# Block cylinders S
## double acting

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## 1 Description of the product

The block cylinders S are equipped with the latest sealing technology, so that optimally adapted versions are available depending on the operating pressure (250 or 500 bar), temperature and hydraulic fluid. At the piston rod outlet, the dirt wipers are largely protected against swarf by the recessed installation. All series are equipped with piston and rod guide rings which absorb side loads between the sliding components and prevent direct metal contact. This increases the service life and minimizes leakage.

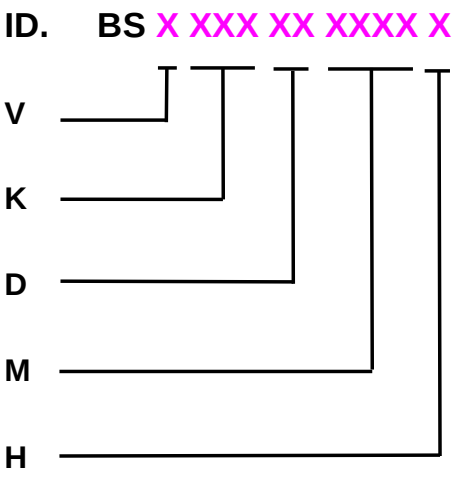
**Function**

The double-acting function ensures high function safety as well as exactly calculable and repeatable stroke times.

## 2 Validity of the documentation

This document applies to the following products:

Block cylinders of data sheet B 1.5100. The following types or part numbers are concerned:




**ID = Part no.**
**V = Piston diameter**

| | | | |
|---|---|---|---|
| 4 | 32 mm | 7 | 63 mm |
| 5 | 40 mm | 8 | 80 mm |
| 6 | 50 mm | | |

**K = max. operating pressure, operating temperature, seals**

| | | | |
|---|---|---|---|
| 251 | 250 bar | -30… +100°C | NBR |
| 501 | 500 bar | -30… +100°C | NBR |
| 252 | 250 bar | -20… +100°C | FKM |
| 253 | 250 bar | -20… +200°C | FKM |
| 503 | 500 bar | -20… +150°C | FKM |

**D = Connection**

| | |
|---|---|
| RA | 2 cross holes |
| RB | cross holes + 4 longitudinal holes |
| RC | 4 threads rod side |
| RD | 4 threads bottom side |
| RE | 2 cross holes + keyway, connection at the right side |
| RF | 2 cross holes + keyway, connection at the left side |

| | | |
|---|---|---|
| FA | Broad side | 2 cross holes, 1 to 49 mm stroke<br>4 cross holes from 50 mm stroke |
| FQ | Broad side | 2 cross holes + keyway, 1 to 49 mm stroke<br>4 cross holes+ keyway from 50 mm stroke |
| SB | Rod side, | 4 longitudinal holes |
| SC | Rod side, | 4 threads |
| BB | Bottom side, | 4 longitudinal holes |
| BD | Bottom side, | 4 threads |

**M = Piston stroke**

| | |
|---|---|
| 025N | 25 mm |
| 050N | 50 mm |
| 075N | 75 mm |
| 100N | 100 mm |

H = **Piston thread, centring collar**

| | |
|---|---|
| 1 | Internal thread (standard) |
| 2 | Internal thread + centring collar (only with housing RB, RC, SB, SC) |
| 3 | External thread |
| 4 | External thread + centring collar (only with housing RB, RC, SB, SC) |

## 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

**⚠ CAUTION**

**Operating pressure > 100 or > 160 bar, provide a support**

For an operating pressures of more than 100 or 160 bar, the products must be supported against the effective direction to compensate the occurring forces.
Screws for fixing can be damaged.

The products are used in industrial / commercial applications to transform hydraulic pressure into movement and /or force. They must only be operated with hydraulic oil.
Furthermore the following belongs to possible uses:

- Use within the capacity indicated in the technical characteristics.
- Use as per operating instructions.
- Compliance with service intervals.
- Qualified and trained personnel for the corresponding activities.
- Mounting of spare parts only with the same specifications as the original part.

## 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 these products is not permitted:

- For domestic use.
- For the use on fun fairs and in 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 chemically acting media damage the seals (seal material durability) or components and thereby functional failure or premature failure could occur.

For deviating operating and environmental conditions,e.g.:

- Higher operating pressures or flow rates than indicated on the data sheet or installation drawing.
- With hydraulic fluids that do not correspond to the specifications.

