Power Units

with two-hand operator console

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1 Description of the product

General Information

The power units of this series consist of a basic power unit with hydraulic control and an electric control with a two-hand operator console.

Hydraulics

The hydraulic control of the power units is adapted to the function safety of the two-hand operator console and the electric control.

The control is designed for double-acting cylinders.

A cylinder motion by the 4/3 directional control valve is only possible, if a solenoid is electrically controlled. In case of voltage drop the cylinder motion will be interrupted.

Electric control

The electric control is installed in a control box and attached to the power unit with a mounting frame.

Two-hand operator console

The two-hand operator console is required for fixtures and installations with dangerous applications, in order to keep hands from the effective area of the dangerous movement.

Both mushroom push-buttons have to be operated simultaneously within 0.5 seconds.

The basic housing of the two-hand operator console is made of plastics and equipped with two mush-room push-buttons and one emergency palm button.

The console is connected with a 3m long cable to the electric control.

NOTE

Acknowledgement button

If the emergency stop push-button is operated, the red acknowledgement button is lit and must be operated for acknowledgement after resetting/unlocking the push-button.

Secure the adjustment at the pressure switch

The pressure switch as per data sheet F9732 can be used for different tasks. It is set to a hydraulic pressure with its adjusting cap. After adjustment, the adjusting cap must be secured against unauthorised adjustment with the locking screw.

1.1 Description of the function

1.1.1 Functional description power unit

In data sheet D8.013, a basic distinction is made between the power units for 3 fixture types:

- Type 1, clamping fixture
- Type 2, clamping fixture with couplings
- Type 3, bending, die-cutting and stamping fixture

Clamping fixture (type 1 and type 2)

To trigger the clamping process, both mushroom push-button must be pressed simultaneously, then the green pilot light flashes.

The mushroom push-buttons must be pressed and held until the cylinder is extended and the green pilot light "Clamped" is permanently lit (permanent light).

NOTICE

Then the clamping pressure is monitored by a pressure switch and automatically increased.
The green pilot light flashes quickly (period 250 ms):
In clamped mode (intermittent cycling), the admissible lower pressure limit of 80% of the set nominal pressure was undershot.

When the system pressure has been reached, pressure switch B1 switches off the pump motor, and switches it on again, if pressure drops by more than 10%.
If the mushroom push-buttons are released while the cylinder is in motion, the cylinder stops.
Further extending or retracting of the cylinder is now possible by touch control of the two mushroom push-buttons or by the luminous push-button “Unclamping”.

Unclamping Variant a
For unclamping, the luminous push-button “Unclamping” must be pressed and held until the cylinder has reached the desired retracted position.

Unclamping Variant b
For unclamping, briefly press the luminous push-button “Unclamping”. The blue luminous push-button "Unclamped" is blinking. Now the mushroom push-buttons must be pressed and held until the cylinder reaches the desired retracted position.
By operating the luminous push-button again, the preselection “Unclamping” can be deactivated.

NOTICE

This power unit can be used for single-acting cylinders (connection A1). The unclamping line “B1” must be blindly closed (screw plug). The single-acting cylinder cannot be monitored hydraulically for the “retracted” position.
For this reason, both mushroom buttons must be pressed and held until the cylinder has been actually retracted.

For machine tool interlock, pressure switch B1 (Ou2) is set to 80% of the clamping pressure. This signal is available free of potential at the binders in the electric control and can be electrically controlled for linkages.

Clamping fixtures with coupling (type 2)
The function here is identical to clamping fixtures without couplings, but the power unit has the additional function of coupling or depressurising.
By an additional white luminous push-button “Depressurised” both cylinder ports are depressurised. This function is required if the clamping fixture has to be separated from the power unit by a coupling unit (see data sheet F9425).
Filter elements are screwed into the ports A + B filter elements.

Bending, die-cutting and stamping fixture (type 3)
Initial state:
Cylinder retracted, the green luminous push-button “Extend” is lit.
To extend the cylinder, both mushroom push-buttons must be pushed simultaneously. The mushroom push-buttons must be pressed and held until the cylinder is completely extended and retracted again.
After it is extended, the green signal lamp goes out, the valve is reversed, the white luminous push-button illuminates and the cylinder retracts again. The luminous push-buttons change again.
If the mushroom push-buttons are released during cylinder motion, the cylinder stops immediately.
The luminous push-button is lit, which indicates the direction in which the cylinder will move after renewed operation of the mushroom push-buttons.
If the direction has to be reversed, the other luminous push-button must be pressed.
The direction changes again each time it is pressed and is indicated by the green and white signal lamp.

For the oil control, a combined oil level and oil temperature control switch and an oil thermometer are installed in the reservoir.

Red pilot light “oil control/malfunction”
Oil control:
The combined oil level and oil temperature control switch immediately switches off the motor when triggered and the red pilot light in the control box illuminates.
A renewed function triggering is only possible after troubleshooting (cool down oil – refill oil).
After troubleshooting, the red pilot light flashes. To switch the electric control back on, the white “Control ON” button must be pressed twice.
If the red signal lamp flashes quickly (duration of 250 ms), the set nominal pressure was not reached and the motor running time was too long (>3 min.).

Technical characteristics: see technical data
V = 11 l,
Ports A1+B1: G3/8
Pressure medium HLP 22 or 32 (see hydraulic circuit diagram)

1.1.2 Description of the components

Description of the piston pump
The power unit generates a constant flow rate which is limited to an adjustable pressure.
The flow rate of the piston pump continues pressure build up until the adjusted value has been achieved.
The power unit may only be operated in a cycling mode or in unpressurised cycle.
If the set operating pressure is reached, the pump switches off or the unpressurised cycle switches on (valve will be deenergised).
If the operating pressure drops by more than 10%, the pump or the valve “unpressurised cycle” will be activated to supply oil.

Description of the gear pump
The gear pump of the power unit generates a constant flow rate which is limited to an adjustable pressure.
The power unit may only be operated in a cycling mode or in unpressurised cycle.
If the set operating pressure is reached, the pump switches off or the unpressurised cycle switches on (valve will be deenergised).
If the operating pressure drops by more than 10%, the pump or the valve “unpressurised cycle” will be activated to supply oil.

Pressure relief valve for system pressure
The pressure relief valve (DBV) is used to adjust the desired system pressure and to limit the pump pressure. It protects the system against overpressure generated by the pump.
The pressure relief valve is manually adjusted with the plastic wing screw.

Description of the high pressure filter

The reliability of a hydraulic system depends for the most part on the cleanness of the hydraulic fluids. It is the task of a high-pressure filter to clean the returning oil from fixtures, etc., which is contaminated (from piping, assembly dirt, etc.), before it will flow again through the hydraulic components of the system (valves, etc.). Thereby the contamination rate is reduced to a minimum, the individual elements are protected against premature wear and the reliability of the system is increased.

The oil filter is installed directly behind the pump in the pressure line of the power unit (see hydraulic circuit diagram). The filter is equipped with a bypass valve to avoid troubles of functioning in case of blocked filter pores.

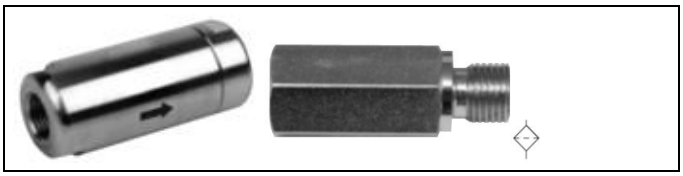
Through the bypass valve, unfiltered hydraulic fluid can enter into the system.

Description - Line filters

The filter elements are used to protect hydraulic elements against contaminations.

They are installed e.g. in front of valves, cylinders and intensifiers and avoid penetration of swarf and dirt praticles. Thereby the safety of functioning as well as the life are considerably increased.

Until the complete clogging of the filter insert, the filters are stable under max. operating pressure.



Oil control

For the oil control a combined oil level and oil temperature control is installed in the reservoir and a pilot light is installed in the door of the control box.

If the pilot light is lit, it signals that the oil temperature is too high or the oil level too low.

The motor switches off, function triggering is no longer possible.

Only after solving the cause and operating the button "hydraulic pump ON" the hydraulic power unit is ready for operation.

Figure 1: Oil control

Electronic pressure switch

The pressure switches offer a high degree of operating convenience.

All devices are provided with 2 switching contacts. While contact 1 is a freely programmable switching output, contact 2 can be selected as analogue output, switching output or alarm output.

By means of the membrane keyboard among other things the switching points and reverse switching points, the output logic as well as time delays can be programmed.

Teach-in function

For teaching, the desired switching as well as reverse switching points are calculated and saved by pressing the Enter/Set key of the system.

Thus, the adjustment of the pressure switch is completed and the pressure switch is ready for operation (RUN mode).

Application

The pressure switch has a 1/4 inch connection with external thread and can be used up to a pressure of 600 bar. The components of the sensor that are in contact with the medium are of stainless steel.

Fig. 1: Electronic pressure switch with TEACH-IN function

Piston pressure switch

Hydro-electric pressure switches in piston design convert the pressure in hydraulic systems into an electrical signal. The switching point can be continuously adjusted and locked by means of an adjusting knob within the adjusting range.

The installed micro switch is a change-over switch which can be connected as break or make contact.

General characteristics: see data sheet F9732

Figure 2: Piston pressure switch

Description - directional control valve ND6

Directional control valves with electromagnetic operation are used for leakage-free control of consumer elements.

These valves are spring-loaded cone poppet valves.

The closed directions of flow are hermetically tight.

Mounting plates are required to connect pipes. Any mounting position is possible.

Flow direction only in the direction of arrow as in symbol

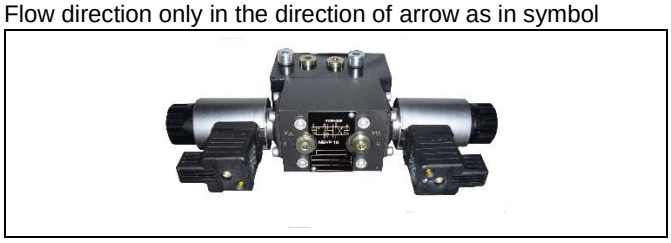


Figure 3: 4/3 directional control valve

1.2 Manually depressurise the system (manual emergency override of the directional control valves)

Emergency release of the directional control valves

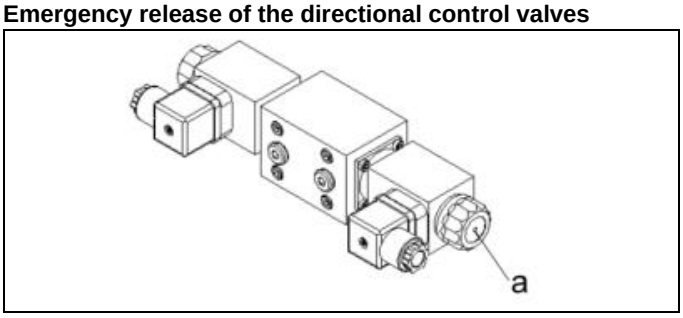


Figure 4: Emergency release (a)

Before working on the hydraulic system, the system must be depressurised. Proceed as follows:

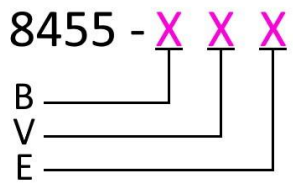
- Switch off main switch.
- Operate the manual emergency override of the directional control valves, in order to reduce the residual pressures.

