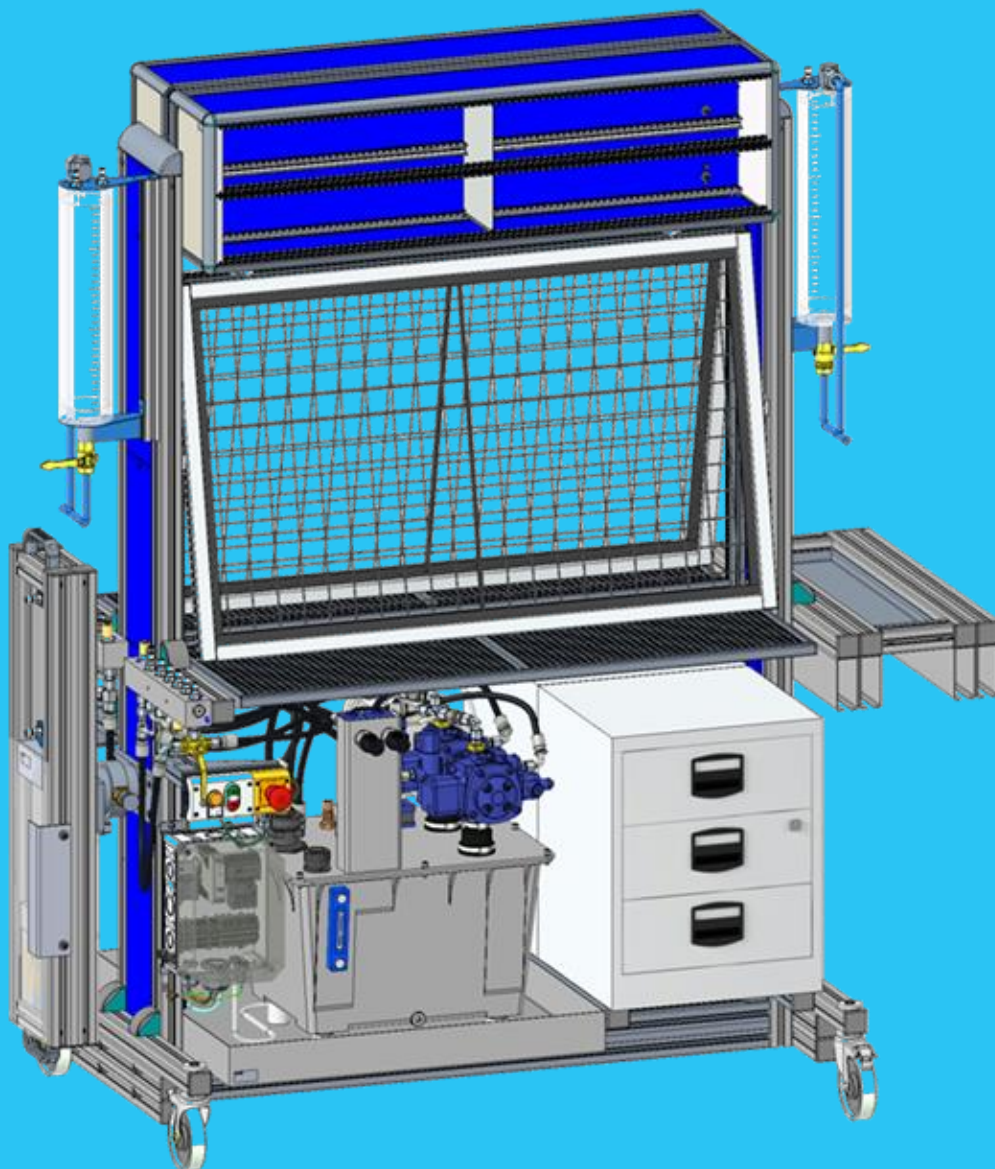


Hydraulix 300

Technical documentation



Impressum

The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

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The original operating instructions were created in the German language.

Series	Hydraulix 300
Title	Technical documentation
Type of documentation	Operating instructions
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Material number	R901595178
Purpose of the documentation	• Primary information for use • Safety instructions • Commissioning • Operation • Handling • Technical setup

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Liability	The data specified only serves to describe the product and are not to be understood as warranted properties in the legal sense. Changes in the content of the documentation and delivery options of the products remain reserved.
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1 About this documentation

1.1 Validity of the documentation

This documentation applies to the following products:

- Hydraulix 300, Hydraulic design

This documentation is intended for trainers, training participants, operators and the system end-user.

This documentation contains important information on how to assemble, transport, commission, operate, use, maintain and disassemble the training system safely and properly and to resolve simple faults independently.



You should read this documentation thoroughly, and in particular the chapter 2 „Safety instructions“, before working with the product.

1.2 Required and supplementary documentation

You can find these operating instructions as well as further documentation and data sheets in the Rexroth media directory at:

<http://www.boschrexroth.com/various/utilities/mediadirectory/>

The current training program and other knowledge products of the Drive & Control Academy can be viewed at the following Internet address:

<http://www.boschrexroth.de/academy>

You can find the right product portfolio for this hydraulic training system at the following Internet address:

<https://store.boschrexroth.com/Academy/Systems>

Table 1: Required and supplementary documentation

Title	Document number	Document type
Adjustable vane pump, pilot-operated	RE 10515	Data sheet
Hydraulic fluids based on mineral oils and related hydrocarbons	RE 90220	Data sheet

1.3
Illustration of information

Uniform safety instructions, symbols, terms and abbreviations are used so that you can quickly and safely work with your product using this documentation. For better understanding, they are explained in the following sections.

1.3.1
Safety instruction

In this documentation, safety instructions are included whenever sequences of actions are explained which bear the danger of personal injury or damage to property. The measures described for the hazard avoidance must be observed.

Safety instructions are set out as follows:

 SIGNAL WORD
Type and source of danger Consequences of non-compliance ► Hazard avoidance measures – <List>

- **Warning sign:** Draws attention to the danger
- **Signal word:** Indicates the seriousness of the danger
- **Type and source of danger:** Designates the type and source of danger
- **Consequences:** Describes the consequences of non-compliance
- **Precautions:** Specifies how the danger can be prevented

Hazard classes according to ANSI Z535.6-2006

Warning sign, Signal word	Meaning
 DANGER	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided
 WARNING	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided
 CAUTION	Indicates a dangerous situation which may cause minor to medium personal injuries if not avoided
 NOTICE	Indicates damage to property: The product or the environment could be damaged

1.3.2 Symbols

The following symbols indicate notes which are not safety-relevant but increase the comprehensibility of the documentation.

Table 2: Meaning of symbols

Symbols	Meaning
	If this information is not observed, the product cannot be optimally used and/or operated
	Tip, general note, useful additional information
	Observe instructions on disposal and environmental protection
•	Enumeration
►	Individual, independent action
1. 2. 3.	Numbered instruction: The numbers indicate that the actions must be carried out one after the other
4.[►**]	Indicates the page of a cross reference
5.Text	Indicates a cross reference in this document
http://	Indicates a hyperlink in this document

1.3.3 Designations

The following designations are used in this documentation:

Table 3: Designations

Designation	Meaning
Training system	Workstation Hydraulix 300

1.3.4 Abbreviation

The following abbreviations are used in this documentation:

Table 4: Abbreviation

Abbreviation	Meaning
BR	B osch R exroth
RE	R exroth Datasheet E nglish
DC	D irect C urrent
AC	A lternating C urrent

2 Safety instructions

2.1 About this chapter

The product has been manufactured according to the generally accepted rules of technology. However, there is still the danger of personal injury and damage to property if you do not observe this chapter and the safety instructions in this documentation.

- Read this documentation completely and thoroughly before working with the product. If you have not clearly understood the documentation in the available language, please contact your responsible Rexroth sales representative.
- Keep this documentation in a location where it is accessible to all users at all times.
- Always include the required documentation when you pass the product on to third parties.
- The unobjectionable and safe operation of this device requires appropriate and proper transport, storage, assembly and installation as well as careful operation and maintenance.

2.2 Intended use

Bosch Rexroth products are developed and produced according to the relevant state-of-the-art. Before their delivery, they are checked for their operationally safe condition.

The products may only be used as intended. If they are not used as intended, situations may arise that result in damage to property and personal injury.

NOTICE

Improper use!

Consequences, disclaimer

- Bosch Rexroth, as the manufacturer, does not provide any warranty, liability or compensation for damage resulting from improper use of the products; the risks of improper use of the products lie solely with the user.

Before using the Bosch Rexroth products, the following prerequisites must be complied with in order to guarantee intended use of the products:

- Everyone who in any way deals with our products must read and understand the corresponding safety regulations and notes regarding the intended use.
- If the products are hardware, they must be left in their original condition, i.e. no structural changes may be made to them. Software products must not be decompiled, their source codes must not be modified.
- Damaged or defective products must not be installed or commissioned.
- It must be guaranteed that the products have been installed according to the instructions given in the documentation.

This Bosch Rexroth product is intended for use in technical education and training in the field of hydraulic control technology.

The product may be used as follows:

- to impart knowledge and skills in the field of hydraulic control engineering,
- for educational and commercial use,
- as an education or training system.

Operation is only permitted under the operating conditions specified in the chapter 14 “Technical data”.

Devices and device sets may only be used for setting up control circuits and simulations if they comply with the operating conditions specified in chapter 14 “Technical data”.

The product is not intended for private use.

Intended use also implies that you have read and understood this documentation in full, in particular Chapter 2 “Safety instructions” and Chapter 3 “General instructions concerning property damage and product damage”.

2.3 Improper use

Any use other than that described in the intended use is not in accordance with the intended use and is therefore not permitted.

Bosch Rexroth AG accepts no liability for damage resulting from improper use. The risks associated with improper use lie solely with the user.

Improper use of the product includes:

- If it is exposed to operating conditions that do not fulfill the prescribed ambient conditions. For example, operation under water, under extreme temperature fluctuations or extreme maximum temperatures is prohibited.

2.4 Qualification of personnel

2.4.1 General information

Basic mechanical and electric knowledge as well as knowledge of corresponding technical terms is required for assembly, commissioning, maintenance (incl. service, inspection, repair) and disassembly. To ensure operational reliability, these activities may therefore only be performed by a qualified expert or an instructed person under the supervision of an expert. Experts are those who are able to recognize potential dangers and apply the appropriate safety measures due to their professional training, knowledge and experience, as well as their understanding of the relevant conditions pertaining to the work to be undertaken. An expert must observe the relevant specific professional rules.

2.4.2 Teaching

At this product, trainees may only work:

- Under direct supervision
- After being given appropriate instructions by an instructor or trained member of staff

2.4.3 Trained personnel

For the supervision during the exercises, trained personnel may also be used.

These are qualified people who were instructed and briefed in relation to:

- tasks ordered,
- possible dangers in the event of improper use,
- safeguards and protective measures.

2.4.4 Transport, Assembly, Installation and Commissioning

Work on the training system, such as installation, connection and commissioning, may only be carried out by authorized specialists or persons with sufficient qualifications and authorization.

Persons authorized to work on the training system must be able to follow the instructions in this documentation and independently complete any missing information based on their own professional qualifications.

Maintenance, repair, troubleshooting and fault rectification require special knowledge and skills and may only be carried out by qualified personnel!

- Work on the electrical equipment may only be carried out by a qualified electrician. A qualified electrician is someone who can assess the work assigned to them, recognize possible dangers and take suitable safety measures based on their technical training and experience as well as their knowledge of the relevant regulations.
- Only qualified personnel with special knowledge and experience in hydraulics may work on hydraulic components. Specialized knowledge of hydraulics means that the personnel must
 - be able to read and fully understand the hydraulic diagrams,
 - in particular, fully understand the interrelationships between the installed safety devices and
 - have knowledge of the function and structure of hydraulic components.

2.5 General safety instructions

- Observe the valid regulations on accident prevention and environmental protection.
- Observe the safety regulations and provisions of the country where the product is implemented / used.
- Exclusively use Bosch Rexroth products in technically perfect condition.
- Observe all notes on the product.
- Persons who assemble, operate, disassemble or maintain Bosch Rexroth products must not be under the influence of alcohol, drugs or pharmaceuticals that may affect their ability to react.
- Only use spare parts approved by the manufacturer in order to exclude hazards to persons due to unsuitable spare parts.
- Comply with the technical data and environmental conditions specified in the product documentation.

2.6 Product- and technology dependent safety instructions

2.6.1 Introduction

The following notes must be read before the first commissioning of the system to avoid physical injury and/or damage to property. These safety instructions must be observed at all times.

Do not attempt to install or commission this device without first reading all documentation provided with the training system. Please contact your responsible Bosch Rexroth sales representative in case you are not provided with any user information.

If the device is resold, rented and/or passed on to others in any other form, these operating instructions must be handed over, as well.



WARNING

Improper handling of these devices and non-observance of the warnings given here as well as improper intervention in the safety equipment!

Can lead to property damage, personal injury, electric shock or in extreme cases death!

2.6.2 General information

- In case of damage due to non-compliance with the warnings in these operating instructions, Bosch Rexroth AG will not accept any liability.
- Before the commissioning, the operating, maintenance and safety instructions are to be read. If you have not clearly understood the documentation in the available language, please ask the supplier and inform the latter.
- The unobjectionable and safe operation of this device requires appropriate and proper transport, storage, assembly and installation as well as careful operation and maintenance.
- You must observe the safety regulations and provisions of the country where the device is used.
- The environmental conditions specified in the product documentation must be observed.

2.6.3 Danger due to high electrical voltage

DANGER

Danger to the safe operation of the training system! High electrical voltage!

Danger to life and limb of the operator or third parties!

- ▶ Depending on the unit variant (230V/400V), suitable mating plugs are required for the mains connection; information can be found in chapter 14 “[Technical data](#)”.
- ▶ An earthed industrial network (TN-C-S net type) is required to operate the training system.
- ▶ Only operate the training system on a network with a functioning residual current circuit breaker (max. 30 mA).
- ▶ The electrical voltages in the training components and training circuits must not exceed 24V DC.
- ▶ Electrical training circuits may only be assembled and disassembled in a de-energized state.

2.6.4 Danger due to faulty safety- and protective devices!

WARNING

Tampered with and/or non-functioning safety and protective equipment! Danger to the safe operation of the training system!

Danger to life or serious injury!

- ▶ Shut down the system immediately!
- ▶ The fault or manipulation must be rectified immediately by qualified personnel.
Never change the pressure setting on the safety pressure relief valve (set to 70 bar and sealed) of the hydraulic unit.

2.6.5 Dangers due to incorrect use

CAUTION

Leaking hydraulic fluid due to leaks or faulty components in the hydraulic system!

Risk of injury! Fire hazard! Risk of burns!

- ▶ Switch off the system immediately (emergency stop button).
- ▶ Identify and eliminate the cause of the leak.
- ▶ Never try to stop or seal the leak or a jet of oil with a cloth.
- ▶ Never get caught in an oil jet spraying out at high pressure.
- ▶ Carry out regular visual checks for leaks in the hydraulic unit and hydraulic components and ensure that hydraulic hose lines (hydraulic couplings) are connected correctly.
- ▶ Wash your hands after coming into contact with hydraulic fluid.

Escaping oil mist!

Fire hazard, risk of allergic reactions, environmental pollution!

- ▶ Only carry out repairs and maintenance work when the unit is depressurized.
- ▶ Keep naked flames and ignition sources away from the hydraulic power unit.
- ▶ Do not enter the danger zone if you are allergic to the ingredients of hydraulic fluids.

Danger from flying parts due to excessive pressure in the hydraulic system!

Risk of injury!

- ▶ Always depressurize the hydraulic circuit before disconnecting the hoses.
- ▶ Look out for damaged, uncoupled hose lines.
- ▶ Watch out for loose, unfastened superstructures.
- ▶ Never work without safety goggles; there is a risk of eye injury.

Risk of slipping due to oily surfaces!

Risk of injury!

- ▶ Secure and mark the danger zone.
- ▶ Use oil binding agents to bind the leaked hydraulic oil.
- ▶ Provide binding agents before filling, refilling or changing the hydraulic oil.
- ▶ Remove and dispose of the contaminated oil binding agent.
- ▶ Wear protective equipment such as safety shoes (min. protection class S1).

Hot surfaces on the hydraulic unit during and after operation!

Risk of injury! Risk of burns!

- ▶ Only touch the surfaces of the power unit and the hydraulic training components when wearing protective gloves. Electric actuating magnets for electrically actuated valves heat up during operation.
- ▶ The temperatures of the components and the hydraulic fluid can exceed 50 °C during or after operation, depending on the operating conditions.
- ▶ Allow these components to cool down sufficiently before accessing them, e.g. dismantling the training circuits.

Risk of crushing due to pressurized moving parts!

Risk of injury!

- ▶ Never remove protective covers from hydraulic motors, hydraulic cylinders or load simulators during operation.
- ▶ Replace damaged covers.

Danger from falling objects!

Risk of injury!

- ▶ Provide free slots on the subrack with covers to prevent objects from being deposited on them.

2.7 Personal protective equipment

The personal protective equipment for users of the product consists of:

- Safety shoes (min. protection class S1 according to EN ISO 20345) during the entire training operation.
- Oil-tight work gloves and eye protection goggles during assembly, disassembly and execution of the training circuits.

All components of the personal protective equipment must be intact.

2.8 Obligations of the operator

The operator of the product is to provide for personnel training on the following subjects on a regular basis:

- Observation and use of the operating instructions as well as the legal provisions
- Intended operation of the Bosch Rexroth product
- Observation of the instructions from the factory security offices as well as the operator's operating instructions
- Behavior in case of emergency

The operator has to guarantee the required prerequisites for the set-up and the installation of the product and provides for:

- Safe set-up by their personnel and/or the persons authorized by them
- Compliance with the accident prevention regulations (UVV in Germany)
- Compliance with the safety regulations of the professional associations as well as further internal and local requirements

He shall in particular make sure that the underground

- is stable,
- is level and horizontal.

The operator will instruct their employees and/or those of third-party companies on possible dangers at the place of installation.

The operator must provide adequate illumination around the area of installation of the product.

2.9 Safety equipment

The training system is equipped with the following safety devices to protect people:

- Emergency stop button
- Thermal overload relay for electric motor, with visual indicator
- Hydraulic pressure limiter
- Sealed safety valve
- Mechanical safety devices
- Hydraulic quick-release coupling

The facilities mentioned are described in more detail below.

Emergency stop button

There is an emergency stop button on each side of the training system.

This must be pressed to prevent danger to persons or the training system.

Pressing the emergency stop button interrupts the electrical supply in the control box and the function of the electrical consumers connected to it. The hydraulic unit is switched off.

Thermal overload relay with visual indicator

There is a control panel with an indicator light on each workstation side of the training system. If the electric motor of the hydraulic unit is thermally overloaded, it is switched off via the thermal overload relay for protection. The visual indicator (yellow indicator light) starts to light up. Only when the electric motor has cooled down does the indicator light go out and the hydraulic unit can be switched on again using the „I“ button.

Hydraulic pressure limitation

The hydraulic unit is preset to a standby pressure of 15 bar and a maximum operating pressure of 50 bar. The maximum system pressure of the hydraulic unit is set to 70 bar via sealed safety pressure relief valves (one pressure relief valve per pump) and is not allowed to be changed.



Suitable pressure indicators (e.g. pressure gauges) and pressure relief valves must be integrated into the training circuit for hydraulic pressure monitoring of training circuits during training.

Mechanical protective devices

The following mechanical safety devices are available:

- Locking device on the transport rollers,
- Protective covers on the swivel load simulator,
- locking bolts and clamping levers on the swiveling load simulator.

Quick-release coupling

Quick-release couplings are fitted to the following components for the hydraulic connection:

- Hydraulic components for training superstructures
- Measuring glass
- P/T/X manifold

The coupling prevents hydraulic fluid from escaping when this connection is disconnected.

2.10 Operator workstation

The following space must be planned in order to be able to teach and learn the procedures on the training system.

Training system for double-sided use -> 2 workplaces

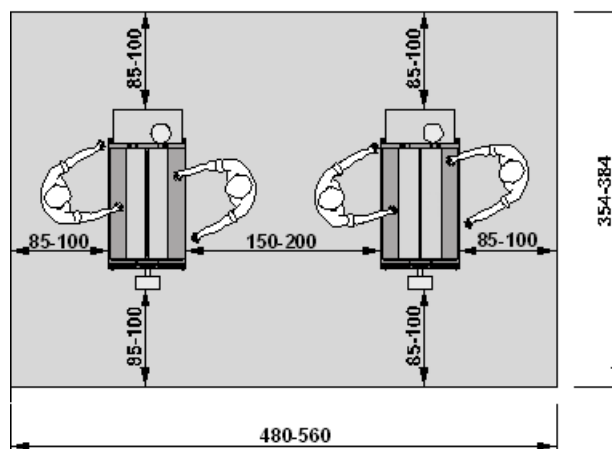


Fig.1: Space requirement (in cm), double-sided training system

3 General instructions concerning property damage and product damage

NOTICE

Danger due to improper handling!

Damage to property!

- ▶ The product may only be used in accordance with chapter 2.2 “[Intended use](#)”.

Mixing hydraulic fluids!

Damage to property!

- ▶ Any mixing of hydraulic fluids is generally not permitted.

Contamination by foreign bodies!

Premature wear and malfunctions!

- ▶ Filter the hydraulic fluid with a suitable filter system when filling.
- ▶ Before commissioning, ensure that all hydraulic and mechanical connections are connected.

Operation with insufficient hydraulic fluid!

Material damage!

- ▶ Ensure that the reservoir is filled with hydraulic fluid during commissioning or recommissioning and that it remains filled during operation.
- ▶ Observe the information on the reservoir regarding the minimum and maximum fill levels. Operation with too little hydraulic fluid will damage the power unit.
- ▶ Observe the hydraulic fluid consumption when connecting external hydraulic components (e.g. hydraulic cylinders). Top up if necessary.

System under pressure and under voltage!

Material damage!

- ▶ Do not disconnect any lines or connections while the training system is under pressure.
- ▶ Do not loosen any electrical connections while the electrical supply is connected.

Incorrect setting of pressure relief valves

Material damage!

- ▶ The training system may only be operated with the pressure specified in chapter 14 “[Technical data](#)”.

Improper cleaning!

Material damage!

- ▶ Do not use aggressive cleaning agents for cleaning.
- ▶ Do not use a high-pressure cleaner.

Environmental pollution due to incorrect disposal!

Environmental pollution! Damage to property!

- ▶ Dispose of the teaching system and packaging in accordance with the national regulations of your country.
- ▶ Dispose of the hydraulic fluid in accordance with the specifications in the valid safety data sheet for the hydraulic fluid.

4 Scope of delivery

The following table lists all components that are included in the scope of delivery as standard.

The term “not included in the scope of delivery” refers exclusively to this table.

Table 5: Scope of delivery

Quantity	Mat.-Nr.:	Designation
1	R9xx	Hydraulix 300 -base frame with the mounted functional assemblies and hydraulic unit - depending on the version with 1 or 2 grid mounting frame(s), - depending on the version with swivelling load simulator - depending on version with measuring glass - depending on version with component rack - depending on version with hose holder
1	R901595177	DOK-SUPPL* BETRIEBSANLEITUNG TS-1/X-DE HX300
1	R901595178	DOK-SUPPL* OPERATING INSTRUCTIONS TS-1/X-EN HX300

4.1 Delivery status

The product is delivered fully assembled. The training system must be filled with hydraulic fluid for operation. Information on suitable hydraulic fluid can be found in chapter [14](#) “Technical data”.

A suitable electrical supply connection must also be available.

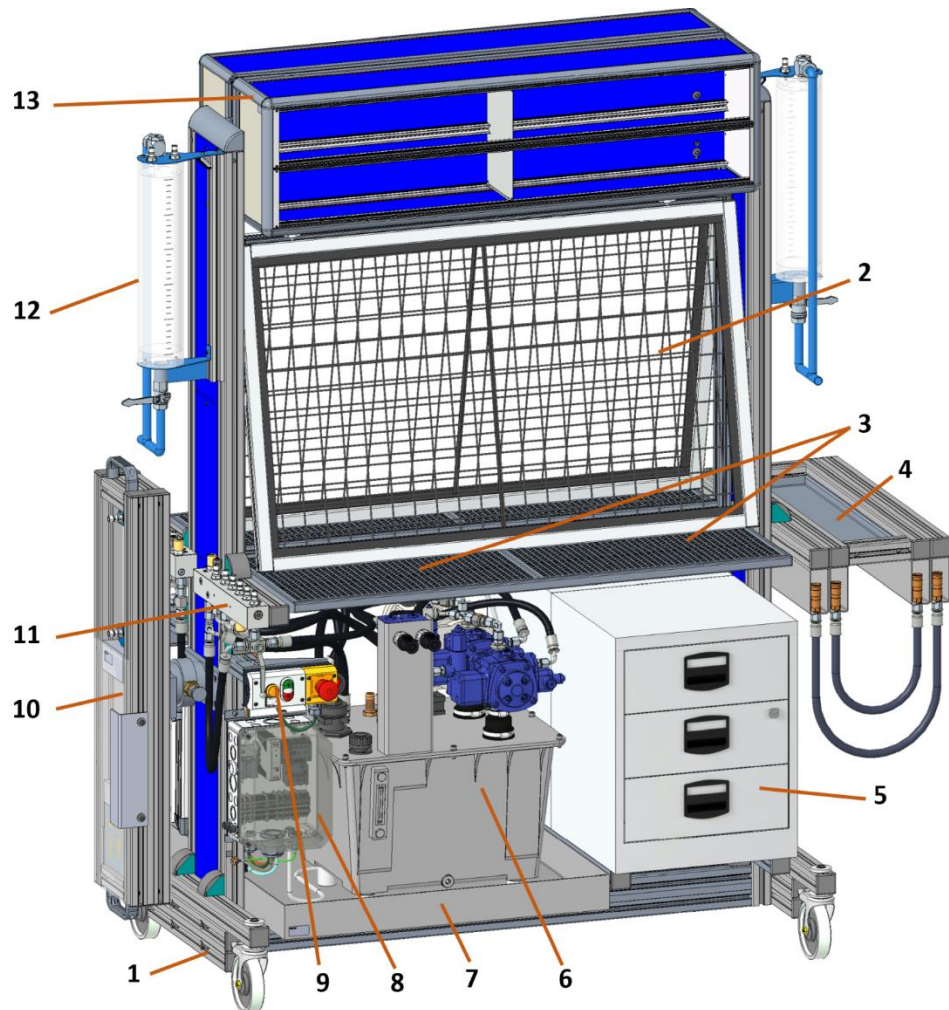
The Hydraulix 300 training system is available in the following operating voltage versions:

- - Version with 230V operating voltage and protective contact plug with at least 2.5 m cable length.
- - Version with 400V operating voltage and CEE plug (5P, 16A) with a minimum cable length of 2.5 m.



1 Protective contact plug 2 CEE-plug

Fig.2: Connection plug



- | | |
|--|--|
| 1 Base frame with transport rollers | 8 Switch box; versions:
230V/50(60) Hz or 400V/50Hz; |
| 2 Grid frame | 9 Control panel with emergency stop, I / O,
signalling light (overload) |
| 3 Oil drip tray, 2 per side
Optional, Writing pad (not shown) | 10 15 kg load simulator, swivel |
| 4 Hose rack for 50 hoses; | 11 P/T/X manifold |
| 5 Drawer cabinet | 12 Measuring glass 2.5 litres |
| 6 Hydraulic unit with double pump 230V/50Hz or
60 Hz; 1.5kW or 400V/50Hz; 2.2kW | 13 Component rack |
| 7 Oil pan | |

Fig.4: Hydraulix 300

5.2 Base frame

The base frame is the basis for the training system. It is assembled from sturdy strut profiles (aluminum) from Bosch Rexroth. Additional components can be attached to the side profiles (45x45 mm groove width 10 mm).

