



Directional control valves ND 4

manual, mechanical or pressure-operated

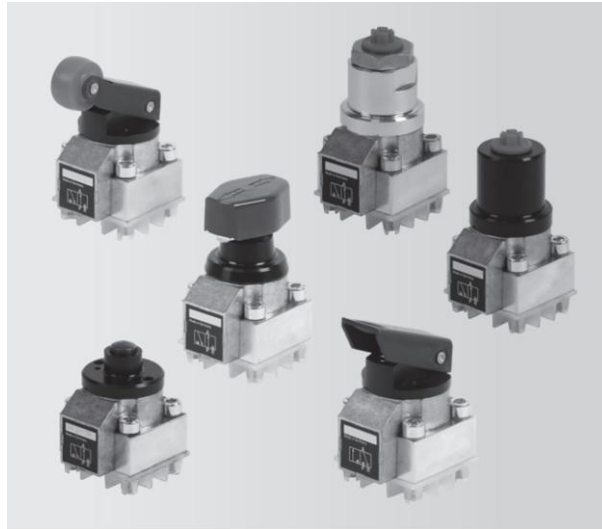


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1 Description of the product

The directly operated directional control valves are used to control hydraulic elements when a power supply is not possible or reasonable.

These directional control valves can directly control hydraulic consumers or be used as pilot valves for hydraulically-operated switching devices.

The closed directions of flow are hermetically tight. The switching operation is smooth and shock-free.

A strainer insert in the pressure port protects the valve seats from coarse impurities.

2 Validity of the documentation

Directional control valve ND 4 of data sheet C 2.320. The following types or part numbers are concerned:

Rotary handle D

- 2321 302,
- 2321 201,
- 2321 300

Sensing lever F

- 2323 302,
- 2323 301,
- 2323 201

Sensing roller K

- 2341 803,
- 2341 101,
- 2341 201,
- 2341 102,
- 2341 301

Sensing pin T

- 2322 302,
- 2322 203,
- 2322 201,
- 2322 200,
- 2322 301

Hydraulics H

- 2331 401,
- 2351 220,
- 2351 320,
- 2351 201,
- 2351 301

Pneumatics P

- 2331 301,
- 2331 100,
- 2332 200,
- 2332 300

3 Target group of this document

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

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.

4 Symbols and signal words

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.

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 for information and avoidance of dangers when installing the products into the machine as well as information and references for transport, storage 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 products can be guaranteed.

Furthermore, the consideration of the operating instructions will:

- avoid injuries
- reduce down times and repair costs,
- increase the service life of the products.

5.2 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.

6 Application

6.1 Intended use

These products are used to control actuators (e.g., clamping cylinders) in industrial and commercial applications.

The valve's switching function can be identified by the symbol shown.

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

- Use within the capacity specified in the technical data (see data sheet).
- Use as described in the operating instructions.
- Personnel qualified or instructed in accordance with the activities.
- The mounting of spare parts only with the same specifications as the original part.
- When used in a subassembly, all components must be suitable for the operating conditions.
- In addition, always follow the operating instructions for the component or subassembly within the specific overall system.

6.2 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 the products is not authorised:

- For domestic use.
- For use at fairgrounds and amusement parks.
- In food processing or in areas with special hygiene regulations.
- In mines.
- In ATEX areas (in explosive and aggressive environments, e.g. explosive gases and dusts).
- If physical effects (welding currents, vibrations or others) or chemically acting media damage the seals (resistance of the seal material) or components and this can lead to functional failure or premature failure.

- Higher flow rates than indicated on the data sheet or installation drawing.
- For use as safety component with safety function.

Special solutions are available on request!

7 Installation

⚠ WARNING

Injury by high-pressure injection (squirting out of hydraulic oil under high pressure)!

Improper connection can lead to escapes of oil under high pressure at the connections.

- Mounting or dismounting of the element must only be made in depressurised mode of the hydraulic system.
- Connection of the hydraulic line as per DIN 3852/ISO 1179.
- Unused connections have to be locked professionally.
- Use all mounting holes.

Injury by high-pressure injection (squirting out of hydraulic oil under high pressure)!

Wear, damage of the seals, ageing and incorrect mounting of the seal kit by the operator can lead to escapes of oil under high pressure.

- Before using them make a visual control.

Poisoning due to contact with hydraulic oil.