Manual emergency override at the 4/3 directional control valve

- Push the tappet with a screwdriver or similar component through the bore hole in the brass cap.

2 Validity of the documentation

This documentation is valid for products with the following code for part numbers:



B = operating pressure
4 = 500 bar
5 = 250 bar
6 = 160 bar

V = fixture type
1 = clamping fixture
2 = clamping fixture with couplings
3 = bending, die-cutting and stamping fixture

E = unclamping function
7 = variant a (fixture types 1+2 only)
8 = variant b (fixture types 1+2 only)
9 = only possible with fixture type 3

3 Target group of this document

3.1 Operator

Tasks:
Operation in setting or automatic mode.

Qualification
No special requests, introduction on the basis of the operating instructions, danger instruction, minimum age 18 years.

3.2 Qualified personnel

Tasks:
Transport, installation, start up, setting mode, trouble shooting, putting out of service, checks, maintenance works.

- Specialists, fitters and set-up men of machines and installations with hydraulic expert knowledge.

- Specialists, fitters and set-up men of machines and installations with expert knowledge in electrical engineering.

Qualification of the personnel
Expert knowledge means that the personnel must

- be in the position to read and completely understand technical specifications such as circuit diagrams and product-specific drawing documents,
- have expert knowledge (electric, hydraulic, pneumatic knowledge, etc.) of function and design of the corresponding components.

An **expert** is somebody who has due to its professional education and experiences sufficient knowledge and is familiar with the relevant regulations so that he

- can judge the entrusted works,
- can recognize the possible dangers,
- can take the required measures to eliminate dangers,
- knows the acknowledged standards, rules and guidelines of the technology.
- has the required knowledge for repair and mounting.

3.3 Expert / qualified person

Tasks:
Maintenance and test of safety equipments.

Qualification
The specifications in the operating safety regulations (BetrSichV) after professional training and prompt professional activity are as follows:

- Technical professional training, e. g. as skilled worker,
- At least two years work experience,
- After classification of the dangerousness corresponding tests passed,
- Regular further training,
- Knowledge of relevant rules and standards (regulations, standards),
- Involvement in the handling of the corresponding products and regular test activities.

An expert / qualified person is a person who has sufficient knowledge in design, control and applications due to their professional education and experience:

- Safety devices as:
  - Two-hand control,
  - Safety light curtains and light grids

- Separating safety devices,
- etc.

- Hydraulic components as:
  - Safety-related parts of controls,
  - Hydraulic hoses,
  - Accumulators,
  - etc.
- Electric components as:
  - Safety-related parts of controls,
  - etc.
- Technical professional training, e. g. as skilled worker,
- etc.

and is familiar with the respective national work safety regulations, accident prevention directions, guidelines and generally accepted technical rules and regulations (e. g. DIN standards, VDE regulations, technical rules of other EC member states) so that he is in the position to judge the working safety and to carry out the delegated tasks.

4 Symbols and signal words

⚠ DANGER

Danger of life / heavy health damages

Stands for an imminent danger.
If it is not avoided, death or very severe injuries will result.

⚠ WARNING

Person damage

Stands for a possibly dangerous situation.
If it is not avoided, death or very severe injuries will result.

⚠ CAUTION

Easy injuries / property damage

Stands for a possibly dangerous situation.
If it is not avoided, minor injuries or material damages will result.

Hazardous to the environment

The symbol stands for important information for the proper handling with materials that are hazardous to the environment.
Ignoring these notes can lead to heavy damages to the environment.

Mandatory sign!

The symbol stands for important information, necessary protection equipment, etc.

NOTE

This symbol stands for tips for users or especially useful information. This is no signal word for a dangerous or harmful situation.

5 For your safety

5.1 Basic information

The operating instructions serve to information and avoidance of dangers for transport, operation and maintenance.
Only in strict compliance with these operating instructions, accidents and property damages can be avoided as well as trouble-free operation of the product can be guaranteed.
Furthermore, the consideration of the operating instructions will result in:

- avoid injuries
- reduced down times and repair costs,
- increased service life of the products.

6 Safety instructions

The product was manufactured in accordance with the generally accepted rules of the technology.
Observe the safety instructions and the operating instructions given in this manual, in order to avoid personal damage or material damage.

- Read these operating instructions thoroughly and completely, before you work with the product.
- Keep these operating instructions so that they are accessible to all users at any time.
- Pay attention to the current safety regulations, regulations for accident prevention and environmental protection of the country in which the product will be used.
- Use the ROEMHELD product only in perfect technical condition.
- Observe all notes on the product.
- Use only accessories and spare parts approved by the manufacturer in order to exclude danger to persons because of not suited spare parts.
- Respect the intended use.
- You only may start up the product, when it has been found that the incomplete machine or machine, in which the product shall be mounted, corresponds to the country-specific provisions, safety regulations and standards.
- Perform a risk analysis for the incomplete machine, or the machine.
  Due to the interactions between the product and the machine/fixture or the environment, risks may arise that only can be determined and minimized by the user, e.g. :
  - generated forces,
  - generated movements,
  - Influence of hydraulic and electrical control,
  - etc.

- For all work steps, pay attention to the use of personal protective equipment.

6.1 Personal protective equipment

For works at and with the product, wear safety goggles!

For works at and with the product, wear safety shoes!

For all works at the product, the operator has to make sure that the necessary protection equipment will be worn.

For works with operating fluids, pay attention to the safety data sheets!

6.2 Safety devices

The below safety devices are for the safety of the operators. As a matter of principle no safety devices may be detached, put out of action or modified.

Used safety devices

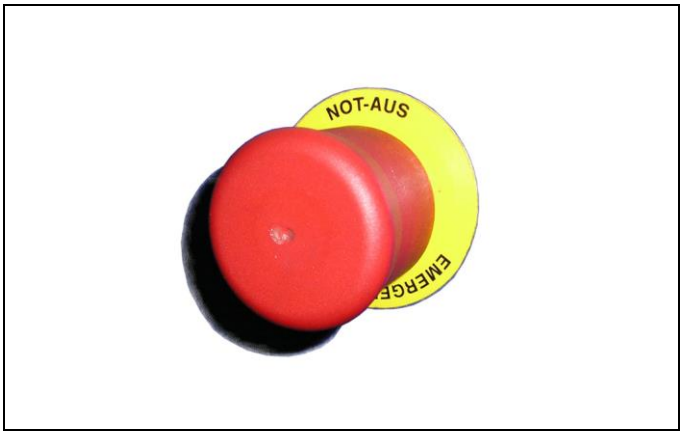


Figure 5: Safety device: Emergency switch (as per type)

Figure 6: Safety device: Main switch and emergency switch (according to the design)

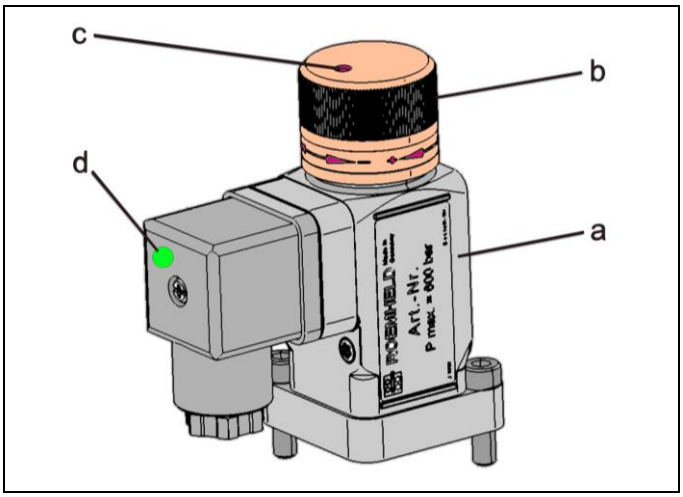


Figure 7: Safety device: secured pressure switch

α Pressure switch β Adjusting cap	c Locking screw with hexagon socket SW2 d Device plug with luminous diode

6.3 Used safety devices - signs

	Warning - voltage

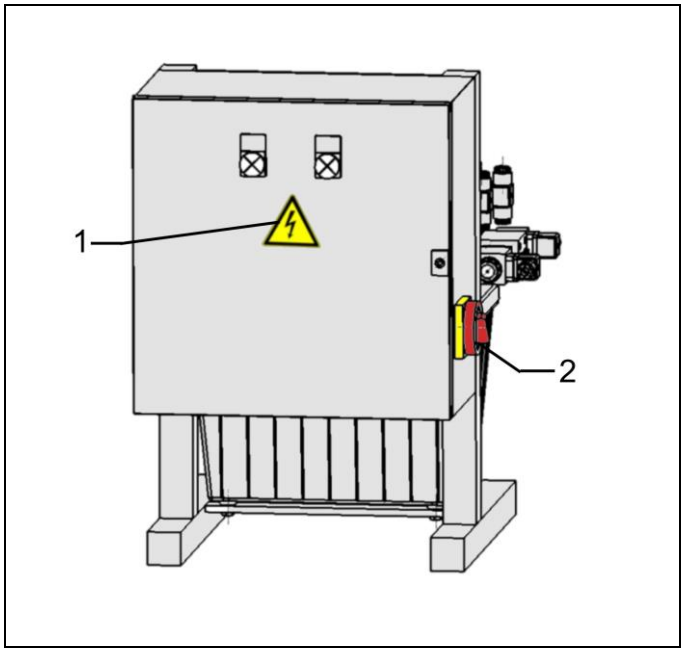


Figure 8: Positions of the safety devices, electric control

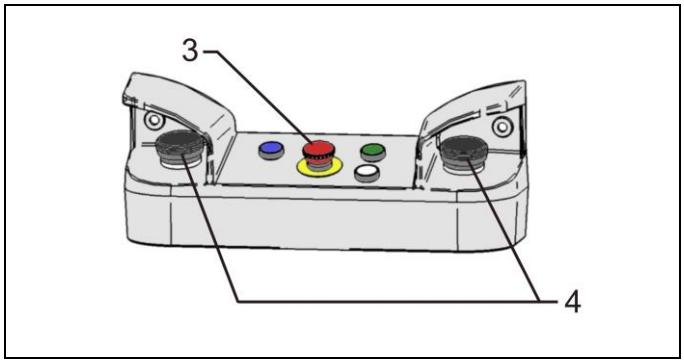


Figure 9: Positions of the safety devices, two-hand operator console (push-button as per type)

1 Warning - electrical voltage 2 Main and emergency stop switch	3 Emergency switch 4 Mushroom push-button two-hand operation

6.4 Check the safety devices

NOTE

Use the regulations

- To check the safety device use the check lists "General examination" and / or "Functional testing". Eliminate immediately recognised defects at the safety devices.