Components of the frame are:

- 4 steerable transport rollers with parking brake
- 1 oil pan for the hydraulic unit
- One oil drip tray on each side underneath the grid frame
- Two oil drip trays on each side or 2 writing supports as accessories
- Mounting plate and holding mechanism for the grid frame
- Grooved plate for holding the component rack

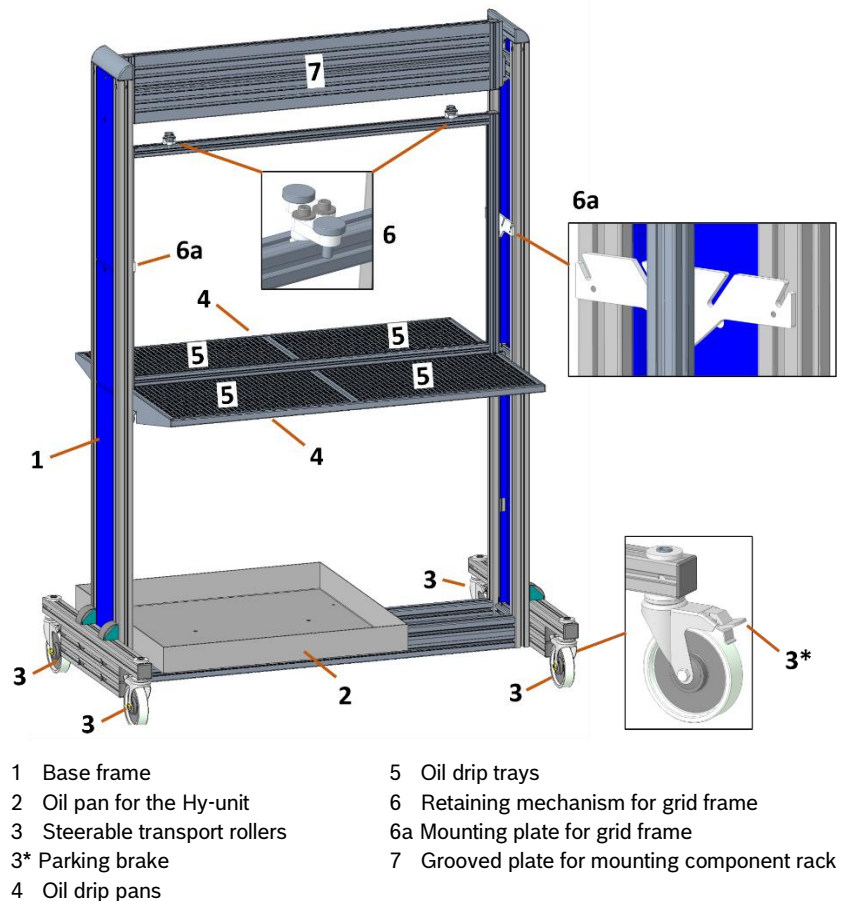


Fig.5: Base frame

Oil drip trays

The oil drip trays are included in the scope of delivery and are inserted into the oil-tight oil drip trays. 4 pieces are required for double-sided fitting.

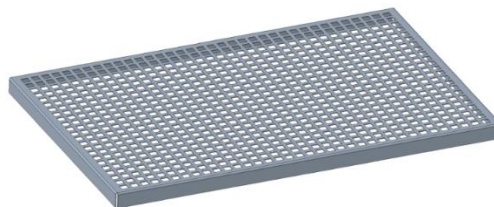


Fig.6: Oil drip tray

Writing pad

The writing pad is available as an accessory. It can be inserted into the oil drip tray in place of the oil drip trays.

Four are required for a complete replacement. Information on ordering can be found in chapter 12.4 “[Extension – Writing pad](#)”.

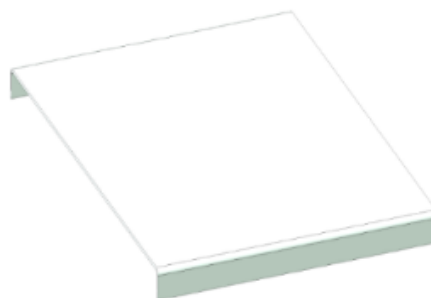


Fig.7: Writing pad

5.3 Grid frame

The grid frame is used to hold the components from the hydraulic equipment sets. The lattice frame is designed so that it can be installed and removed again as required by simply hooking it into the base frame, e.g. to clean the oil drip trays.

The grid frame has bolts on both sides and two sliding blocks in the groove of the upper strut profile (see illustration). The grid frame is hooked into one of the two grooves of the side support plates via the bolts. A pivoting holding mechanism fixes the grille frame with a knurled screw that presses on the sliding block in the upper strut profile.

The front groove of the mounting plate must be used for the slightly inclined position of the lattice frame. If the rear groove of the mounting plate is used, the grille frame is vertical.

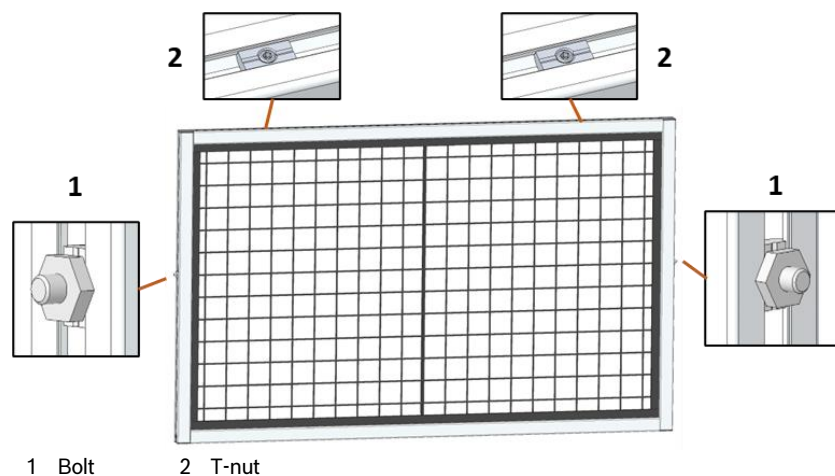


Fig.8: Detail Grid frame

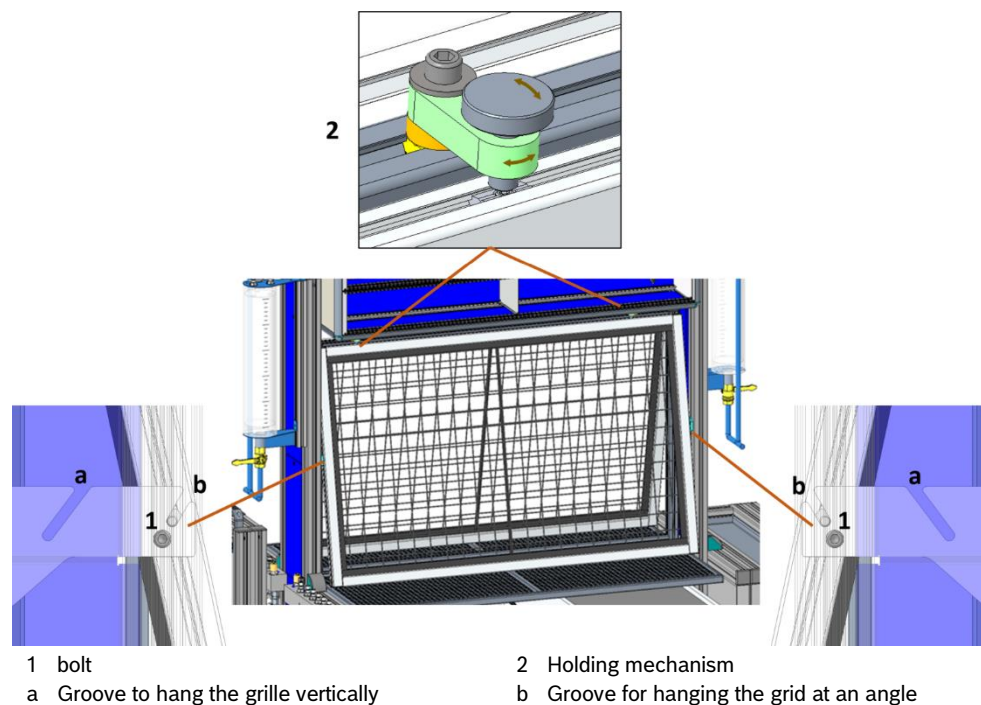


Fig.9: Detail positioning and fixing of the grid frame

5.4 Hose rack

The hose rack is attached to the side section of the base frame at the factory and is used to hold up to 50 hose assemblies. The hose assemblies are hooked into the lower profiles. To do this, the hose assembly is pushed into the profiles via the fitted coupling sleeves.

The two inner profiles are intended for hose assemblies up to a length of 700 mm. The two outer profiles are for all longer hose assemblies.

An oil tray for storing small parts is also integrated on the top of the hose tray.

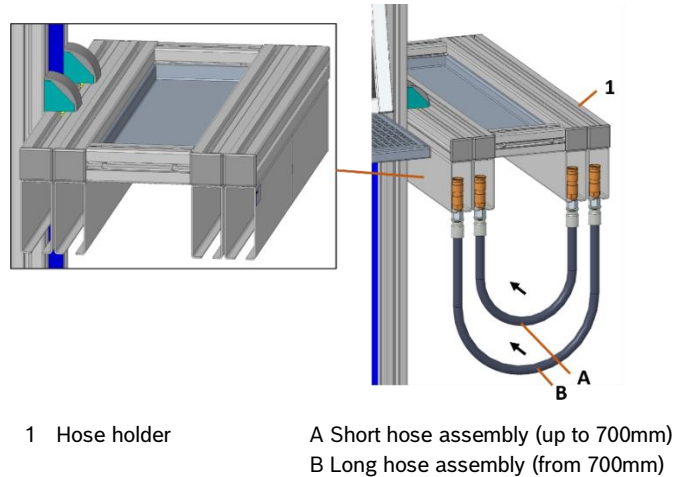


Fig.10: Hose holder

5.5 Drawer cabinet

The training system is equipped with a built-in cabinet at the factory. This is to be used to safely store loose components, such as sensor cables or tools.

Until the beginning of 2024, the built-in cabinet consisted of a built-in container that was only accessible from one working side.

Due to the reduced depth, 2 drawer cabinets are installed. This means that each working side has its own cabinet.

Built-in container (to 2024)

The built-in container is equipped with 5 drawers on smooth-running runners and a lock on the front. All drawers can be locked using the lock.

It is fixed to the base frame next to the hydraulic unit.

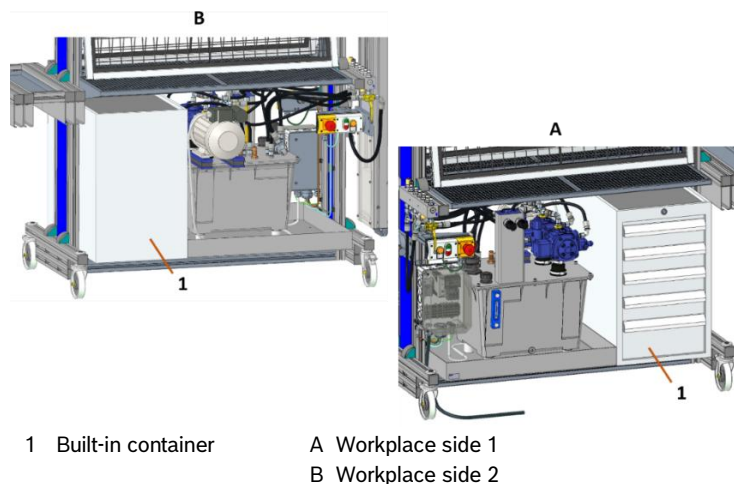


Fig.11: Built-in Container

Drawer cabinet
(from mid-year 2024)

The drawer cabinet is equipped with 3 drawers on smooth-running runners and a lock on the front. The two upper drawers can be locked using the lock. It is fixed to the base frame next to the hydraulic unit.

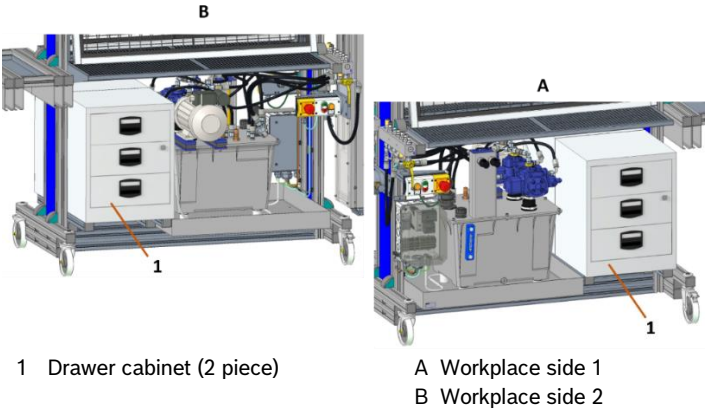


Fig.12: Drawer Cabinet

5.6 **Hydraulic unit**

5.6.1 **Overview**

The hydraulic unit with double pump supplies both workstations with hydraulic fluid. The following hydraulic circuit diagram shows the power unit with double pump, the two P/T/X manifolds and the two measuring glasses.

An overview of the item numbers with the names of the assemblies can be found on the next page.

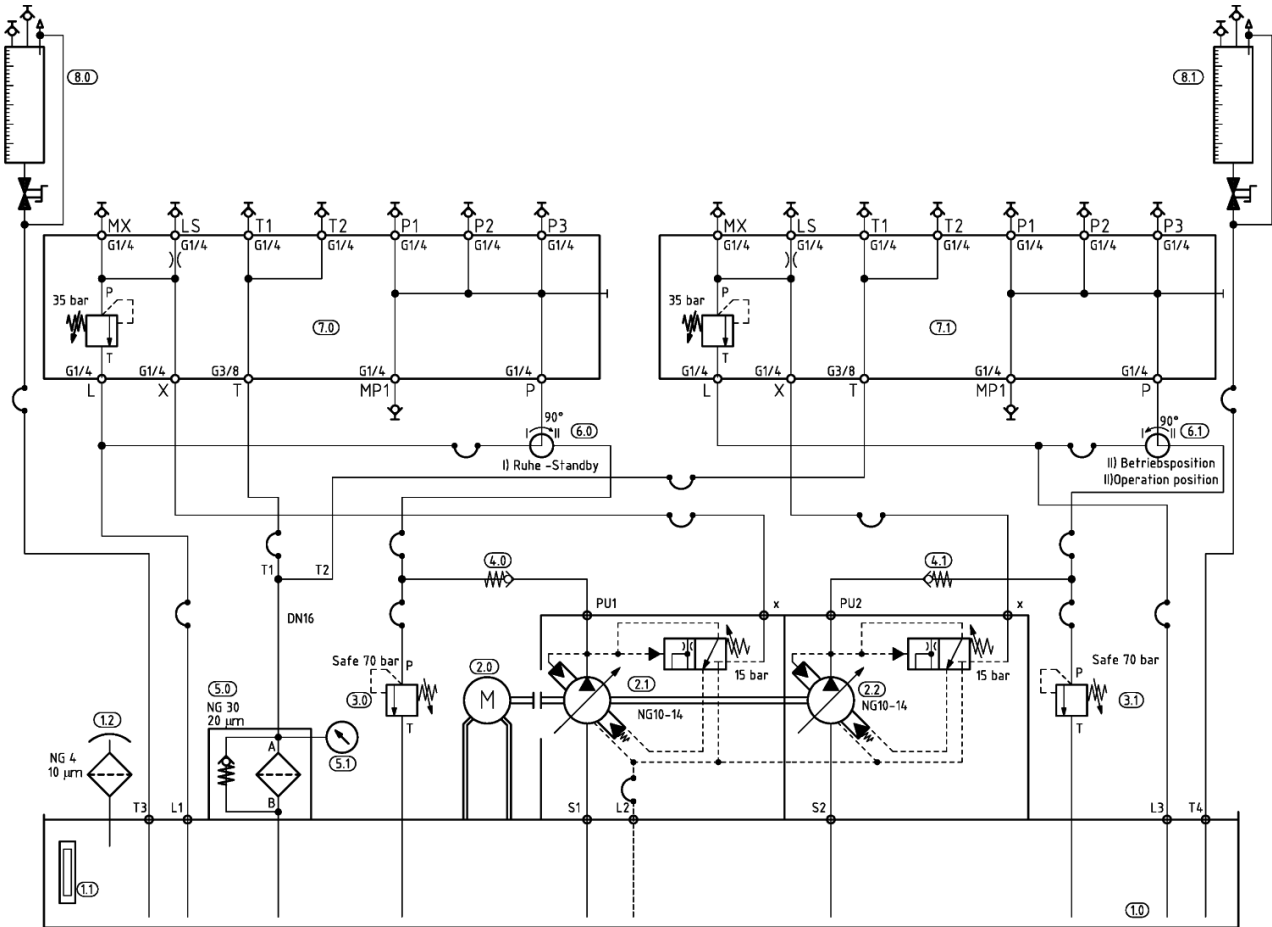
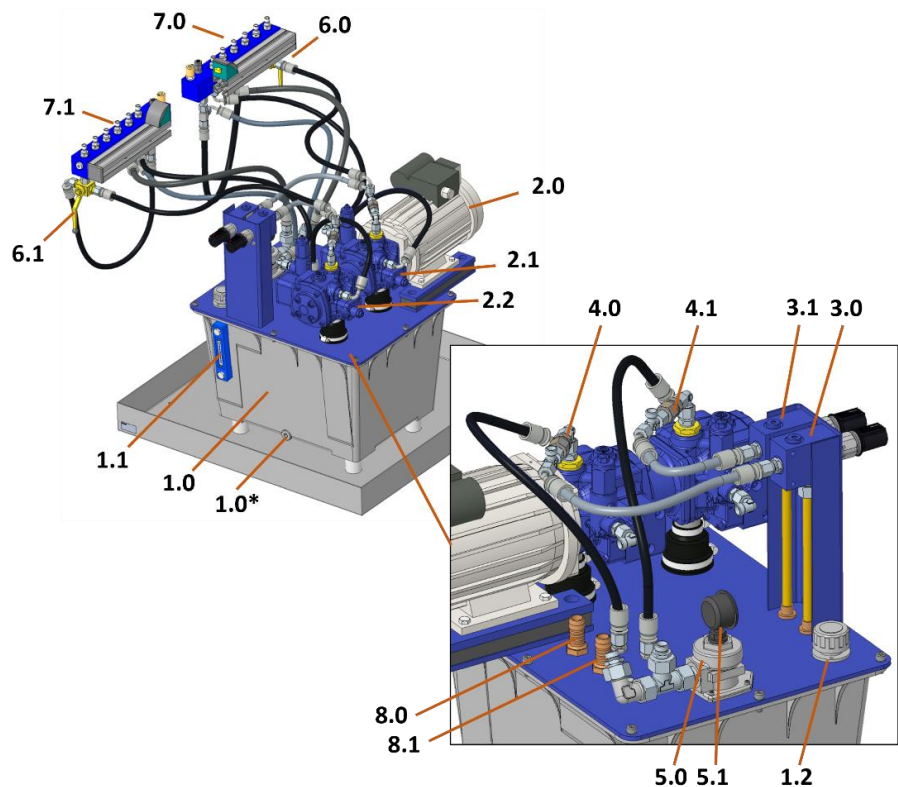


Fig.13: Hydraulic circuit diagram

Detailed view of the hydraulic unit with position numbers from the hydraulic circuit diagram.



- | | |
|---|---|
| 1.0 Tank (1.0* Drain plug) | 5.0 Return flow filter |
| 1.1 Level and temperature indicator | 5.1 Clogging indicator |
| 1.2 Filler neck with ventilation cap | 6.0 3/2-way ball valve
(hydraulic circuit first pump) |
| 2.0 Electric motor | 6.1 3/2-way ball valve
(hydraulic circuit second pump) |
| 2.1 First vane pump | 7.0 P/T/X manifold
(hydraulic circuit first pump) |
| 2.2 Second vane pump | 7.1 P/T/X manifold
(hydraulic circuit second pump) |
| 3.0 Sealed pressure relief valve
(hydraulic circuit first pump) | 8.0 Measuring glass connection 1
(Hydraulic circuit first pump) |
| 3.1 Sealed pressure relief valve
(hydraulic circuit second pump) | 8.1 Measuring glass connection 2
(hydraulic circuit second pump) |
| 4.0 Check valve
(hydraulic circuit first pump) | |
| 4.1 Check valve
(hydraulic circuit second pump) | |

Fig.14: Detailed view of the hydraulic unit

5.6.2 Components and functions

Tank

The tank has a volume of 40 litres. The tank includes the following components:

- Filler neck with ventilation cap (sealing cap)
The tank is filled with hydraulic fluid via the filler neck.
The sealing cap is also used for ventilation. As this does not seal the tank tightly, the tank must be emptied before transport.
- Fill level and temperature indicator
The fill level can be checked visually using the fill level indicator. If the liquid is between the two markings 'Max.' and 'Min.' when the system is switched off, the fill level is OK.
The integrated thermometer continuously measures the temperature of the liquid.
- Oil drain plug
The oil drain plug on the tank can be used for draining.
The hydraulic unit must be taken out of operation, before opening the oil drain plug.

E-motor

The electric motor is an asynchronous motor and is available in the following versions:

- 1-phase with operating capacitor 230V/50 Hz or 230V/60Hz and 1.5 kW
- 3-phase 400V/50 Hz and 2.2 kW

Vane pump

Both hydraulic pumps are vane pumps with an adjustable displacement volume.

They are flanged together and driven by an electric motor.

Technical data are:

- Manufacturer: Bosch Rexroth
- Type: PV7 (BG10- NG 14 cm³) with volume flow controller
- Type code: PV7-1X/10-14RE01MN0-16

The task of the pumps is to deliver the hydraulic fluid from the tank and to forward it to the two P/T/X manifolds.

The two vane pumps are set to a standby pressure of 15 bar at the factory. The maximum operating pressure of 50 bar can only be reached when hydraulic pressure is present at the LS connection of the P/T/X manifold, which is determined by the pressure relief valve (LS) installed in the P/T/X manifold. This pressure relief valve is preset to 35 bar and limits the hydraulic pressure at connection X of the hydraulic pump.

The relationship between operating pressure and pressure at connection 'LS' is:

Operation pressure (max. 50 bar) = Standby press. (15 bar) + Pressure on Connection „LS“

The hydraulic pressure signal at the LS connection can come directly from an application, e.g. in exercises from the mobile hydraulics learning topic. Alternatively, a direct connection between a P and LS connection (on the P/T/X manifold) is also possible with a hydraulic hose assembly (with coupling on both sides). The hydraulic pressure feedback then comes directly from the operating pressure.

Principle of hydr. control

In stand-by mode and at a maximum operating pressure of 50 bar, the pressure regulator regulates the pump and only delivers the amount of hydraulic fluid required to maintain the set pressure. Further information on the design and function of the vane pump can be found in data sheet RE10515 (Bosch Rexroth). Information on how to obtain this data sheet can be found in chapter [1.2 „Required and supplementary documentation“](#).

Pressure relief valve

The sealed pressure relief valves protect the two pump circuits at 70 bar.

Check valve

The check valves block the flow in one direction and open against a spring in the other direction. The spring force corresponds to a certain pressure. During operation, the hydraulic fluid flows via the non-return valves to the two P/T/X manifolds. The return flow from the P/T/X manifolds to the vane pumps is prevented.

Return flow filter with clogging indicator

The return flow of the hydraulic fluid from the T-connections of the manifolds to the tank takes place via the return filter. The filter with bypass circuit is used to filter out the smallest impurities from the hydraulic oil. It consists of the filter housing with a filter element and the clogging indicator.

If the filter element is clogged and needs to be replaced, this is indicated visually by the clogging indicator. Further information can be found in chapter [10.5.2 „Replacing the filter cartridge of the return filter“](#).

5.7 Power supply - switch box

The switch box is attached to the base frame. The switch box includes two fixed wired identical control panels and a connection cable with plug for the power supply. One control panel is installed on each side of the workstation with which the hydraulic unit can be switched on and off.

The power supply and cable connection are available in the following versions:

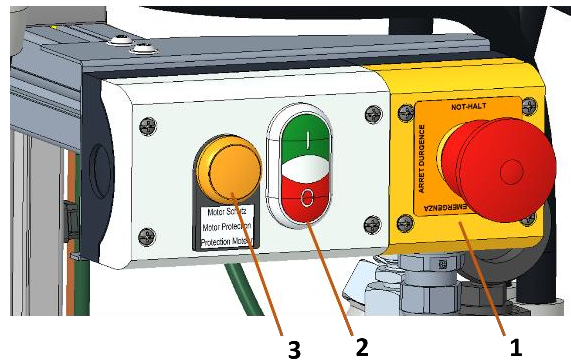
- 1-phase 230V/ 50 Hz or 230V/60Hz and 1.5 kW
Connection via protective contact plug 16A 3p (2P+PE), protection class: IP54
- 3-phase 400V/ 50 Hz and 2.2 kW
Connection via CEE plug 16A 5p (3P+N+PE) 6h, protection class: IP44/54



1 Protective contact plug 16A 3p (2P+PE) 2 CEE-plug 16A 5p

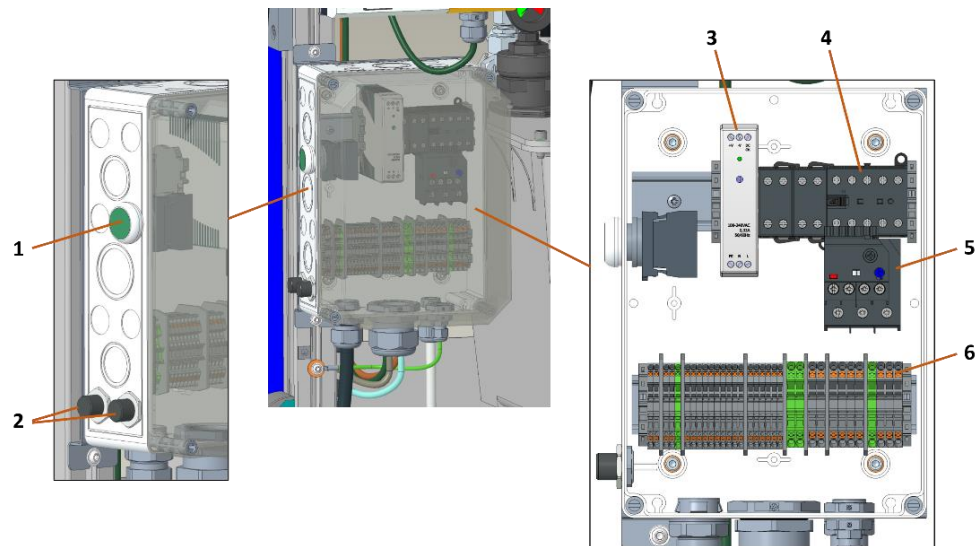
Fig.15: Connection cable plug types

The following pictures show one of the two control panels and the control box.



1 Emergency stop button 3 Thermal overload indicator light
2 I / O button (start / stop hydraulic unit)

Fig.16: Control panel



- 1 On/Off switch 24V DC supply
- 2 M12 signalling output (-2XG1, -3XG1)
- 3 24V DC power supply unit
- 4 Power contactor
- 5 Thermal overload relay
- 6 Terminal strip

Fig.17: Switch box

5.7.1 Assemblies and functions on the switch box

On/off switch

The power contactor and the power supply for the external control panels are controlled via 24V DC safety extra-low voltage.

The 24V DC power supply unit is switched on or off using the on/off switch on the side.

This switch is also fitted with a lamp that lights up green when it is switched on.

When the power supply unit is ready for operation, this is indicated by a green LED on the front of the power supply unit. Only when the power supply unit is ready for operation can the electric motor and thus the hydraulic unit be switched on via the control panels.

The electric motor cannot be started without the 24V DC supply.

M12 Signal output (-2XG1, -3XG1)

The status of the two emergency stop buttons and the operating status (switched on or off) of the electric motor are output via the two signalling outputs.

The following circuit diagram shows the control within the switch box.

A detailed circuit diagram can be found in chapter 15.2 „Electrical diagrams“.

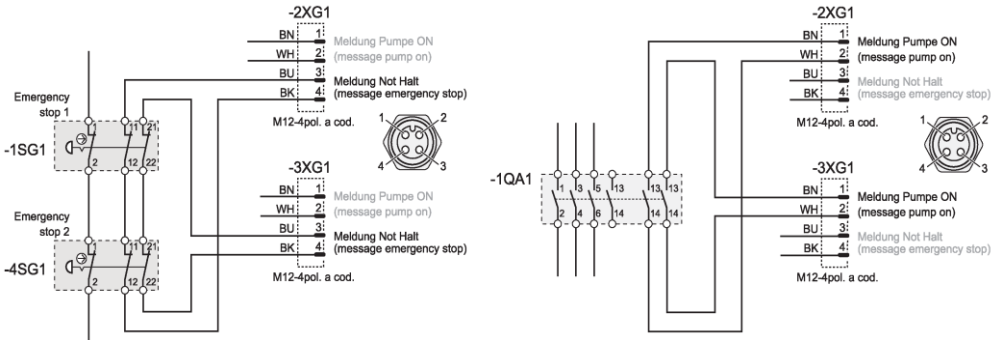


Fig.18: Principle circuit Signal output

24V DC- Power supply unit

The power supply unit is a single-phase primary switched-mode power supply unit. It is equipped with a universal input (85-264VAC), overload protection through current limiting and LED display for power-on.

Power contactor	The power contactor has a load circuit for switching the electric motor and a control circuit. The contactor is switched via the control circuit (safety extra-low voltage 24V DC). The two control panels also belong to this circuit.
Thermal overload relay	The thermal overload relay is attached to the power contactor and the motor current flows through it. It is designed to protect the electric motor from excessive current (overload) and thus overheating. There is an adjusting screw on the front with a scale for setting the maximum current. If the maximum current is exceeded, the relay trips and de-energises the electric motor. This status is indicated by the indicator light on the two control panels.
Caution!	The setting value on the overload relay is preset and must not be changed. If the value is set too high, the electric motor may burn out.
5.7.2 Assemblies and functions on the control panels	
Emergency stop button	When the emergency stop button is pressed, only the control voltage to the contactor is interrupted and the electric motor is de-energised. The 230V or 400V mains section of the terminal strip is not affected by this and is still energised. Therefore, the power supply unit is still active even after the emergency stop button is activated. If the emergency stop button is unlocked again, the electric motor can be switched on again using the „I“ button on the control panel.
I / O button on the control panel	When the „I“ button is pressed, the electric motor is switched on and switched off again via the „O“ button. An indicator light is installed between the „I“ button and the „O“ button. This lights up green when the “I” button is pressed.
Indicator light (motor protection)	If the thermal overload relay is triggered, this indicator light lights up and the electric motor is automatically switched off. The electric motor cannot be switched on again while the indicator light is illuminated. The electric motor can only be switched on when the indicator light is off.