Wear, damage of the seals, aging and incorrect mounting of the seal kit by the operator can lead to escapes of oil.

Incorrect connection can lead to escapes of oil at the ports.

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

7.1 Design

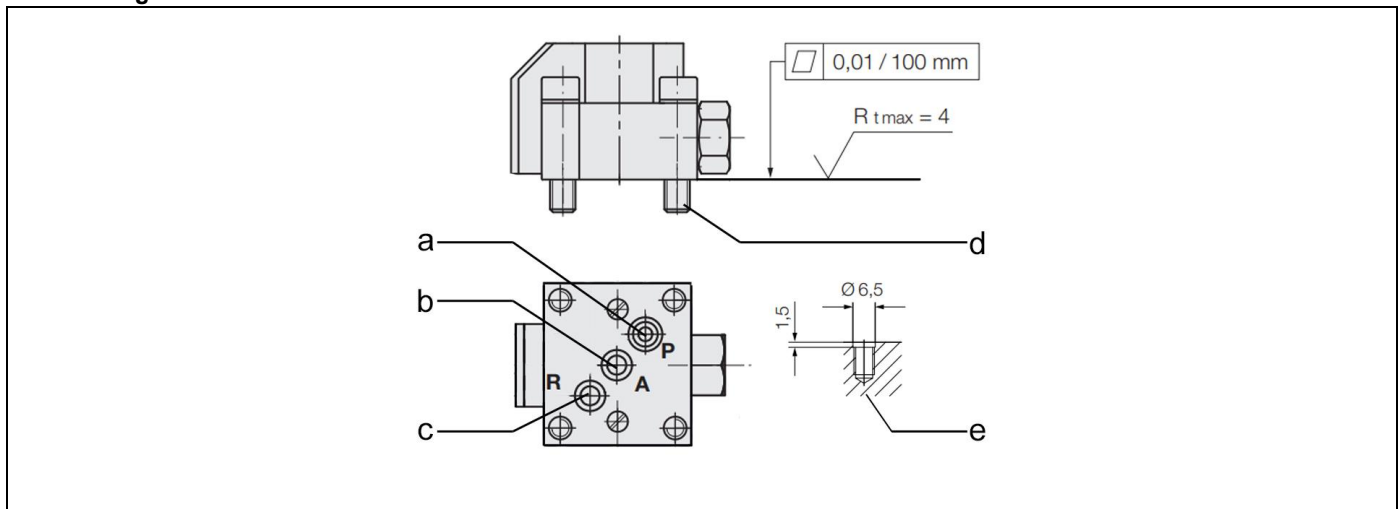


Fig. 1: Valve without operation

a Pump (P)	d Fixing screws (4 × M6, tightening torque 9.5 Nm)
b Port (A) (consumer)	e Counterbore of the fixing thread
c Return line (R)	

ⓘ NOTICE

O-ring

O-ring NBR 90Sh P+R 8 × 1,5, A5 × 1,5

Ports A, P and R

The ports A (consumer port), P (pump) and R (return) are fixed by the ball seating principle and cannot be interchanged at will.

Negative overlap

Due to the negative overlap, all ports are briefly connected to one another during switching.

Strainer in port P

The built-in strainer in the P port protects against coarse contaminants, but is not a substitute for the standard hydraulic filters in the pump unit.