Testing intervals
- at the beginning of every shift
- once a week in case of continuous shift
- after each maintenance or repair

Testing content
- Function
- State and position

- Safe fixing

General examination

Covers	Number, available and undamaged
Screw plugs	Number, available and undamaged
Name plates with specifications	Number, available, readable and undamaged
Danger signs	Number, available and undamaged
Mandatory signs	Number, available and undamaged
Further safety devices available	available, undamaged and ready for operation
Testing date:	Tester (signature):

(Number see "Position of safety devices")

Functional test of the main switch and the emergency switch

Main switch	Switch on (switch position "1")
Main switch	Switch off (switch position "0")
Two-hand control, if available	Operate both mushroom push-buttons at the same time
Testing date:	Tester (signature):

6.5 Behaviour in an emergency

In case of an emergency:

- To operate the emergency stop switch.
- Turn the main switch and emergency switch to switching position "0".

7 Application

7.1 Intended use

The products are used to generate hydraulic pressure for industrial/commercial applications for bending or clamping workpieces and/or operating fixtures or hydraulic drives inside enclosed, low-dust rooms.

In addition, use in compliance with the intended purpose includes:

- Use within the capacity limits specified in the technical data (see data sheet).
- Use as described in this operating manual.
- Compliance with maintenance intervals.
- Qualified and trained personnel for the corresponding activities.
- Mounting of spare parts only with the same specifications as the original part.

7.2 Misapplication

⚠ WARNING

Injuries, material damages or malfunctions!

Modifications can lead to weakening of the components, reduction in strength or malfunctions.

- Do not modify the product!

The use of these products is not admitted:

- For domestic use.
- On pallets or machine tool tables in primary shaping and metal forming machine tools.
- In areas for which special guidelines apply, especially installations and machines:
  - For the use on fun fairs and in amusement parks.
  - In food processing or in areas with special hygiene regulations.
  - In mines.
  - In explosive and aggressive environments (e.g. ATEX).
- For other operating and environmental conditions.

8 Transport

⚠ WARNING

Injury due to overturning product!

Overturning product due to inappropriate means of transportation.

- Do not stand below the load during lifting and lowering, stay outside the danger zone.
- Use suitable means of transportation.
- Pay attention to the weight of the equipment.
- Pay attention that the product is safely located (centre of gravity see instruction sign).
- Wear suitable protective equipment (e.g. safety helmet, safety shoes).

Risk of injury during transport

Improper transport of the product can cause property damage or can injure people.

- Displace the product at the provided fixing points only with appropriate lifting equipment.

⚠ CAUTION

Injury by falling products!

- Do not lift the product on the motor.

The product is secured and delivered on a pallet for transport.
The product fixed on the pallet for transport may only be transported to the place of installation by means of a corresponding conveyor (pay attention to the min. lifting force).
Pay attention that the product is safely located on the hand-lift truck or fork lift truck.
The pallet must be lifted from the pallet by means of a conveyor. It is important to pay attention to the centre of gravity of the product

For works at and with the product, wear safety shoes!

8.1 Slings

The product is delivered secured on a pallet.

- Transport the pallet only with a hand-lift truck or a fork lift truck (min. lifting force – see weight indication in the technical data) to the installation site.
  Pay attention that the product is safely located on the hand-lift truck or fork lift truck.
- Attach a suitable lifting device (e.g. crane hangers) to the eye screws.
- Lift the product with the lifting device from the pallet and bring it to the installation position.
- Remove the eye screws.

When using slings, the product has to be lifted on all slings by an admissible crane pendant. Then the slings can be removed.

9 Installation

For works at and with the product, wear suitable protection equipment!

For works at and with the product, wear safety shoes!

⚠ CAUTION

Malfunctions!

Chips, coolants and cutting fluids can cause malfunctions.

- Protect the power units against penetration of chips, coolants and cutting fluids!

The power unit has to be mounted in upright position, if possible above the installation or fixture.
If the power unit will be installed below the fixture, an air bleeding possibility has to be provided at the highest point of the installation.

- Install the power unit at an appropriate place.
- If required mount at the provided holes / plates at the bottom of the reservoir (see chapter Overview of components).

9.1 Place of installation

Select the place of installation so that for the required cleaning and maintenance, all around a clearance of at least 700 mm is maintained.

9.2 Climate at the place of installation

The products are designed for a moderate climate zone.
In places with difficult (problematic) environmental conditions, e.g.

- high or low environmental temperatures,
- high humidity,
- etc.

pay attention to the indications of the technical characteristics.

The ideal location should be

- good visible,
- ventilated,
- clean,
- and dry.

9.3 Environment conditions at the place of installation

In an environment with high risk of contamination, for example

- dust
- swarf
- coolants
- humidity (see environment)
- or the like

a protective housing has to be provided.

9.4 Fixing of the product

The following figure show the fixing points for floor mounting.

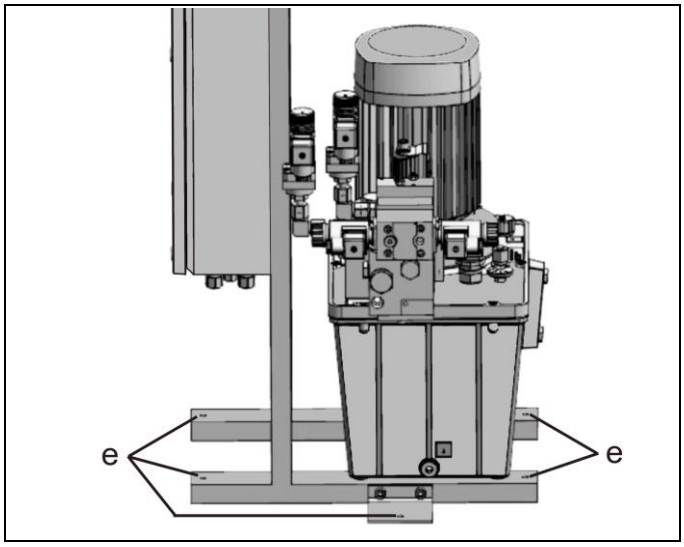


Fig. 10: Power unit V11, with electric control

e	Mounting holes 9 mm

9.5 Overview of components

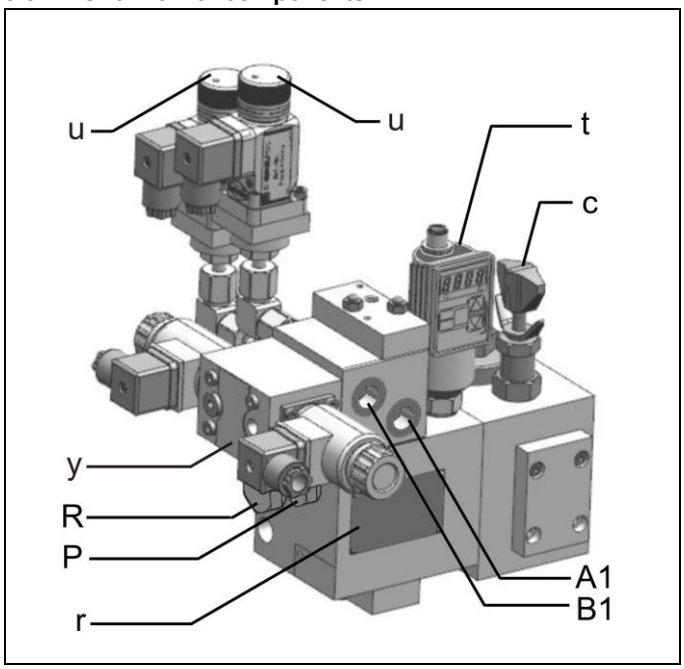


Figure 11: photo of the hydraulic control

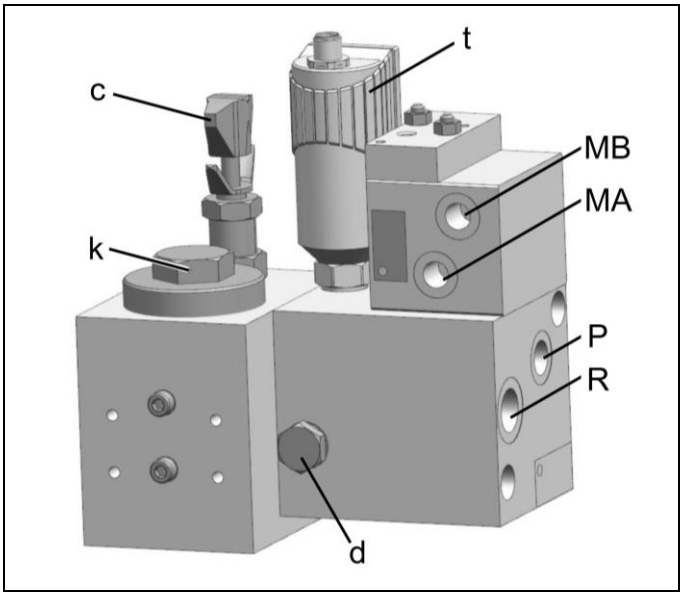


Figure 12: photo of the connecting block and the ports

c Pressure relief valve for system pressure d System check valve k Maintenance cover of the pressure filter r Name plate	t Electronic pressure switch with display to indicate the system pressure u Piston pressure switch for machine tool interlock/function sequence y 4/3 directional control valve

Port	Function
A1	Port for consumer element G3/8 extend
B1	Port for consumer element G1/8 retract
MA	Port for pressure switch G1/4
MI	Port for pressure switch G1/4
P	Port for system pressure G3/8
R	Port for oil return G1/2