5.8 Load simulator, swivel

The load simulator is used for practical exercises with weighted hydraulic cylinders. It can be swiveled through 360 degrees in sections of 60 degrees.

This means that the weight load hangs at the bottom of the hydraulic cylinder and by swiveling (180 degrees) it also stands above the hydraulic cylinder. This means that pulling and pushing weight loads can be displayed.

A mounting plate is fitted on the front for attaching limit switches.

The load simulator has 2 hydraulic couplings for the hydraulic connection. Suitable hoses assemblies and electrical limit switches can be found in the Bosch Rexroth e-shop (see chapter 1.2 „Required and supplementary documentation”).

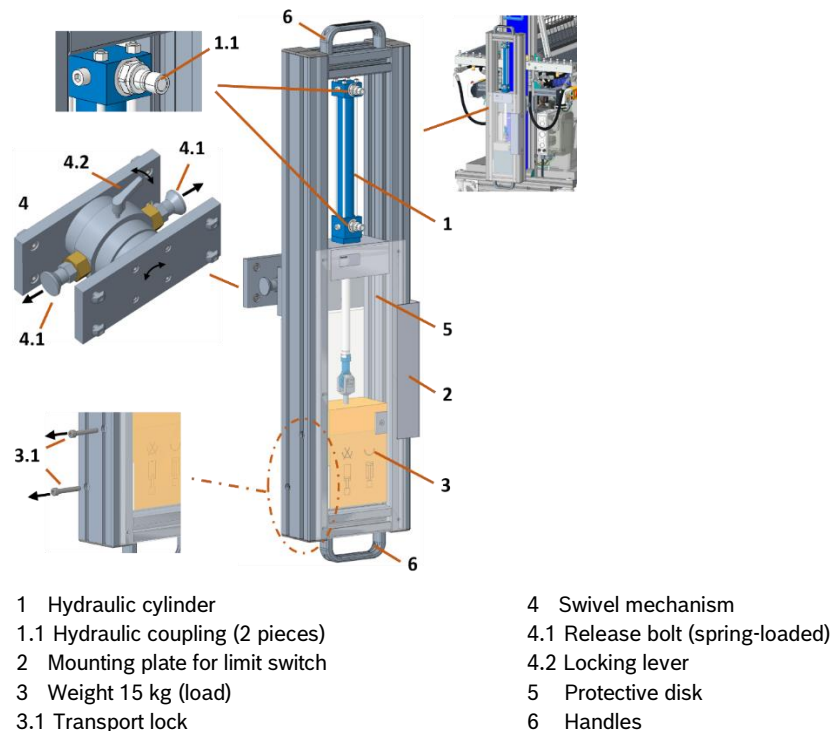


Fig.19: Load simulator

5.8.1 Function of the swivel mechanism

To be able to swivel the load simulator safely, the swivel movement is divided into 60 degree sections. The swivel axis is equipped with 3 grooves for this purpose. The spring-loaded unlocking bolts engage in these grooves and lock the movement.

To swivel, one of the release bolts must always be pulled alternately. Detailed information on operation can be found in chapter 9.3 „Operation of the swivelling load unit“.

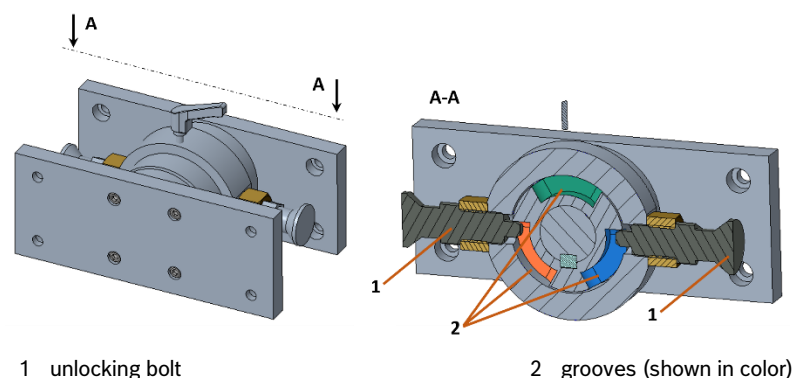


Fig.20: Swivel mechanism

5.9 P/T/X – manifold

The P/T/X manifold forms the interface between the hydraulic power unit and the hydraulic exercise set-up. The connection to the hydraulic power unit is realized with fixed hydraulic hoses. Several hydraulic couplings are available for the hydraulic connection of exercise set-up.

A P/T/X manifold is installed on each workplace side of the training system.

The functions of the individual components are described in more detail in the following section.

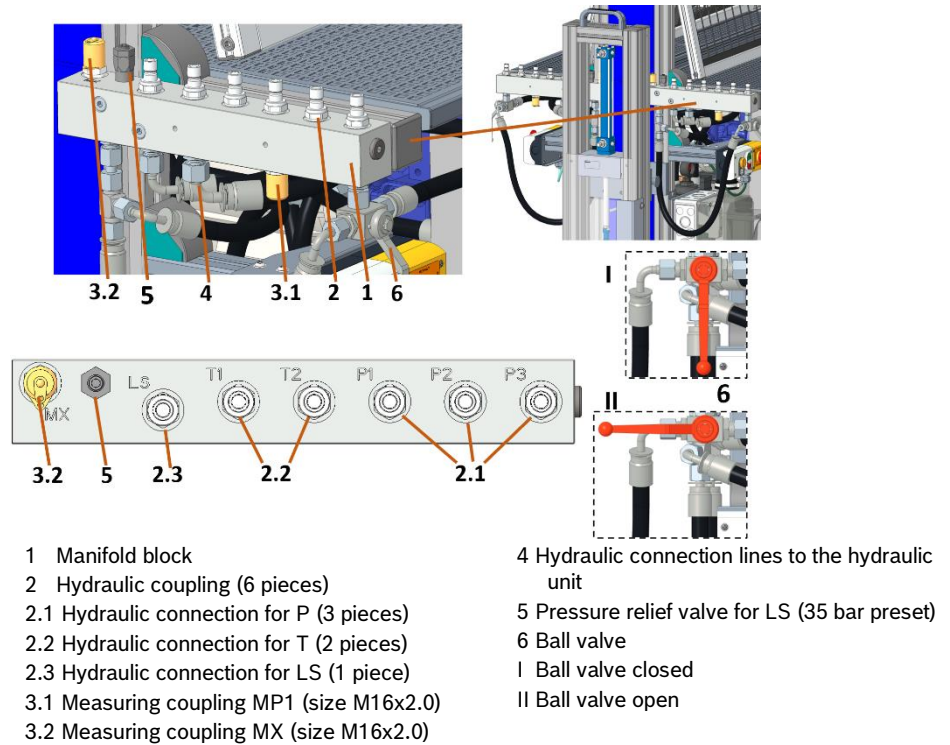


Fig.21: P/T/X Manifold

5.9.1 Components and functions

Hydraulic connection P1, P2, P3

The hydraulic exercise setup is supplied with hydraulic fluid via these connections. The hydraulic pressure at the P connections is only greater than 15 bar (standby pressure) when a hydraulic pressure signal is present at the hydraulic connection 'LS'. Otherwise, only the standby pressure is available.

Further information on this can be found in chapter 5.6.2 „Components and functions“.

T1, T2

These connections are used to return the hydraulic fluid to the tank via the return filter.

Hydraulic connection LS

This connection is used for the hydraulic pressure signal to the hydraulic pump (connection X on the hydraulic pump). The following relationship applies:

Operating pressure = stand-by pressure (15 bar) + pressure at 'LS' P/T/X manifold

Measuring coupling MP1

A standard measuring connection M16x2.0 mm can be used to connect a pressure measuring device (pressure sensor or pressure gauge) can be connected. The pressure measured here corresponds to the hydraulic pressure in connections P1, P2 or P3 and is a maximum of 50 bar.

Measuring coupling MPX

A standard measuring connection M16x2.0 mm can be used to connect a pressure gauge (pressure sensor or pressure gauge) can be connected. The pressure measured here corresponds to the hydraulic pressure at connection X of the hydraulic pump. This is a maximum of 35 bar when 50 bar is applied to the LS connection.

LS pressure relief valve

The pressure relief valve limits the hydraulic pressure at connection X of the hydraulic pump. This pressure is preset to a maximum of 35 bar.

Ball valve

The ball valve opens or closes the supply of hydraulic fluid at connections P1, P2 and P3. In the 'ball valve closed' position, the P connections are depressurised. The hydraulic pump is in the so-called zero stroke position. Very little energy is consumed here, as the pump only delivers the quantity required to maintain the standby pressure of 15 bar. In the 'ball valve open' position, the P connections are initially pressurised with standby pressure. Only when a pressure greater than 15 bar (standby pressure) is present at the LS connection does the delivery volume and the pressure at the P connections increase.

5.10 Measuring glass 2.5 litres

A measuring glass with a maximum capacity of 2.5 litres of hydraulic fluid is installed on each workplace side. Unlike the P/T/X manifold, the hydraulic fluid does not flow back via the return filter, but directly to the tank.

Equipped with a air release valve, ball valve and an external overflow, the measuring glass can be used for:

- simple volume flow measurements with a stopwatch
- testing the oil circulation

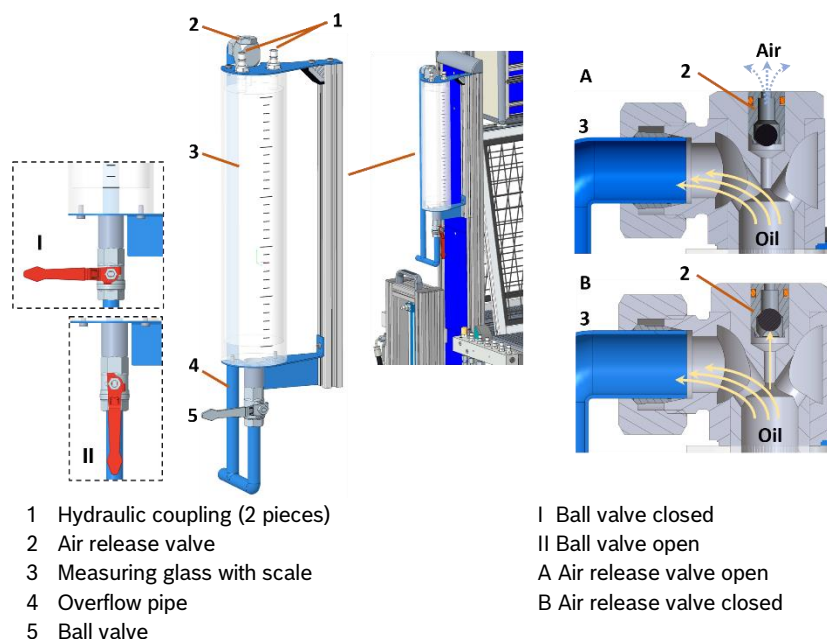


Fig.22: Measuring glass 2,5 litres

When the measuring glass is filled, excess hydraulic fluid flows out through the overflow pipe to the container.

The air release valve ensures that air can flow into the measuring glass when the hydraulic fluid is drained and out of the measuring glass when it is filled. A ceramic ball inside the valve prevents hydraulic fluid from escaping in the area of the vent opening during filling. This ball floats on the fluid column and then closes the vent opening.

5.11 Component rack

The component rack is required to mount electrical operating modules in 19-inch design.

The 19-inch design is included in the IEC 60297 series of standards.

The term 19-inch design is derived from the front width of a component rack or system front panel, which is defined as 482.6 mm and corresponds exactly to 19 inches (1 inch is 25.4 mm).

The IEC 60297-3-100 standard defines the main dimensions of front panels, racks and cabinets. Possible installation spaces are described using so-called HE (height unit) and TE (partition unit).

The height unit defines the height of front panels, subracks and racks.

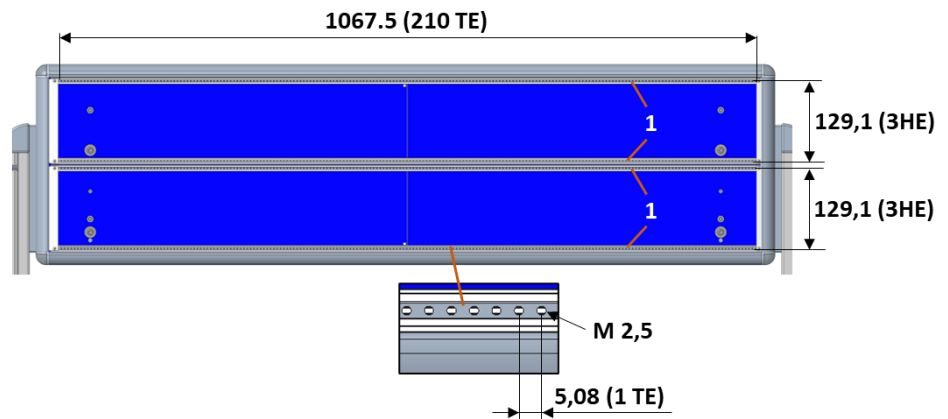
This corresponds to 1 HE = 44.45 mm.

The pitch unit defines the width of front panels, component rack and plug-in units.

This corresponds to 1 TE = 5.08 mm.

The electrical operating modules are each attached using 2 horizontal threaded strips. The centre-to-centre distances of the holes in the threaded strip correspond to 1 TE (5.08 mm).

The component rack is equipped with a 210 TE installation width and an installation height of 2x 3 HE for the installation of electrical operating modules. The installation height is divided into 2 levels with 3 HE each.



1 Threaded strips, Thread size M2,5

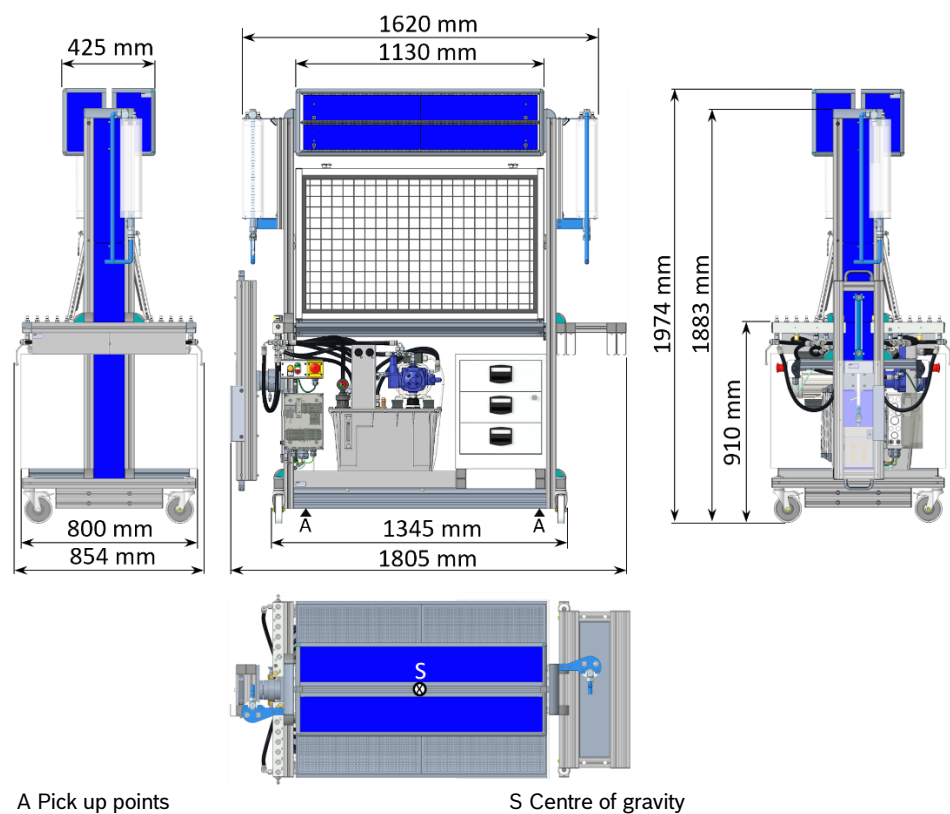
Fig.23: Component rack



Free slots on the subrack can be fitted with covers. A selection can be found in chapter [12.5 „Extension Component rack – cover plates“](#).

5.12
Dimension sheet

The following illustration shows the external dimensions.



A Pick up points
Fig.24: Dimensions

5.13 Product identification

5.13.1 Type code

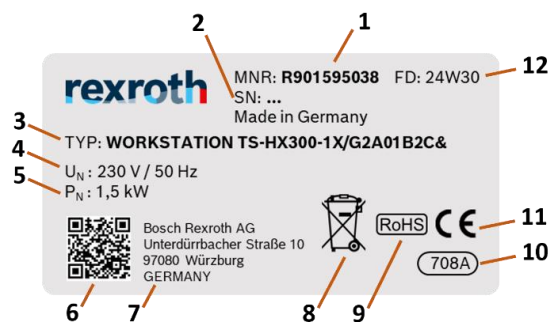
The illustration shows the structure of the type code. Your sales partner can provide you with information on the current status of the available versions.

Example	WORKSTATION	TS	-	HX300	-	1X	/	G2	A01	B2	C2	M2	S1	L1
	1	2		3		4		5	6	7	8	9	10	11

- 1 Product: Workstation
- 2 System: TS=Training system
- 3 Base frame: HX300 = Hydraulix 300
- 4 Serie: 1x
- Options
- 5 Grid: G0 = without grid
G1 = 1 grid
G2 = 2 grids
- 6 Power pack: A00 = without hydraulic unit, oil pan, hose set and P/T/X manifold
A01 = 1 hydraulic unit, 230V/50Hz with 2 PV7 vane pumps
A02 = 1 hydraulic unit, 230V/60Hz with 2 PV7 vane pumps
A03 = 1 hydraulic unit, 400V/50Hz with 2 PV7 vane pumps
A04 = 1 hydraulic unit, 230V/50Hz with 1 PV7 vane pump
A05 = 1 hydraulic unit, 230V/60Hz with 1 PV7 vane pump
A06 = 1 hydraulic unit, 400V/50Hz with 1 PV7 vane pump
- 7 Subrack: B0 = without subrack
B1 = 1 subrack, double row
B2 = 2 subracks, double row
- 8 Built-in container or drawer cabinet: C0 = without built-in container
C1 = 1 built-in container
C2 = 2 built-in containers
- 9 Measuring glass: M0 = without measuring glass
M1 = 1 measuring glass
M2 = 2 measuring glasses
- 10 Hose holder: S0 = without hose holder
S1 = 1 hose holder for 50 hoses
- 11 Load unit: L0 = without load unit
L1 = 1 load unit, swivelling, 15 kg
L2 = 2 load unit, swivelling, 15 kg

5.13.2 Typ plate

The details and information on the type plate of the training system are described below as an example.



- | | |
|-------------------------------------|--|
| 1 Material number | 7 Manufacturer address |
| 2 Serial number | 8 Disposal symbol, do not dispose of in household waste! |
| 3 Device type | 9 RoHS labelling |
| 4 Technical data (opt.) | 10 Factory identification |
| 5 Technical data (opt.) | 11 CE marking |
| 6 QR code | 12 Production week, |
| (Link to the Bosch Rexroth Academy) | 24W30 = year 2024, week 30 |

Fig.25: Typ plate

6 Transport and storage

6.1 Preparing for transport

DANGER

Damage to the training system, individual components or material assets. Danger to the safe operation of the training system!

Danger to life and limb of the operator or third parties!

- ▶ Always observe chapter 2 „[Safety instructions](#)“ and chapter 3 „[General instructions concerning property damage and product damage](#)“ in these operating instructions.

WARNING

Danger due to overloading or unsuitable posture during transport. Risk of tipping!

Risk of injury, damage to property!

- ▶ Always move the training system with at least two people when lifting and transporting it to prevent it from tipping over.
- ▶ Do not attempt to lift the training system alone (weight > 350 kg). Instead, use a suitable lifting aid, e.g. pallet truck or forklift.
- ▶ Always drive the lifting aid completely under the training system so that it is only lifted by the lower cross struts.
- ▶ The lower oil pan and the built-in or drawer cabinet are not suitable for lifting.

Thanks to the mobile design with transport castors, the training system can be moved and parked in a different location at any time.

Observe the following guidelines during transport:

- Check the space requirements at the place of use.
- Check the transport route. Ensure that doors and passages are of sufficient height and width (for dimensions, see chapter 5.12 „[Dimension sheet](#)“).
- Remove any attachments and equipment sets that are not required before transport.
- Reattach the transport lock to the load simulator (see chapter 7.4.1 „[Remove transport lock on load simulator](#)“).
- Consider the high weight of the training system with regard to the load-bearing capacity of the ground, as well as the floor load inside buildings.
- Before transport, ensure that no hydraulic fluid can leak out. The cap on the filler neck only has slosh protection. Empty the tank as a precaution.
- Do not transport any other objects or persons with the training system.
- The training system must be protected against dust and moisture during transport outside buildings.
- The training system must be placed on a pallet for shipping. The rollers must be supported by wooden beams. Secure the training system on the pallet with suitable transport straps to prevent it from falling. Ship the training system in a transport crate to protect it from external influences. Also ensure the necessary protection against moisture.
- Damage during transport must be avoided.

6.2
Transport product

- Proceed as follows:
1. Disconnect the power plug, making sure that it is not driven over during transport.
 2. Release the brakes on the transport castors.
 3. Push the training system to the new location with at least 2 people.
 4. Secure it with several people on inclines or slopes.
 5. Place the training system on a solid, level surface.
 6. Lock the brakes on the transport rolls.

6.3
Storing the product


NOTICE

Risk of damage due to moisture and humidity!

Material damage!

- Protect the training system from moisture by covering it.
- Only store in dry rooms protected from rain.
- Protect the product from strong temperature fluctuations, strong sunlight and strong cooling to prevent condensation and corrosion.

Table 6:
Storage classification for the product

Designation	Unit	Value
Storage temperature range	°C	+5 bis +30
Relative humidity (non-condensing)	%	5 bis 70

- How to store the product:
- For longer storage periods (> 1 month), the training system must be jacked up on the frame of the base frame with suitable underlay material to prevent the rollers from flattening.
 - It is recommended to empty the tank. The properties of the hydraulic fluid are altered by ageing processes, making it no longer suitable for the training system.
 - Protect the training system against dust and moisture by using appropriate packaging.
 - Protect the training system from strong temperature fluctuations, strong sunlight and strong cooling in order to prevent condensation and corrosion.
 - Only store the training system in areas protected from the weather.
 - Lock the castor brakes to prevent it from rolling away.

7 Assembly

DANGER

Damage to the training system, individual components or material assets. Danger to the safe operation of the training system!

Danger to life and limb of the operator or third parties!

- ▶ Always observe chapter 2 „[Safety instructions](#)“ and chapter 3 „[General instructions concerning property damage and product damage](#)“ in these operating instructions.

7.1 Unpacking the product

CAUTION

Danger of falling parts!

Parts may fall out if the packaging is not opened properly and lead to damage or injury!

- ▶ To unpack, place the packaging on a level, load-bearing surface.
- ▶ Use personal protective equipment (safety shoes ...).

Danger due to sharp and pointed packaging parts!

Sharp and pointed packaging parts can lead to injuries if handled incorrectly!

- ▶ Open the packaging with suitable aids.
Do not use sharp blades. Internal parts may be damaged.

Danger from lifting heavy parts!

Lifting heavy parts can cause back injuries!

- ▶ Do not try to lift the training system alone (weight > 350 kg). Instead, use a suitable lifting aid, such as a pallet truck or forklift.
- ▶ Always drive the lifting aid all the way under the training system so that it is only lifted over the lower crossbars.
The lower oil pan and the built-in or drawer cabinet are not suitable for lifting.

To unpack the device, proceed as follows:

- Carefully remove the training system from the packaging.
- Remove all packaging residues.
- Remove any stickers on the training system (not the type plate).

Disposal of packaging:

The packaging protects the product from transport damage. The packaging materials are selected according to environmental compatibility and disposal aspects and are therefore recyclable. Returning the packaging to the material cycle saves raw materials and reduces waste. Dispose of the packaging material according to the national regulations of your country and your company's internal specifications.



Transport damage and defects must be recorded immediately with a photo and reported in writing to the Bosch Rexroth Customer Service together with a damage report.



If possible, keep the original packaging during the warranty period of the device so that it can be properly packed and sent back in the event of a warranty claim.

7.2 Installation conditions

The product is intended for use in offices, laboratories, training and seminar rooms. The permissible ambient conditions can be found in the table below.

Table 7: Installation conditions of the product

Designation	Unit	Value
Min. operating temperature	°C	+15
Max. operating temperature	°C	+55
Installation location	- - -	closed Space
Ambient temperature	°C	+5 bis +40
Max. relative humidity	%	90 bei 20 °C

Please note the following points before the final list:

- Make sure that there is sufficient space for the training system (see chapter 2.10 "Operator workstation").
- Check the flatness and bearing capacity of the contact surface.
- Make sure that there is an electrical connection (see Chapter 14 „Technical data“ for details).
- Ensure sufficient lighting conditions at the installation site.

7.3 Necessary accessories Installation conditions

The training system is supplied without hydraulic fluid. This must be ordered.

7.4 Mounting the product

The training system is delivered ready for operation. This means that no components have to be mounted. Only the transport lock on the swivelling load unit must be removed.

For the subsequent commissioning, the tank with hydraulic fluid and the electrical mains connection must be made.

Further information is described in the following chapters.

7.4.1 Remove transport lock on load simulator

The following tools are required for disassembly.

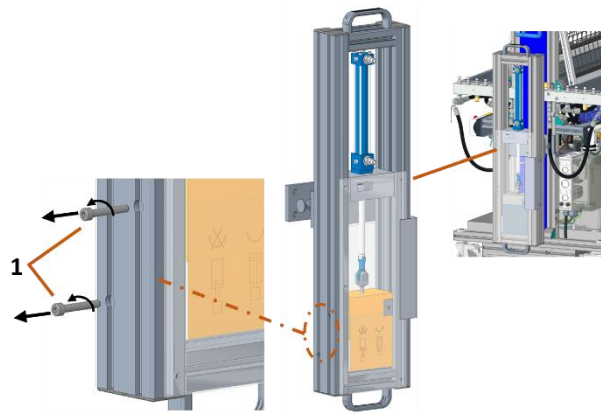
Table 8: Necessary tool

Picture	Designation
	Hexagon wrench – SW 6 mm

The weight of the swivelling load simulator is secured with 2 cylinder screws. These must be dismantled before operation.

For disassembly, proceed as follows:

- Put the hexagon wrench on the first cylinder screw and turn this screw out completely against the clock.
- Repeat the process for the second screw.
- Store the two screws in a safe place. These are needed again for a possible transport of the training system.



1 Cylinder screw

Fig.26: Transport safety load simulator

7.4.2 Filling tanks with hydraulic fluid

! CAUTION

Risk of injury!

Risk of slipping due to leaking hydraulic fluid!

- ▶ Immediately bind/ dispose of leaked hydraulic fluid.
- ▶ Provide binder before filling, refilling or changing.

! NOTICE

Use of an unsuitable hydraulic medium!

Risk of malfunction and damage to the hydraulic unit!

- ▶ Do not use hydraulic fluid older than 1 year or stored outdoors. Aging products or condensation are possible.
- ▶ Do not mix hydraulic fluids. Despite type similarity, but different aging, mixing can lead to damage to the hydraulic medium.

Leaking hydraulic fluid!

Risk of injury, allergic reaction!

- ▶ Use oil-proof gloves to fill and put on eye protection glasses.
- ▶ Wash your hands after contact with hydraulic fluid.

Technical information for the hydraulic fluid to be used can be found in chapter [14 "Technical data"](#). Ordering information for the recommended hydraulic fluid can be found in chapter [10.6 „Spare parts“](#).

How to fill the hydraulic unit:

- Clean the surroundings of the filling opening.
- Open the ventilation cap (turn counter-clockwise) on the filler neck.
- Fill the hydraulic oil up to the "MAX" mark on the level indicator.
Use a filter funnel for filling.
- Close the tank filler neck with the ventilation cap (turn clockwise).
- Absorb leaking hydraulic oil with suitable cleaning cloths.



Dispose of oil-contaminated cleaning cloths and binders in accordance with the national regulations of your country or your company's internal specifications.

