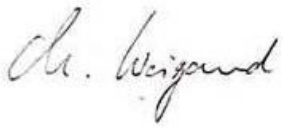
FlexxPump 401 DLS, 402 DLS, 403 DLS, 404 DLS, 422 DLS
as well as **FlexxPump 401 DLSA, 402 DLSA, 403 DLSA, 404 DLSA, 422 DLSA**

delivered by us, concerning design and construction as well as the model put into circulation, comply with the above mentioned EG directive.
In particular, the following harmonized standards were applied:

EN 61000-6-2, EN 61000-6-4 Elektromagnetic 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, 12.01.2018



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