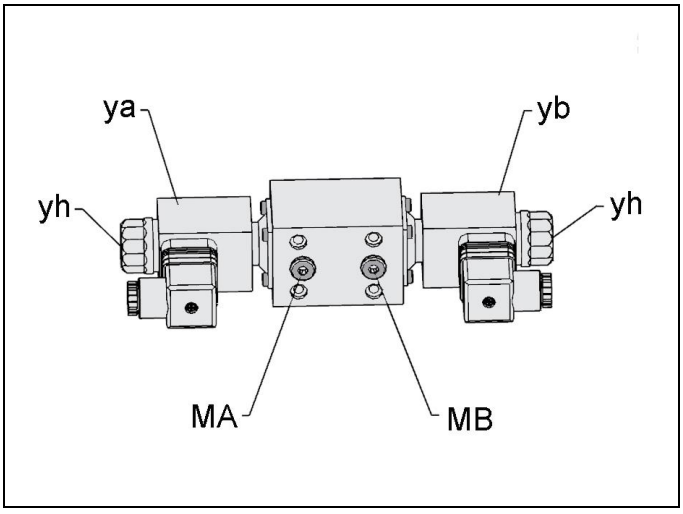


Figure 13: 4/3 directional control poppet valve (pmax. 250 / 500 bar)
Characteristics: see technical characteristics

ya Electromagnet a yb Electromagnet b yh Emergency stop	MA Port for pressure gauge G1/8 MB Port for pressure gauge G1/8

9.6 Power units with a reservoir volume V = 11 litres

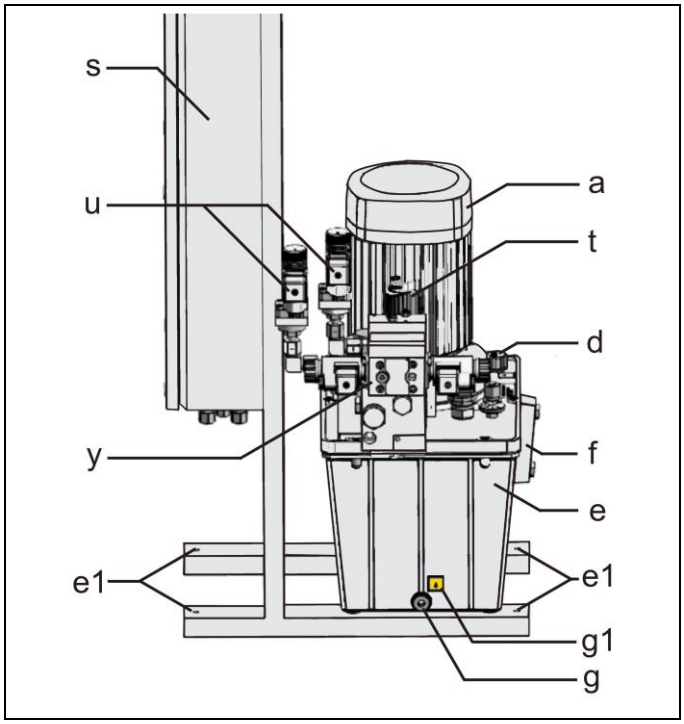


Figure 14: power unit V11, with electric control

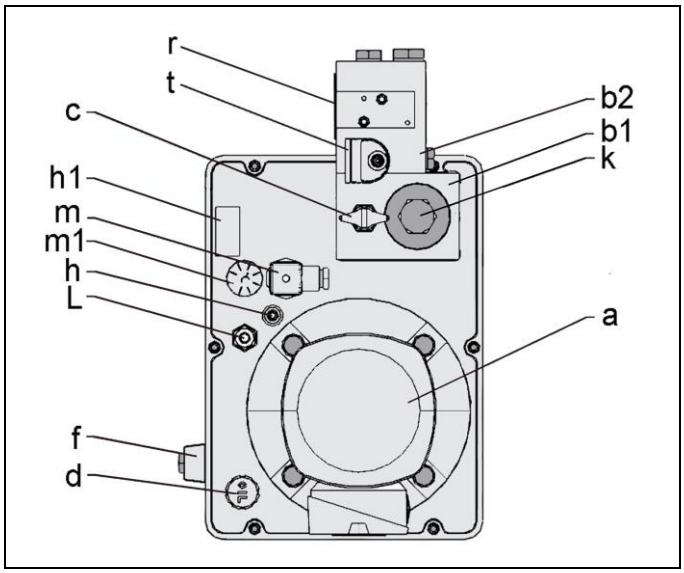


Figure 15: cover of power unit V11

a Electric motor b1 Connecting block with pressure relief valve and pressure filter b2 Connecting block with pressure switch and system check valve (structure of control valves) c Pressure relief valve system pressure d Filling and air filter e Oil reservoir e1 Mounting holes f Oil level gauge, sight glass g Drain plug	k Pressure filter with screw cap m Oil level and oil temperature control m1 Dial thermometer n Directional control valve for cylinder control r Name plate s Electric control t Electronic system pressure switch with digital display u Pressure switch for machine tool interlock L Port Ø10L for leakage

g1 Instruction sign “Drain oil here” h Bleeding screw M6 for piston pump h1 Instruction sign - bleeding of piston pump	

9.7 Two-hand operation

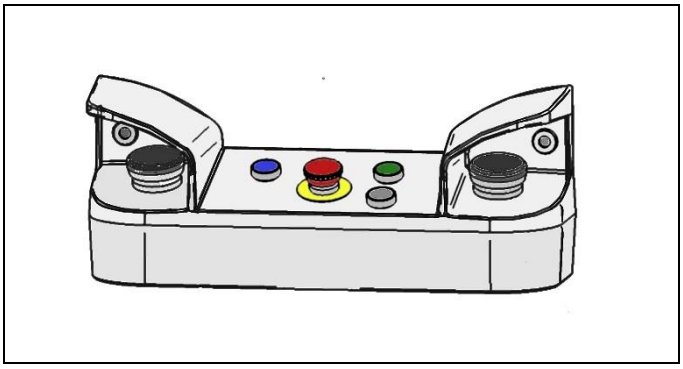


Figure 16: Two-hand operator console

9.8 Connection of the hydraulic equipment

⚠ CAUTION

Work by qualified personnel
- Works only to be effected by authorised personnel.

NOTE

Screwed Plug
- Use only fittings "screwed plug B and E" as per DIN 3852 (ISO 1179).

Hydraulic connection
- Do not use sealing tape, copper rings or coned fittings.

Pressure fluids
- Use hydraulic oil as per ROEMHELD data sheet A 0.100.

Connection of the hydraulic

Further connection data, plans or similar (e. g. hydraulic, electric circuit diagrams or electrical parameters) see enclosures!

9.9 Electric connection

⚠ WARNING

Injury / burning due to contact with energized parts!
- Before working on electric equipment, the energized parts must be de-energized and secured.
- Do not open protection covers at electric parts.
- All electrical works must only be realised by electricians.

⚠ CAUTION

Work by qualified personnel
- Works only to be effected by authorised personnel.

Connect the mains cable

When connecting, the technical data of the electric circuit or terminal diagram are to be considered.
Cable cross section and cable type have to be designed according to the applicable directives.
Degree and type of protection are indicated below the technical data.

Procedure:
1. Check if the electric connection is in accordance with the operating voltage of the motor (see name plate).
2. In case of power units with electric control put the main switch to "0".
3. Open the cover of the terminal box or the electric control.

4a. For power units with electric control:
Insert the mains connecting line into the provided screwed cable gland and connect it to the terminals L1, L2, L3 and PE.

4b. For power units with terminal box:
Insert the mains connecting line into the provided motor supply line and connect it to the terminals 1, 2, 3 and PE.
Insert the control line into the provided screwed cable gland and connect it to the corresponding terminals and PE.

5. Fix the screwed cable gland and make sure that the cables are strain-relieved.
6. Close the cover of the terminal box or the electric control.

Sense of rotation of the electric motor

The following senses of rotation must be kept:
- for radial piston pump any direction,
- for gear pump clockwise,
- for two-stage pump counterclockwise,

(viewed from above onto drive shaft, see arrow at the electric motor)

NOTE

Attention!
The sense of rotation of the motor must be observed according to the direction of the arrow on the motor.

⚠ CAUTION

Hydraulic power unit can be damaged!
- Stick absolutely to the indicated direction of the rotary field.

Wrong sense of rotation

In the case of wrong sense of rotation of the electric motor, the pump may be destroyed.

10 Start up

10.1 Charging with hydraulic oil

⚠ WARNING

Poisoning due to contact with hydraulic oil!
- For handling with hydraulic oil consider the material safety data sheet.
- Wear protection equipment.

For works with operating fluids, pay attention to the safety data sheets!

For works at and with the product, wear suitable protection equipment!

NOTE

The pressure generator is delivered without oil filling.

- Filling must only be made when the connected hydraulic actuators and accumulators are in off-position.
- Accumulated oil volume in actuators or accumulators can lead to overflowing of the oil reservoir!

Hydraulic fluids

Operation of the products with hydraulic fluids that do not correspond to the specifications is inadmissible. See technical characteristics:

Pressure medium

- Use hydraulic oil according to the information on the hydraulic circuit diagram.

Impurities in the oil reservoir to avoid!

No impurities must enter into the oil reservoir.
Use clean filter cloth!

Follow the signs

Attention!
Before filling the oil unscrew bleeding screw M6. Screw in again after filling. (Used for piston pumps or combinations)

Note
Fill with oil here.

Recommendation for piston pumps
Use hydraulic oil as per DIN 51524-2 HLP 22.

Recommendation for gear and piston pumps as well as combinations
Use hydraulic oil as per DIN 51524-2 HLP 32.

For oil filling proceed as follows:

1. Make sure that all hydraulic drives (hydro-cylinders, etc.) are retracted in off-position!
2. Switch off main switch at the electric control, switching position "0", or disconnect from the mains.
3. Depressurise the system e.g. by pressing the emergency stop at the valves (depending on the type).
4. • Unscrew the cover for oil filling at the return filter or the filling and air filter.
   - Use venting and filling element (d)!
   - Return filter, remove filter cartridge!
5. Unscrew bleeding screw M6.
   - Bleeding M6 (h) only necessary for piston pumps!
6. Insert clean funnel with filter or filter cloth (see chapter "Maintenance and check of the hydraulic fluid") in the oil filler neck (d).
7. Filling of hydraulic oil until hydraulic oil can be seen between the two markings at the oil level gauge (f).
8. Screw in cover.
9. Operate the fixture several times.
   (For the first start up, pay attention to the chapter "Bleeding of the hydraulic system".)
10. Check oil level at the oil level gauge (f) and refill hydraulic oil, if necessary.
11. Screw in the venting screw after 15 min.