7.2 Types of operation

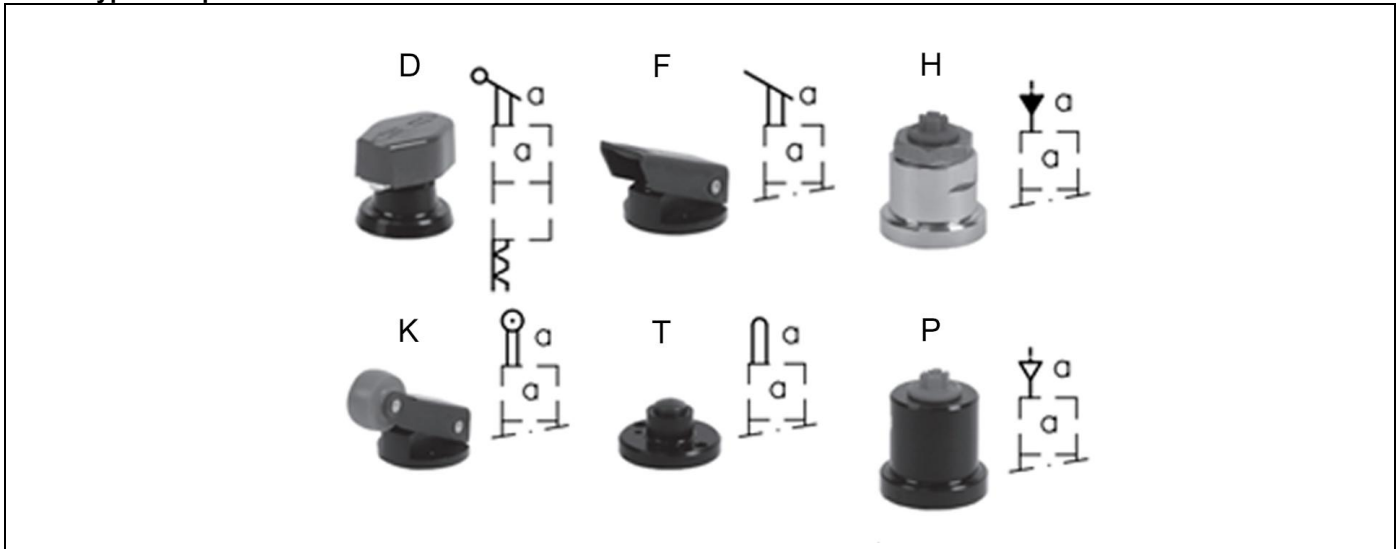


Fig. 2: Types of operation

D Rotary handle	T Sensing pin
F Sensing lever	H Hydraulics
K Sensing roller	P Pneumatics

7.3 Installation

Any mounting position is possible.

- Drill holes for hydraulic oil supply and return in the fixture.
- Grind the flange surface.
- Clean the support surfaces.
- Fix the valve with inserted sealing rings on the fixture with screws (4 screws, see data sheet)

7.3.1 Connection of the hydraulic equipment

1. Connect hydraulic lines to qualifying standards and pay attention to scrupulous cleanness!

NOTE

More details

- See ROEMHELD data sheets A 0.100, F 9.300, F 9.310 and F 9.360.

Hydraulic fluids

- Use hydraulic oil as per ROEMHELD data sheet C2.320.

Hydraulic oil

The hydraulic oil must be perfectly filtered with particles not larger than nominally 10 µm. This is the reason why we offer a filter unit (part-no. 3887-060), which can be directly integrated in the tubing of the low-pressure side (see page 2).

Completely bled

After completion of all assembly and installation works, the hydraulic system must be completely bled.

- Swarf or contamination in the hydraulic oil lead to increased wear or damage at the guides, running surfaces and seals. The maximum operating pressure and the admissible flow rate of the valve must not be exceeded.
- Use only hydraulic oil HLP32 as per DIN51524.

NOTE

The return flow from A to P is only possible if the inlet pressure P drops below the set outlet pressure A.