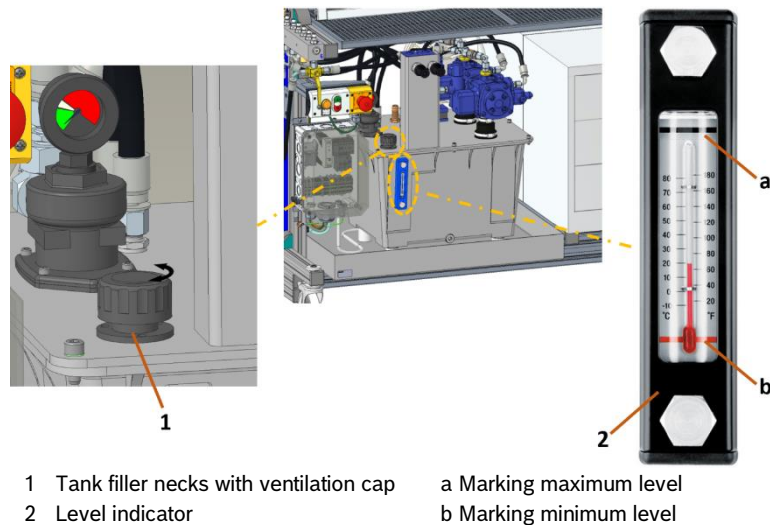


Fig.27: Filler neck and level indicator on the tank

7.4.3 Connecting the electrical supply

⚠ CAUTION

Risk of injury!

Risk of tripping through freely laid electrical cables!

- Lead freely laid electrical cables into cable bridges.

Risk of irregularities, deviations, faults, defects!

Risk of injury!

Visually check the power cord and plug according to the following criteria:

- Damage to the outer layer (chafing, cracks, ...)
 - Damage to the power plug
 - Do not operate the training system.
 - Find out the cause and correct the defect properly.
- If this is not possible, please contact your Bosch Rexroth service department.

The electrical installation of the training system is described below.

For the electrical installation of the training system, it is required that

- the correct connection voltage (incl. line fuse and residual current protection switch) is available at the customer's power supply,
- according to the characteristics of the training system (earthed contact plug or CEE connector) customer side a matching mating connector is available,
- no electrical wires are damaged,
- the power cord is laid in such a way that it is not squeezed, run over, bent, can be tensioned and there is no risk of tripping.

If all requirements are met, you can connect the power plug on the connection cable of the switch box to the customer's power socket.

8 Commissioning

DANGER

Damage to the training system, individual components or material assets. Danger to the safe operation of the training system!

Danger to life and limb of the operator or third parties!

- Always observe chapter 2 „[Safety instructions](#)“ and chapter 3 „[General instructions concerning property damage and product damage](#)“ in these operating instructions.

8.1 Necessary accessories

The following accessories are required for bleeding the hydraulic pump and checking the working pressure. You can order the accessories from the Bosch Rexroth e-Shop (see chapter 1.2 „[Required and supplementary documentation](#)“) or alternatively from your Bosch Rexroth sales partner.

Table 9: Necessary accessories

Quantity	Material number	Designation
2 (1*)	R961002474	HOSE ASSEMBLY TS-HC-ZN10031-08-W00& (straight, both sides hydraulic couplings, hose length 630 mm)
2 (1*)	R961002473	HOSE ASSEMBLY TS-HC-ZN10031-08-W00& (straight, both sides hydraulic couplings, hose length 1500 mm)
1	R961009534	MANOMETER DIM 20 0/100 BAR KPL (digital manometer)
	alternatively R961002715	MANOMETER 0-100 BAR with measuring hose (analog manometer)

1* This quantity applies to a Hydraulix 300 with only one hydraulic pump

8.2 Checklist before initial commissioning

The following checklists are used to visually check the product for errors or defects. If an item in the checklist is not successfully completed, the commissioning may not be continued until the error has been corrected. Refer to Chapter 13 „[Troubleshooting](#)“.

Table 10: Checklist before initial commissioning

Examination	Measure
General	Chapter 2 „ Safety instructions “ and Chapter 3 „ General instructions concerning property damage and product damage “ have been read, understood and observed in full.
Environmental conditions	The working environment required for the operation of the product is available. Information on this can be found in chapter 2.10 „ Operator workstation “.
	Workplace regulations, accident prevention regulations, personal protective equipment, etc., of the respective operator country must be observed. The responsibility lies with the operator.
	The environmental conditions according to chapter 7.2 „ Installation conditions “ are fulfilled.
Safety device	Protective and safety devices such as emergency stop buttons must not be damaged.
Housing and mechanics	The transport lock on the pivoting load unit has been dismantled in accordance with Chapter 7.4.1 „ Remove transport lock on load simulator “.
	Covers of electrically live parts must be assembled and in proper condition
	Housing must not be damaged or bent.
	Existing protective covers must be mounted and in proper condition.
Hydraulics	The hydraulic hose assembly must be in proper condition and must not be damaged. The connections must be firmly connected. The age of the hydraulic hose lines must not be exceeded. For details see chapter 10.5.3 „ Changing hydraulic hoses “.
	There must be sufficient hydraulic fluid in the tank. The level must be in the range Min - Max of the level indicator. If there is less hydraulic fluid than the min mark, it must be refilled. Details can be found in Chapter 7.4.2 „ Filling tanks with hydraulic fluid “.
electrical Connection	The training system is connected to the electrical supply according to chapter 7.4.3 „ Connecting the electrical supply “.

8.3 Preparation - venting hydraulic unit

After a new or initial filling of the tank with hydraulic fluid, the two hydraulic pumps must be vented at the first switch-on.

To prepare the two hydraulic pumps for venting, proceed as follows:

- Insert the short hose assembly (R961002474) on the first P/T/X manifold to the connection LS and T2.
- Insert the long hose assembly (R961002473) on the first P/T/X manifold to the connection P2 and to a connection of the measuring glass.
- Plug the short hose assembly (R961002474) into the second P/T/X manifold on the connection LS and T2.
- Insert the long hose assembly (R961002473) on the second P/T/X manifold to the connection P2 and to the second connection of the measuring glass.
- On both P/T/X manifolds, place the ball valves in the operating position (lever horizontal).
- On the measuring glass, position the ball valve open (lever vertical).

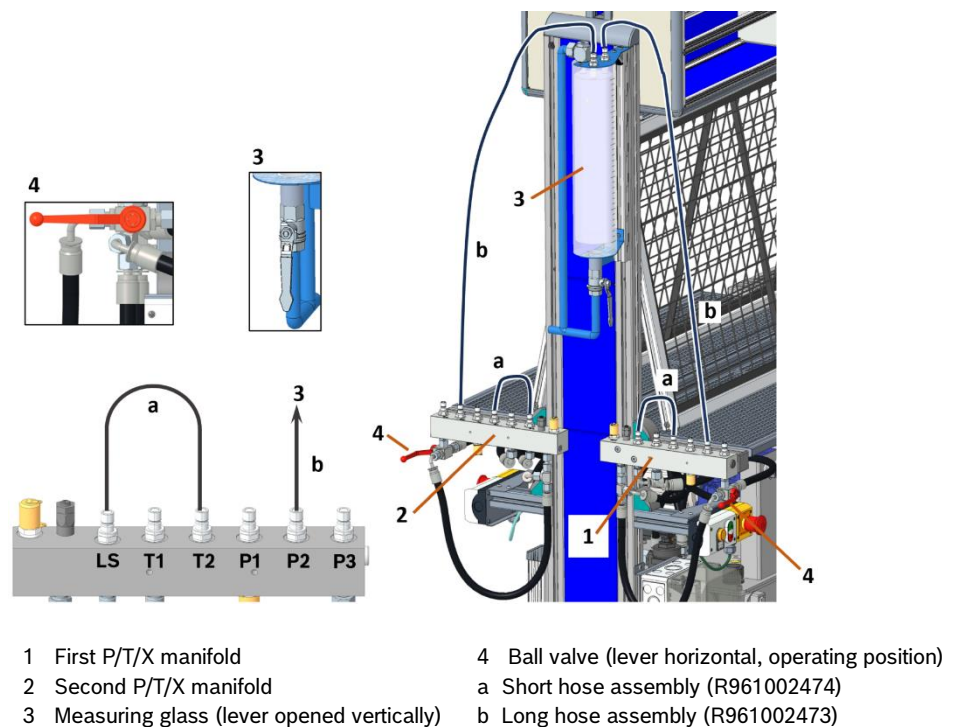


Fig.28: Preparation venting hydraulic unit

8.4 Initial commissioning

CAUTION

Risk of irregularities, deviations, faults, defects during commissioning!

Risk of injury, risk of damage to components!

- ▶ The initial commissioning must be carried out in the specified order. The following chapters are arranged chronologically. If a chapter is not completed successfully, the commissioning may not be continued until the error has been corrected. See also chapter 13 „[Troubleshooting](#)“.

Steps of initial commissioning by chapter

1. Provision of necessary accessories - Chapter 8.1 „[Necessary accessories](#)“
2. Review of the training system using a checklist
Chapter 8.2 „[Checklist before initial commissioning](#)“
3. Preparation - venting Hydraulic Unit, Chapter 8.3 „[Preparation - venting hydraulic unit](#)“
4. Testing the emergency stop function - Chapter 8.4.1 „[Test the emergency stop function](#)“
5. Venting the hydraulic unit and checking its function
Chapter 8.4.2 „[Venting hydraulic unit and checking function](#)“
6. Checking the Hydraulic Unit Stand-by-Pressure
Chapter 8.4.3 „[Check Hydraulic unit standby pressure](#)“
7. Checking the Operating Pressure of a Hydraulic Unit
Chapter 8.4.4 „[Check hydraulic unit operating pressure](#)“

8.4.1 Test the emergency stop function

In order to work safely with the training system, the emergency stop function must first be tested. When one of the two emergency stop buttons is pressed, the hydraulic unit should be switched off immediately.



The emergency stop test starts the hydraulic unit. In order not to damage the hydraulic pumps at the first start-up, the preparation for venting must be completed. For details see Chapter 8.3 „[Preparation - venting hydraulic unit](#)“.

How to do the check:

1. Press the On/Off switch on the right side of the switch box.
When pressed, it lights up in green and the green LED on the power supply lights up in the control box. The control voltage is now available.
2. Press the green button "I" on one of the control panels.
The electric motor of the hydraulic unit starts.
3. Press the emergency stop button on one of the control panels.

Result

The electric motor of the hydraulic unit is **not switched off**.

There is a faulty installation or a defective emergency stop button.

Proceed as follows:

1. Turn off the training system using the switch on the right side of the control box.
Disconnect the power connector of the training system from the customer's power socket.
2. Inform a qualified electrician.

The electric motor of the hydraulic unit is **switched off**.

- The emergency stop circuit is fine. Unlock the operated emergency stop button by a rotary movement (clockwise) on the mushroom handle.
Proceed as follows:
- Perform the check for the second emergency stop button as well.
If this emergency stop circuit is also in order, this function test is completed.



Do not forget to unlock the "emergency stop button"!

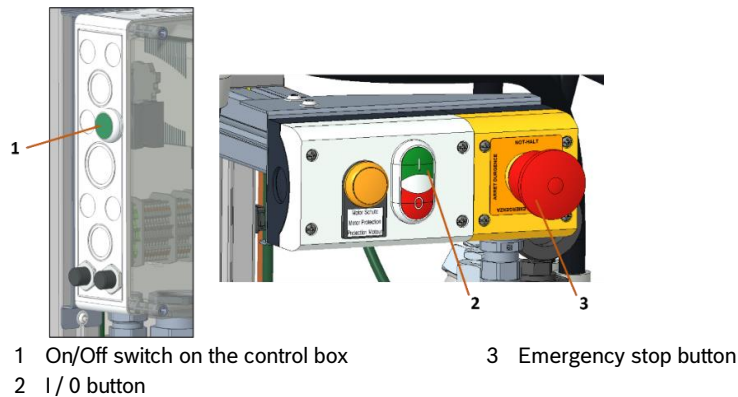


Fig.29: Controls on the control box and control panel

8.4.2 Venting hydraulic unit and checking function

Due to the successful test of the emergency stop button, the hydraulic unit was already briefly switched on. In order to also eliminate the remaining air in the pipes, the hydraulic pumps must run for some time.

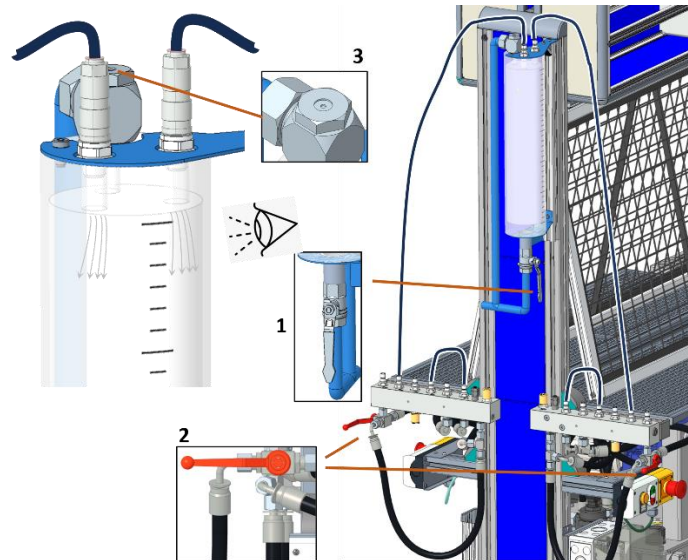
This is how you vent and test:

1. Check if the switch box is still on, the on/off switch will turn green.
If not, turn on the On/Off switch.
2. Check whether both ball valves on the P/T/X manifold and the ball valve on the measuring glass are in the "open" position.
3. Press the green button "I" on the control panel.
4. The electric motor of the hydraulic unit starts and both hydraulic pumps start pumping the hydraulic fluid.
5. After a few seconds, hydraulic fluid should flow into the measuring glass via both connections. Check this by visual inspection.
If there is no hydraulic fluid flowing on one or both connections of the measuring glass, you must switch off the hydraulic unit. Press the red button „0“ on the control panel. For more help, see Chapter 13 „Troubleshooting“.
6. Since both hydraulic pumps convey into a measuring glass, it fills slowly. Wait at least 20 s or until it is filled and then switch off the hydraulic unit via the red button „0“ on the control panel.
7. Put the levers of both ball valves on the P/T/X manifold back into position "closed" (vertical position).
8. Wait until the measuring glass is empty and then place the lever of the ball valve on the measuring glass in the closed position (horizontal position).
9. Remove the inserted hydraulic hose assembly.

The hydraulic unit is now vented.



When the measuring glass is filled, excess hydraulic fluid flows through the overflow pipe to the container. In the area of the ventilation valve, hydraulic fluid may escape. The amount should not exceed a few drops. If a larger quantity should leak, the valve is either clogged or defective, further help can be found in chapter 13.1.4 „Replacing the ventilation valve on the measuring glass“;



1 Ball valve on the measuring glass (open position) 3 Ventilation valve
2 Ball valve on the P/T/X manifold (open position)

Fig.30: Venting hydraulic unit and checking function

8.4.3 Check Hydraulic unit standby pressure

A pressure gauge and a short hydraulic hose assembly (R961002474) are required for the subsequent test. For more information on these accessories, please refer to Chapter 8.1 „Necessary accessories“.

This is how you carry out the standby pressure test:

1. Connect the pressure gauge to the MP1 port of the first P/T/X manifold.
2. Connect the „LS“ connector to the „T2“ connector on the first P/T/X manifold.
3. Check if the switch box is still on, the on/off switch will turn green. If not, turn on the on/off switch.
4. Check whether both ball valves are closed on the P/T/X manifold.
5. Press the green button „I“ on the control panel.
6. Allow the hydraulic unit to warm up for at least 1 min in internal circulation (ball valves are closed).
7. Slowly open the ball valve of the first P/T/X manifold.
8. On the pressure gauge, check the pressure on the MP1 connection.
This should be **15 bar ±2 bar**.

Result

The displayed **pressure is higher or lower than 15 bar ±2 bar**
There is an incorrect setting.

1. Bring the ball valve of the first P/T/X manifold into position closed.
2. Switch off the hydraulic unit via the red button „O“ on the control panel.
3. For more information, see Chapter 13 „Troubleshooting“.

The displayed **pressure is 15 bar ± 2 bar** and is therefore ok.

Next, check the stand-by pressure on the **second P/T/X manifold**.

Proceed as follows:

1. Bring the ball valve of the first P/T/X manifold into position closed.
2. Switch off the hydraulic unit via the red button "0" on the control panel.
3. Remove the pressure gauge and the attached hydraulic hose assembly from the first P/T/X manifold.
4. Connect the pressure gauge to the MP1 port of the second P/T/X manifold.
5. Connect the "LS" connector to the "T2" connector on the second P/T/X manifold.
6. Check whether both ball valves are closed on the P/T/X manifold.
7. Press the green button "I" on the control panel.
8. Slowly open the ball valve of the second P/T/X manifold.
9. On the pressure gauge, check the pressure on the MP1 connection.

This should be **15 bar ± 2 bar**.

If the displayed pressure is **higher or lower than 15 bar ± 2 bar**, there is an incorrect setting. For further steps, see instruction for the first P/T/X manifold.

The displayed **pressure is 15 bar ± 2 bar** and is therefore ok.

1. Turn off the hydraulic unit via the red button „0“ on the control panel.
2. Place the lever of the ball valve in the closed position.
3. Remove the attached hydraulic hose assembly and pressure gauge.

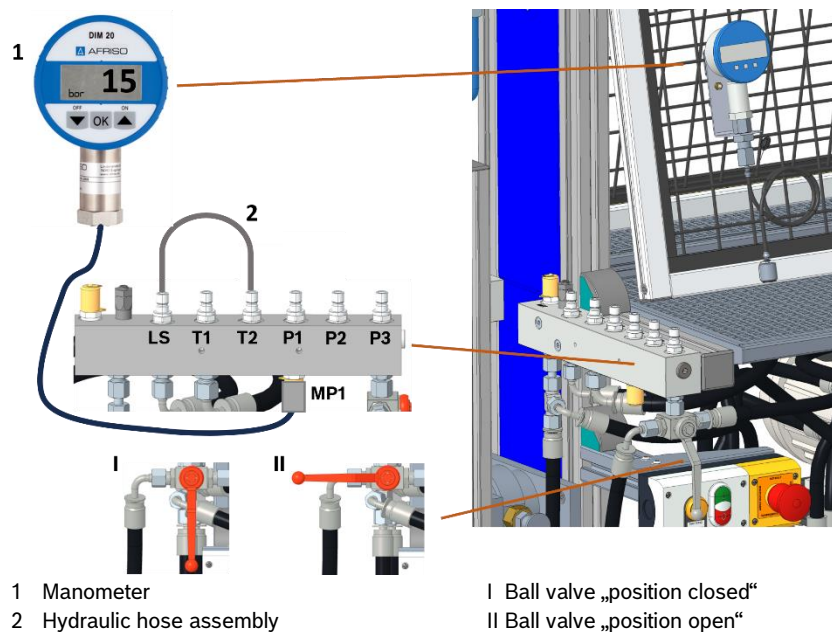


Fig.31: Check stand-by pressure on the first P/T/X manifold

8.4.4 Check hydraulic unit operating pressure

A pressure gauge and a short hydraulic hose assembly (R961002474) are required for the subsequent test. For more information about these accessories, see chapter [8.1 „Necessary accessories“](#).

This is how you carry out the operating pressure test:

1. Connect the pressure gauge to the MP1 port of the **first P/T/X manifold**.
2. Connect the „LS“ connector to the „P3“ connector on the first P/T/X manifold.
3. Check if the switch box is still on, the on/off switch will turn green. If not, turn on the on/off switch.
4. Check whether both ball valves on the P/T/X manifold are in „closed“ position.
5. Press the green button „I“ on the control panel.
6. Warm up the hydraulic unit for at least 1 min in internal circulation (ball valves are closed).
7. Bring the ball valve of the first P/T/X manifold slowly open position
8. On the pressure gauge, check the pressure on the MP1 connection.
This should be **50 bar ±2 bar**.

Result

The displayed pressure **is higher or lower than 50 bar ±2 bar**.

There is an incorrect setting.

1. Position the ball valve of the first P/T/X manifold „closed“
2. Switch off the hydraulic unit via the red button „0“ on the control panel.
3. For more information, go to Chapter [13 „Troubleshooting“](#).

The displayed pressure **is 50 bar ±2 bar** and is therefore ok.

Next, check the stand-by pressure on the **second P/T/X manifold**.

Proceed as follows:

1. Position the ball valve of the first P/T/X manifold „closed“.
2. Switch off the hydraulic unit via the red button „0“ on the control panel.
3. Remove the pressure gauge and the attached hydraulic hose assembly from the first P/T/X manifold.
4. Connect the pressure gauge to the MP1 port of the second P/T/X manifold.
5. Connect the „LS“ connector to the „P3“ connector on the second P/T/X manifold.
6. Check whether both ball valves on the P/T/X manifold are in „closed“ position.
7. Press the green button „I“ on the control panel.
8. Slowly open the ball valve of the second P/T/X manifold.
9. On the pressure gauge, check the pressure on the MP1 connection.
This should be **50 bar ±2 bar**.

If the displayed pressure **is higher or lower than 50 bar ±2 bar**, the setting is incorrect. For further steps, see instructions for the first P/T/X manifold.

The displayed pressure **is 50 bar ±2 bar** and is therefore ok.

1. Switch off the hydraulic unit via the red button 0" on the control panel.
2. Put the lever of the ball valve in "closed" position.
3. Remove the pressure gauge and the attached hydraulic hose line from the second P/T/X manifold.

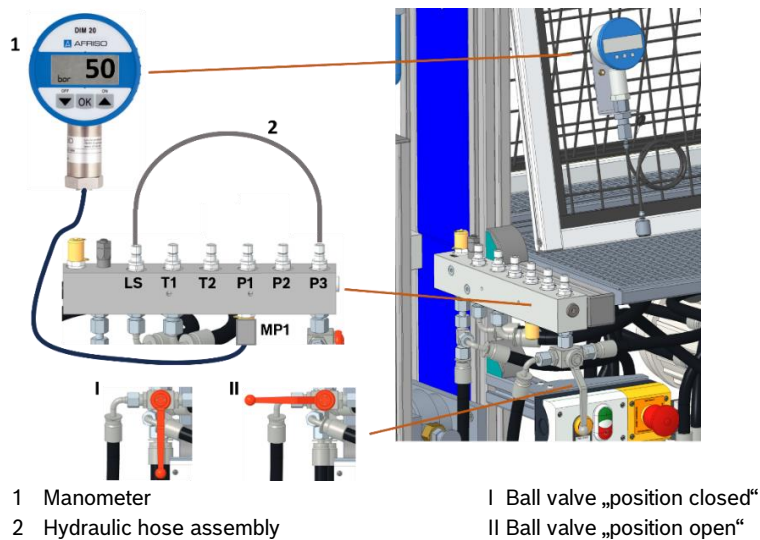


Fig.32: Check operating pressure on the first P/T/X manifold

8.5 Product commissioning

**NOTICE**

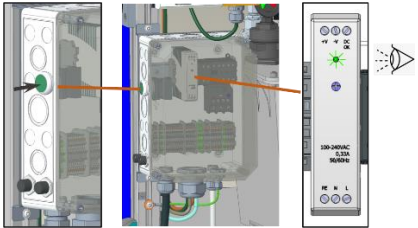
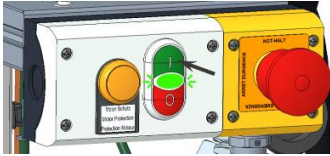
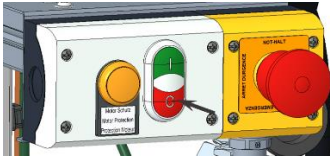
Danger due to irregularities, deviations, faults, defects during operation!

Risk of damage!

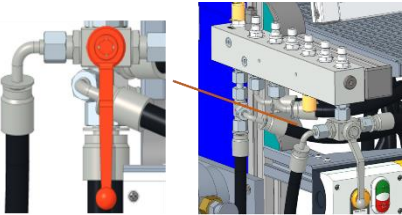
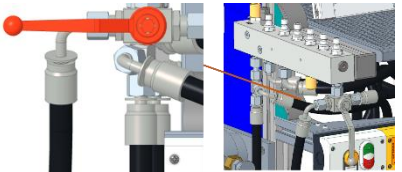
- ▶ Take the training system out of operation immediately.
- ▶ Determine the cause and rectify the fault.
- ▶ Replace the defective component.
- ▶ In the event of leaks in hydraulic components (screw connections, hydraulic hoses), first check whether the parts are screwed tight.

- Conditions**
- The steps in chapters 8.2 to 8.4 have been carried out.
 - Electric motor fan grille is free of objects.
 - The brakes on the transport castors are locked.

Operation hydraulic unit

Action step	Picture
Press the on/off switch on the switch box, to switch on the power supply unit. The power supply unit is switched on when the green LED on the power supply unit lights up.	
Press the „I“ button on the control panel. The indicator light underneath lights up green and the electric motor of the hydraulic unit starts. The pumps coupled to the electric motor start pumping hydraulic fluid!	
To switch the hydraulic unit off again press the „0“ button on the control panel. Stopping the electric motor also stops the delivery of hydraulic fluid!	

Operating the ball valve on the P/T/X manifold

Action step	Picture
The ball valve on the P/T/X manifold is closed in the vertical position. The „P“ connections are not supplied with hydraulic fluid.	
The ball valve on the P/T/X manifold is open in the horizontal position. The „P“ connections are supplied with hydraulic fluid.	

8.6 Recommissioning after standstill

After a longer standstill (> 1 week), it is recommended to bleed the hydraulic unit before operation and to check the contamination indicator on the return filter.

You will need 2 hydraulic hose assemblies (R961002474, see chapter 8.1 „Necessary accessories“). Use these to connect connections P3 to T2 on the two P/T/X manifolds.

Set both ball valves to the open position and switch on the hydraulic unit.

Check the clogging indicator on the return filter. Information on the colour ranges and instructions for action can be found in chapter 10.5.2 „Replacing the filter cartridge of the return filter“.

Allow the hydraulic unit to run for at least 1 minute. Then switch the hydraulic unit off again using the „0“ button on the control panel. Then return both ball valves to the „closed“ position.

The hydraulic unit is now vented.

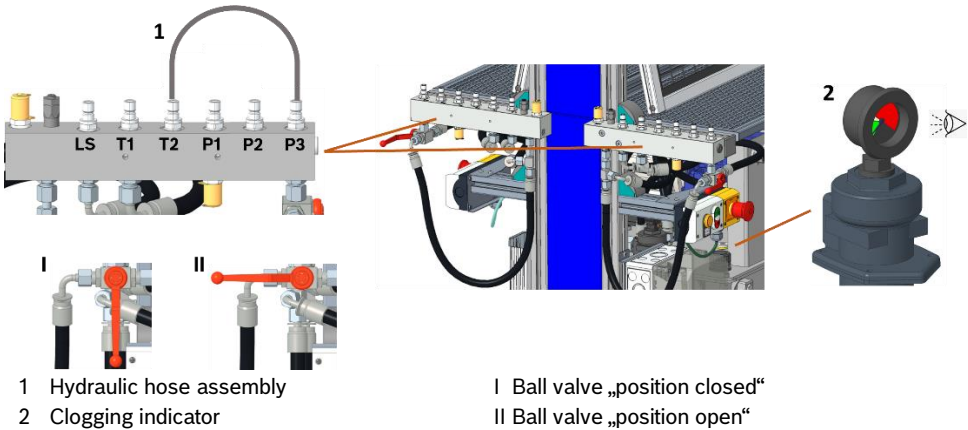


Fig.33: Recommissioning after standstill

9 Operation



Damage to the training system, individual components or material assets. Danger to the safe operation of the training system!

Danger to life and limb of the operator or third parties!

- ▶ Always observe chapter 2 „[Safety instructions](#)“ and chapter 3 „[General instructions concerning property damage and product damage](#)“ in these operating instructions.

To ensure safe operation of the product, the following requirements must be met:

- ▶ Assembly and the electrical supply and installation have been carried out correctly, see chapter 7 „[Assembly](#)“.
- ▶ Initial commissioning has been carried out successfully, see chapter 8 „[Commissioning](#)“.

9.1 Switching on the training system

Note the following **points** before switching on the training system.

- ▶ Check whether an emergency stop button has been pressed.
Before unlocking the emergency stop button, find out the cause of its actuation.
If no obvious cause is recognisable, you can unlock the emergency stop button again.
The emergency stop button is unlocked by turning the actuating element slightly.
- ▶ Always check the level of hydraulic fluid in the tank before switching on.
- ▶ Each time after setting up the exercise set-ups, check that the components are securely fastened to the grid.
- ▶ Check that all hydraulic hose lines are securely connected to the exercise set-ups.
- ▶ Inspect each exercise set-up for:
 - Functional safety,
 - Safety against injuries.

Switch on the training system as follows:

1. Press the on/off switch on the control box (when switched on, it lights up green).
2. Press the „I“ button on a control panel (hydraulic unit is switched on).
3. Slowly move the lever on the ball valve of the P/T/X manifold to the horizontal position (the training system is supplied with hydraulic fluid).



Do not forget to connect the „LS“ connection to the P/T/X manifold. Otherwise only the stand-by pressure (15 bar) will be available.