- Bleeding M6 (h) only necessary for piston pumps!

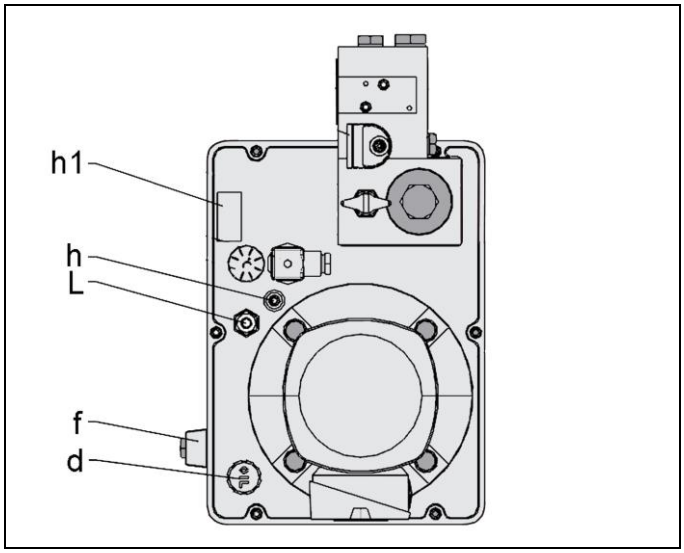


Figure 17: cover of power unit V11

d Filling and air filter f Oil level gauge, sight glass h Bleeding screw M6 for piston pump h1 Instruction sign - bleeding of piston pump	L Port Ø10L for leakage

10.2 Switch on electric control

Electric control

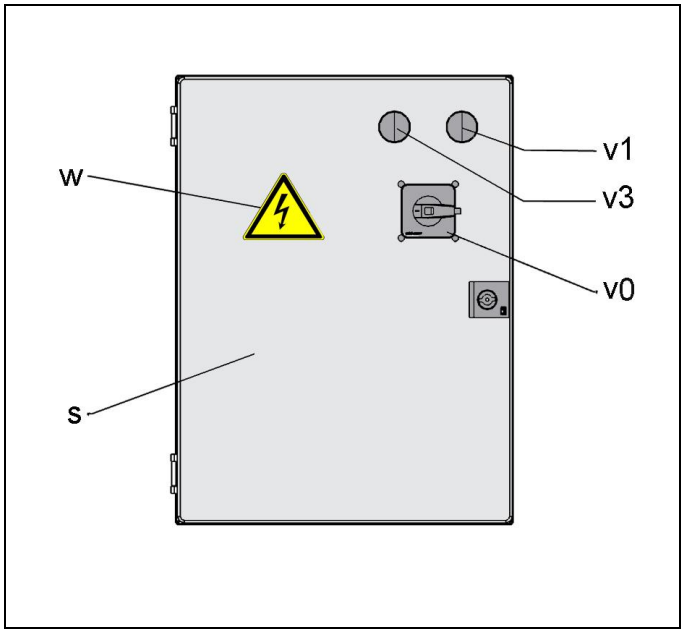


Figure 18: control box door with operating elements

s Electric control v0 Main switch / emergency stop v1 Malfunction light oil temperature too high / oil level too low	v3 Luminous push-button control on w Danger sign

Start up of control:
1. Switch on main switch
2. Press push-button control on
   (luminous push-button must be lit)
   (Point 2 is omitted for compact control)

10.3 Bleeding of the hydraulic system

Only for piston pumps

⚠ CAUTION

Malfunction caused by air in the system

Before filling the oil, unscrew bleeding screw M6.
Screw in again bleeding screw after filling.

Piston pumps must be bled:
1. Before filling the oil, unscrew bleeding screw M6.
2. Fill with oil.
3. Screw in again bleeding screw approx. 15 minutes after filling.

For all pumps

After filling the hydraulic oil there is still air in the internal and external pipes and the hydraulic drives (hydraulic cylinders, etc).
Air in hydraulic systems has among other things the following undesirable effects:

- prolongation of the extending and retracting times of consumer elements
- short cycling
- accelerated ageing of the oil.
- increased wear at seals and pump.

To avoid these undesirable effects the whole hydraulic system (power unit, valves, drives and piping) have to be bled by suitable measures!

Procedure:
1. For bleeding the oil pressure has to be reduced to a very low value!
2. Adjust pressure relief valve to the lowest possible value by screwing counterclockwise.
3. Pressurise clamping line.
4. Loosen carefully a bleeding screw or a fitting at the highest or remotest point of the fixture.
5. Pump until bubble free oil comes out.
6. Close bleeding point.
7. If double-acting elements are used, bleeding has to be effected also for the unclamping line.
8. Refill lost oil.

ⓘ NOTE

Carry out function test.

- The operating direction of the control units must be obvious to the direction of motion of the plant.

10.4 Adjust operating pressure

⚠ WARNING

Risk of injury due to insufficient operating pressure!

If the operating pressure is set too low, the force on the cylinder is not sufficient. People can be injured.
- Workpieces can be ejected from the clamping fixture during machining.
- Press-in processes are not carried out with sufficient force.
- Bending is not performed correctly.

Injury due to movement of the connected drives!
- Connected drives can carry out a movement.
- Secure the working area of the drives.

Injuries caused by missing safety devices!
- To avoid injuries appropriate safety devices must be provided by the customer.

Injuries due to misuse, incorrect operation or abuse!

Injuries can occur if the product is not used within the intended use and the technical performance data.
- Before start up, read the operating instructions!

Burning due to hot surface!

During operation, surface temperatures on the product can exceed 70°C.
- Maintenance and repair work should only be performed in a cooled down condition and/or with protective gloves.

Burning due to hot solenoid valves!

Hot solenoids may cause burns on parts of the body.
- Depending on the duty cycle, high temperatures can occur at the solenoids during operation.
- Maintenance and repair work should only be performed in a cooled down condition and/or with protective gloves.

⚠ CAUTION

Work by qualified personnel
- Works only to be effected by authorised personnel.

Performance of the product!

The admissible performance data of the product, see chapter "Technical characteristics", may not be exceeded.

Hydraulic power unit can be damaged!
- Stick absolutely to the indicated direction of the rotary field.

The system pressure in a hydraulic system corresponds to the linkage of pump, motor and pressure relief valve.
Hydraulic systems must be secured against overpressure.
The pressure relief valve (DBV) limits the pump pressure in the system to a set value.

When this value is reached, the complete flow rate of the pump is drained to the reservoir via the pressure relief valve.
This leads to a strong and very fast heating of the oil.

Thus, the following measures are imperative after the pressure build-up:
- the pump motor has to be switched off (see section “Switch off pump motor”.)
- or the pump has to be switched to unpressurised cycle. (see section “Switch to unpressurised cycle”:).

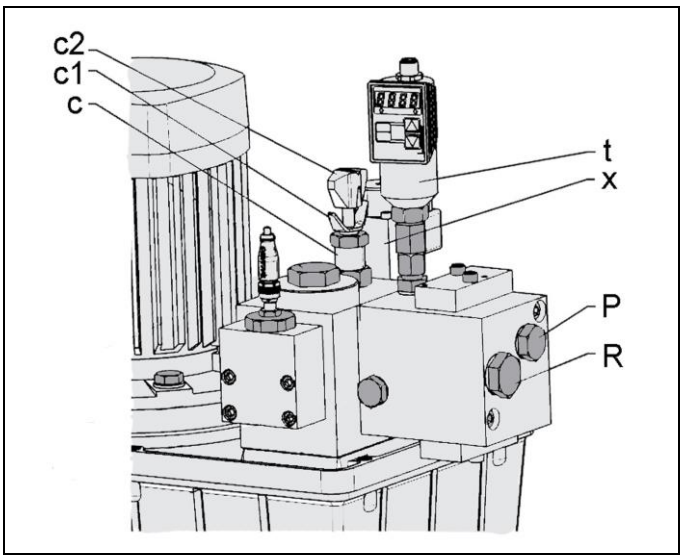


Figure 19: Components at the pressure relief valve

c	Pressure relief valve system pressure	x	Directional control valve for unpressurised cycle
c1	Lock nut	P	Connecting possibility to system pressure G3/8
c2	Adjustment screw for adjustment of the system pressure	R	Connecting possibility to return line (reservoir) G1/2
t	Electronic pressure switch with digital display for the system pressure		

Further notes to the pressure switch in the corresponding operating instructions.

10.4.1 Setting the mechanical pressure switch for the clamping fixture (clamping and unclamping)

The pressure switches are set to approx. 80% (unclamping) and approx. 95% (clamping) of the operating pressure. On delivery, the values are as shown on the hydraulic circuit diagram.

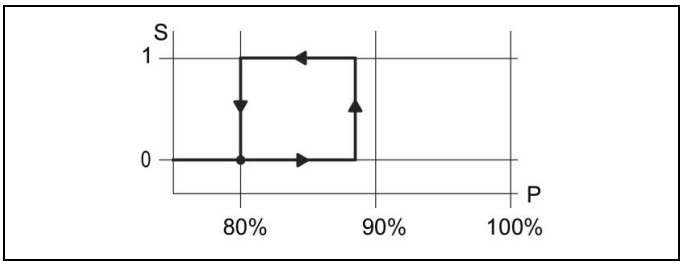


Fig. 20: example: switching points for mechanical pressure switch

S	Switching output	P	Operating pressure

An electronic pressure switch is mounted on the clamping side in addition to the mechanical pressure switch (2-channel processing of the clamping pressure).
The relevant switching point is fixed at 97% of the nominal pressure (TEACH value). The associated mechanical pressure switch (clamping side) must be adjusted manually to approximate this switching point.

⚠ WARNING

Adjust the mechanical pressure switch to the switching point of the electronic pressure switch (clamping side).
For safety reasons (2-channel processing), the switching point of the mechanical pressure switch on the clamping side must be set to approx. 95% of the nominal pressure.

If the operating pressure is changed, the switching points must be set to approx. 80% (unclamping side) and approx. 95% (clamping side) of the adjusted operating pressure.

Procedure for adjustment:

- Loosen the locking screw (c) with Allen key (e).
- Adjust pressure relief valve to 80/95% of the operating pressure (pump motor must permanently run against pressure).
- Operate the corresponding valve.
- Turn the pressure switch (a) with adjusting cap (b) clockwise, until the LED illuminates yellow.
- Turn the pressure switch (a) with adjusting cap (b) **counter-clockwise**, until the switching point is obtained (LED illuminates green).
- Operate valves alternately to check adjustments.
- Tighten the locking screw (c) with Allen key (e).
- Secure locking screw (c) with screw locking varnish.