7.3.2 2/2 and 3/2 directional control valve

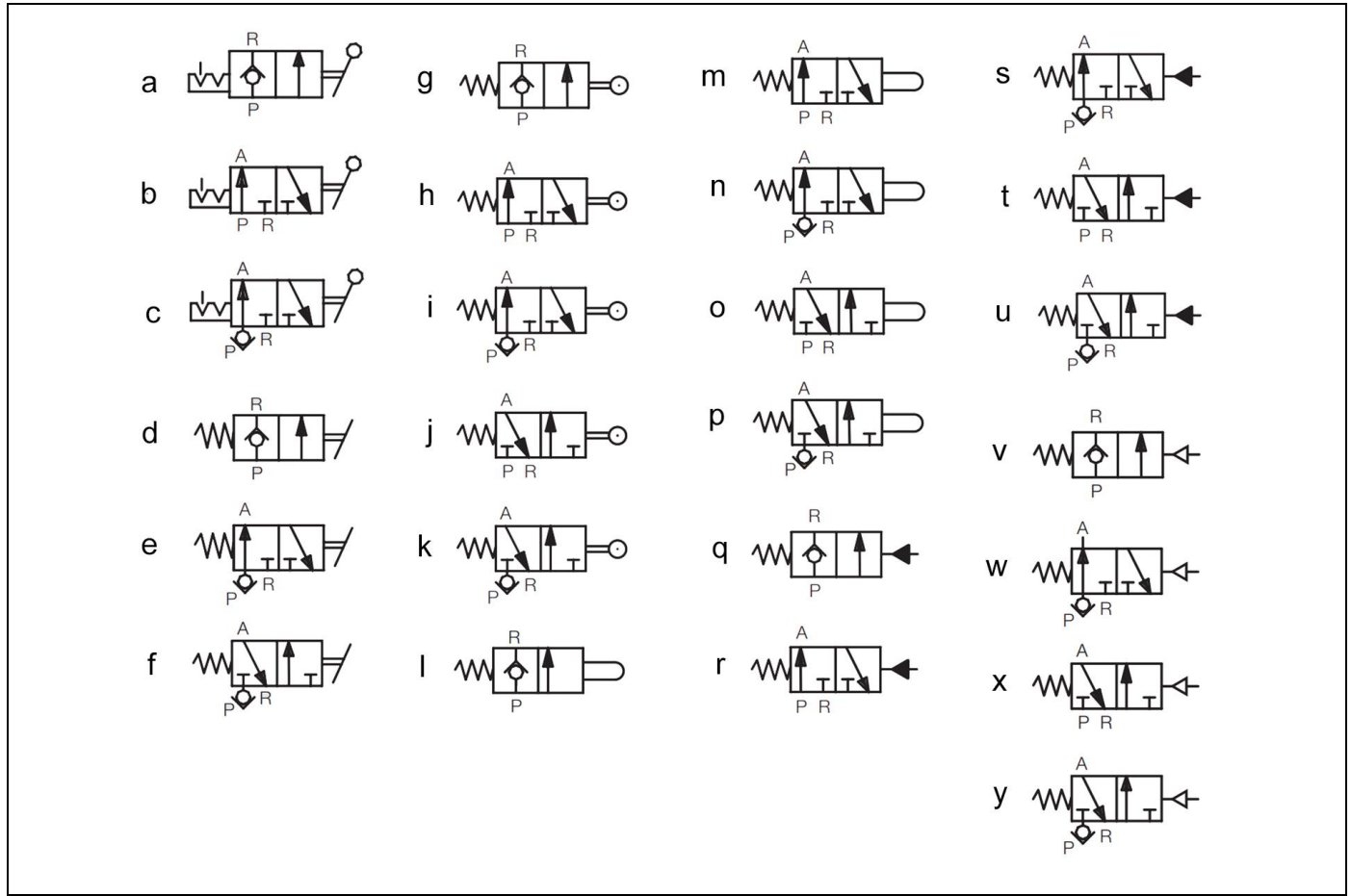


Figure 3: Presentation in the hydraulic circuit diagram

a	2/2 directional control valve DR2-1	n	3/2 directional control valve TZ3-1R
b	3/2 directional control valve DZ3-1	o	3/2 directional control valve T3-1
c	3/2 directional control valve DZ3-1R	p	3/2 directional control valve T3-1R
d	2/2 directional control valve FR2-1	q	2/2 directional control valve HR2-1
e	3/2 directional control valve FZ3-1R	r	3/2 directional control valve HZ3-1
f	3/2 directional control valve F3-1R	s	3/2 directional control valve HZ3-1R
g	2/2 directional control valve KR2-1	t	3/2 directional control valve H3-1
h	3/2 directional control valve KZ3-1	u	3/2 directional control valve H3-1R
i	3/2 directional control valve KZ3-1R	v	2/2 directional control valve PR2-1
j	3/2 directional control valve K3-1	w	3/2 directional control valve PZ3-1R
k	3/2 directional control valve K3-1R	x	3/2 directional control valve P3-1
l	2/2 directional control valve TR2-1	y	3/2 directional control valve P3-1R
m	3/2 directional control valve TZ3-1		

8 Start up

WARNING

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.

Troubles of functioning

Protect the valve against penetration of swarf, otherwise the clamping force of a connected clamping cylinder is possibly no longer guaranteed.

Swarf in the hydraulic oil

Swarf in the hydraulic oil can damage the valve seat so that an immediate pressure drop can occur in the clamping system.

CAUTION

Injury due to bursting or malfunction

Exceeding the max. operating pressure (see technical data) can cause the product to burst or malfunction.

