



Block cylinders double acting

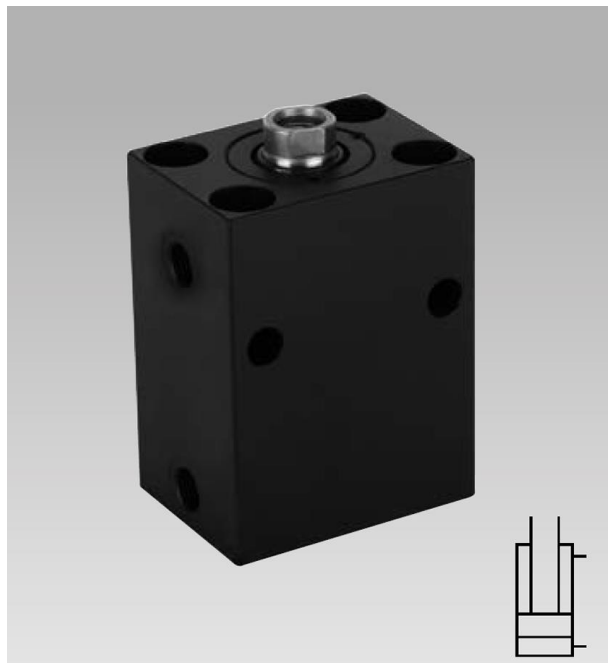


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1 Description of the product

Double-acting block cylinders can be used universally for all hydraulic-operated linear movements.

Positioning	Clamping	Supporting
Gripping	Bending	Riveting
Punching	Moving	Opening
Closing	Locking	Unlocking
Lifting	Lowering	Pressing
Pulling		

Function

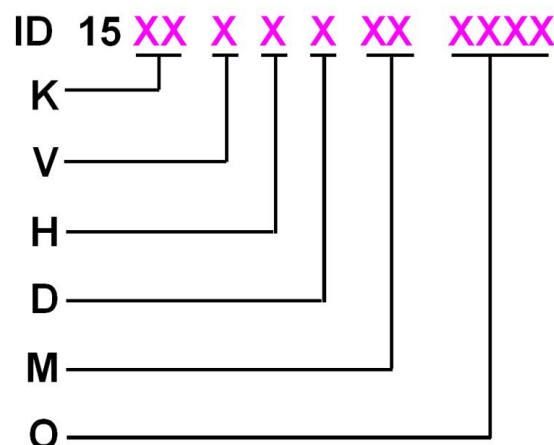
The double-acting functioning allows a force generation in both axial directions (force to push and to pull). This guarantees a high function safety as well as exactly calculable and repetitive times required for the stroke.

2 Validity of the documentation

This document applies to the following products:

Block cylinders of data sheet B1.5094. The following types or part numbers are concerned:

2.1 Code for part numbers of the basic versions



ID = Part-no.

K = piston diameter

41 = 16 mm	48 = 80 mm
43 = 25 mm	49 = 100 mm
44 = 32 mm	50 = 125 mm
45 = 40 mm	51 = 160 mm
46 = 50 mm	52 = 200 mm
47 = 63 mm	

V = serial number

0 = piston Ø 160 to 200 mm	pipe thread and manifold mounting connection
1 = piston Ø 16 to 125 mm	pipe thread and manifold mounting connection
2 = stroke 160 to 200 mm	

H = piston stroke

0	= 16 to 40 mm	
6	= 50 mm	
7	= 63 mm	
8	= 80 mm	
9	= 100 mm	
1	= 160 mm 15XX 210	FKM, 4 cross holes and 4 longitudinal holes
1	= 200 mm 15XX 211	longitudinal holes

D = sealings and holes in the housing

0	= NBR, 2 cross holes
1	= FKM, 2 cross holes (except 154X 211)
5	= NBR, 2 cross holes and 4 longitudinal holes
6	= FKM, 2 cross holes and 4 longitudinal holes