NOTICE

After adjusting the mechanical pressure switches, they must be secured against unauthorised adjustment.

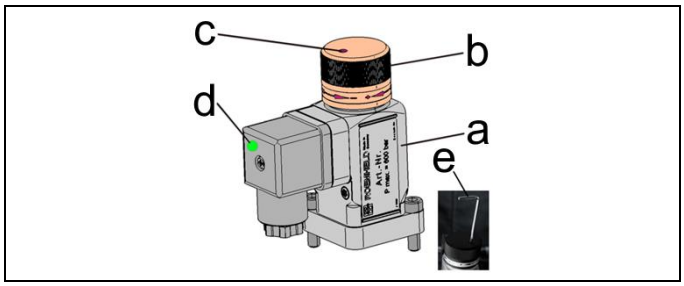


Fig. 21: Safety device: secured pressure switch

a	Pressure switch	d	Device plug with luminous diode (accessory)
b	Adjusting cap	e	Hexagon socket wrench SW2
c	Locking screw with hexagon socket SW2		

If the switching points of the pressure switches are adjusted, the operating pressure must be readjusted.
The pump motor must switch off correctly again.

10.4.2 Setting the mechanical pressure switch for the bending, die-cutting and stamping fixture

The pressure switch is set to approx. 80% (retract) of the operating pressure. On delivery, the value is as shown on the hydraulic circuit diagram.

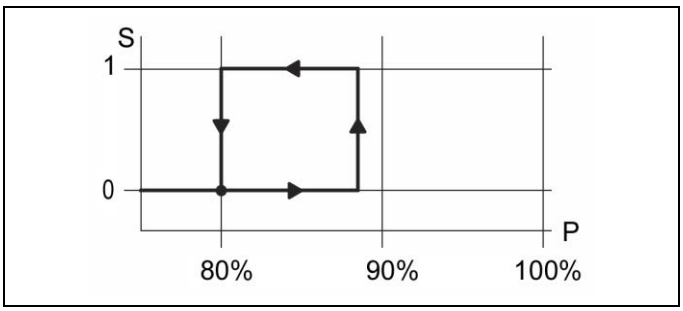


Fig. 22: example: switching points for mechanical pressure switch

S Switching output	P Operating pressure

There is one pressure switch mounted in the extension line and one in the retract line.

If the operating pressure is changed, the switching points must be set according to the adjusted operating pressure.

Procedure for adjustment:

- Loosen the locking screw (c) with Allen key (e).
- Adjust pressure relief valve to 80% of the operating pressure (pump motor must permanently run against pressure).
- Operate the corresponding valve.
- Turn the pressure switch (a) with adjusting cap (b) clockwise, until the LED illuminates yellow.
- Turn the pressure switch (a) with adjusting cap (b) **counterclockwise**, until the switching point is obtained (LED illuminates green).
- Operate valves alternately to check adjustments.
- Tighten the locking screw (c) with Allen key (e).
- Secure locking screw (c) with screw locking varnish.

If the switching points of the pressure switch are adjusted, the operating pressure must be readjusted.
The pump motor must switch off correctly again.

10.4.3 Adjust operating pressure with electronic Teach-In system pressure switch

Figure 23: Design of the pressure switch with Teach-In function

1 Pressure increase

- Main switch ON (connect operating voltage).
  The device is automatically in RUN mode.
  The current pressure is displayed.
- Simultaneously actuate the push-buttons at the pressure switch ▲ and ▼ (Reset/Esc) for at least 3 seconds (see operating instructions of the Teach-In pressure switch).
- Thus, the TEACH mode is activated.
  The digital display extinguishes cyclically in TEACH mode and the pump runs in continuous operation against pressure.
  Attention: The mushroom buttons on the two-hand operation must be actuated permanently.
- Adjust at the pressure relief valve the desired higher pressure by clockwise turning of the wing screw.
  (2nd person required). Control by digital display.
- Tighten lock nut.
- Actuate push-button Enter/Set (2nd person required).
  The digital display now shows permanently the current system pressure.

Now the pump switches off and/or the valve (optional) for unpressurised cycle relieves the pump (clearly audible).
After a pressure drop of 10% (return switching point pressure switch) the pump supplies again.

NOTE

A pressure reduction is not possible in this cycle. See next section.

2 Pressure reduction

- Turn out the wing screw at the pressure relief valve by some counterclockwise turns
- Simultaneously actuate the push-buttons at the pressure switch ▲ and ▼ (Reset/Esc) for at least 3 seconds (see operating instructions of the Teach-In pressure switch).
- Thus, the TEACH mode is activated.
  The digital display extinguishes cyclically in TEACH mode and the pump runs in continuous operation against pressure.
  Attention: The mushroom buttons on the two-hand operation must be actuated permanently.
- Operate for a short time the cylinder control for the pressure relief of the system.
- The current pressure is displayed.
- Adjust at the pressure relief valve the desired higher pressure by clockwise turning of the wing screw.
  (2nd person required). Control by digital display.
- Tighten lock nut.
- Actuate push-button Enter/Set (2nd person required).
  The digital display now shows permanently the current system pressure.

NOTE

Check the adjustments and readjust, if required, in warm operating mode.

10.4.4 Brief instruction - Pressure switch with Teach-In function

1. Connect operating voltage. The device is now automatically in RUN mode
2.

Press the key Reset / Esc for at least 3 s. - Activation of the TEACH mode. (Press arrow key up and arrow key down at the same time)	

The device is now in TEACH mode (display extinguishes cyclically).

3. Now the pressure can be adjusted at the pressure generator and can be checked at the display of the pressure switch.
4.

Shortly press Enter/Set key.	Enter Set

The device is now again automatically in RUN mode, the switching points were newly calculated and saved.

NOTE

System pressure

If the system pressure is reduced, a pressure relief must be planned at the side of the consumer elements!
This is required to relieve the integrated check valve, otherwise the function is impaired.

11 Operation

DANGER

Injury due to movement of the connected drives!

- The pump motor starts running again after the clamping process and a pressure drop of 10% to maintain the clamping pressure!
- Connected drives can carry out a movement!
- Secure the working area of the drives!

WARNING

Injury due to movement of the connected drives!

- The pump motor starts running again after the clamping process and a pressure drop of 10% to maintain the clamping pressure!
- Connected drives can carry out a movement!
- Secure the working area of the drives!

Burning due to hot surface!

During operation, surface temperatures on the product can exceed 70°C.

- Maintenance and repair work should only be performed in a cooled down condition and/or with protective gloves.

Burning due to hot solenoid valves!

Hot solenoids may cause burns on parts of the body.

- Depending on the duty cycle, high temperatures can occur at the solenoids during operation.
- Maintenance and repair work should only be performed in a cooled down condition and/or with protective gloves.

For works at and with the product, wear protective gloves!

For works at and with the product, wear suitable protection equipment!

Duty cycle of the electric motor (ED)

The relative duty cycle of the electric motor (ED) depends on the operating mode of the power unit.
This applies to the operating mode intermittent cycle S3 or the unpressurised cycle S6:

- in intermittent cycle mode, the electric motor will be switched off as soon as the preset operating pressure is reached.
- in unpressurised cycle mode, the valve switches the flow rate of the pump to pressureless to the reservoir, the electric motor is running in continuous operation.

Calculate duty cycle

The calculation of the relative duty cycle of the electric motor is based on a cycle time (tS) of 10 minutes. With 40% ED, e.g. the maximum load (tB) within the cycle should not exceed 4 minutes. During the remaining time (tSt), the motor is switched off (S3) or is continuously running in operating mode S6 with a capacity of less than 50%.
for more information see chapter Technical characteristics and data sheet D8.026.

NOTE

Duty cycle (ED)

The reachable duty cycle refers only to the electric motor.
The running time of the pump at max. pressure depends on the occurring power losses.
The oil is led by the pressure relief valve to the oil reservoir, if the power unit is operated with 100% duty cycle and no consumer elements are operated. The oil warms up.
Pay attention that the oil temperature does not exceed 63°C.

The relative duty cycle (%ED) can be calculated as follows:

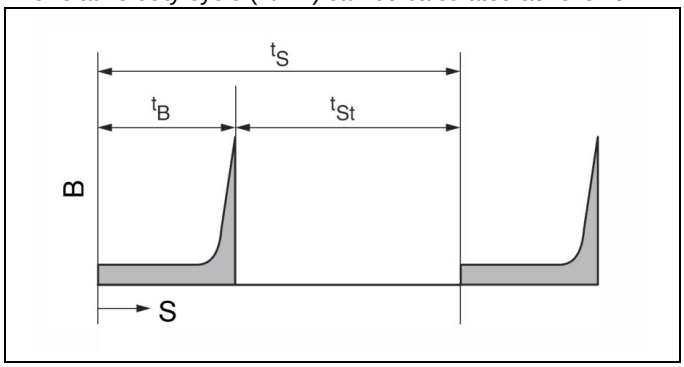


Figure 24: Diagram relative duty cycle

B Load (pressure) S Start tB Time elapsed from motor start to motor cut off (running time)	tS Cycle time (minutes) tSt Downtime or time of unpressurised cycle

$$\%\,ED = \frac{t_B}{t_B + t_{St}} \cdot 100 = \frac{t_B}{t_S} \cdot 100$$

Different motor running and idle times are simply added.

12 Maintenance

WARNING

Injury due to improper maintenance!

- Maintenance work may only be carried out when the power unit is de-energised and depressurised.
- Secure working areas.

Poisoning due to contact with hydraulic oil!

- For handling with hydraulic oil consider the material safety data sheet.
- Wear protection equipment.

Burning due to hot oil!

- In operating conditions oil temperatures up to 70 °C can appear due to environment influences.
- All works must only be made in cool mode!

⚠ WARNING

Burning due to hot surface!

During operation, surface temperatures on the product can exceed 70°C.

- Maintenance and repair work should only be performed in a cooled down condition and/or with protective gloves.

Burning due to hot solenoid valves!

Hot solenoids may cause burns on parts of the body.

- Depending on the duty cycle, high temperatures can occur at the solenoids during operation.
- Maintenance and repair work should only be performed in a cooled down condition and/or with protective gloves.

⚠ CAUTION

Work by qualified personnel

- Works only to be effected by authorised personnel.

For works at and with the product, wear suitable protection equipment!

NOTE

Operating instructions

- Further operating instructions for individual components are available in the internet (www.ROEMHELD.com) or on request!