**Side load acting on the piston rod**

The application of side loads to the piston rod as well as the use of the product as a guiding element is inadmissible.

**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.

**Injury by dropping parts!**

Some products have a heavy weight and can cause injury when dropping.

- Transport products professionally.
- Wear personal protection equipment!

Weight specifications see chapter "Technical characteristics".

**Injury by crushing!**

Due to the stored energy, an unexpected start of the product can occur.

- Maintenance works at the product must only be made in depressurised mode!
- Keep hands and other parts of the body out of the working area!

**⚠ CAUTION**

**Side loads and forced conditions acting on the piston lead to increased wear.**

- Observe side loads as per data sheet.

### 7.1 Design

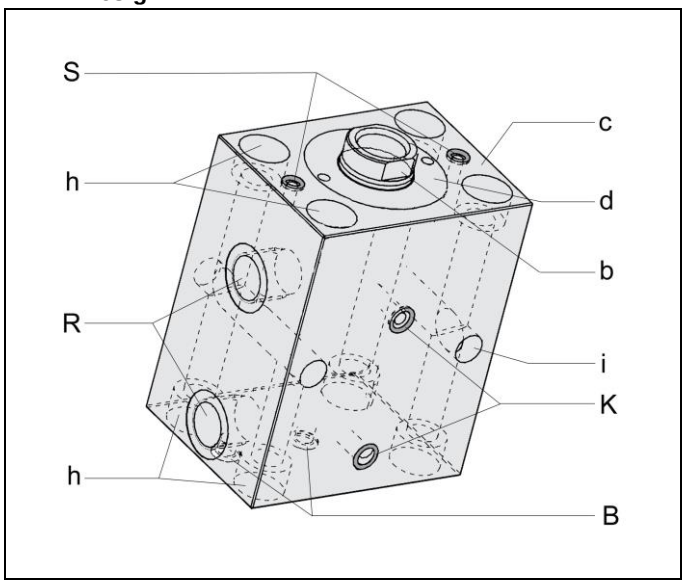



Figure 1: Schematic diagram of the components and connections

| | |
|---|---|
| B O-ring connections at the bottom side (BB and BD version)<br>K O-ring connections at the broad side (FA and FQ version)<br>R Hydraulic connections pipe thread (RA, RB, RC, RD, RE and RF version)<br>S O-ring connections at the rod side (SB and SC version) | b Piston rod<br>c Housing<br>d Threaded bushing<br>h Fixing possibility with longitudinal holes and counterbore (as per type of connection)<br>i Fixing possibilities with cross hole (according to type of connection) |