M = variants

	= pipe thread	
C	= pipe thread	with 4 interior threads rod side
D	= pipe thread	with 4 interior threads bottom side
E	= pipe thread	with connections at the right side and keyway
F	= pipe thread	with connections at the left side and keyway
CD	= pipe thread	with 4 interior threads rod side and bottom side

To screw on, with O-ring sealing

K	= broad side	with 2 cross holes, stroke 16 to 40 mm
L	= broad side	with 4 cross holes, stroke from 50 mm
S	= rod side	with 4 longitudinal holes
B	= bottom side	with 4 longitudinal holes
KQ	= broad side	with 2 cross holes, keyway
LQ	= broad side	with 4 cross holes, keyway
SC	= rod side	with 4 interior threads rod side
BD	= bottom side	with 4 interior threads bottom side

O = stroke limitation

Example:

Block cylinder 1547 210 (pipe thread)
with stroke limitation to 180 mm
Part-no. 1547 210 H180

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 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.

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".

CAUTION

Malfunction or early failure

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

- Provide external guides.
- Avoid forced conditions (overdetermination) of the piston.

7.1 Design

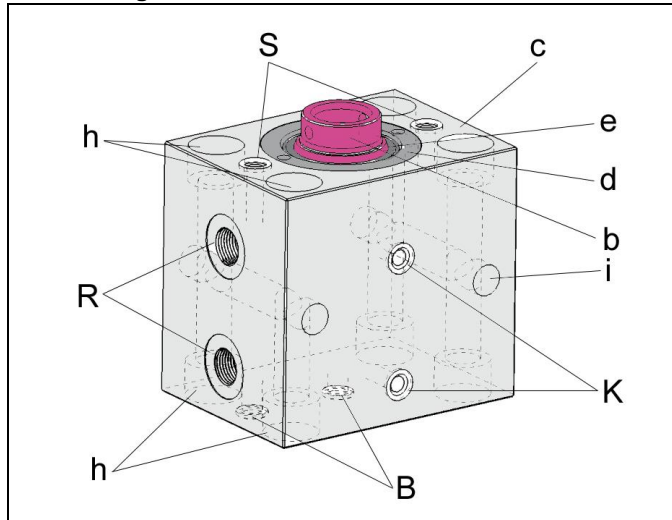


Figure 1: Schematic diagram of the components and connections

B	O-ring connection at the bottom side (according to type of connection)	b	Piston rod
K	O-ring connections at the broad side, K and L version (according to type of connection)	c	Housing
R	Hydraulic ports pipe thread (according to type of connection)	d	Threaded bushing
S	O-ring connection at the Rod side	e	Wiper
		F	Flange with O-ring sealing (according to type of connection)
		h	Fixing possibility with longitudinal holes and counterbores (as per type of connection)
		i	Fixing possibilities with cross holes (according to type of connection)