12.1 Plan for maintenance

Maintenance works	Interval	Realisation
Cleaning	As required	Operator
Check	daily	Operator
Checking of hydraulic system and components	yearly	Qualified personnel
Exchange of the hydraulic fluid after start up	after 250 operating hours or 3 months	Qualified personnel
Check the hydraulic fluids, if required, exchange the hydraulic fluid and the filter	after 1250 operating hours or 6 months	Qualified personnel
Change the hydraulic fluid and the filter	After 2500 operating hours, at the latest after 24 months, or in case of damage	Qualified personnel
Repair		ROEMHELD service personnel

NOTE

Rest period

- Observe the rest period of at least 1 hour after changing the hydraulic fluid!

⚠ CAUTION

Malfunction of the circuit breaker

- Based on the safety considerations in EN ISO 13849 and to ensure that performance level “d” is achieved, it is recommended that the two circuit breakers be replaced after approx. 1,350,000 switching cycles.

12.2 Regular checks

Checks by the operator have to be effected as follows:

12.3 Daily checks

- Check all fixing screws, retighten if required.
- Check all cable fixings and fittings, retighten if required.
- Check if hydraulic hoses, pipes and cables are damaged, or have chafe marks, etc.).
- Check hydraulic components for external leakage - retighten fittings, if required.
- Hydraulic hoses must not get in contact with substances which can cause a damage (acids, lys, solvents, ...).
- Check the oil level of the hydraulic power unit (see chapter Charging of the hydraulic power unit with oil) - if required refill oil (specifications see chapter Technical characteristics).
- Check safety devices as per chapter Safety devices.

12.4 Yearly checks

Hydraulic system, hydraulic hoses

An expert has to check all hydraulic components at least once a year if they are still work-proof. Assessed damages have to be repaired immediately.

The following checks and works have to be effected:

- An expert has to check all hydraulic hoses at least once a year if they are still work-proof. Assessed damages have to be repaired immediately.
- The hydraulic hoses of the device have to be exchanged as per BGR 237 at least after 6 years by new ones.

12.5 Maintenance accumulator

12.5.1 Basic maintenance instructions

Diaphragm accumulators are in general maintenance-free. However to allow trouble-free function and a long life the following checks have to be realised:

- Gas preload
- Safety devices
- Pipe connections
- Fixing of the accumulator

12.5.2 Test intervals prefilling pressure

It is recommended to keep the following test intervals:

- after every installation,
- one week after installation,
- eight weeks after installation

If no noticeable gas loss appeared, the future test intervals can be made

- once a year.

Note

Continuous use at high operating temperatures requires shorter test intervals.

12.5.3 Service life

The service life of diaphragm accumulators depends on the width of pressure variations and the number of load changes. Similar to high-pressure hoses, you can assume a life of 6 years with conventional use.
With high operational availability, the test intervals should be kept.

12.6 Cleaning

⚠ CAUTION

Injury by flying out components or oil!

- For cleaning works always wear safety goggles, protective shoes and safety gloves.

Material damage, damage or functional failure

Aggressive cleaning agents can cause damage, especially to seals.
The product must not be cleaned with:

- corrosive or caustic substances or
- organic, solvents such as halogenated or aromatic hydrocarbons and ketones (cellulose thinner, acetone, etc.).

The following cleaning works have to be effected daily at the mechanical components:

- Clean the product only with cleaning clothes.
- Afterwards lubricate slightly movable components (piston rods, guides etc.) and not coated steel components.

12.7 Maintenance and check of the hydraulic fluid

Important factors that influence the degree of contamination of the hydraulics fluid are:

- Contamination of the surroundings
- Size of the hydraulic system
- Design of the hydraulic system as specified
- Number of consumer elements,
- Cycle time,
- Number of fluid circulations through the filter per time unit,
- Implementation of the maintenance schedules,
- Training of the maintenance personnel.

They change the operating characteristics of hydraulic fluids and lead to their ageing.
The monitoring of the condition and a filtration adapted to the requirements of the application (if necessary, draining and degasification) are indispensable for the maintenance of the operating characteristics and guarantee of a long service life of hydraulic fluids and components.
The hydraulic fluid must be regularly exchanged or examined by the lubricant manufacturer and/or qualified staff.
A reference investigation according to the maintenance schedule with analysis as per ISO 4406 or mass of impurities with analysis as per E 12662 is recommended

Note

For guarantee, liability and warranty claims, maintenance proofs and/or the results of analysis of the hydraulic fluids have to be submitted to us.

Purity of the hydraulic fluids

The admissible contamination (unsolved impurities in the hydraulic fluid) depends on the component of the hydraulic system that is most sensitive to dirt. The indicated purity class is the maximally admissible value that should not be exceeded, with regard to the operating safety (clogging of gaps, orifices as well as the locking of the control piston) and the service life (wear reduction).

Application	Minimum purity as per NAS 1638	Minimum purity as per ISO 4406	attainable with filter fineness *
Radial piston and gear pumps, valves and cylinders	8 (recommended: 5 up to 7)	20 / 17 / 13	≤ 20 µm
Proportional pressure and flow control valves	7 (recommended: 5 up to 6)	18 / 16 / 13	≤ 10 µm

* Important influential factors see chapter: "Maintenance and check of the hydraulic fluid"

Note

Please note that a new hydraulic fluid "on tap" does not meet the requirements of cleanness. If necessary, use cleaned oil.

Note

Mixing of different types of hydraulic fluid can lead to unintended chemical reactions with mud formation resinification or similar.
Therefore, the respective manufacturers should be consulted for a change between different hydraulic fluids.
In any case, the entire hydraulic system is to be rinsed thoroughly.

12.8 Oil change

Hazardous to the environment

Due to possible environmental pollution, the individual components must be disposed only by an authorised expert company.

NOTE

- Oil changes must only be made in depressurised mode.

Hydraulic oil use according sign

Use hydraulic oil as per sign at the oil filler neck (see also technical characteristics).

Filtration and cleanliness level of the hydraulic fluid

Pay attention to the indication for filtration and purity class of the hydraulic fluid (see technical characteristics).

For works with operating fluids, pay attention to the safety data sheets!

Only for piston pumps

⚠ CAUTION

Malfunction caused by air in the system

Before filling the oil, unscrew bleeding screw M6.
Screw in again bleeding screw after filling.

Piston pumps must be bled:
1. Before filling the oil, unscrew bleeding screw M6.
2. Fill with oil.
3. Screw in again bleeding screw approx. 15 minutes after filling.

To change the oil proceed as follows:

1. Make sure that all hydraulic drives (hydro-cylinders, etc.) are retracted in off-position!
2. Switch off main switch at the electric control, switching position "0", or disconnect from the mains.
3. Depressurise the system e.g. by pressing the emergency stop at the valves (depending on the type).
4. Unscrew oil drain plug.
5. Drain oil completely.
6. Apply oil drain plug - if required screw in new screw (see spare parts list).
7. • Unscrew the cover for oil filling at the return filter or the filling and air filter.
   - Use venting and filling element (d)!
   - Return filter, remove filter cartridge!
8. Unscrew bleeding screw M6.
   - Bleeding M6 (h) only necessary for piston pumps!
9. Insert clean funnel with filter or filter cloth (see chapter "Maintenance and check of the hydraulic fluid") in the oil filler neck (d).
10. Filling of hydraulic oil until hydraulic oil can be seen between the two markings at the oil level gauge (f).
11. Screw in cover.
12. Operate the fixture several times.
    (For the first start up, pay attention to the chapter "Bleeding of the hydraulic system".)
13. Check oil level at the oil level gauge (f) and refill hydraulic oil, if necessary.
14. Screw in the venting screw after 15 min.
    - Bleeding M6 (h) only necessary for piston pumps!

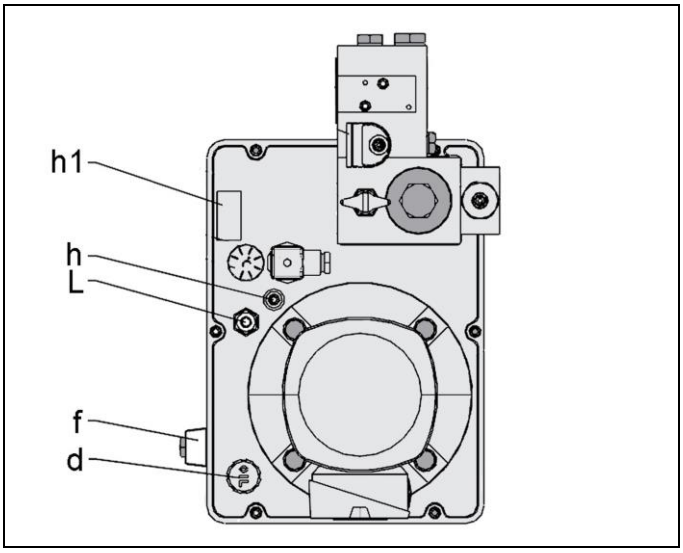


Figure 25: Figure on cover of power unit V11

d	Filling and air filter	h1	Instruction sign - bleeding of piston pump
f	Oil level gauge, sight glass	L	Port Ø10L for leakage
h	Bleeding screw M6 for piston pump		

NOTE

Component overview
- Pay attention to chapter "Overview of components"!

Oil change
It is recommended to exchange always the oil filter when changing the oil.

Rest period
- Observe the rest period of at least 1 hour after changing the hydraulic fluid!

12.9 Exchange pressure filter

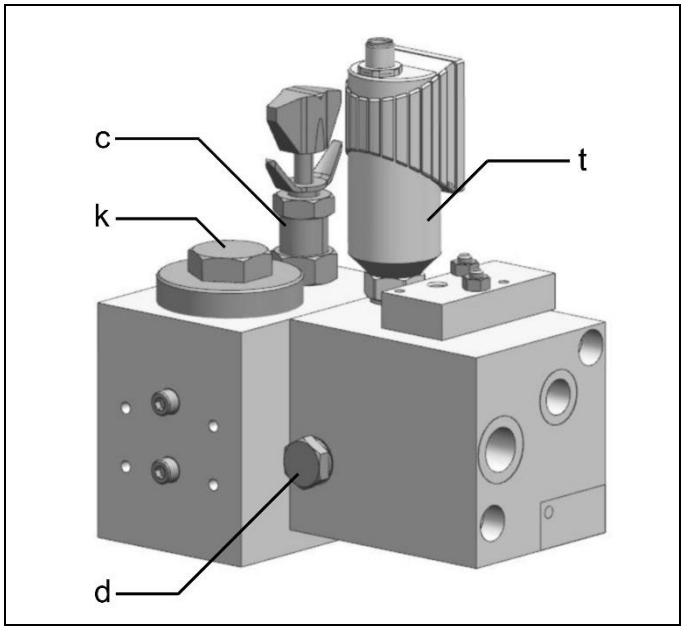


Figure 26: Connector block with screw cap of the oil filter (k)

d	System check valve	k	Screw cap / oil filter
c	Pressure relief valve for system pressure	t	Electronic pressure switch with digital display

12.10 High-pressure filter

1. Switch power unit to voltage-free mode.
2. Depressurise the system e.g. by pressing the emergency stop at the valves.
3. Unscrew screw cap of the oil filter with a fork spanner.