### 7.2 Fixing of the product

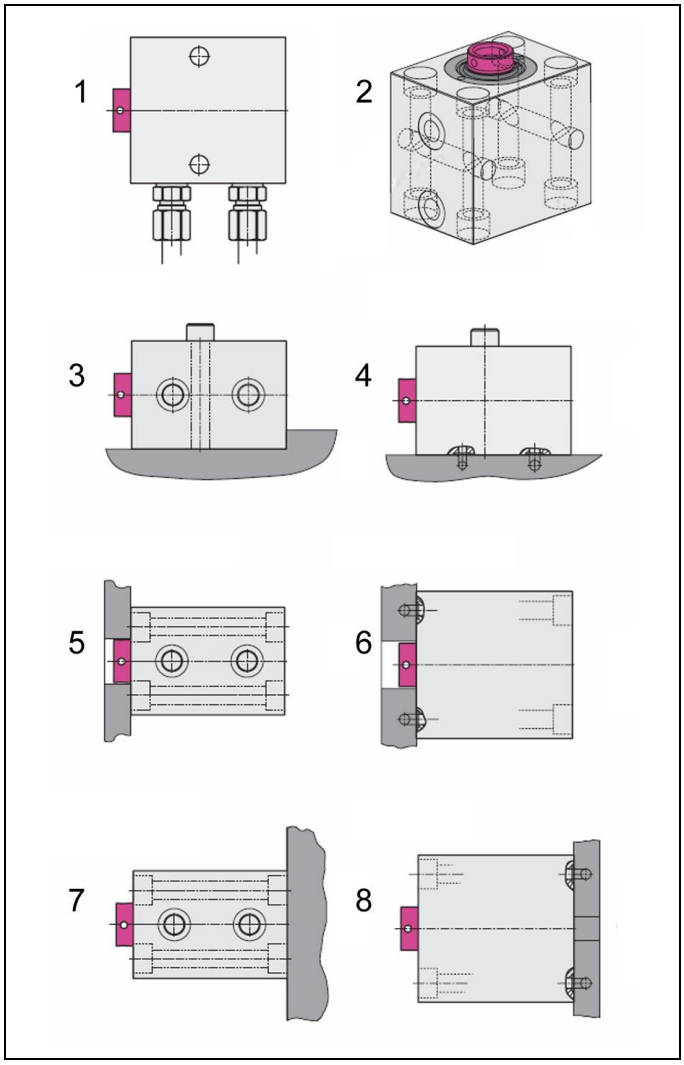



Figure 2: Fixing possibilities

| | |
|---|---|
| 1 Pipe thread<br>2 Possible mounting holes<br>3 Fixing - broad side, with pipe thread and support (operating pressure > 160 bar)<br>4 Fixing - broad side with O-ring connection, without support | 5 Fixing - rod side with pipe thread<br>6 Fixing - rod side with O-ring connection<br>7 Fixing - bottom side with pipe thread and O-ring connection<br>8 Fixing - bottom side with O-ring connection |

### 7.3 Support of the product

**⚠ CAUTION**

**Operating pressure > 100 or > 160 bar, provide a support**

For an operating pressures of more than 100 or 160 bar, the products must be supported against the effective direction to compensate the occurring forces.
Screws for fixing can be damaged.

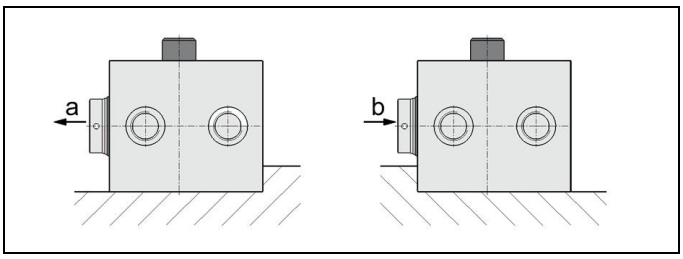



Figure 3: Block cylinder, supported

| | |
|---|---|
| a to push (p > 100 bar) | b to pull (p > 160 bar) |

**NOTE**

**Further information**

- For further technical data see ROEMHELD data sheet. B15100

### 7.4 Internal piston stop

If the entire stroke of the block cylinder is used, the piston moves against the internal stops. The sudden load that occurs during this process is dependent on

- the piston speed v
- the mass m connected to the piston

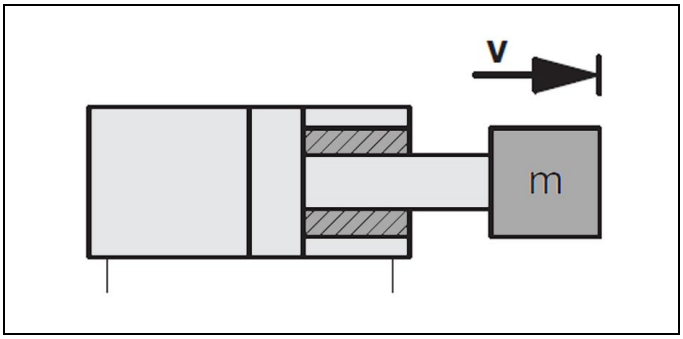



Figure 4: Internal piston stop

| | |
|---|---|
| m fixed mass | v piston speed |

**NOTE**

**Further information**

- For further technical data see ROEMHELD data sheet. B15100

### 7.5 Admissible piston side load

The admissible load is dependent on

- the distance of the side load from the cylinder body
- the total stroke of the block cylinder
- the actual driven piston stroke
- the operating temperature
- the hydraulic fluid

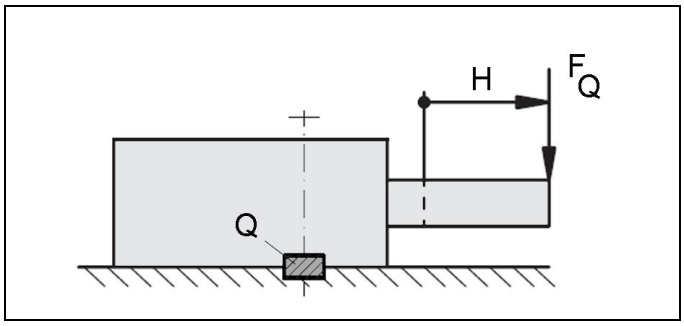



Figure 5: Internal piston stop

| | |
|---|---|
| Q Keyway<br>H Stroke | $F_Q$ Side load |

**NOTE**

**Further information**

- For further technical data see ROEMHELD data sheet. B15100

### 7.6 Admissible oil flow rate

**⚠ WARNING**

**Injury due to overload of the element**

High-pressure injection (squirting out of hydraulic oil under high pressure) or flying components!