For exercise set-ups in the field of industrial hydraulics, you can obtain the LS-signal via one of the three „P“ connections on the P/T/X manifold.

Use a short hydraulic hose assembly (R961002474, see chapter 8.1 „[Necessary accessories](#)“) to connect the „LS“ connection to the „P1“ connection, for example.

In the case of exercise set-ups from the mobile hydraulics sector, you can obtain the LS-signal from the mobile control block.

Connect the „LS“ connection on the P/T/X manifold to the „LS“ connection on the mobile control block using a suitable hydraulic hose assembly.

9.2 Switching off the training system

Turn off the training system as follows:

1. Slowly bring the lever on the ball valve of the P/T/X manifold into the vertical position (the exercise set-up is no longer supplied with hydraulic fluid).
2. Press the „0“ button on a control panel (hydraulic unit is turned off).
3. Check the exercise set-up for remaining residual pressures and relieve it by actuating the hydraulic valves in the exercise set-up.
4. Dismantle the exercise set-up.
5. Press the On/Off switch on the control box to turn off the power supply.
6. If necessary (e.g. for transport or when not in use for a longer period of time), disconnect the electrical power plug from the power supply.

9.3 Operation of the swivelling load unit

The swivelling load unit can be used to represent a pulling or pressing weight load on the piston rod of a differential cylinder. When delivered, the piston rod is extended and the weight is below, see 1 in Fig.34:.

If the hydraulic cylinder is now retracted, this results in a pulling load on the piston rod. If one swivels the load unit in this position by 180 degrees, the weight is at the top and the hydraulic cylinder at the bottom, see 3 in Fig.34:.

If you move the hydraulic cylinder in this position, this results in a pressing load on the piston rod.

The steps for swivelling are explained in more detail below.

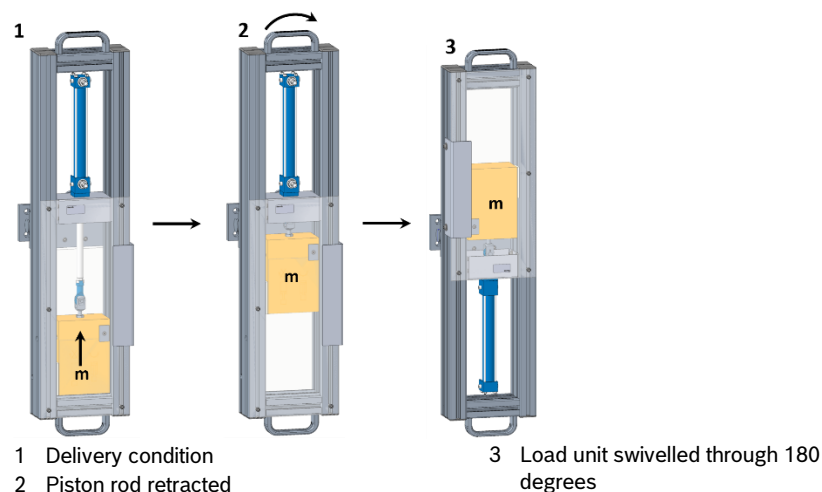


Fig.34: Swivelling load unit, overview

To make it easier to swivel the load unit, we recommend positioning the weight close to the centre of rotation. This reduces the torque required for swivelling, which means that the piston rod of the hydraulic cylinder must be retracted when delivered, see 2 in Fig.34:.

A hydraulic circuit is required to move the piston rod. For this purpose, the hydraulic cylinder is connected to the P/T/X manifold of the training system via a hydraulic directional control valve. As soon as the piston rod side is pressurised, the piston rod retracts with weight. In order to be able to maintain the retracted position for swivelling, there must always be pressure in the piston rod side. The hydraulic hoses assemblies could now be disconnected and the hydraulic coupling would then lock the pressure. As a result, it would no longer be possible to connect a hydraulic hose assembly, as the hydraulic coupling is blocked by the locked pressure. Leaving the hydraulic hoses assemblies fitted is also not an option, as they can twist when swivelling.

It is better if the hydraulic pressure in the hydraulic cylinder is contained via directly plugged isolation valves. Once the hydraulic cylinder is retracted, the isolation valves are closed, the pressure remains in the hydraulic cylinder and the hydraulic hoses assemblies can then be depressurised. Once the swivelling process is complete, the hydraulic hoses assemblies are reattached and the isolation valves are opened to release the enclosed pressure. The following components are required for the recommended hydraulic circuit.



The components listed in the table are included in most hydraulic equipment sets from Bosch Rexroth. However, there is always only one ball valve in the equipment sets, which is why a throttle valve is used as the isolation valve. When fully closed (turn handle clockwise as far as it will go), it blocks the flow.

Table 11: Components for hydraulic circuit

Stückzahl	Materialnummer	Designation
1	R961002552	DIRECTIONAL CONTROL VALVE TS-HC-4WMM 6 C5X (is hung in the grid frame)
1	R961002539	THROTTLE VALVE TS-HC-DV 06 -1- 1X/V
1	R961002491	BALL VALVE TS-HC-AB21-20/G 1/4-&
2	R961002474	HOSE ASSEMBLY TS-HC-ZN10031-08-W00& (straight, hydraulic couplings on both sides, hose length 630 mm)
2	R961002473	HOSE ASSEMBLY TS-HC-ZN10031-08-W00& (straight, hydraulic couplings on both sides, hose length 1500 mm)

The following illustration shows the hydraulic circuit for moving the piston rod of the hydraulic cylinder. Once the piston rod has reached its final position, close the isolation valves. These remain plugged into the hydraulic cylinder, only the connected hydraulic hoses assemblies are removed. The load unit can then be swivelled. The swivelling process is described in more detail in the following section.



Only a low pressure is required to move the piston rod with the load. The stand-by pressure (15 bar) is sufficient for this. No additional hydraulic hose assembly needs to be connected between the LS and P connection on the P/T/X manifold.

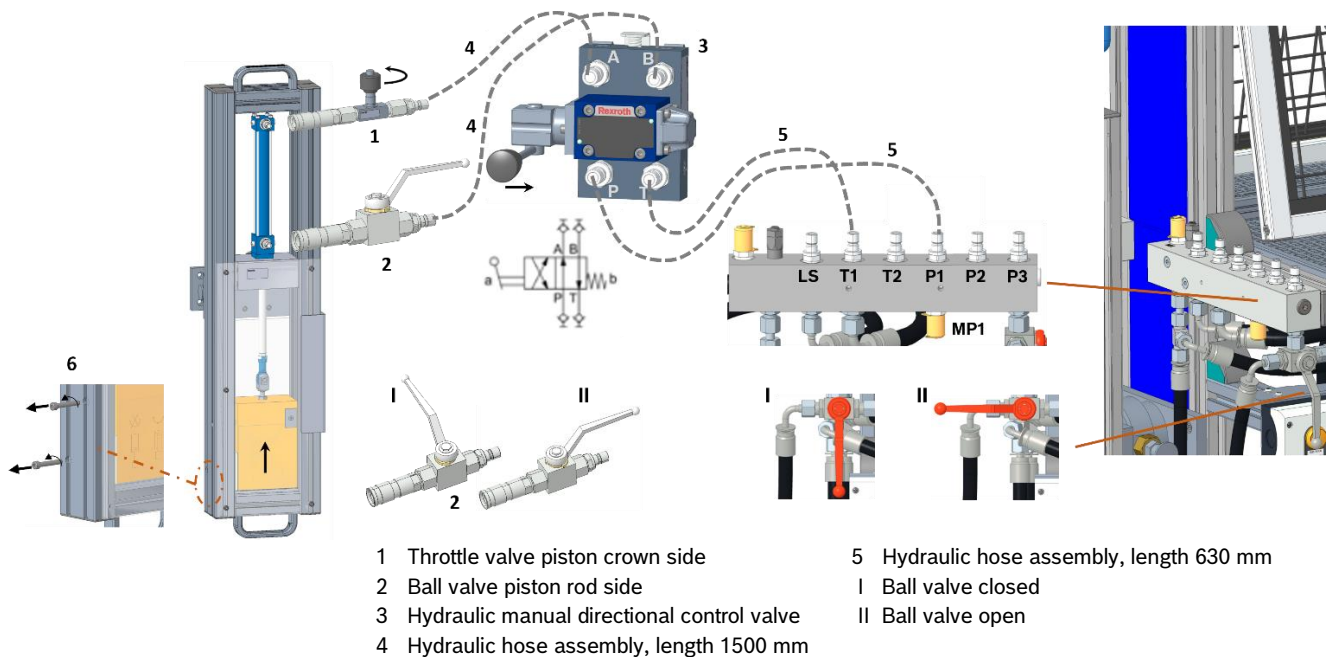


Fig.35: Hydraulic circuit to be able to move the piston rod

The following illustration shows the handling steps for swivelling the load unit 180 degrees from its delivery state.

Carry out the following steps to swivel the load unit:

1. Loosen the locking lever anti-clockwise.
2. Firmly grip the upper handle of the load unit with one hand. With the other hand, pull the left release lever (Fig.36: 1. A-A). The load unit can now be turned to the right within the red groove (Fig.36: 1. A-A). Continue turning until the left release lever engages in the next groove (green, Fig.36: 2. A-A).
3. Firmly grip the lower handle of the load unit with one hand. With the other hand, pull the right-hand release lever (Fig.36: 2. A-A). The load unit can now be turned to the right within the green groove (Fig.36: 2. A-A). Continue turning until the right-hand release lever engages in the next groove (blue, Fig.36: 3. A-A).
4. Keep one hand on the lower handle of the load unit. With the other hand, pull the left unlocking lever (Fig.36: 3. A-A). The load unit can now be turned to the right within the blue groove (Fig.36: 3. A-A). Continue turning until the left unlocking lever engages in the next groove (red, Fig.36: 4. A-A).
5. Turn the locking lever clockwise to tighten.

The swivelling process is complete. If you want to swivel the load unit back again, proceed in reverse order.

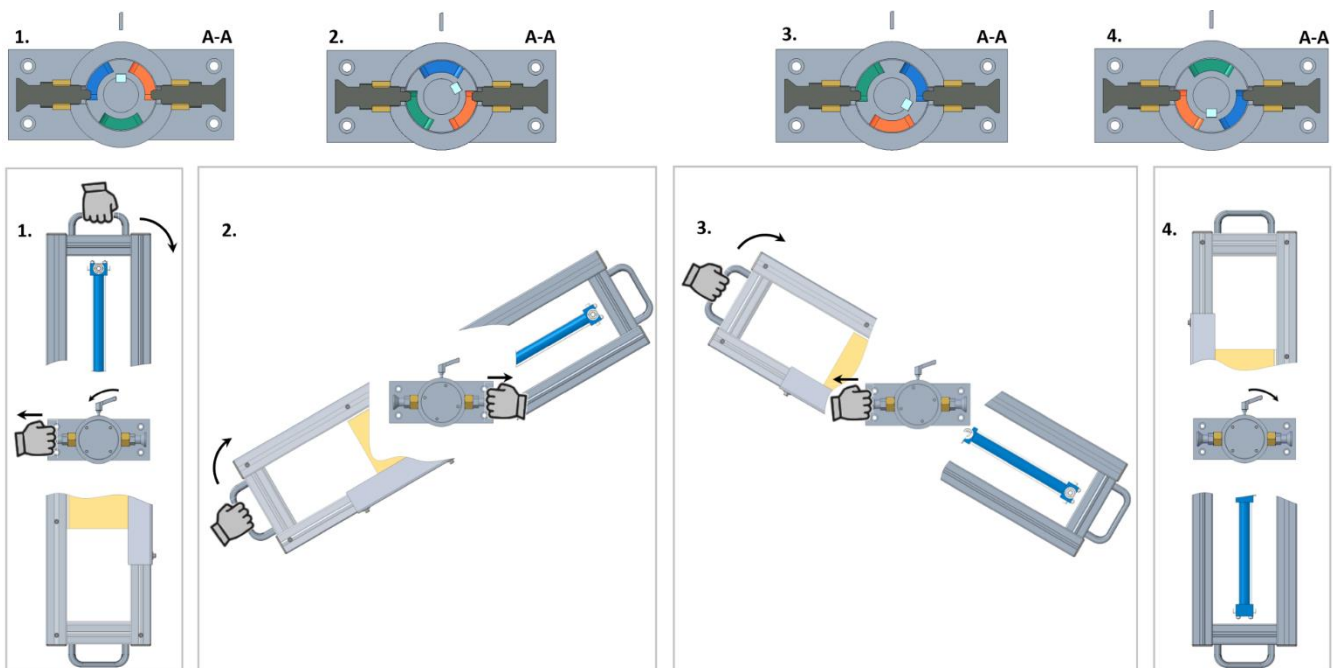


Fig.36: Handling steps to swivel the load unit

9.4 Fastening variants for installation in the grid

The following is an overview of the fastening variants of the hydraulic components for installation in the Hydraulix 300 grid frame. The fastening variants on the hydraulic components are designed for mounting in a welded steel grid with a grid dimension of 50 x 50 mm and a wire diameter of 4 mm.

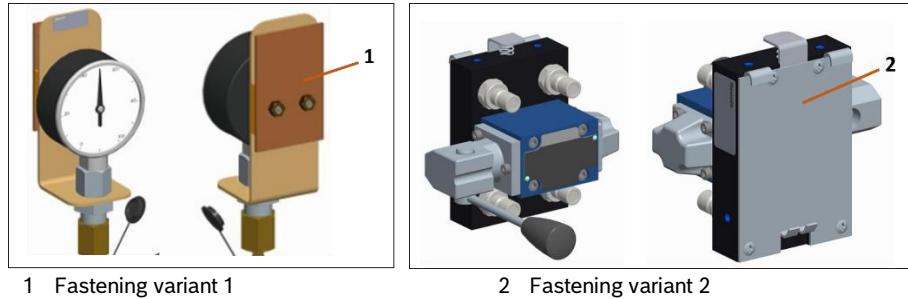


Fig.37: Overview fastening variants

Mounting fastening variant 1

1. Grip the component securely with both hands.
2. Place the front retaining plate between two longitudinal wires at an angle on the grid.
3. Lift the component until the rear retaining plate fits past a lower cross wire. Then swivel the component towards the grid in the raised position.
4. Lower the component until the centre retaining plate rests on the lower cross wire.
5. Check that the components are held securely: This must now rest against the entire surface of the grid. The rear retaining plate must lie completely behind 2 cross wires of the grid at the top and bottom.

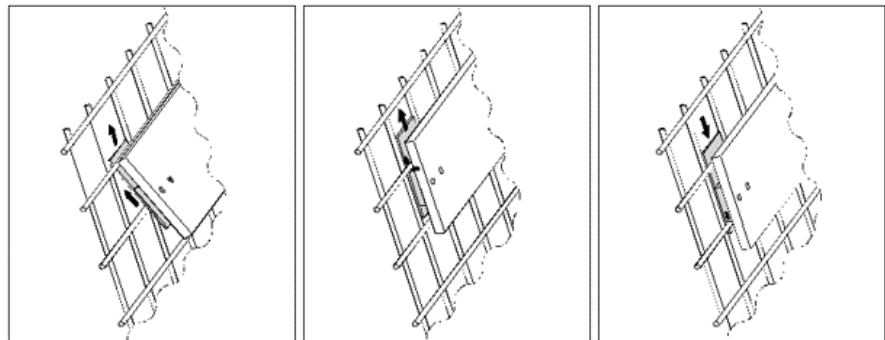


Fig.38: Positioning, lifting and lowering components

Mounting fastening variant 2

1. Grip the component securely with both hands.
2. Hang the component with the two upper hooks on a horizontal wire of the grid.
3. Actuate the unlocking lever (located between the two upper hooks) and swivel the component towards the grid.
4. Align the component so that the hook of the unlocking lever is in the middle of the vertical wire.
5. Slowly release the unlocking lever. When correctly positioned, the hook of the unlocking lever should engage in a horizontal wire.
6. Check that the components are securely in this position. This must now rest against the entire surface of the grid. The hooks must be in contact with the top and bottom horizontal bars of the grid.

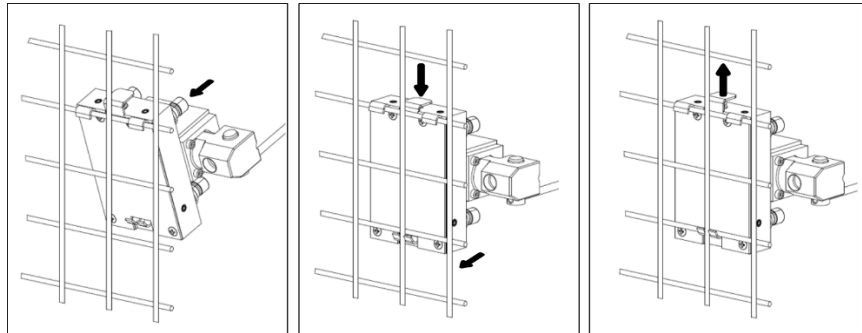


Fig.39: Hook in component, actuate, lock

Disassembly

Disassembly is carried out according to the fastening variants, in reverse order to assembly.

9.5 The hydraulic coupling

The hydraulic components are connected with hydraulic hose assemblies for the exercise set-up. A quick-release coupling is installed to separate the hydraulic hose from the hydraulic component. This is available in the following versions coupling plug and coupling sleeve.

The coupling plug is installed on hydraulic valves, hydraulic cylinders and hydraulic motors. The coupling sleeve is used for hydraulic hoses.

Both versions, coupling sleeve and coupling plug, are used for pressure / flow and isolation valves as well as hydraulic manifold.

The closure of the quick-release coupling is spring-loaded. To couple, press the coupling sleeve straight onto the coupling plug. To uncouple, actuate the release mechanism and pull off the coupling sleeve.

Please note the following for use:

- ▶ Do not couple or uncouple while the hydraulic unit is running.
- ▶ Do not uncouple with residual pressure.
- ▶ Always place the coupling sleeves straight onto the coupling plug.
Avoid tilting, otherwise the coupling will be damaged.



After each uncoupling, check that the locking mechanism is working and the coupling is closed. The locking mechanism on the coupling sleeve and plug prevents hydraulic fluid from escaping unintentionally. The coupling is sealed oil-tight and pressure-tight (up to 100 bar) by this mechanism.

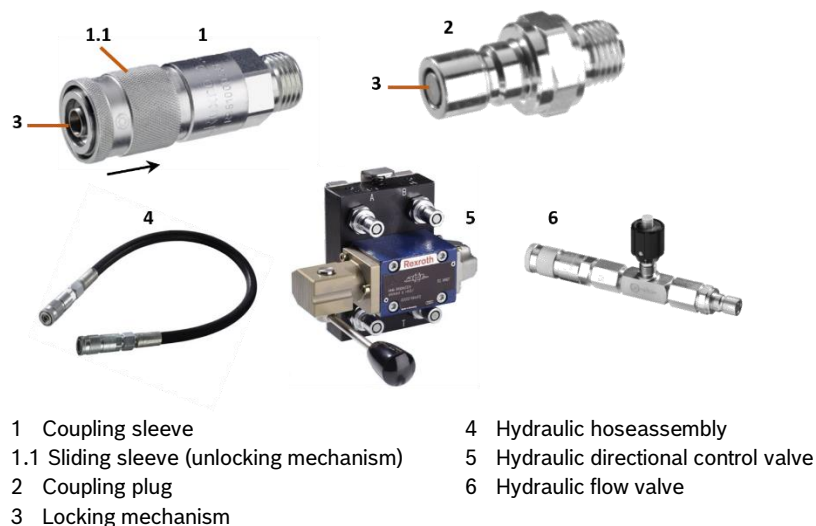


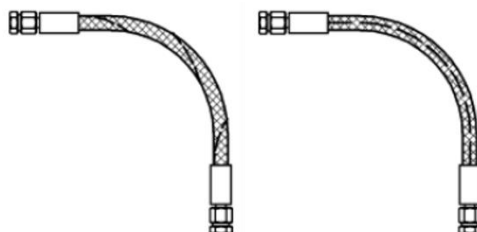
Fig.40: Overview of hydraulic coupling

9.6 Handling hydraulic hose assembly

This chapter describes the correct handling of hydraulic hose assemblies, especially when installing exercise circuits.

The following illustrations and notes are extracts from the DIN 20066.

- Twisting of the hose must be avoided



False

Correct

- Hydraulic hose assemblies must be laid in such a way that tensile stresses are avoided in all operating states, with the exception of tensile stresses caused by the weight of the hose assemblies itself.

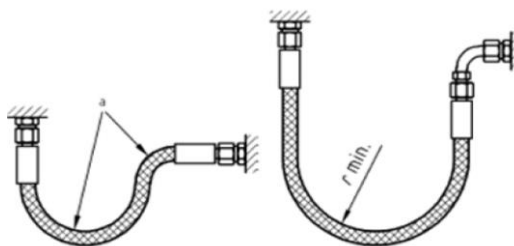


False



Correct

- If possible, hose lines should be installed following their natural position, whereby the smallest permissible bending radius must not be undercut.



False

Correct

a – Bending radius too small

10 Maintenance and repair

DANGER

Damage to the training system, individual components or material assets. Danger to the safe operation of the training system!

Danger to life and limb of the operator or third parties!

- ▶ Always observe chapter 2 „[Safety instructions](#)“ and chapter 3 „[General instructions concerning property damage and product damage](#)“ in these operating instructions.

WARNING

Danger to life due to electrical voltage! Working in the vicinity of live parts is life-threatening.

Danger to life, risk of injury from electric shock!

- ▶ Work on the electrical system may only be carried out by qualified electricians.

Personal injury and damage to property during maintenance work while the system is in operation!

Danger to life!

- ▶ Never carry out maintenance work on a running training system.
- ▶ Secure the system against restarting and unauthorised use during maintenance work.

NOTICE

Inspection and maintenance work not carried out on time!

Material damage!

- ▶ Carry out the prescribed inspection and maintenance work at the intervals described in these instructions.
- ▶ When replacing hydraulic hose lines, only use those that fulfil the requirements of the DIN EN 857 standard.

If irregularities, deviations, faults and wear are noticed during operation or testing, the following must always be observed:

- ▶ Take the training system out of operation immediately.
- ▶ Determine the cause and rectify the faults. If this is not possible, inform Bosch Rexroth customer service.
- ▶ Replace the defective component.
- ▶ If necessary, do not put the training system back into operation.
- ▶ Store and dispose of leaked and used operating and auxiliary materials in accordance with the country-specific legal regulations.

10.1 Cleaning and care

Cleaning plastic components.

A damp cloth is sufficient to wipe off light soiling (e.g. dust).

For heavier soiling (e.g. oily residues), the use of a special plastic cleaner is recommended.

Never use solvents or aggressive cleaning agents that could attack the plastic.



Before using a cleaning agent, find out about its usability and possible hazards by referring to the user instructions on the packaging of the cleaner.

If you need to remove pressurised fluid, use suitable binding agents and cleaning cloths. Store and dispose of leaked and used operating and auxiliary materials in accordance with the country-specific legal regulations.

10.2 Inspection plan

To ensure that the training system functions reliably for a long time, Bosch Rexroth recommends that you the following inspection plan.

Table 12: Inspection plan

Work to be carried out		Interval
Entire training system	Check for loose and defective components.	Before operation
Hydraulic unit, hydraulic components	Check the hydraulic fluid level in the tank.	Before operation
	Visual inspection for damage and loose parts.	
	Check the clogging indicator of the return filter.	During operation
	Check for leaks.	During operation
Hydraulic hoses	Check for visible damage (cracks, chafing, brittleness).	Before operation
	Check for leaks.	During operation
electrical cables	Check for visible damage (cracks, chafing, brittleness).	Before operation
Emergency stop button	Check for function.	After switching on

10.3 Maintenance plan

Table 13: Maintenance plan

Work to be carried out		Interval
Hydraulic hoses	Exchange/replacement	6 years after date of manufacture Details view Cap. 10.5.3
Hydraulic fluid	Exchange/replacement	Details view Cap. 10.5.1
Electrical installations	Protective conductor test. (Electrical safety test)	Annually, or according to country-specific regulations

10.4 Maintenance

Spare parts

Only use original Bosch Rexroth spare parts, otherwise functional safety cannot be guaranteed and you will lose your warranty claim. The material number and the material short text are required when ordering spare parts. The data can be found on the respective rating plate (see chapter [5.13.2 „Typ plate“](#)). After maintenance and before commissioning, the following must be checked by a qualified specialist:

- The proper execution of the work.
- The unrestricted operational readiness of the training system.

10.5 Replacing wear parts

10.5.1 Changing the hydraulic fluid

General

Change the hydraulic fluid if

- the condition deteriorates unacceptably,
- ageing is well advanced,
- the replacement period for the hydraulic fluid has expired.



Comprehensive information on the service life of hydraulic fluid can be found in the data sheet RE 90220 in chapter 4.11 'Fluid maintenance, fluid analysis and filtering'. Information on how to obtain the data sheet can be found in chapter 1.2 „Required and supplementary documentation“ in this documentation.

The hydraulic fluid must be drained completely. It is recommended that the hydraulic fluid is extracted via the filler neck using a suitable suction device.

After refilling, the hydraulic components must be vented. Corresponding instructions can be found in the chapters:

- [7.4.2 Filling tanks with hydraulic fluid](#)
- [8.4.2 Venting hydraulic unit and checking function](#)

Dispose of leaked and used operating and auxiliary materials in accordance with the country-specific legal regulations.

10.5.2 Replacing the filter cartridge of the return filter

NOTICE

Clogging indicator in the red range! Hydraulic fluid is not filtered!

Risk of damage to the hydraulic pumps!

- ▶ Shut down the training system immediately.
- ▶ Contact Bosch Rexroth customer service to clean the hydraulic pumps.

The clogging indicator (differential pressure on the filter element) is only effective while the hydraulic unit is switched on and the filter is flowing through.

The clogging indicator

- indicates the degree of contamination of the replaceable filter element,
- provides indirect information on the degree of contamination of the hydraulic fluid,
- shows the following colour ranges.

Table 14: Clogging indicator

Colour range	Differential pressure on the filter	To do
Green	0...2 bar Bypass valve closed. Continuous filtering.	None
Yellow	2...3 bar Bypass valve partially open. Only partial filtration.	Change the filter element.
Red	3...10 bar Bypass valve fully open. No filtering.	Change the filter element and hydraulic fluid in the tank. Contact Bosch Rexroth customer service to clean the hydraulic pumps.

To change the filter element

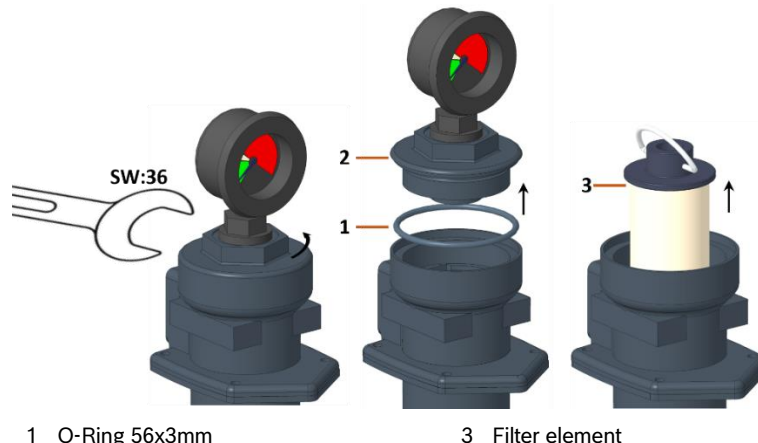
Required material/tools:

- open-end wrench SW 36
- new filter element
- if necessary cover sealing ring

The filter may only be changed when the hydraulic unit is switched off.

Removal and installation

- ▶ Unscrew the cover of the return filter using the open-end wrench.
- ▶ Pull up the dirty filter element with the retaining basket and remove it.
- ▶ Check the sealing ring for damage.
If necessary, replace the sealing ring if it is damaged or porous.
- ▶ Clean the lower part and mounting surface of the cover.
- ▶ Clean the retaining basket and insert the filter element.
- ▶ Insert the new filter element with retaining basket into the lower section.
- ▶ Reinsert the sealing ring for a perfect fit.
- ▶ Screw the cover with clogging indicator back on.
- ▶ Tighten the cover again using the open-end wrench.
- ▶ Add hydraulic fluid to the tank if necessary. If the reservoir is very dirty, refill it.



- 1 O-Ring 56x3mm
- 2 Cover with clogging indicator
- 3 Filter element

Fig.41: Change filter element

Test run

To check the successful replacement of the filter element and whether everything is tight, a test run must be carried out.

You need 2 hydraulic hose assemblies (R961002474, see chapter 8.1 „Necessary accessories“). Use these to connect the „P3“ to „T2“ connections on the two P/T/X manifolds.

Bring both ball valves in the „open“ position and switch on the hydraulic unit via the „I“ button on the control panel.

Check the clogging indicator on the return filter. This should now be in the Range „green“.

Check the return filter for leaks, if necessary, replace the o-ring on the lid.