NOTE
- For tight connection of a new pressure filter also O-ring and back-up ring have to be exchanged (included in the exchange kit pressure filter).

4. Clean the magnetic disk.
5. Insert filter cartridge.
6. Screw on screw cap.

Spare parts

Spare part	Part no.
Exchange kit pressure filter	3887-107

12.11 Clean oil screens (if available)

Note

The screen disks are in the hydraulic ports.

In case of strong contamination, the screen disks must be cleaned.

1. Remove fittings at the hydraulic ports.
2. Unscrew the screen disk with a pointed tool (scriber).
3. Clean the disk and refit.
4. Screw in fitting.

Spare parts

Spare parts	Part no.
Screen disk G1/4	3887 009 (0.63mm)
Screen disk G3/8	3300 097 (0.63mm)
Screen disk G1/2	3887 120 (0.63mm)

13 Trouble shooting

Fault	Cause	Remedy
Power unit does not start:	Two-hand operation not activated	Press both mushroom push-buttons simultaneously.
	Safety fuse defective	Check and exchange, if required
	Pressure switch misaligned	Adjustment (see "Adjust operating pressure")
	Electric control is not o.k., e.g. overload current, parting of cable	⚠ **Caution** Work should be performed only by authorised personnel. Reset protection switch
	Oil level too low or oil temperature too high, the light in the door of the control box or at the main switch is lit	Refill oil or let cool oil
Motor does not switch off after reaching operating pressure	Pressure switch misaligned	Adjustment (see "Adjust operating pressure")
	Pressure switch defective	Exchange pressure switch

⚠ CAUTION

Work by qualified personnel

- Works only to be effected by authorised personnel.

Trouble	Cause	Remedy
Operating pressure will not be obtained	Pressure relief valve adjusted too low	Adjustment (see section "Adjust operating pressure")
	External leakage	Eliminate leak, e.g. by tigthening fittings or replacing pipes or hoses.
	Solenoid valves are leaky	Replace solenoid valve(s)
	Pump defect	Exchange pump or return power unit for repair
	Leckage of a hydraulic drive	Check which drive is leaky.
	Pressure switch misaligned	Adjustment (see section "Adjust operating pressure")

Trouble	Cause	Remedy
Pump motor will be switched on and off in short intervals in position "Clamping" and "Unclamping":	Check valve System pressure in the connecting block below the electronic pressure switch leaking	Remove G1/4 screw plug (M1), replace check valve (tightening torque 15 Nm)
	Leakage at the cylinder (clamping element/ cylinder or similar)	Squeeze pressure line to locate the leakage, exchange seal or element.
	Fittings are leaky	Retighten fittings
	Pump not bled (only for piston pumps)	Drain off completely the oil and refill (see section "Oil filling")
	Solenoid valve(s) are leaky (internal leakage)	Replace solenoid valves
Pump does not deliver:	Oil level is too low	Refill oil
	Pump not bled (only for piston pumps)	Drain off completely the oil and refill (see section "Oil filling")
	Direction of rotation incorrect (for gear pumps and two-stage pumps)	Check electrical connection, see arrows of direction of rotation on the ventilator cowl of the electric motor

NOTE

After the exchange or the repair of hydraulic components, their function must be tested.

14 Technical characteristics

Hydraulic fluids

Details of the hydraulic fluids to be used are attached to the oil filler neck.

For piston pumps

Use hydraulic oil as per DIN 51524-2 HLP 22.

For gear and piston pump combinations

Use hydraulic oil as per DIN 51524-2 HLP 32.

Purity of the hydraulic fluids

The admissible contamination (unsolved impurities in the hydraulic fluid) depends on the component of the hydraulic system that is most sensitive to dirt. The indicated purity class is the maximally admissible value that should not be exceeded, with regard to the operating safety (clogging of gaps, orifices as well as the locking of the control piston) and the service life (wear reduction).

Application	Minimum purity as per NAS 1638	Minimum purity as per ISO 4406	attainable with filter fineness *
Radial piston and gear pumps, valves and cylinders	8 (recommended: 5 up to 7)	20 / 17 / 13	≤ 20 µm
Proportional pressure and flow control valves	7 (recommended: 5 up to 6)	18 / 16 / 13	≤ 10 µm

***** Important influential factors see chapter: "Maintenance and check of the hydraulic fluid"

Especially with proportional valves, the repetitive accuracy depends especially on the purity degree of the hydraulic fluid.

Note

New hydraulic fluid

- Please note that a new hydraulic fluid "on tap" does not meet the requirements of cleanness. If necessary, use cleaned oil.

Mixing of different types of hydraulic fluid

- Mixing of different types of hydraulic fluid can lead to unintended chemical reactions with mud formation resinification or similar.
- Therefore, the respective manufacturers should be consulted for a change between different hydraulic fluids.
- In any case, the entire hydraulic system is to be rinsed thoroughly.

NOTE

Dirt from entering the system

- With increasing dirt penetration into the hydraulic system, additional high-pressure filters have to be provided in front of the connections.

Technical data see hydraulic or electric circuit diagram:

Hydraulics

Operating pressures [bar]	See hydraulic circuit diagram
Flow rates [l/min]	See hydraulic circuit diagram
Reservoir volume/ Max. oil charge	11 l (up to the reservoir cover)
Usable oil volume	6.0 l (with max. filling)
Max. oil temperature	60 °C
Hydraulic oil	See hydraulic circuit diagram HLP 22/HLP32/HLP46, grade of contamination ISO 4406:1999 18/16/13 as per DIN 51 524
	⚠ Important! Not suited for fluids of the type HF-A, HF-C and HF-D.

Electricity

Operating voltage	See electric circuit diagram
Relative duty cycle (ED)	See section "Operation"
Motor connection	3 x 1.5 mm^2
Operating voltage motor	See motor name plate
Isolation class	See motor name plate
Code class	IP 55
Type	Asynchronous motor

Environment

Ambient temperature	+ 5 °C to + 35 °C
Noise level	max. 80 dB (A) (in 1 m distance and height above the floor)

NOTE

Further characteristics, see name plate of the power unit or in the operating manuals:

- BAS_9740 050

Hydraulic and electrical characteristics

Poppet valves ND6

Part no.	2363-3xx
Type	Poppet valve (hermetically sealed)
Max. operating pressure	250 bar / 500 bar
Max. flow rate	up to 400 bar = 20 l/min from 400 bar = 6 l/min
Direction of flow	in the direction of the arrow as per symbol
Hydraulic oil	HLP 22 / HLP 32 as per DIN 51524
Nominal voltage +5%-10%	24 V DC
Pick up and holding power	26 /30 watt (250/500 bar)
Make time	60 ms
Brake time	60 ms
Max. cycles	2000/h

Duty cycle	100% ED
Code class	IP 65
Electric connection	Cable socket as per DIN EN 175 301-803 and ISO 4400

Pressure switch 9730-xxx

Part no.	**9730-500/501/502**
All sizes and data	See data sheet F9.732

Pressure switch 9740-xxx

Part no.	**9740-050**
All sizes and data	See operating manual BAS_9740 050
Part no.	**9740-049**
All sizes and data	See operating manual BAS_9740 049

14.1 Environmental conditions

The products are designed for a moderate climate zone.

In an environment with high risk of contamination, for example
- dust
- swarf
- coolants
- humidity (see environment)
- or the like

A protective housing is to be planned.

NOTE

Information on the name plate
For further information see name plate as well as supplied documents.

Characteristics
Characteristics for fittings, pipe clamps and hydraulic high-pressure hoses see ROEMHELD data sheets.

Valve control
Proposals for valve control see ROEMHELD data sheet.

Screwed Plug
- Use only fittings "screwed plug B and E" as per DIN 3852 (ISO 1179).

Pressure fluids
- Use hydraulic oil as per ROEMHELD data sheet A 0.100.

15 Disposal

Hazardous to the environment
Due to possible environmental pollution, the individual components must be disposed only by an authorised expert company.

The individual materials have to be disposed as per the existing regulations and directives as well as the environmental conditions.
Special attention has to be drawn to the disposal of components with residual portions of hydraulic fluids. The instructions for the disposal at the material safety data sheet have to be considered.
For the disposal of electrical and electronic components (e.g. stroke measuring systems, proximity switches, etc.) country-specific legal regulations and specifications have to be kept.

17 Declaration of incorporation

Manufacturer

Römheld GmbH Friedrichshütte
Römheldstraße 1-5
35321 Laubach, Germany
Tel.: +49 (0) 64 05 / 89-0
Fax: +49 (0) 64 05 / 89-211
E-mail: info@roemheld.de
www.roemheld.com

Responsible person for the documentation:
Dipl.-Ing. (FH) Jürgen Niesner, Tel.: +49(0)6405 89-0.

This declaration of incorporation applies to the following products:

Power units in modular design of data sheet D8013 from the part number ranges:

- 8455 417, 8455 418, 8455 427, 8455 428, 8455 439
- 8455 517, 8455 518, 8455 527, 8455 528, 8455 539
- 8455 617, 8455 618, 8455 627, 8455 628, 8455 639

The listed products are designed and manufactured in line with the relevant versions of the directives **2006/42/CE** (EC-MSRL) and in compliance with the valid technical rules and standards. In accordance with EC-MSRL, these products are not yet ready for use and are exclusively designed for the installation in a machine, a fixture or a plant.

The following additional EU directives were applied:

- **2006/42/EC,** Machinery directive [www.eur-lex.europa.eu]

The following harmonised standards have been applied:

DIN EN ISO 12100, 2011-03, Safety of machinery; Basic concepts, General principles for design (replacement for part 1 and 2)

DIN EN ISO 4413, 2011-04, Hydraulic fluid power - General rules and safety requirements for systems and their components

The products may only be put into operation after it was assessed that the machine, in which the product shall be installed, corresponds to the machinery directives (2006/42/EC).

The manufacturer commits to transmit the special documents of the products to state authorities on request.
The technical documentation as per appendix VII part B was prepared for the products.

i.V. Ralph Ludwig

Ralph Ludwig
Head of Research and Development

Römheld GmbH
Friedrichshütte

Laubach, 08.03.2023