- Due to throttling or closing of ports a pressure intensification can occur.
- Connect the ports professionally!

**⚠ CAUTION**

**Malfunction or early failure**

Exceeding the max. flow rate can lead to overload and premature failure of the product..

- The maximum flow rate must not be exceeded!

#### 7.6.1 Calculation of the admissible flow rate

**Admissible flow rate**

The admissible flow rate or the admissible stroke speed is valid for vertical mounting positions in combination with standard add-on parts as clamping arms or contact bolts, etc.

In case of other mounting positions and/or add-on parts the flow rate has to be reduced.

If the pump flow rate divided by the number of elements is larger than the admissible flow rate of one element, the flow rate has to be throttled.

This prevents an overload and therewith an early failure.

The flow rate can be checked as follows:

$$Q_P \leq 0{,}06 \cdot \dot{V}_Z \cdot n \quad \text{and/or} \quad Q_P \leq 6 \cdot v_Z \cdot A_K \cdot n$$

for clamping elements and work supports (indicated on the data sheets)

**Maximum piston speed**

At specified pump flow rate $Q_P$ and with the effective piston area $A_K$ the piston speed can be calculated as follows:

$$v_m < \frac{Q_P}{6 \cdot A_K \cdot n}$$

**Legend**

$\dot{V}_Z$ = Admissible flow rate of the element in [cm³/s]

$Q_P$ = Flow rate of the pump in [l/min]

$A_K$ = Piston area in [cm²]

$n$ = Number of elements, same dimensions

$v_Z = {}^{v_m}$ = Admissible/maximum stroke speed in [m/s]

**NOTE**

**Flow rate**

- Adm. stroke speed V max. = 0,5m/s

Further "things worth knowing about hydraulic cylinders, basics, detailed knowledge and calculations on hydraulic cylinders" see in the Technical library on the internet!

or download

### 7.6.2 Throttling of the flow rate

The throttling always has to be effected in the supply line to the element. Only thus pressure intensification and thereby pressures exceeding the operating pressure are avoided. The hydraulic circuit diagram shows flow control valves which allow oil return from the element without any impediments.

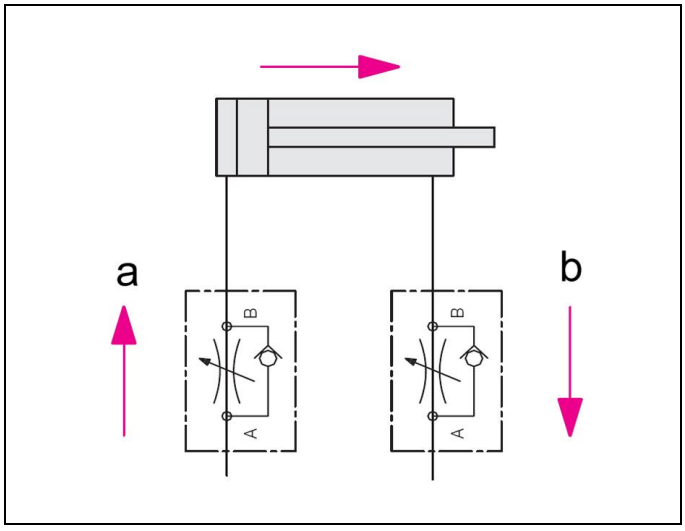



Figure 6: Hydraulic circuit diagram without flow control valves

| | |
|---|---|
| a Throttling direction | b Free flow |

If a return-flow throttling is required due to a negative load, it must be guaranteed that the max. operating pressure (see technical characteristics) will not be exceeded.

### 7.7 Installation of pipe-mounted types

1. Clean the support surfaces.
2. Fix the element at the support surface (see figure "Mounting types).

**WARNING**

**Product can fall down**

Injury by falling products!

- Safety shoes have to be worn to avoid injuries due to falling objects.

**CAUTION**

**Product not properly tightened**

Product can loosen during operation.

- Fix and/or secure with sufficient tightening torque.

**NOTE**

**Determination of the tightening torque**

To determine the tightening torque of the fixing screws a screw calculation as per VDI 2230 page 1 has to be effected. The screw material is indicated in the chapter "Technical characteristics".