Run the hydraulic unit for at least 30 s. Then switch off the hydraulic unit via the „0“ button on the control panel. Then bring both ball valves back into „closed“ position.

The hydraulic unit is now vented.

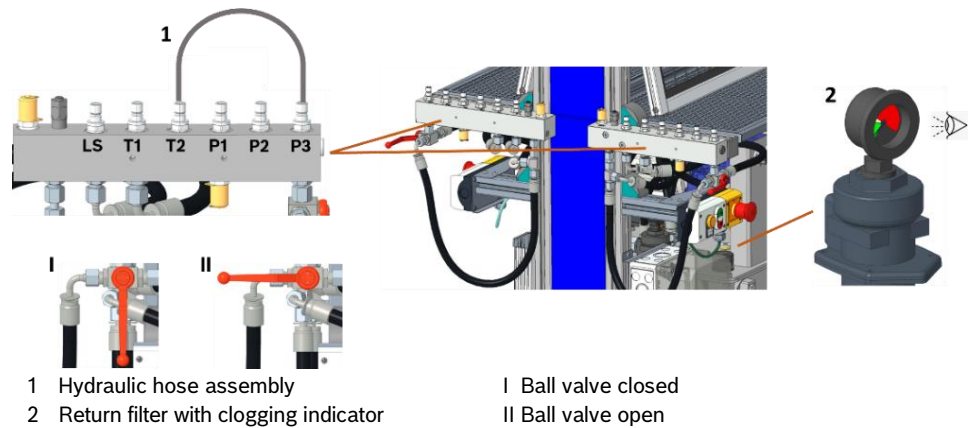


Fig.42: Test run after filter element replacement

10.5.3 Changing hydraulic hoses

The hydraulic hoses must be replaced 6 years after the production date. The operator of the training system is responsible for checking these deadlines.

An overview of the fixed installed hydraulic hoses in the training system, with ordering information can be found in chapter 10.6.1 „Spare parts - Hydraulic hoses“.

The following figure gives an overview of the markings on the hydraulic hoses.

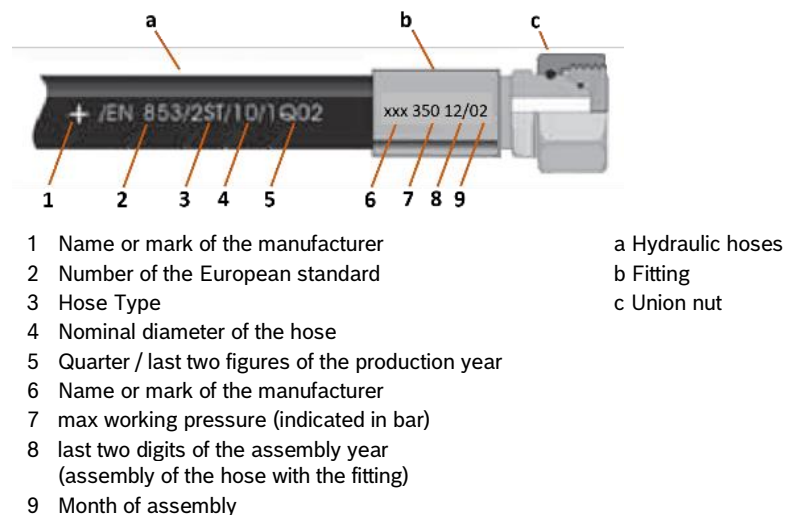


Fig.43: Markings on the hydraulic hoses

Below are the steps for changing the hydraulic hoses:

- ▶ Remove the hydraulic hoses. To do this, loosen the union nuts with a open-end wrench on both sides of the hydraulic hoses.
 - Hose nominal diameter 10 mm (M16x1.5 mm) -> Wrench width 19 mm
 - Hose nominal diameter 12 mm (M18x1.5 mm) -> wrench width 22 mm
- ▶ When disassembling, please note that there is still residual liquid in the hydraulic hoses.
- ▶ Install the new hydraulic hoses and tighten them manually. Then you still turn 1/4 turn further firm, see figure below.

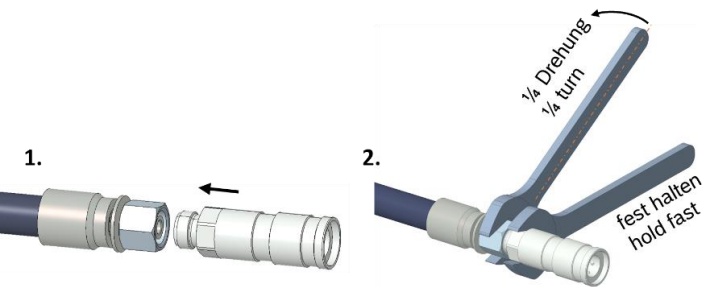


Fig.44: Changing the hydraulic hoses

- ▶ Check the tight fit of the fittings of the hydraulic hose line.
- ▶ After the replacement, you must make an initial commissioning according to chapter [8.4 „Initial commissioning“](#).

10.6 Spare parts

The table below provides an overview of spare parts.

Table 15: Spare parts

Component	Distributor / Material number	Material short text / Order information
Coupling plug on the P/T/X manifold	Bosch Rexroth R961000482	CONNECTOR PLUG FF-005-2-XX014-AAAF &
Filter element Return flow filter	Bosch Rexroth R928017073	FILTER ELEMENT 9.30LA PWR20-A00-0-M SO3000
Sealing ring Lid - return flow filter	local Distributor	O-Ring ISO 3601 56x3 NBR90
Ventilation valve for measuring glass	Bosch Rexroth R900329451	BLEEDER VALVE TS-HC-626701-BS
Hydraulic fluid*	R913046494	HYDRAULICS OIL AVIA FLUID RSL 22-20L
LED element on on/off switch	local Distributor	Manufacturer: EATON Typ: M22-CLED230-W, Part nr. 216575
LED element on I / O button (control panel)	local Distributor	Manufacturer: EATON Typ: M22-CLEDC-G (24V DC), Part nr. 216574
LED element on Indicator light (control panel)	local Distributor	Manufacturer: EATON Typ: M22-CLEDC-W (24V DC), Part nr. 216572

* This material number corresponds to an order quantity of 1 kg. For the minimum order quantity you need to add 18 pieces to cart. This quantity corresponds to a canister with 20 liters capacity.

You can order the spare parts from the Bosch Rexroth E-Shop (see chapter [1.2 „Required and supplementary documentation“](#)) or from your Bosch Rexroth sales partner.



The following table shows the type key for hydraulic hose assemblies used by Bosch Rexroth in-house. The information shown is reduced to the fixed installed hydraulic hoses in the training system.

Example: Hose assembly		2	SC	08	/	N	90	-	10	N	00	-	10	/	650-	1	ST	3	N	00	Z	0	Z	000	D	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17								
1	Hose type :	1SC or 2 SC																								
2	Nominal size of hose according to DIN 20066:	08 or 10																								
3	Type of fitting 1:	N -> DKOL 90 -> 90 degree bend N -> DKOL 45 -> 45 degree bend N -> DKOL 00 -> no bend, straight fitting																								
4	Nominal size of fitting 1:	10 -> Thread of the union nut M16x1,5 mm 12 -> Thread of the union nut M18x1,5 mm																								
5	Type of fitting 2:	N -> DKOL 90 -> 90 degree bend N -> DKOL 45 -> 45 degree bend N -> DKOL 00 -> no bend, straight fitting																								
6	Nominal size of fitting 2:	10 -> Thread of the union nut M16x1,5 mm 12 -> Thread of the union nut M18x1,5 mm																								
7	Length of hose assembly:	Hose assemblies with straight fittings have to be measured from the outer edge of the fitting.  Hose assemblies with elbow fittings have to be measured from center to center of the fitting. 																								
8	Design of fittings :	1 Standard design																								
9	Material of fittings:	ST -> Steel																								
10	Corrosion protection class :	3 -> Cr(VI)-free																								
	Low corrosion conditions, areas without a corrosive atmosphere																									
11	Sealing material:	N -> NBR																								
12	Inspection documents:	00 -> Without																								
13	Acceptance certificate:	Z -> Without																								
14	Security cable :	0 -> Without																								
	Note: Some hoses may have a hose safety catch (factory-specific test specifications). This can be omitted after replacement because the operating pressures are much lower than the factory test pressures.																									
15	Protection sleeves for hose assemblies:	Z -> Without																								
16	Angular position of fittings:	000 -> Without																								
17	Mounting direction:	D -> Standard																								

11 Disposal

CAUTION

Improper disassembly!

Bodily harm by crushing, shearing, cutting, thrusting!

- In principle, the chapter 2 „[Safety instructions](#)“ of these operating instructions must be observed.



For disposal of the product, comply with the following instructions:

1. Completely empty the tank of the hydraulic unit.
2. Dispose of the hydraulic fluid according to the national regulations of your country. Also note the valid safety data sheet of the hydraulic fluid.
3. Disassemble the product into its individual components in order to recycle them.
4. Separate the materials, e.g.:
 - Steel
 - Aluminium
 - Non-ferrous metal
 - Electronic waste
 - Plastic
 - Seals

11.1 Environmental protection

NOTICE

Careless disposal of the product and the packaging material may lead to environmental pollution!

Illegal waste disposal can lead to criminal charges and fines!

- Dispose of the product and the packaging material in accordance with the national regulations of your country.

12 Extension and modification

12.1 Extension – Supporting arm

Material number	1827003725
Material short text	SUPPORTING ARM TS-MC-DS3/DS4
Dimensions (LxBxH)	730x420x180 mm
Weight	8,3 kg
Load capacity	25 kg



- The support arm with 2 joints and a rotating support surface (415x415 mm) can be used to hold a laptop with an external keyboard. The separate sheet is hung on the side of the support surface and serves as a mouse holder.
- The front mounting bracket is for storing the keyboard, material chrome-plated round steel.
- The support arm is attached to the side part of the base frame. The mounting material is included in delivery.

12.2 Extension – Information panel

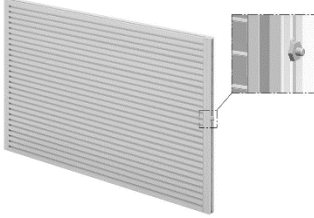
Material number	1827003721
Material short text	INFORMATION PANEL TS-MC-DINA4-GELENK
Dimensions (LxBxH)	70x280x80 mm
Weight	3,5 kg
Size	DIN A4



- The information panel with 2 joints can be used to store a script in DIN A4 format.
- The information panel is attached to the side part of the base frame. The mounting material, including a cover plate made of transparent acrylic glass, is included in the scope of delivery.

12.3 Extension – T-slot plate

Material number	R961000169
Material short text	T-SLOT PLATE TS-MC-DS4-1130X700X3&
Dimensions (LxBxH)	1130x700x30 mm
Weight	24 kg
Groove width	8 mm
Groove center distance	25 mm



- The grooved plate is used to fasten components with the Snap-In quick fastening system from the field of pneumatics and automation technology. The grooved plate can be quickly and easily hung and securely attached in place of the grid frame on both sides of the Hydraulix 300 workstation.

12.4 Extension – Writing pad

Material number	1827003705
Material short text	WRITING STAND TS-MC-DS3/DS4
Dimensions (LxBxH)	275x360x25 mm
Material	PMMA,white
Delivery unit	2 pices



12.5 Extension Component rack – cover plates

Material number	R901488520
Material short text	FRONT PANEL TS-MC-3HE-2TE
Height	3HE
Width	2 TE



Material number	R961001336
Material short text	FRONT PANEL TS-MC-3HE-4TE
Height	3HE
Width	4 TE



Material number	R913004345
Material short text	FRONT PANEL TS-MC-3HE-6TE
Height	3HE
Width	6 TE



Material number	1827008410
Material short text	FRONT PANEL TS-MC-3HE-7TE
Height	3HE
Width	7 TE



Material number	1827008409
Material short text	FRONT PANEL TS-MC-3HE-8TE
Height	3HE
Width	8 TE



Material number	1827008408
Material short text	FRONT PANEL TS-MC-3HE-21TE
Height	3HE
Width	21TE



13 Troubleshooting

The fault-finding table can help you troubleshoot. The table does not claim to be complete. If the causes of the fault cannot be identified and eliminated, contact the responsible Bosch Rexroth customer service.

13.1 Measures in case of failures

! DANGER

Damage to the training system, individual components or material assets. Danger to the safe operation of the training system!

Danger to life and limb of the operator or third parties!

► Always observe chapter 2 „Safety instructions“ and chapter 3 „General instructions concerning property damage and product damage“ in these operating instructions.

Table 17: Measures in case of failures

Situation	Possible causes	Recommended workaround
On/off switch on the control box does not click into place when pressed. Switch works like a button.	Latching function on switching element not activated	The following work should only be carried out by a qualified electrician! De-energize the training system, pull out the power plug and open the control box. Then turn the switch according to „Fig.46:“ dismantle and activate the locking function. Then reassemble the switch in the reverse order and carry out a functional test
On/off switch on the control box switched on but the hydraulic unit cannot be started via the control panel.	No power supply available	Check whether the lamp on the on/off switch lights up green -> If no -> Check whether the mains plug is plugged in -> Check whether the control lamp on the power supply unit lights up -> If no, commission a qualified electrician to investigate and remedy the situation. If the indicator light on the power supply lights up, the LED in the on/off switch may be defective and must be replaced by a qualified electrician.
	Yellow warning light on the control panel lights up	Thermal motor protection relay has tripped. Allow the hydraulic unit to cool down until the warning light goes out, then switch on again.
	Emergency stop button has been pressed	Find out the cause and, if necessary, commission a qualified electrician to investigate and remedy the situation.
One of the indicator lights is not working.	LED element is defective	The following work should only be carried out by a qualified electrician! Replace the defective LED element, see Chapter 13.1.3. Spare parts can be found in Chapter 10.6
Hydraulic unit started but no volume flow detectable.	The filling level in the container is too low	Switch off the hydraulic unit immediately and refill the hydraulic fluid.
	Incorrect motor rotation direction	Switch off the hydraulic unit immediately and commission a qualified electrician to investigate and remedy the situation.
	Coupling damage between electric motor and hydraulic pump or pump defective	Switch off the hydraulic unit immediately and contact Bosch Rexroth customer service.
	Return filter clogged	Check the clogging indicator, see chapter 10.5.2 „Replacing the filter cartridge of the return filter“ for measures.

Situation	Possible causes	Recommended workaround
Hydraulic unit started but hydraulic pressure at port P is only 15 bar.	LS pressure feedback is missing	Check whether a hydraulic hose line is connected to the LS connection of the P/T/X distributor. The other end of this hose line must either be plugged into one of the P connections of the P/T/X distributor or into an LS connection of a mobile hydraulic control block.
The volume flow setting of the hydraulic unit is not correct.	Wrong setting	A detailed description of the factory settings of the hydraulic unit can be found in Chapter 16 “Service Instructions”. You can also contact Bosch Rexroth Service for this work.
Hydraulic clutch cannot be engaged.	Residual pressure in the component	To reduce the residual pressure in components with a coupling plug, use the pressure unloading sleeve material number R961002927. For handling see chapter 13.1.1 To reduce the residual pressure in components with a coupling sleeve, you must loosen the coupling sleeve from the component. For handling see chapter 13.1.2.
Locking mechanism of the hydraulic coupling is stuck (see right picture in Fig.47:)	Operation error	Repeat the coupling process (sliding the coupling sleeve onto the coupling plug) at least 3 times. If the locking mechanism does not come loose, you will have to replace the defective coupling.

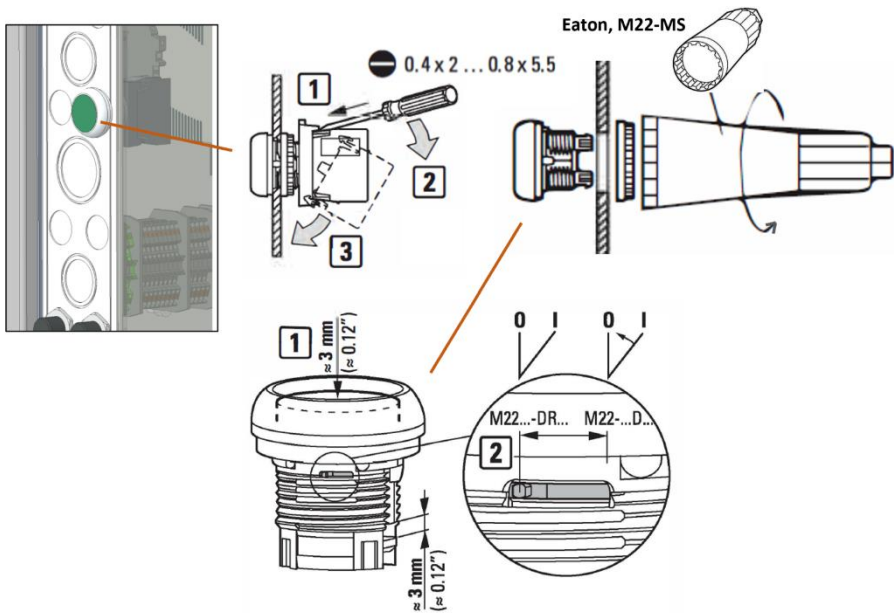


Fig.46: Activate the locking function on the on/off switch

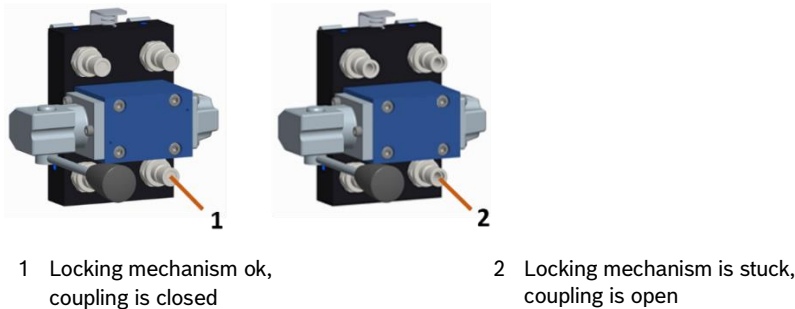


Fig.47: Closing mechanism of the hydraulic cloupling

13.1.1 Handling steps – pressure unloading sleeve

- ▶ Check the following points before using the pressure relief sleeve:
 - Connect the container connection (marking T) of the component (e.g. directional valve) to the container connection on the P/T/X manifold of the training system and operate the component, e.g. switch the directional valve.
 - Connect a hydraulic hose line (e.g. R961002474) to the container connection of the P/T/X distributor. Then connect the other side of the hydraulic hose line to the connection that cannot be coupled.
- ▶ If the above did not work and the coupler plug is still blocked, use the pressure unloading sleeve.
- ▶ Turn the pressure unloading sleeve spindle counterclockwise all the way out.
- ▶ Insert the pressure unloading sleeve onto the coupling plug to be relieved. Press the locking sleeve.
- ▶ Hold the pressure unloading sleeve with one hand and operate the spindle with the other hand. Turn the spindle clockwise until resistance is felt. Turn the spindle a maximum of 3 more rotations.
- ▶ Check whether the coupling plug is now relieved.
- ▶ Check whether the locking mechanism of the coupling plug works.



When using the pressure unloading sleeve, do not use any additional aids (such as extensions) to increase the force of the spindle. When using the pressure unloading sleeve, pressure fluid may leak. Have appropriate cleaning wipes ready. Dispose of used cleaning cloths in accordance with country-specific regulations.

If the pressure unloading sleeve does not work because the residual pressure is too high, you must loosen the coupling plug. Corresponding steps in the following section.

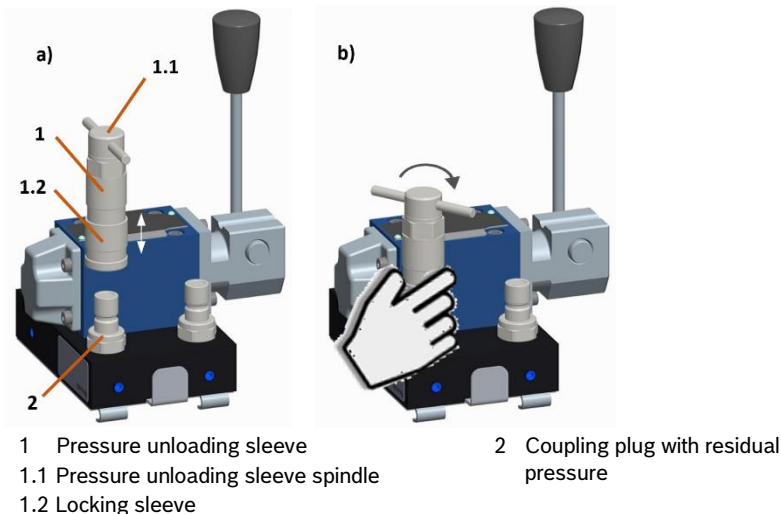


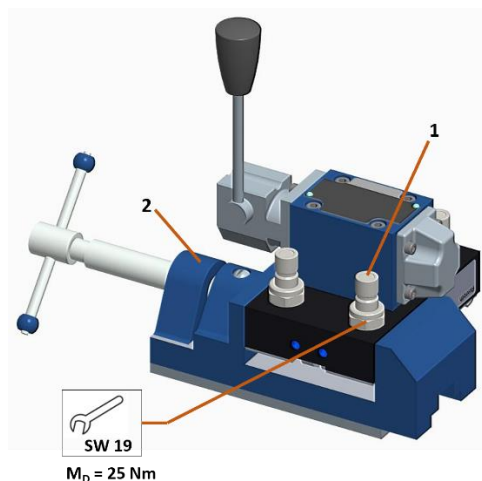
Fig.48: Handling the pressure unloading sleeve

13.1.2 Handling steps - Removing the coupling box / plug

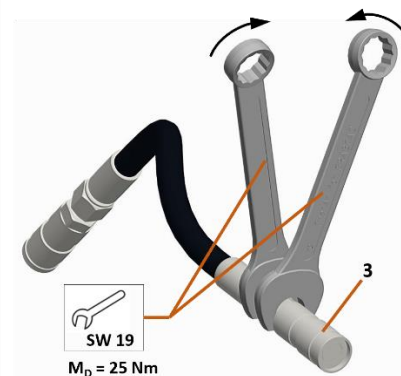
- ▶ To loosen the coupling plug, which is installed in a plate, it is recommended to first fix the component with a clamping device.
- ▶ Two open-end wrenches are used to loosen a coupling sleeve recommended with a wrench size of 19 mm. One of the two open-end wrenches is used as a counterholder.
- ▶ Loosen the blocked coupling plug / box with the open-end wrench.
- ▶ Unscrew the coupling plug / box 2 more turns.
- ▶ Check whether the coupling plug is now relieved. To do this, insert one Hydraulic hose assembly (e.g. R961002474) onto the coupling plug.
- ▶ Leave the hydraulic hose assembly coupled and turn the coupling plug hand-tight. The excess pressure fluid can flow into the hydraulic hose assembly.
- ▶ Disconnect the hydraulic hose assembly and turn the coupling plug with a tightening torque of 25 Nm.
- ▶ For coupling box: Couple the coupling box to be relieved after the loosen to one of the two tank connections (T1, T2) of the P/T/X manifold.
- ▶ Leave the coupling box coupled and tighten it hand-tight. The excess hydraulic fluid can flow into the tank connection of the P/T/X manifold.
- ▶ Uncouple the coupling box and turn the coupling box with the 25 Nm tightening torque.



Some hydraulic fluid may leak when loosening the coupling plug / box. Have appropriate cleaning wipes ready. Dispose of used cleaning cloths in accordance with country-specific regulations.



- 1 Coupling plug with residual pressure
- 2 Clamping device



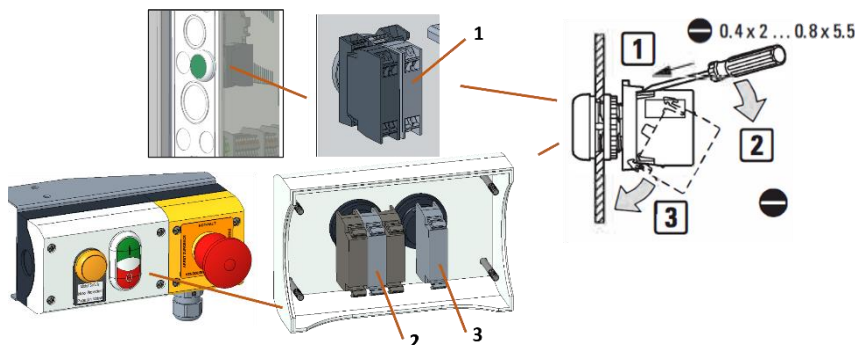
- 3 Coupling box with residual pressure

Fig.49: Loosen the coupling plug / box

13.1.3 Replacing defective LED elements

LED elements are installed on the control box and on the controls. These can be replaced in the event of an error. The power plug must be pulled out for work. The replacement must be carried out by a qualified electrician.

- ▶ Open the control box or control panel using a suitable tool.
- ▶ Remove the defective LED element as shown in the following illustration.
- ▶ Install the spare part, for an overview of spare parts see chapter 10.6.
- ▶ Reconnect the control box or control panel. Check the function.



- 1 LED element on the on/off switch
- 2 LED element on the I/O button
- 3 LED element on the indicator light

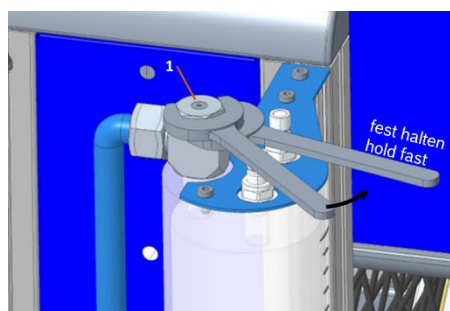
Fig.50: Replacing LED element

13.1.4 Replacing the ventilation valve on the measuring glass

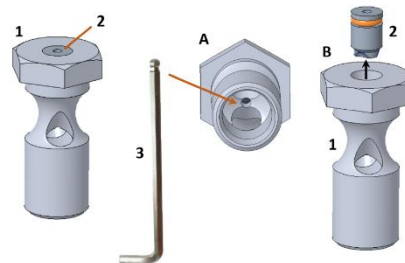
The ventilation valve is installed in the upper screw connection of the overflow pipe. This screw connection must first be dismantled for replacement or cleaning.

Proceed as follows:

- ▶ The ventilation valve is inserted into the fastening screw of the screw connection. First unscrew the fastening screw using a 27 mm open-end wrench. You will need a 32 mm open-end wrench to hold it.
- ▶ A hexagonal wrench (wrench size 2.5 mm) is recommended for removing the valve. Insert the longer part of the hexagon wrench into the connecting hole of the fastening screw and then press the valve out.
- ▶ If the valve is just stuck together, you can clean it with a suitable cleaner (e.g. wash benzine). If that doesn't work, you will have to order a new valve, for replacement parts see Chapter 10.6 „Spare parts“.
- ▶ Installation is carried out in reverse order. First insert the valve into the fastening screw and then reinstall it.



- 1 Fixing screw
- 2 Ventilation valve
- 3 Hexagon wrench



- A Insert hexagon wrench
- B Press out the ventilation valve

Fig.51: Remove ventilation valve

14 Technical data

Table 18: Technical data for the product

Description		Unit	Value
Total weight without hydraulic fluid and equipment sets (varies depending on the equipment variant)		kg	270 bis 425*
Dimensions	Length	mm	1810
	Width	mm	800
	Height	mm	1950
Min. operating temperature		°C	+15
Max. operating temperature		°C	+55
Installation location		- - -	in weather-protected areas
Ambient temperature		°C	+5 bis +40
Max. relative humidity		%	90 bei 20 °C
Max. installation height		m	1000 a.s.l.
Hydraulic	max. Operating pressure Hydraulic unit	bar	50 (default)
	Security pressure Hydraulic unit	bar	70 (default)
	Standby pressure Hydraulic unit	bar	15 (default)
	max. System pressure Exercise set-ups	bar	120
	Tank volume	l	40
	Oil type (DIN 51524)		HLP VG22
	Purity level (ISO 4406)	Klasse	20/18/15
	Recommended hydraulic fluid		AVIA RSL 22
	Flow rate	l/min	6 (electr. connection var. 1) 8 (electr. connection var. 2)
Electrical connection variant 1	Voltage	V _{AC}	230
	Frequency	Hz	50 oder 60
	Power	kW	1,5
	Required power plug		Isolated ground receptacle (2P+PE, safeguard 16A)
			
Electrical connection variant 2	Voltage	V _{AC}	400
	Frequency	Hz	50
	Power	kW	2,2
	Required power plug		CEE-plug socket (5P, safeguard 16A)
			
A-weighted continuous sound pressure level (at the operator's workplace)		dB [A]	62

15 Appendix

15.1 Safety Data Sheet Avia Fluid RSL22

Safety Data Sheet according to REACH-Regulation (EC) 1907/2006 amended by regulation (EC) 2020/878 (DE)

AVIA FLUID RSL 22



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SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

AVIA FLUID RSL 22

1.2 Relevant identified uses of the substance or mixture and uses advised against

1.2.1 Relevant uses

Lubricant

1.2.2 Uses advised against

None known.