- The maximum operating pressure must not be exceeded.
- If necessary, avoid overpressure by using suitable valves.

Acceptable performance conditions

The admissible performance data of the product and the downstream components must not be exceeded (see chapter "Technical characteristics" of the products and the downstream components).

NOTE

Check perfect functioning by repeated operation.

9 Maintenance



Hazardous to the environment

In case of improper use leaking oil can lead to environmental pollution
Pay attention to the notes for appropriate handling.

WARNING

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!

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.

9.1 Cleaning

The product must be cleaned from dirt, swarf and liquids at regular intervals.

9.2 Regular checks

WARNING

Injury by high-pressure injection (squirting out of hydraulic oil under high pressure)!

Defect or leaking fittings and connecting parts have to be exchanged.

General information

Check if the hydraulic ports are tight (visual control). The valves themselves are maintenance free.

10 Trouble shooting

Fault	Cause / Remedy	
Switching function is not correctly effected	Manual operation is not correctly adjusted	Control the position of the knob
	Valve defect	Exchange
Pressure at outlet port is not maintained	Check valve contaminated or leaky	Dismount valve of mounting plate and check, clean or exchange check valve
	Internal poppet valve leaky	Exchange valve

11 Accessory

NOTE

Accessories

- See data sheet.

12 Technical characteristics

General characteristics

Max. operating pressure, ports A, P, R	500 bar
Max. flow rate	8 l/min
Hydraulic oil	HLP 22

Turning handle D

Part no.	2321 XXX
Turning handle	Latching
Rotation angle	4 × 90°
Operating torque	approx. 0.63 Nm
Weight	approx. 0.4 kg
Ambient temperature	-25 to +80 °C

Sensing lever F

Part no.	2323 XXX
Sensing lever	Non-locking with return spring
Switching stroke	max. 20.5 mm
Switching force	25 to 28 N
Weight	approx. 0.4 kg
Ambient temperature	-25 to +80 °C

Sensing roller K

Part no.	2341 XXX
Roller lever	with return spring
Functional stroke	10.5 mm
Switching force	25 to 28 N
Weight	approx. 0.4 kg
Ambient temperature	-25 to +80 °C

Sensing pin T

Part no.	2322 XXX
Sensing pin	with return spring
Switching stroke	max. 4 mm
Switching force	51 to 57 N
Weight	approx. 0.4 kg
Ambient temperature	-25 to +80 °C

Hydraulics H

Part no.	2351 XXX
Hydraulic piston	with return spring
Operating volume	approx. 0.4 cm ³
Control pressure	12 to 500 bar
Weight	approx. 0.5 kg
Adm. temperature range	-40 to +80 °C

Pneumatics P

Part no.	2331 XXX
Pneumatic piston	with return spring
Operating volume	approx. 1 cm ³
Control pressure	4 to 15 bar
Compressed air	lubricated and filtered
Weight	approx. 0.4 kg
Adm. temperature range	-20 to +70 °C

NOTE

Further information

- For further technical data see ROEMHELD data sheet.

13 Storage

CAUTION

Damage due to incorrect storage of components

In case of improper storage, the seals can embrittle and resinification of the anti-corrosive oil or corrosion on/in the element can occur.

- Storage in the packaging and moderate environmental conditions.
- The product must not be exposed to direct sunlight, since UV light may cause serious damage to the seals.

The elements are tested by default with mineral oil. The exterior of the elements is treated with a corrosion inhibitor.

The oil film remaining after the test provides for a six-month interior corrosion protection, if stored in dry and uniformly tempered rooms.

For longer storage times, the element has to be filled with a non-resinifying corrosion inhibitor and the outside surfaces must be treated.

14 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.

15 Declaration of manufacture

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.

Declaration of manufacture of the products

They are designed and manufactured in line with the relevant versions of the directives **2006/42/EC**(EC MSRL) and in compliance with the valid technical rules and standards.

In accordance with EC-MSRL, these products are components, that are not yet ready for use and are exclusively designed for the installation in a machine, a fixture or a plant.

According to the pressure equipment directives the products are not to be classified as pressure reservoirs but as hydraulic placing devices, since pressure is not the essential factor for the design, but the strength, the inherent stability and solidity with regard to static or dynamic operating stress.

The products may only be put into operation after it was assessed that the incomplete machine / 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.

Laubach, 27.03.2026