**NOTE**

**Tightening torques**

- The tightening torques for the fixing screws have to be designed with reference to the application (e. g. as per VDI 2230).

Proposals and approximate values for the tightening torques see chapter "Technical characteristics".

### 7.8 Installation of manifold-mounted types

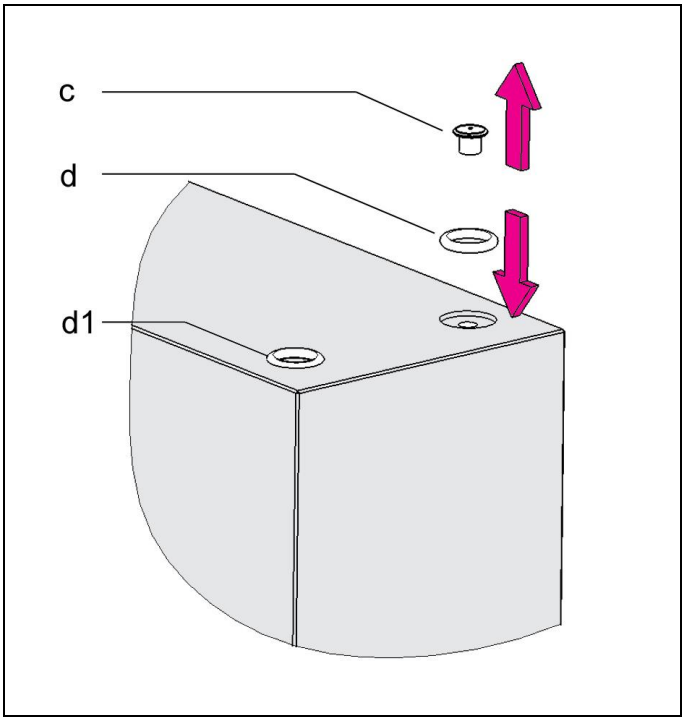



Figure 7: Example, preparation for hydraulic ports without pipes

**HINWEIS**

**schematic diagram**

- The shown figure is a schematic diagram. The arrangement of the ports depends on the respective product (see chapter "Design").

| | |
|---|---|
| c Countersunk plug against dirt during transport<br>d O-ring (accessory, depending on the version) | d1 Mounted O-ring |

1. Drill the holes for hydraulic oil supply and return in the fixture (see also data sheet).
2. Grind or finish mill the 4 and a flatness of 0.02 mm to manifold-mounting surface (Rz 100 mm, marks, scratches, shrink holes, concentric machining marks are inadmissible).
3. Countersunk plug remove., insert o-rings (accessories, if required).
4. Clean the support surfaces.
5. Position and fasten on the fixture.
6. Install bleeding screws at the upper ends of the piping.

**NOTE**

**Tightening torques**
- The tightening torques for the fixing screws have to be designed with reference to the application (e. g. as per VDI 2230).

Proposals and approximate values for the tightening torques see chapter "Technical characteristics".

### 7.9 Connection of the hydraulic equipment

**CAUTION**

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

1. Connect hydraulic lines to qualifying standards and pay attention to scrupulous cleanness (A = Extend, B = Retract)!

**NOTE**

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

**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!

## 8 Start up

**WARNING**

**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.

**Injury by crushing!**

Components of the product make a movement while they are in operation, this can cause injuries.
- Keep parts of the body and items out of the working area!

**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.

1. Check tight seat.
2. Check tight seat of the hydraulic ports (check tightening torque of the hydraulic ports).
3. Bleed the hydraulic system.

**NOTE**

**Clamping time**
- Without bleeding the clamping time will be considerably prolonged and function problems may occur.

### 8.1 Bleeding of pipe-mounted types

1. Loosen carefully at low pressure union nut of the pipe at the hydraulic ports.
2. Pump until bubble free oil comes out.
3. Fasten union nuts of the pipe.
4. Check tightness.

### 8.2 Bleeding of manifold-mounted types

1. Loosen carefully the bleeding screws of the fixture at low pressure.
2. Pump until bubble free oil comes out.
3. Fasten the bleeding screws.
4. Check correct function.
5. Check sealing of the hydraulic connections!

# 9 Maintenance

**⚠ 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.

**Injury by crushing!**

Due to the stored energy, an unexpected start of the product can occur.

- Maintenance works at the product must only be made in depressurised mode!
- Keep hands and other parts of the body out of the working area!