1.3 Details of the supplier of the safety data sheet

Company AVIA AG
Schmierstoffe
Grillparzerstrasse 8
81675 München / GERMANY
Phone +49 (0)89-455045-0
Fax +49 (0)89-455045-10
Homepage www.avia.de
E-mail datenblatt@avia.de

Address enquiries to

Technical information datenblatt@avia.de

Safety Data Sheet sdb@chemiebuero.de (No dispatch of safety data sheets)

Safety data sheets are available from the supplier.

1.4 Emergency telephone number

Advisory body +49 (0)89-19240 (24h) (English)

Company +49 (0)89-455045-0

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture [REGULATION (EC) No 1272/2008]

No classification.

2.2 Label elements

The product is required to be labelled in accordance with regulation CLP.

Hazard pictograms none

Signal word none

Hazard statements none

Special labelling EUH210 Safety data sheet available on request.

2.3 Other hazards

Human health dangers If swallowed or in the event of vomiting, risk of product entering the lungs.
Frequent persistent contact with the skin can cause skin irritation.

Environmental hazards Does not contain any PBT or vPvB substances.
Contains no ingredients with endocrine-disrupting properties.

Other hazards Further hazards were not determined with the current level of knowledge.

SECTION 3: Composition / Information on ingredients

3.1 Substances

not applicable

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3.2 Mixtures

The product is a mixture.

Range [%]	Substance
35 - <90	Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract)
	CAS: 64742-56-9, EINECS/ELINCS: 265-159-2, EU-INDEX: 649-469-00-9, Reg-No.: 01-2119480132-48-XXXX
	GHS/CLP: Asp. Tox. 1: H304

Comment on component parts

Contains less than 3% w/w DMSO-extract (only for mineral oils)
 Substances of Very High Concern - SVHC: substances are not contained or are below 0.1%.
 For full text of H-statements: see SECTION 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General information	Take off contaminated clothing and wash before reuse.
Inhalation	Ensure supply of fresh air. In the event of symptoms seek medical treatment.
Skin contact	When in contact with the skin, clean with soap and water. Consult a doctor if skin irritation persists.
Eye contact	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	Rinse out mouth and give plenty of water to drink. Do not induce vomiting. In the event of symptoms seek medical treatment.

4.2 Most important symptoms and effects, both acute and delayed

If swallowed or in the event of vomiting, risk of product entering the lungs.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media	Carbon dioxide. Dry powder. Foam.
Extinguishing media that must not be used	Full water jet.

5.2 Special hazards arising from the substance or mixture

In the event of fire the following can be released:
 Carbon monoxide (CO)
 Carbon dioxide (CO₂)
 Nitrogen oxides (NO_x).
 Sulphur oxides (SO_x).

5.3 Advice for firefighters

Use self-contained breathing apparatus.
 Fire residues and contaminated firefighting water must be disposed of in accordance within the local regulations.
 Cool containers at risk with water spray jet.

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

High risk of slipping due to leakage/spillage of product.
 Keep away from all sources of ignition.
 Use personal protective clothing.

6.2 Environmental precautions

Do not discharge into the drains/surface waters/groundwater.
 Prevent spread over a wide area (e.g. by containment or oil barriers).
 In case the product spills into drains/surface waters/groundwater, immediately inform the authorities.

6.3 Methods and material for containment and cleaning up

Take up with absorbent material (e.g. oil binder).
 Dispose of absorbed material in accordance within the regulations.

6.4 Reference to other sections

See SECTION 8+13

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Use only in well-ventilated areas.
 Avoid formation of oil dust.
 Keep away from all sources of ignition - Refrain from smoking.
 Vapours can form an explosive mixture with air.
 Wash hands before breaks and after work.
 Use barrier skin cream.
 Do not eat, drink, smoke or take drugs at work.

7.2 Conditions for safe storage, including any incompatibilities

Keep only in original container.
 Prevent penetration into the ground.
 Do not store together with oxidizing agents.
 Do not store together with food and animal food/diet.
 Keep container tightly closed.
 Protect from heat/overheating and from sun.
 Keep away from frost.

storage class (TRGS 510)

Storage class 10 (VCI)

7.3 Specific end use(s)

See product use, SECTION 1.2

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SECTION 8: Exposure controls / personal protection

8.1 Control parameters

Ingredients with occupational exposure limits to be monitored (DE)

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract)
CAS: 64742-56-9, EINECS/ELINCS: 265-159-2, EU-INDEX: 649-469-00-9, Reg-No.: 01-2119480132-48-XXXX
Exposure limit: 5 mg/m ³ , Ölnebel

Ingredients with occupational exposure limits to be monitored (EU)

not relevant

DNEL

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
Industrial, dermal, Long-term - systemic effects, 0,97 mg/kg bw/day
Industrial, inhalative, Long-term - local effects, 5,58 mg/m ³
Industrial, inhalative, Long-term - systemic effects, 2,73 mg/m ³
general population, oral, Long-term - systemic effects, 0,74 mg/kg bw/day

PNEC

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
oral (food), 9,33 mg/kg food

8.2 Exposure controls

Additional advice on system design	Ensure adequate ventilation on workstation. Measurement methods for taking workplace measurements must meet the performance requirements of DIN EN 482. For example, recommendations are given in the IFA's list of hazardous substances.
Eye protection	Safety glasses. (EN 166:2001)
Hand protection	>0,35mm Nitrile rubber, >240 min (EN 374-1/-2/-3). The details concerned are recommendations. Please contact the glove supplier for further information.
Skin protection	Oil-resistant protective clothing.
Other	Avoid contact with eyes and skin. Do not breathe vapour/spray.
Respiratory protection	In the event of occupational exposure limits being exceeded or of inadequate ventilation: wear appropriate respiratory protection. Short term: filter apparatus, combination filter A-P2. (DIN EN 14387)
Thermal hazards	not applicable
Delimitation and monitoring of the environmental exposition	Protect the environment by applying appropriate control measures to prevent or limit emissions.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	liquid
Form	liquid
Color	clear
Odor	characteristic
Odour threshold	not relevant
pH-value	not applicable
pH-value [1%]	not applicable
Boiling point [°C]	not determined
Flash point [°C]	208 - 224 (DIN ISO 2592)
Flammability	not determined
Lower explosion limit	not determined
Upper explosion limit	not determined
Oxidising properties	no
Vapour pressure/gas pressure [kPa]	not determined
Density [g/cm³]	0,873 (DIN 51757) (15 °C / 59,0 °F)
Relative density	not determined
Bulk density [kg/m³]	not applicable
Solubility in water	insoluble
Solubility other solvents	No information available.
Partition coefficient [n-octanol/water]	not determined
Kinematic viscosity	23,2 - 32,14 mm²/s (40°C) (DIN EN ISO 3104)
Relative vapour density	not relevant
Evaporation speed	not relevant
Melting point [°C]	not applicable
Auto-ignition temperature [°C]	not determined
Decomposition temperature [°C]	not determined
Particle characteristics	not applicable

9.2 Other information

Pour point: -27°C - -33°C (ASTM D 5985)

SECTION 10: Stability and reactivity

10.1 Reactivity

Reactions with oxidizing agents.

10.2 Chemical stability

Stable under normal ambient conditions (ambient temperature).

10.3 Possibility of hazardous reactions

No dangerous reactions known if used as directed.
 If product is heated above decomposition temperature toxic vapours may be released.

10.4 Conditions to avoid

See SECTION 7.2.

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10.5 Incompatible materials

Strong oxidizing agent.

10.6 Hazardous decomposition products

No dangerous reactions known if used as directed.
In the event of fire: See SECTION 5.

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SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute oral toxicity

Product
ATE-mix, oral, >2000 mg/kg bw
Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
LD50, oral, Rat, >5000 mg/kg bw (OECD 401)
NOAEL, oral, Rat, >1000 mg/kg bw (OECD 421)

Acute dermal toxicity

Product
ATE-mix, dermal, >2000 mg/kg bw
Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
LD50, dermal, Rabbit, >5000 mg/kg bw (OECD 403)
NOAEL, dermal, Rat, >2000 mg/kg bw (OECD 414)

Acute inhalational toxicity

Product
ATE-mix, inhalative, >20 mg/l
Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
LC50, inhalative, Rat, >5,53 mg/l air (OECD 403)

Serious eye damage/irritation

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

Skin corrosion/irritation

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

Respiratory or skin sensitisation

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

Specific target organ toxicity — single exposure

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

Specific target organ toxicity — repeated exposure

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
NOAEC, inhalative, Rat, 980 mg/m³, no adverse effect observed
LOAEL, oral, Rat, 125 mg/kg bw/day, adverse effect observed

Mutagenicity

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

Reproduction toxicity

Toxicological data of complete product are not available.
 Does not contain a relevant substance that meets the classification criteria.

- Fertility

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9

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NOAEL, oral, Rat, 1000 mg/kg bw/day, In vivo study, negativ

- Development

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
NOAEL, oral, Rat, 1000 mg/kg bw/day, In vivo study, negativ

Carcinogenicity	Toxicological data of complete product are not available. Does not contain a relevant substance that meets the classification criteria.
Aspiration hazard	Toxicological data of complete product are not available. Based on the available information, the classification criteria are not fulfilled.
General remarks	none The toxicity data listed pertaining to the ingredients are intended for those working in the medicinal professions, experts for occupational health and safety and toxicologists.

11.2 Information on other hazards

Endocrine disrupting properties	Contains no ingredients with endocrine-disrupting properties.
Other information	

SECTION 12: Ecological information

12.1 Toxicity

Substance
Distillates (petroleum), solvent-dewaxed light paraffinic (containing < 3% DMSO-extract), CAS: 64742-56-9
EL50, (24h), Daphnia magna, >10000 mg/l (OECD 202)
LL50, (96h), Pimephales promelas, >100 mg/l (OECD 203)
NOEL, (72h), Pseudokirchneriella subcapitata, >100 mg/l (OECD 201)
NOEL, (21d), Daphnia magna, 10 mg/l (OECD 211)

12.2 Persistence and degradability

Behaviour in environment compartments	not determined
Behaviour in sewage plant	not determined
Biological degradability	not determined The product is slightly soluble in water. It can be largely eliminated from the water by abiotic processes, e.g. mechanical separation.

12.3 Bioaccumulative potential

Accumulation in organisms is not expected.

12.4 Mobility in soil

Spillages may penetrate the soil causing ground water contamination.

12.5 Results of PBT and vPvB assessment

Based on all available information not to be classified as PBT or vPvB respectively.

12.6 Endocrine disrupting properties

Contains no ingredients with endocrine-disrupting properties.

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12.7 Other adverse effects

Ecological data of complete product are not available.
 The toxicity data pertaining to the ingredients were supplied by the manufacturers of raw materials.
 Do not discharge product unmonitored into the environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Waste material must be disposed of in accordance with the Directive on waste 2008/98/EC as well as other national and local regulations. It is not possible to determine a waste code for this product in accordance with the European Waste Catalogue (EWC) since it is only possible to classify it according to how it is used by the customer. The waste code is to be determined within the EU in liaison with the waste-disposal operator.

Product

Disposal in an incineration plant in accordance with the regulations of the local authorities.
 In according to RoHS!

Waste no. (recommended)

130110*

Contaminated packaging

Uncontaminated packaging may be taken for recycling.
 Uncontaminated packaging may be reused.

Waste no. (recommended)

150110* packaging containing residues of or contaminated by hazardous substances
 150102
 150104

SECTION 14: Transport information

14.1 UN number or ID number

Transport by land according to ADR/RID not applicable

Inland navigation (ADN) not applicable

Marine transport in accordance with IMDG not applicable

Air transport in accordance with IATA not applicable

14.2 UN proper shipping name

Transport by land according to ADR/RID NO DANGEROUS GOODS

Inland navigation (ADN) NO DANGEROUS GOODS

Marine transport in accordance with IMDG NOT CLASSIFIED AS "DANGEROUS GOODS"

Air transport in accordance with IATA NOT CLASSIFIED AS "DANGEROUS GOODS"

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- 14.3
 Transport hazard class(es)
- Transport by land according to ADR/RID
 not applicable
- Inland navigation (ADN)
 not applicable
- Marine transport in accordance with IMDG
 not applicable
- Air transport in accordance with IATA
 not applicable

- 14.4
 Packing group
- Transport by land according to ADR/RID
 not applicable
- Inland navigation (ADN)
 not applicable
- Marine transport in accordance with IMDG
 not applicable
- Air transport in accordance with IATA
 not applicable

- 14.5
 Environmental hazards
- Transport by land according to ADR/RID
 no
- Inland navigation (ADN)
 no
- Marine transport in accordance with IMDG
 no
- Air transport in accordance with IATA
 no

- 14.6
 Special precautions for user
- Relevant information under SECTION 6 to 8.

- 14.7
 Maritime transport in bulk according to IMO instruments
- not applicable

Safety Data Sheet according to REACH-Regulation (EC) 1907/2006 amended by regulation (EC) 2020/878 (DE)
AVIA FLUID RSL 22



AVIA AG
81675 München

Date printed 15.05.2023, Revision 15.05.2023

Version 8.0. Supersedes version: 7.0 Page 11 / 12

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EEC-REGULATIONS	2008/98/EC 2000/532/EC; 2010/75/EU; 2004/42/EC; (EC) 648/2004; (EC) 1907/2006 (REACH); (EU) 1272/2008; 75/324/EEC ((EC) 2016/2037); (EU) 2020/878; (EU) 2016/131; (EU) 517/2014
- Annex XIV (REACH)	According to Annex XIV of Regulation (EC) 1907/2006 (REACH) the product does not contain any substances ≥ 0.1% that are subject to authorisation.
- Annex XVII (REACH)	According to Annex XVII of Regulation (EC) 1907/2006 (REACH) the product does not contain any substances ≥ 0.1% that are restricted.
TRANSPORT-REGULATIONS	ADR (2023); IMDG-Code (2023, 41. Amdt.); IATA-DGR (2023)
NATIONAL REGULATIONS (DE):	Hazardous Substances Ordinance - GefStoffV 2016; Detergent and Cleaning Agents Act - WRMG; Federal Water Act - WHG; Technical Rule for Hazardous Substances - TRGS: 200, 220, 615, 900, 905.
- Water hazard class	1, conf. AwSV, 18.04.2017
- Decree for case of interference, observe limits	no
- Class. according to TA-Luft	5.2.5.
Storage class (TRGS 510)	Storage class 10 (VCI)
- Observe employment restrictions for people	none
- VOC (2010/75/CE)	not relevant
- Other regulations	TRGS 510: Storage of hazardous substances in non-stationary containers

15.2 Chemical safety assessment

not applicable

SECTION 16: Other information

16.1 Hazard statements (SECTION 3)

H304 May be fatal if swallowed and enters airways.

Safety Data Sheet according to REACH-Regulation (EC) 1907/2006 amended by regulation (EC) 2020/878 (DE)
AVIA FLUID RSL 22



AVIA AG
81675 München

Date printed 15.05.2023, Revision 15.05.2023

Version 8.0. Supersedes version: 7.0

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16.2 Abbreviations and acronyms:

ADR = Accord européen relatif au transport international des marchandises Dangereuses par Route
 RID = Règlement concernant le transport international ferroviaire de marchandises dangereuses
 ADN = Accord européen relatif au transport international des marchandises dangereuses par voie de navigation intérieure
 ATE = acute toxicity estimate
 CAS = Chemical Abstracts Service
 CLP = Classification, Labelling and Packaging
 DMEL = Derived Minimum Effect Level
 DNEL = Derived No Effect Level
 EC50 = Median effective concentration
 ECB = European Chemicals Bureau
 EEC = European Economic Community
 EINECS = European Inventory of Existing Commercial Chemical Substances
 EL50 = Median effective loading
 ELINCS = European List of Notified Chemical Substances
 EmS = Emergency Schedules
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals
 IATA = International Air Transport Association
 IBC-Code = International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
 IC50 = Inhibition concentration, 50%
 IMDG = International Maritime Code for Dangerous Goods
 IUCLID = International Uniform Chemical Information Database
 IVIS = In vitro irritation score
 LC50 = Lethal concentration, 50%
 LD50 = Median lethal dose
 LC0 = lethal concentration, 0%
 LOAEL = lowest-observed-adverse-effect level
 LL50 = Median lethal loading
 LQ = Limited Quantities
 MARPOL = International Convention for the Prevention of Marine Pollution from Ships
 NOAEL = No Observed Adverse Effect Level
 NOEC = No Observed Effect Concentration
 PBT = Persistent, Bioaccumulative and Toxic substance
 PNEC = Predicted No-Effect Concentration
 REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals
 STP = Sewage Treatment Plant
 TLV®/TWA = Threshold limit value – time-weighted average
 TLV®STEL = Threshold limit value – short-time exposure limit
 VOC = Volatile Organic Compounds
 vPvB = very Persistent and very Bioaccumulative

16.3 Other information

Classification procedure

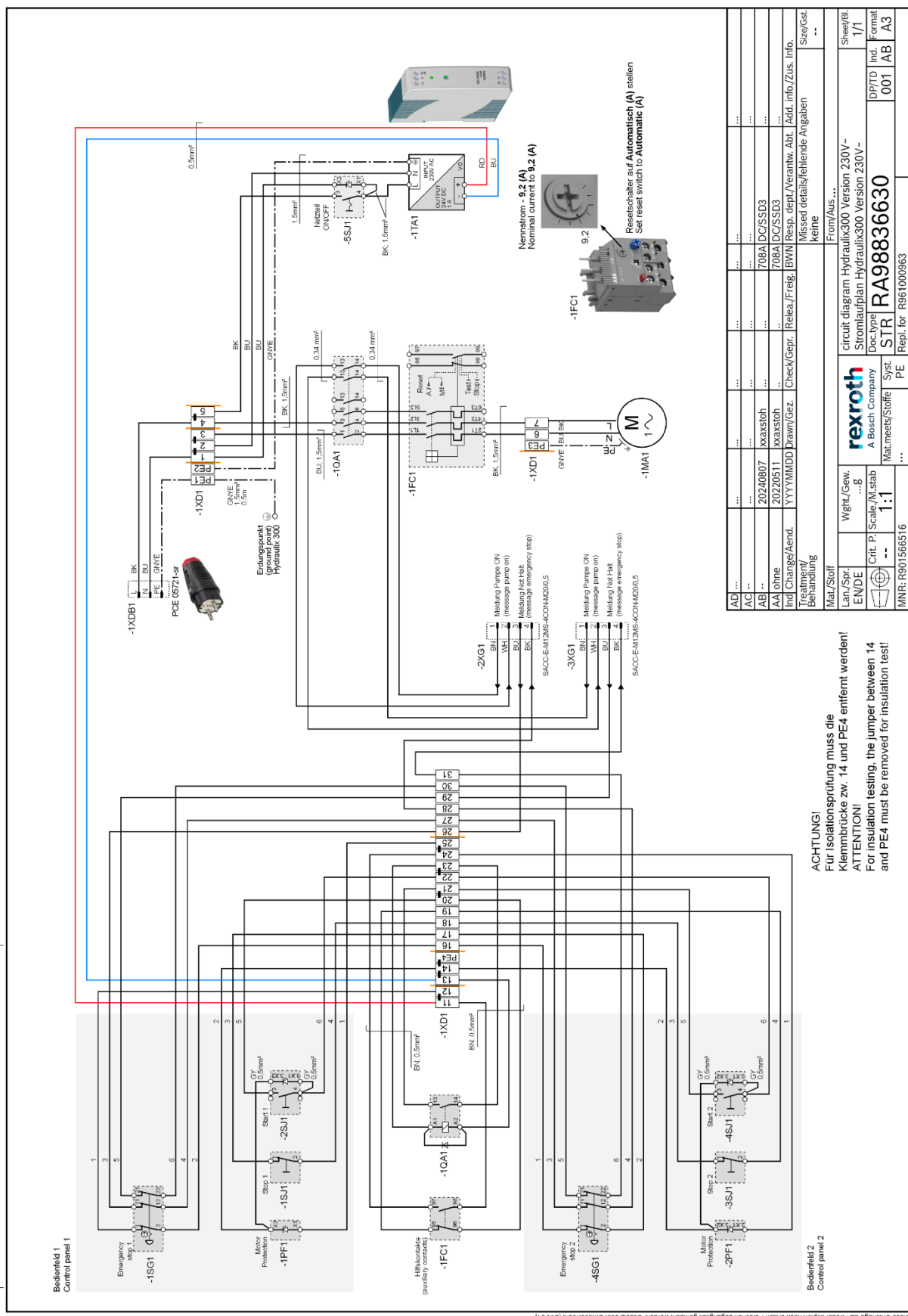
Modified position

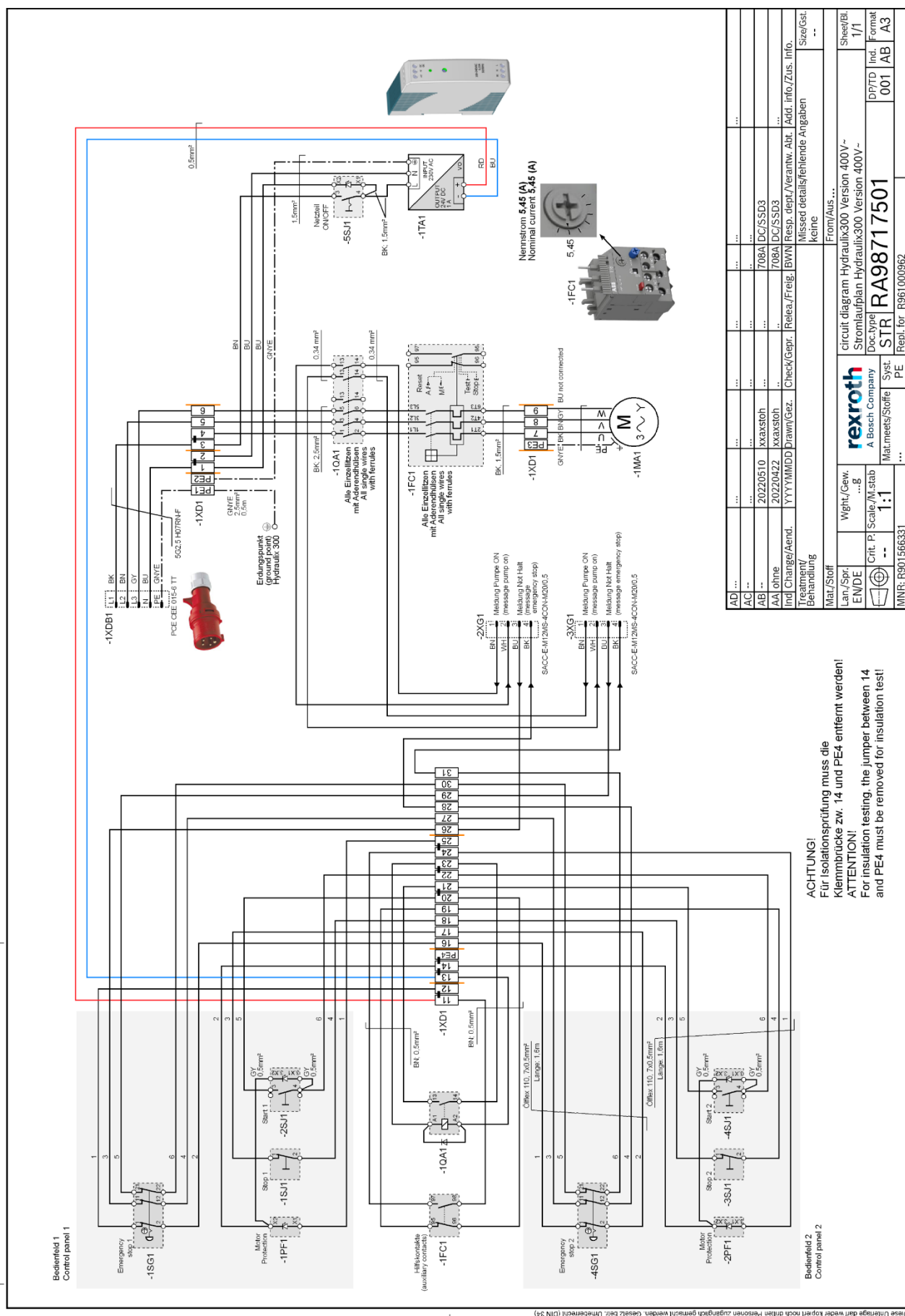
SECTION 4 been added: In the event of symptoms seek medical treatment.
 SECTION 4 deleted: Seek medical advice immediately.
 SECTION 4 been added: Rinse out mouth and give plenty of water to drink.
 SECTION 9 been added: not applicable
 SECTION 9 been added: clear

Copyright: Chemiebüro®

15.2 Electrical diagrams

15.2.1 Electrical diagram for 230V hydraulic power unit





15.3 Address book

15.3.1 Service und Support

If you have any questions about Bosch Rexroth components, our customer service helpdesk at the main plant in Lohr am Main will be happy to provide you with advice and assistance. Outside helpdesk hours, the service can be contacted directly via the Germany service hotline.

	Helpdesk	Service-Hotline World
Time	Mo.-Fr.: 7-18 Uhr	Outside Germany, please first contact our nearest contact person. You can find the hotline number at the sales addresses on the Internet.
Phone	+49 (0) 9352 40 50 60	
E-Mail	service.svc@boschrexroth.de	
Internet	https://www.boschrexroth.com/de/de/service/ Here you will also find additional information about service and repairs (e.g. delivery addresses).	

Preparation of information

For quick and efficient support, please provide us with the following information:

- Detailed description of the fault and conditions.
- Information on the type plate of the concerned products, particularly type codes and serial numbers.
- Contact phone / fax numbers and e-mail address in case of any open questions.

15.3.2 Contacts for product support and repair

If you need any support for commissioning of your training system, please contact your sales representative or the following contact. Your request will be forwarded directly to the competent position.

Bosch Rexroth AG

Bosch Rexroth Academy
 Unterdürrbacher Str. 10
 97080 Würzburg
 Deutschland
 Telefon: +49 (9352) 18-1920
 E-Mail: training@boschrexroth.de
<http://www.boschrexroth.de/training>

Or the respective responsible sales companies. Addresses can be found on the Internet at:

<http://www.boschrexroth.com>

15.4
Declaration of conformity



EU-Konformitätserklärung - Original
EC declaration of conformity

Dok.-Nr. / Doc. No.: DCA-DE000131
Datum / Date: 09.2024

- ☒ nach Maschinenrichtlinie 2006/42/EG / in accordance with Machinery Directive 2006/42/EC
- ☐ nach Niederspannungsrichtlinie 2014/35/EU / in accordance with Low Voltage Directive 2014/35/EU
- ☐ nach EMV-Richtlinie 2014/30/EU / in accordance with EMC Directive 2014/30/EU
- ☐ nach Druckgeräte-Richtlinie 2014/68/EU / in accordance with Pressure Equipment Directive 2014/68/EU
- ☐ nach ATEX-Richtlinie 2014/34/EU / in accordance with ATEX Directive 2014/34/EU
- ☒ nach RoHS-Richtlinie 2011/65/EU / in accordance with RoHS Directive 2011/65/EU

Hiermit erklärt der Hersteller, / The manufacturer
Bosch Rexroth AG, Unterdürnbacher Straße 10, 97080 Würzburg (GERMANY)

dass das nachstehende Produkt / hereby declares that the product below

Bezeichnung / Name: Trainingssystem Hydraulix 300 / Training system Hydraulix 300
Funktion / Function: Schulungsgerät / Training Equipment
Modell / Model: -
Typ / Type: Arbeitsstation TS-HX300-1X / Workstation TS-HX300-1X
Materialnummer / Material number: R901595038,R901595043,R901595045,R901595051,R901595054,R901595055,
Handelsbezeichnung / Trade name: -
Baujahr / Year of construction: ab 2024 / from 2024

in Übereinstimmung mit oben genannte(n) Richtlinie(n) entwickelt, konstruiert und gefertigt wurde. / was developed, designed and manufactured in compliance with the above-mentioned directive(s).

Die alleinige Verantwortung für die Ausstellung dieser EU-Konformitätserklärung trägt der Hersteller. / This EC declaration of conformity is issued under the sole responsibility of the manufacturer.

Angewandte harmonisierte Normen / Harmonized Standards applied:

Norm / Standard	Titel / Name	Ausgabe / Issue
EN ISO 12100:2010	Sicherheit von Maschinen – Allgemeine Gestaltungsleitsätze – Risikobeurteilung und Risikominderung /Safety of machinery - General principles for design - Risk assessment and risk reduction	2011-03
EN ISO 4413:2010	Fluidtechnik –Allgemeine Regeln und sicherheitstechnische Anforderungen an Hydraulikanlagen und deren Bauteile / Hydraulic fluid power - General rules and safety requirements for systems and their component	2011-04
EN ISO 20607:2019	Sicherheit von Maschinen – Betriebsanleitung – Allgemeine Gestaltungsgrundsätze / Safety of machinery – Instruction handbook - General drafting principles	2019-10
EN 60204-1:2018	Sicherheit von Maschinen –Elektrische Ausrüstung von Maschinen – Teil 1: Allgemeine Anforderungen / Safety of machinery – Electrical equipment of machines - Part 1: General requirements	2019-06
DIN EN IEC 63000	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe / Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances	2019-05

Weitere Erläuterungen / Further explanations:

Die Montage- und Installationshinweise gemäß Produktdokumentation sind zu beachten. / The assembling and installation instructions according to the manual have to be followed.
Die CE-Kennzeichnung gilt nur für das Gerät im Auslieferungszustand. Nach Veränderungen am Gerät muss die CE-Konformität überprüft werden. / The CE marking only applies to the appliance as delivered. After modifications to the device, CE conformity must be checked.