7.2 Fixing of the product

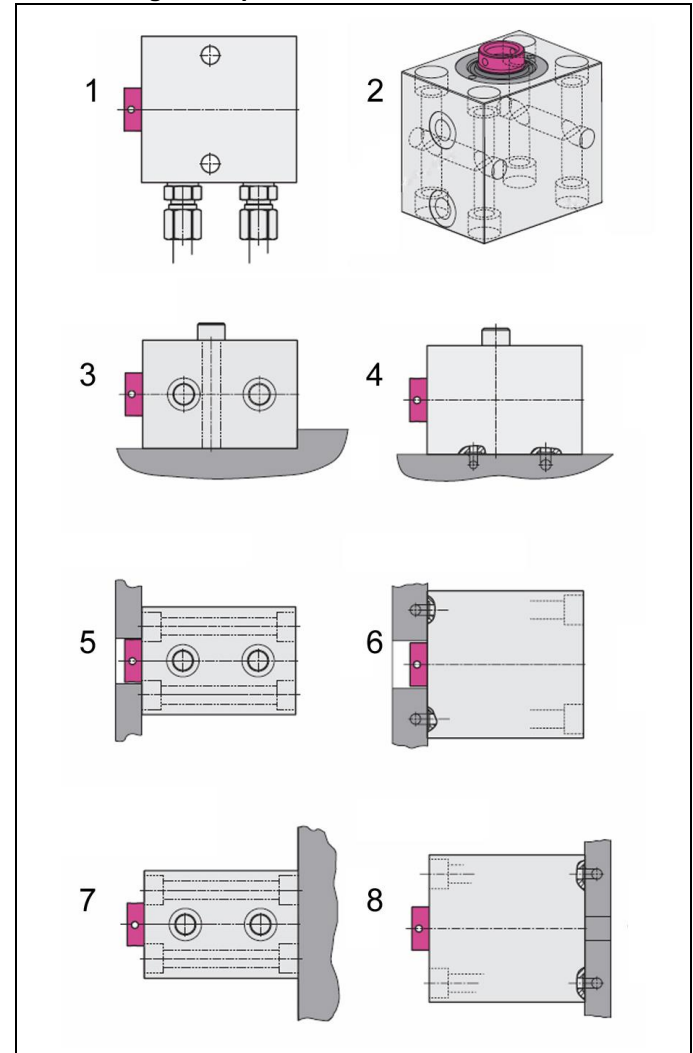


Figure 2: Fixing possibilities

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

⚠ CAUTION

Product not properly tightened

Product can loosen during operation.

- Fix and/or secure with sufficient tightening torque.

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.

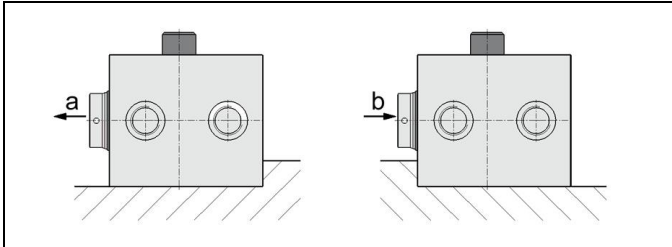


Figure 3: Block cylinder, supported

a to push (p > 100 bar)	b to pull (p > 160 bar)
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7.4 Admissible dynamic load

This block cylinder line is not equipped with stroke end cushioning, i.e. a weight m fixed to the piston will move with speed v against the internal stop without braking. Above all in extending direction, the threaded bushing is overloaded and the operating safety is jeopardised.

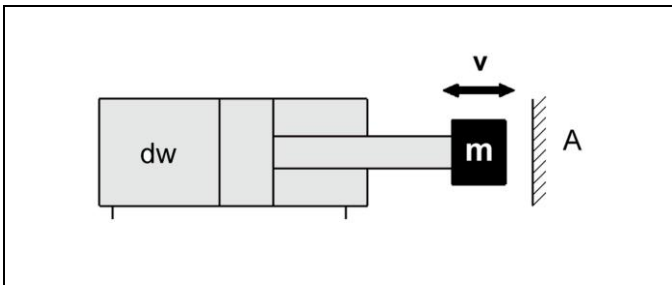


Figure 4: Dynamic forces

dw double acting	m fixed mass
A external stop	v piston speed

At piston speeds higher than 0.05 m/s and a weight that exceeds the own weight of the block cylinder, a cylinders with stroke end cushioning has to be used or the cylinder movement must be effected against an external stop. This is also valid for punching applications

7.4.1 Side loads and/or torques

Side load acting on the piston rod

For a piston stroke up to 50 mm side loads of max. 3% of the push force may be introduced into the piston rod. The use as a guiding element is inadmissible.