**⚠ CAUTION**

**Maintenance and repair work**

All maintenance and repair works only to be effected by ROEMHELD service staff.

## 9.1 Cleaning

**⚠ CAUTION**

**Material damage, damage to moving components**

Damage to piston rods, plungers, bolts, etc., as well as wipers and seals can lead to leakage or premature failure!

- Do not use cleaning agents (steel wool or similar) that cause scratches, marks or the like.

**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 product must be cleaned at regular intervals, especially the area of the piston or the plunger housing has to be cleaned from swarf and other liquids.

In the case of heavy contamination, the cleaning has to be made in shorter intervals.

## 9.2 Regular checks

1. Check tightness of hydraulic connections (visual control).
2. Check running surfaces (of the piston rod or bolt) if there are marks and scratches. Traces of marks can be an indication for a contaminated hydraulic system or an inadmissible side load of the block cylinder.
3. Leakage check at the housing - piston rod, bolt or flange.
4. Clamping force control by pressure control.
5. Check if the maintenance intervals are kept.

## 9.3 Exchange seal kit

The exchange of the seal kit is made in case of external leakages. For high availability, the seals have to be changed at the latest after 1,000,000 cycles or 2 years.

The seal kit is available as spare part. An instruction for the exchange of the seal kit is available on request.

**NOTE**

**Seal Kits**

- Do not install seal kits which were exposed to light for a longer time.
- Pay attention to the storage conditions (see chapter "Technical characteristics").
- Only use original seals.

# 10 Trouble shooting

| Trouble | Cause | Remedy |
|---|---|---|
| Piston does not extend: | hydraulic oil supply or return is impeded | check and blow through tubes or channels |
| Piston extends jerkily: | air in the hydraulic system | hydraulic bleeding |
| System pressure reduces: | hydraulic port leaky | seal |
| | wear of seals | replace seals |

# 11 Accessory

**NOTE**

**Accessories**

- See data sheet.

# 12 Technical characteristics

**Characteristics**

| Type | Maximum operating pressure [bar] |
|---|---|
| BSX501XXXXXXX | **500*** |
| BSX503XXXXXXX | **500*** |
| BSX251XXXXXXX | **250** |
| BSX252XXXXXXX | **250** |
| BSX253XXXXXXX | **250** |

*for punching applications max. 250 bar

| Type | Max. pushing force at 500 bar [kN] | Max. pulling force at 500 bar [kN] |
|---|---|---|
| BS4XXXXXXXXX | **40.2** | **24.5** |
| BS5XXXXXXXXX | **62.8** | **38.2** |
| BS6XXXXXXXXX | **98.1** | **57.9** |
| BS7XXXXXXXXX | **155.8** | **93.0** |
| BS8XXXXXXXXX | **251.3** | **153.1** |

**Weight**

| Types | BSXX4 | BSXX5 |
|---|---|---|
| Stroke [mm] | 25/50/75/100 | 25/50/75/100 |
| Weight [kg] | 2.7/3.3/4.0/4.6 | 3.7/4.6/5.4/6.2 |

| Types | BSXX6 | BSXX7 |
|---|---|---|
| Stroke [mm] | 25/50/75/100 | 25/50/75/100 |
| Weight [kg] | 5.7/6.9/8.0/9.1 | 10.0/11.8/13.6/15.4 |

| Types | BSXX8 |
|---|---|
| Stroke [mm] | 25/50/75/100 |
| Weight [kg] | 18.2/21.1/24.0/26.8 |

**Proposal, tightening torques for screws of tensile strength 8.8**

**NOTE**

- The indicated values are approximate values and have to be interpreted according to the user's application!
  See note!

| Thread | Tightening torque (MA) [Nm] |
|---|---|
| | 8.8 |
| M6 | 10 |
| M8 | 25 |
| M10 | 49 |
| M12 | 85 |
| M14 | 135 |
| M16 | 210 |
| M20 | 425 |
| M24 | 730 |
| M30 | 1,450 |

**Note:** Valid for workpieces and set screws made of steel with metric thread and connecting surface dimensions as per DIN 912, 931, 933, 934 / ISO 4762, 4014, 4017, 4032
In the table values for tightening torques (MA) the following is considered:
Design steel/steel, friction value µges = 0.14 - not oiled, utilisation of the minimum yield point = 90%.

**NOTE**

**Further information**

- For further technical data see ROEMHELD data sheet. B15100

## 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**

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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, 02.01.2024