Ort / Place , Datum / Date , i.V. , i.V. , i.V.
Leiter / Head (Name, Abt.) Leiter / Head (Name, Abt.)

Änderungen im Inhalt der EU-Konformitätserklärung sind vorbehalten. Derzeit gültige Ausgabe auf Anfrage.

16 Service manual

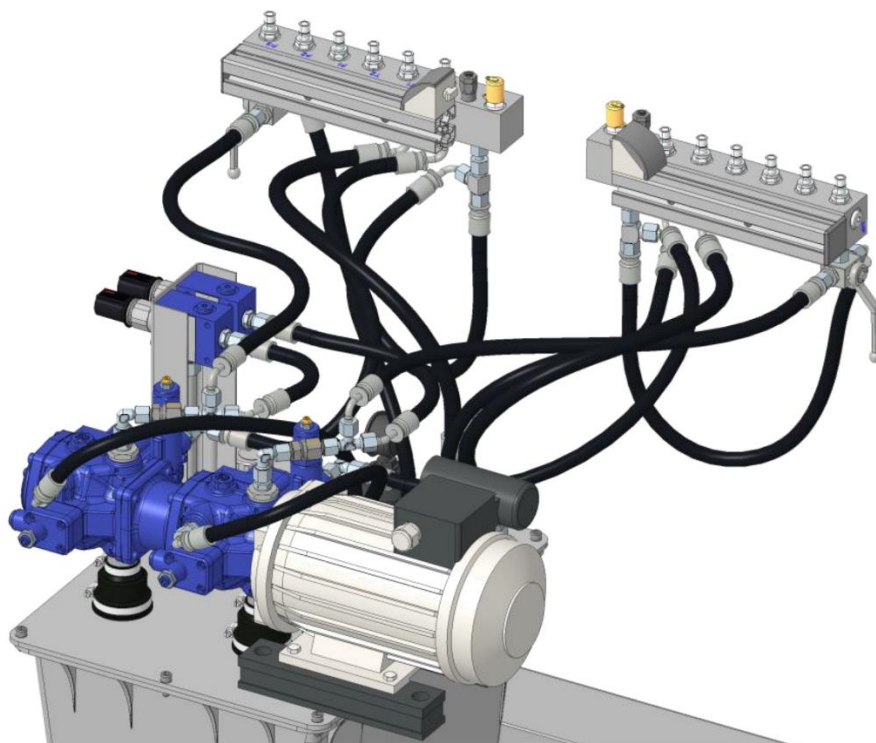
rexroth
A Bosch Company

Hydraulix 300 Unit

RB14377131/05.24

Ersetzt:
english

Adjustment instructions



The data provided are used to describe the product and do not release the user from his own assessments and tests. Our products are subject to a natural wear and aging process.

©All rights at Bosch Rexroth AG, including in the case of applications for intellectual property rights, any power of disposition, such as the right to copy and transfer, with us.

An example configuration is shown on the front page, so the delivered product may differ from the picture.

Original setting instructions

Hydraulix 300 unit RB14377131/05.24	Bosch Rexroth AG	3/16
	Inhalt	

Inhalt

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Purpose

1 Purpose

This manual describes the basic setting of the hydraulic unit of the Hydraulix 300 workstation.

The hydraulic unit of the work station is available in 2 performance classes, 1.5 kW (230 V) and 2.2 kW (400 V). Due to the different power classes, the set value of the volume flow differs.

The 2.2 kW variant is set to the higher value - 8 l/min and the 1.5 kW variant to 6 l/min.

Attention! For the correct adjustment of the unit, it is necessary to work through all adjustment steps in sequence. This applies even if a setting value would already be suitable.

2 Scope of application

This manual applies to the basic setting of the hydraulic units of the Hydraulix 300 (former designation WS290 or DS4).

The hydraulic units are already preset at the factory. This instruction should be used for checking and, if necessary, readjusting the basic setting.

3 Qualification of the staff

The activities described in this manual require basic knowledge of mechanics and hydraulics as well as knowledge of the associated technical terms. Therefore, in order to ensure safe use, these activities may only be carried out by an appropriate professional or an instructed person under the guidance of a professional.

A specialist is a person who, on the basis of his or her professional training, knowledge and experience and knowledge of the relevant provisions, assesses the work entrusted to him identify potential hazards and take appropriate security measures. A specialist must comply with the relevant technical rules and have the necessary hydraulic expertise.

4 General safety instructions

- Observe the applicable regulations for accident prevention and environmental protection.
- Observe the safety regulations and regulations of the country in which the product is used/applied.
- Use Rexroth products only in perfect technical condition.
- Follow all instructions on the product.
- Persons who work with this setting instruction must not be under the influence of alcohol, other drugs or drugs that affect the responsiveness.
- Use only accessories and spare parts approved by the manufacturer to exclude personal hazards due to unsuitable spare parts.
- Comply with the technical data and environmental conditions specified in the product documentation.

Product data sheet of the installed vane pump:

RE 10515, Adjustable vane pump, pilot operated, type PV7

Type key: PV7-1X/10-14RE01MN0-16

5 Abbreviations

This documentation uses the following abbreviations:

Abbreviation	Meaning
PRV	Pressure relief valve
CH	Measuring channel
SW	Width across flats

6 Necessary work equipment

Digital measuring equipment is required to measure the pressure and volume flow. The use of a mechanical pressure gauge is unsuitable due to the inaccuracy of the measuring instrument. It is also not recommended to use the measuring glass of the Hydraulix 300 to determine the volume flow.

Table with necessary work equipment from the Bosch Rexroth e-Store

Material number	Number	Designation
R961002474	3 (6)	HOSE ASSEMBLY TS-HC-ZN10031-08-W00NN-630
R961004332	1	HOSE ASSEMBLY TS-HC-ZN10031-08-W90NN-700
R961002520	1 (2)	PRESSURE RELIEF VALVE TS-HC-DBDH 6 G1X/100
Measuring equipment		
R961002508	1	FLOW METER TS-HC-GFM 3843-03-S-3
R913038909	1	MEASURING DEVICE SET 3020A-PP-17-17 (includes 2 pressure sensors, 1 measuring device, measuring cable)

Values in brackets apply to double-sided workstations (with 2 pumps and 2 P/T/X manifolds).

Notice Digital measuring devices from other manufacturers can also be used to measure the pressure and volume flow. The accuracy of these measuring instruments should be within the scope of the following values:

- Accuracy in volume flow measurement $\pm 0.3\%$ of the measured value
- Accuracy in pressure measurement 0.2% FS (measuring range 250 bar)

Notice The following tools are required to open the lock nuts and adjust the adjusting screws:

- Hexagon socket screw key 3 mm
- Hexagon socket screw key 5 mm
- Hexagon socket screw key 6 mm
- Open-end wrench SW 13 mm
- Open-end wrench SW 17 mm
- Open-end wrench SW 19 mm

The following tools are required for noise optimization:

- Hexagon socket screw key 8 mm
- Open-end wrench SW 24 mm

7 Connection measurement

Both the flow meter (R961002508) and the pressure sensors included in the set of measuring instruments (R913038909) are equipped with an ISDS identifier. When using sensors with ISDS identification, the meter automatically detects the connected sensors during power-on and takes over all parameters, such as measuring range, unit of measurement, calibration value, etc. This prevents sensor confusion and eliminates the need to manually enter a large amount of data. The following picture shows components of the measuring set R913038909.



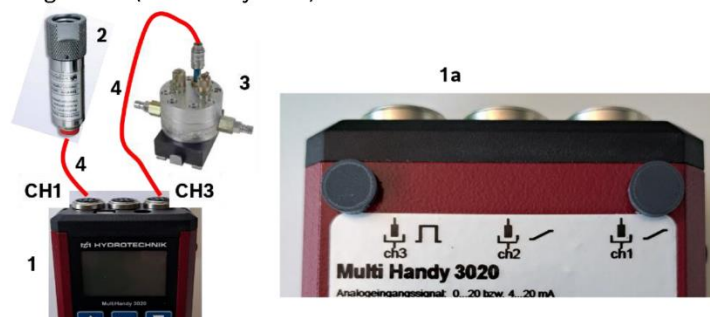
- | | | | |
|---|------------------------------------|---|--|
| 1 | 2x measuring cable for ISDS | 4 | Power supply unit with country adapter |
| 2 | Measuring device (MultiHandy 3020) | 5 | 2x Minimes direct connections adapter (typ 1620) for connection to pressure sensor |
| 3 | 2x pressure sensors 250 bar | | |

The P/T/X manifold of the workstation is equipped with a mini measuring connection for measuring the system pressure.

The mini measuring direct connection adapter, included in the set of measuring instruments, must be mounted on the pressure sensor before use at the workstation (see figure).



The following picture shows the electrical connection diagram of the sensors to the measuring device (MultiHandy 3020).



- | | | | |
|----|--|---|-------------------------------|
| 1 | MultiHandy 3020 | 3 | Flow meter -> Frequency (CH3) |
| 1a | Rear view MultiHandy 3020 with channel marking | 4 | 2x measuring cable ISDS |
| 2 | Pressure sensor -> analog (CH1) | | |

8 Adjustment steps

8.1 Setting step 1 - Check oil level and vent system

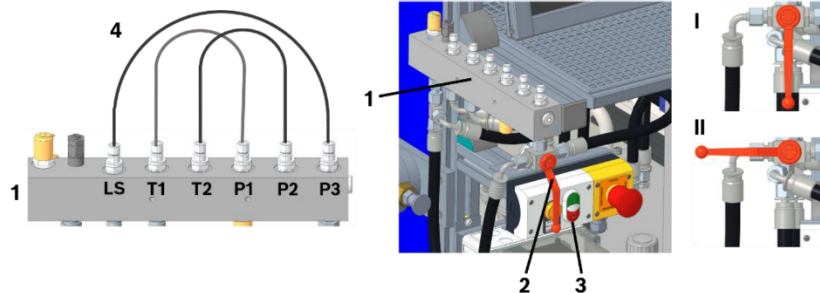
Before setting, the oil level must be checked and the tank should be filled until the level indicator is filled. If not, it must be refilled. The oil type for filling and refilling can be found in the technical data of the operating instructions of the workstation. For venting, the following hose assemblies must be plugged into the P/T/X manifold: P1->T1, P2->T2 and P3->LS

Notice For double-sided workstations with 2 workplaces, the second P/T/X manifold must also be equipped.

Then open the ball valve on the P/T/X manifold (for double-sided workstations, open both ball valves), for this purpose bring the lever in the horizontal position.

Then turn on the hydraulic unit and run for 1-2 minutes.

After the time, close ball valves (vertical position), switch off the hydraulic unit and dismantle the hose assemblies.



- | | |
|---------------------------------|---|
| 1 P/T/X Manifold | 4 3x Hose assemblies length 630 mm (R961002474) |
| 2 Ball valve | I Position Ball valve closed |
| 3 I / O Switch, start hydr.unit | II Position Ball valve open |

8.2 Setting step 2 - Heating the hydraulic unit

Due to the heating of the hydraulic unit during operation and related changes, including the viscosity, it is necessary to adjust the hydraulic unit even in the operating temperature state.

The unit is warmed up via a pressure relief valve (PRV) with a pressure value to be set according to the table.

Notice For double-sided workstations, a PRV must be plugged into each of the two P/T/X manifolds, this ensures even heating.

Table - pressure value

Hydraulix 300 Variant	Setting value PRV
2,2 kW (400 V)	30 bar $\pm 0,3$ bar
1,5 kW (230 V)	20 bar $\pm 0,3$ bar

Notice In order to achieve a pressure value greater than the LS preset value (15 bar), an additional connection between P3 and LS must be made on the P/T/X manifold. More Information can be found in operating instructions of the workstation.

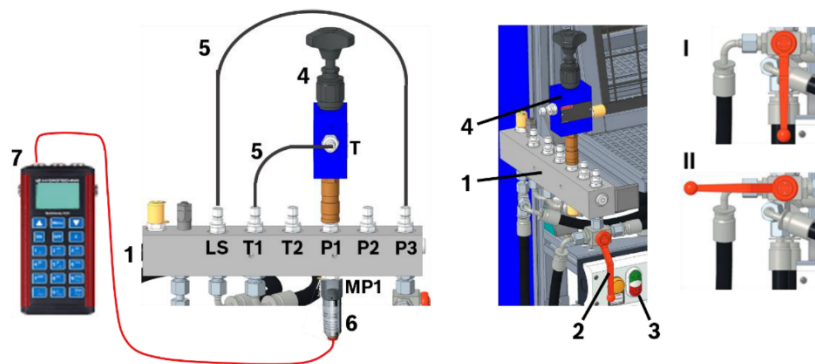
Adjustment steps

To detect the pressure value, the pressure sensor is connected to the measuring port MP1 (located on the bottom) of the P/T/X manifold. Then switch on the hydraulic unit, open the ball valve on the P/T/X manifold and set the pressure value on the PRV valve according to the table above.

Notice For both-sides workstations, the PRV must be adjusted one after the other.

For the adjustment of the second PRV, rebuild the pressure sensor to the second P/T/X manifold. Alternatively, the second pressure sensor (connection to measuring channel 1) from the measuring case can also be used here. If the PRV (in case of double-sided workstations, both PRV) is set according to the table, the hydraulic unit is heated for 20 to 30 minutes. The oil temperature in the tank should be about 28 to 30°C (view on the thermometer on the tank). When the temperature is reached, close ball valves (vertical position), switch off the hydraulic unit, remove the PRV and the hose assemblies.

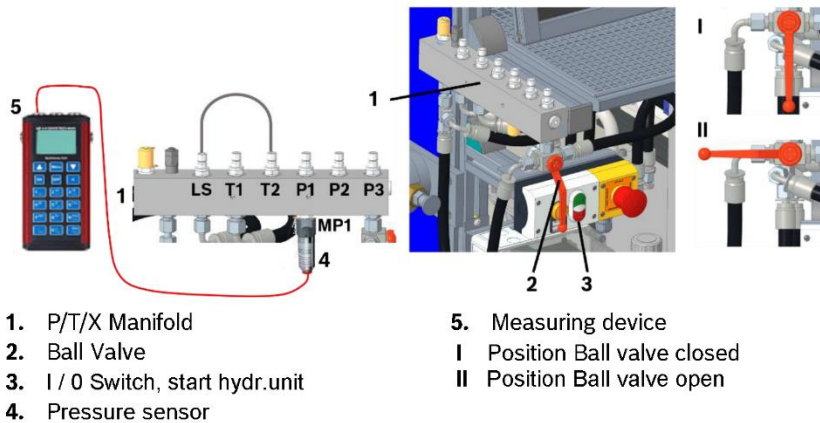
Notice The pressure sensor can be mounted on the P/T/X manifold for further settings.



- | | |
|--|------------------------------|
| 1. P/T/X Manifold | 6. Pressure sensor |
| 2. Ball Valve | 7. Measuring device |
| 3. I / O Switch, start hydr.unit | I Position Ball valve closed |
| 4. Pressure relief valve R961002520 | II Position Ball valve open |
| 5. 2x Hose assemblies length 630 mm (R961002474) | |

8.3 Setting step 3 - LS Check and set pressure

The **LS pressure** is preset to **15 bar (± 0.5 bar)** as default. This pressure can be measured at the P/T/X manifold on the measuring port MP1 (located on the bottom). For the measurement, it is important to relieve the LS connection by making a hose connection between the LS and T2. Then turn on the hydraulic unit and open the ball valve and read the value on the measuring device (for double-sided workstations, measure both sides).



Notice The pressure sensor can remain mounted on the P/T/X manifold for further settings.

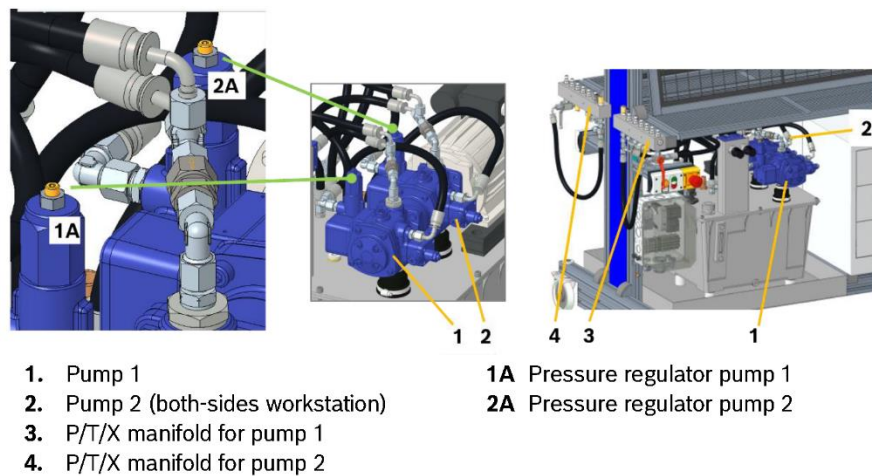
If the display value does not correspond to 15 bar (± 0.5 bar), the value must be reset on the pump.

The pressure regulator is located on the left side of the pump.

The adjusting spindle (SW 3) is secured with a lock nut (SW 13) and locking varnish. Loosening the lock nut also breaks the locking varnish.

To adjust the LS pressure, turn the adjustment spindle carefully while the hydraulic unit is running. Turning to the right (clockwise) increases the LS pressure and turning it to the left reduces it. If the measured value is suitable, the lock nut must be tightened again.

Notice Please note that tightening the lock nut can change the set value.



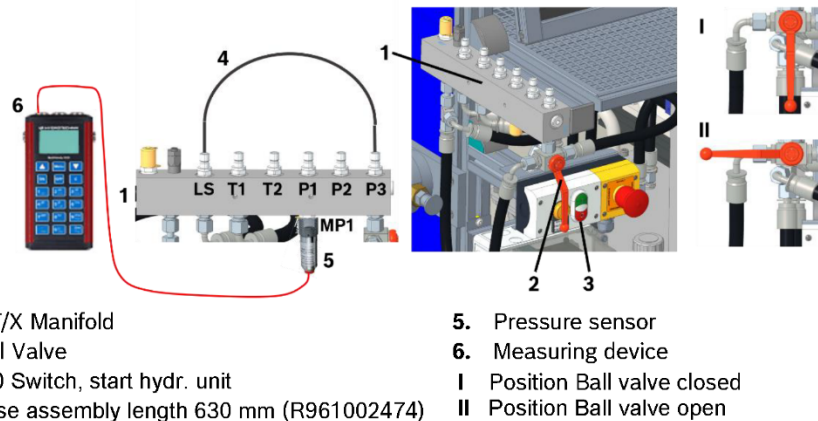
Adjustment steps

8.4 Setting step 4 - Check and set the max. operating pressure

The **maximum operating pressure** is preset to **50 bar (±0.5 bar)** as default.

This pressure can be measured at the P/T/X manifold on the measuring port MP1 (located on the bottom).

To do this, insert a hose assembly P3 -> LS, switch on the hydraulic unit and open the ball valve. Read the value on the measuring device (at double-sided workstations, plug the hose assemblies on both sides and measure the value).



Notice The pressure sensor can remain mounted on the P/T/X manifold for further settings.

If the displayed value does **not** correspond to 50 bar (±0.5 bar), the value must be reset on the pressure relief valve for LS.

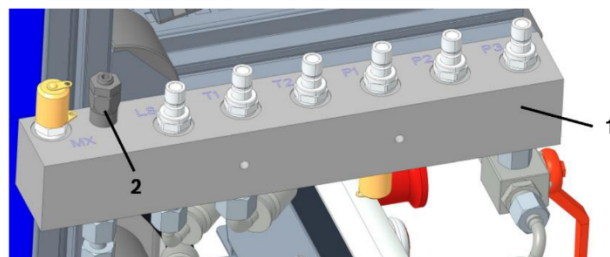
The pressure relief valve for LS is located on the top of the P/T/X manifold, directly next to the MX measuring port.

The adjusting spindle (SW 5) is secured with a lock nut (SW 17) and locking varnish. Loosening the lock nut also breaks up the locking varnish.

To adjust the pressure, carefully turn the adjusting spindle while the unit is running. Turning to the right (clockwise) increases the operating pressure and turning it to the left reduces the operating pressure. Always observe the measured value when making adjustments. If the measured value is correct, the lock nut must be tightened again.

Notice Please note that tightening the lock nut can change the set value

Attention! The maximum operating pressure must not be set higher than 50.5 bar. Otherwise, premature damage (overheating) to the electric motor may occur.



1. P/T/X Manifold 2. Pressure relief valve for LS

8.5 Setting step 5 Check and adjust max. volume flow

Depending on the hydraulic unit variant, the maximum volume flow is preset to a value according to the table.

If you measure the volume flow at the P/T/X manifold without a hydraulic load (e.g. PRV), it is usually higher than stated in the table.

Since the speed of asynchronous motors decreases under load and thus the volume flow, this must be set at a defined load.

This ensures that sufficient volume flow is available when carrying out the exercise.

The defined load is achieved by setting a PRV to a fixed pressure value (table).

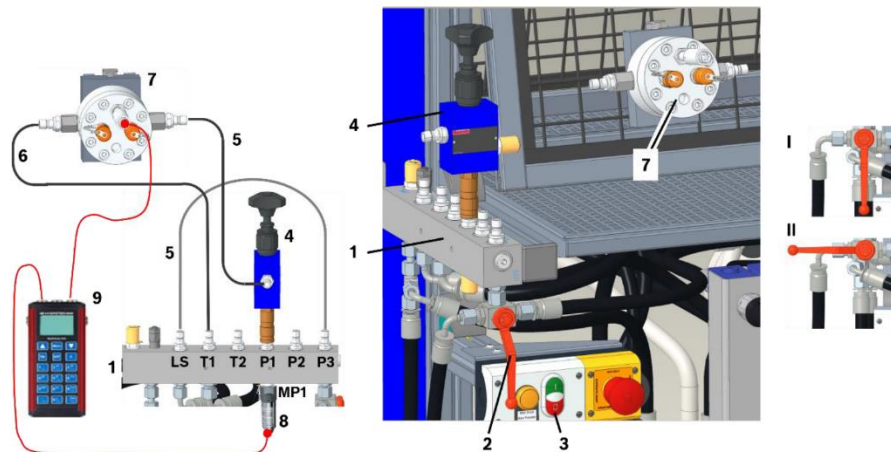
To do this, connect the PRV to P1 and the flow meter between the T connection of the PRV and the tank connection T1 of the P/T/X manifold.

Mount the pressure sensor on the measuring connection MP1.

Then switch on the hydraulic unit, open the ball valve on the P/T/X manifold, set the pressure value on the PRV according to the table, read the measured value for the volume flow and compare it with the value in the table.

For both-sided workstations, a PRV must be plugged into both P/T/X manifolds and set according to the table. Use the flow meter first for one side and then for the other.

Hydraulix 300 Variant	Setting value PRV	Setting value volume flow
2,2 kW (400 V)	30 bar $\pm 0,5$ bar	8 l/min $\pm 0,1$ l/min
1,5 kW (230 V)	20 bar $\pm 0,5$ bar	6 l/min $\pm 0,1$ l/min



- | | |
|--|------------------------------|
| 1. P/T/X Manifold | 7. Flow Meter (R961002508) |
| 2. Ball valve | 8. Pressure sensor |
| 3. I / O Switch, start hydr. unit | 9. Measuring device |
| 4. PRV R961002520 | I Position Ball valve closed |
| 5. 2x Hose assembly length 630 mm (R961002474) | II Position Ball valve open |
| 6. Hose ass. length 700 mm angled (R961004332) | |

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Hydraulix 300 Aggregat | RB14377131/05.24

Adjustment steps

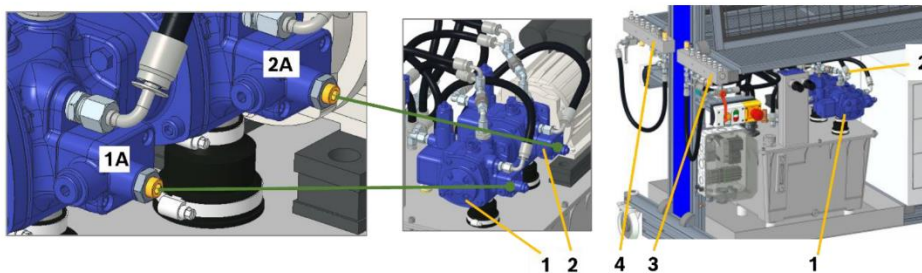
If the displayed value does not correspond to the table, the value must be reset on the pump.

The volume flow controller is located on the right side of the pump.

The adjusting spindle (SW 6) is secured with a lock nut (SW 19) and locking varnish. Loosening the lock nut also breaks up the locking varnish.

To adjust the volume flow, carefully turn the adjusting spindle while the unit is running. Turning to the right (clockwise) reduces the volume flow and increasing it when turning to the left. Always observe the measured value when making adjustments. If the measured value is correct, the lock nut must be tightened again.

Notice Please note that tightening the lock nut can change the set value



- 1. Pump 1
- 2. Pump 2 (both-sides workstation)
- 3. P/T/X manifold for pump 1
- 4. P/T/X manifold for pump 2

- 1A Volume flow controller pump 1
- 2A Volume flow controller pump 2

9 Optimize noise at the pump

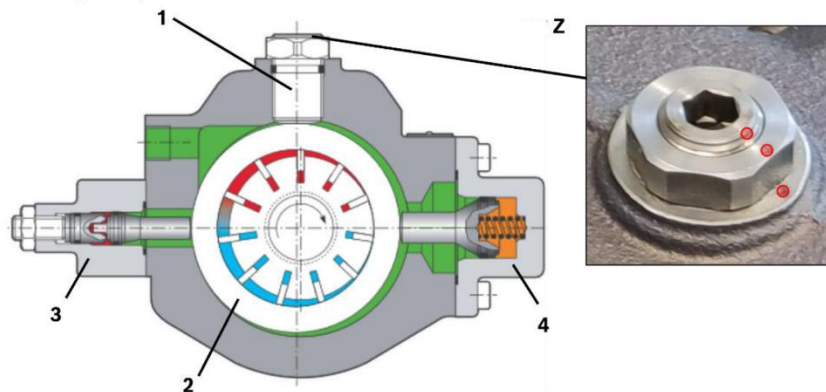
Attention! The noise level is not specified. This is a purely subjective feeling. The setting should only be made in exceptional cases, as changing the factory settings too much can destroy the pump. Be extremely sensitive when making the adjustment.

Notice To assess the noise, all background noise should be turned off. First bring the hydraulic unit to operating temperature after setting step 2. The noise setting is also carried out using the structure and the setting values from setting step 2.

Hydraulix 300 Variante	Setting value PRV
2,2 kW (400 V)	30 bar $\pm 0,3$ bar
1,5 kW (230 V)	20 bar $\pm 0,3$ bar

Pumps of type PV7 are already noise-optimized upon delivery. This is done by the height adjustment screw moving the stator ring into the best possible position and holding it there.

You can recognize the factory setting by the 3 markings on the housing, lock nut and height adjustment screw.



1. Height adjustment screw
2. Stator ring
3. Volume flow controller
4. Pressure regulator
(simplified presentation)

Z Detail view Markings on housing

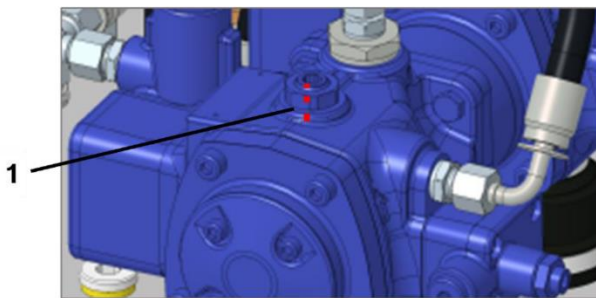
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Hydraulix 300 Aggregat | RB14377131/05.24

Optimize noise at the pump

The height adjustment screw is located on the top of the pump.
The adjusting screw (SW 8) is secured with a lock nut (SW 24). Loosen the lock nut.
With the power unit running, carefully turn the height adjustment screw to the left or right in small increments, paying attention to any changes in the noise.
It is recommended to adjust in increments of max. 45° and no more than 90°.
After adjustment, carefully tighten the lock nut again.
If possible, mark the new setting, e.g. with a waterproof pen.

Notice Adjusting the stator ring can also result in an adjustment of the volume flow. It is therefore necessary to measure the volume flow to be measured and readjusted if necessary, see setting step 5.



1. Mark with waterproof pen

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