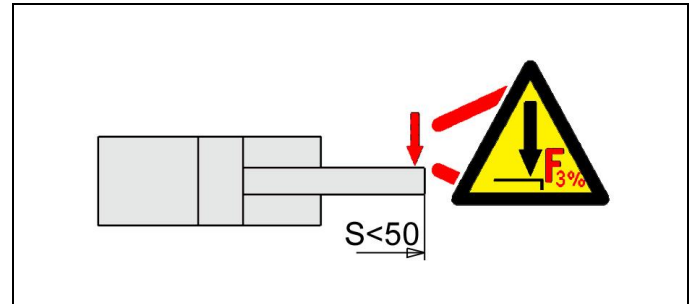


Figure 5: Introduction of side loads

F force or torque (max. 3%)	S Stroke ± 50 mm
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7.5 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!

7.5.1 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

- The maximum oil volume and/or the maximum stroke speed depend on the corresponding product.
 - For clamping cylinders see data sheet A 0.100.
 - For clamping elements, work supports, hydraulic valves, power units and other hydraulic elements indicated on the corresponding data sheets.

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

7.5.2 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.

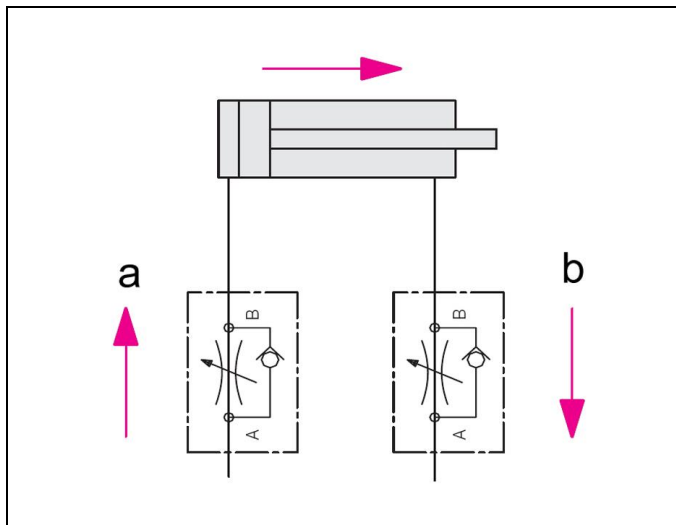


Figure 6: Hydraulic circuit diagram without flow control valves

a Throttling direction	b Free flow
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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.

7.6 Installation of pipe-mounted types

- Clean the support surfaces.
- 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".

7.7 Installation of manifold-mounted types

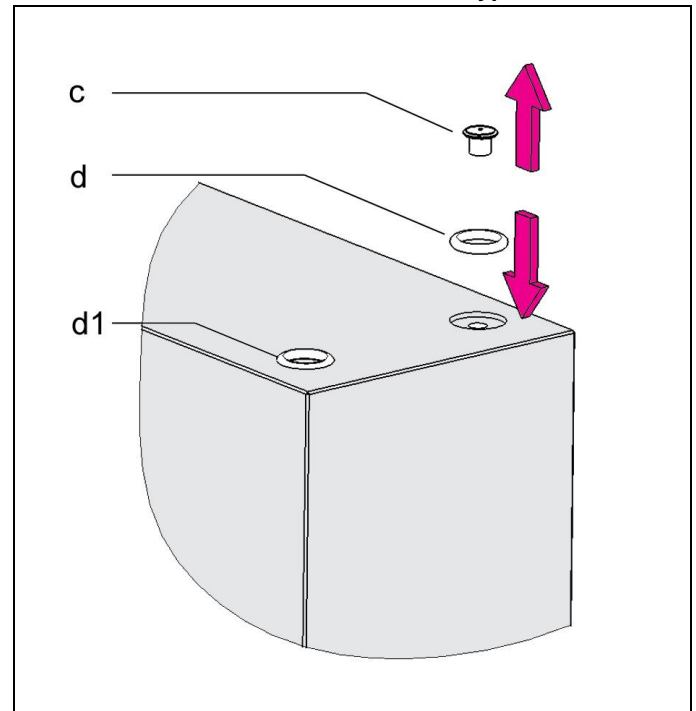


Figure 7: Example of the preparation for hydraulic ports without pipes

NOTE

Schematic sketch

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

c Countersunk plug against dirt for transport	d1 Mounted O-ring
d O-ring (accessory, according to the version)	

- Drill the holes for hydraulic oil supply and return in the fixture (see also data sheet).
- Grind or finish mill flange surface (Rz max.4 and a flatness of 0.04 mm to □100 mm. Marks, scratches, shrink holes are not admissible on the surface.)
- Remove countersunk plug. Insert O-rings (accessory, if required).
- Clean the support surfaces.
- Position and fix on the fixture.

NOTE

Tightening torque

For fixing screws and tightening torques see technical data.

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 Connection of the hydraulic equipment

CAUTION

Work by qualified personnel

- Works only to be effected by authorised personnel.

- 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.

- Check tight seat.
- Check tight seat of the hydraulic ports (check tightening torque of the hydraulic ports).
- 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

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

8.2 Bleeding of manifold-mounted types

- Loosen carefully the bleeding screws of the fixture at low pressure.
- Pump until bubble free oil comes out.
- Fasten the bleeding screws.
- Check correct function.
- 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 de-pressurised 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

- Check tightness of hydraulic connections (visual control).
- 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.
- Leakage check at the housing - piston rod, bolt or flange.
- Clamping force control by pressure control.
- 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

General characteristics

Type	Maximum operating pressure [bar]	Maximum force to push [kN]	Maximum force to pull [kN]
1541-XXX X	500	10.0	6.1
1543-XXX X	500	24.5	14.5
1544-XXX X	500	40.2	24.5
1545-XXX X	500	62.8	38.3
1546-XXX X	500	98.5	57.9
1547-XXX X	500	156.0	93.0
1548-XXX X	500	252.0	153.2
1549-XXX X	500	392.0	236.8
1550-XXX X	500	613.5	362.0
1551-XXX X	500	1005.0	612.6
1552-XXX X	500	1570.0	957.0

*) with or without spring return.

Weights

Types	1541-XXX	1543-XXX
Stroke [mm]	25/50/100	25/50/100/160
Weight [kg]	0.8/0.9/1.6	1.2/1.9/3.1/4.2

Types	1544-XXX	1545XXX
Stroke [mm]	25/50/100/160/200	25/50/100/160/200
Weight [kg]	1.8/2.7/4.5/6.0/7.1	2.6/3.6/5.6/7.6/9.0

Types	1546-XXX	1547XXX
Stroke [mm]	25/50/100/160/200	30/63/100/160/200
Weight [kg]	3.8/5.3/8.2/11.2/12.5	6.7/9.8/13.2/18.1/21.0

Types	1548-XXX	1549XXX
Stroke [mm]	32/80/100/160/200	40/100/160/200
Weight [kg]	12.8/19.8/22.8/30.7/36	24/37/50/60

Types	1550-XXX	1551-XXX
Stroke [mm]	40/100/160/200	40/100/160/200
Weight [kg]	39/54/60/70	85/110/128/147

Types	1552-XXX	
Stroke [mm]	100/160/200	
Weight [kg]	183/235/264	

For version FKM sealing and their flange versions **-K**, **-L**, **-S** and **-B**, as well as the version with keyway **-Q**, **-E** and **-F**.

The indicated weights can deviate according to the version.

Proposal, tightening torques for screws of tensile strength 8.8, 10.9, 12.9

NOTE

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

Thread	Tightening torque [Nm]		
	8.8	10.9	12.9
M3	1,3	1,8	2,1
M4	2,9	4,1	4,9
M5	6,0	8,5	10
M6	10	15	18
M8	25	36	45
M10	49	72	84
M12	85	125	145
M14	135	200	235
M16	210	310	365
M20	425	610	710
M24	730	1050	1220
M30	1,450	2100	2450

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 the following is considered:
Design steel/steel, friction value $\mu_{ges} = 0.14$ - not oiled, utilisation of the minimum yield point = 90%.

NOTE

Further information

- For further technical data see ROEMHELD data sheet. B 15094

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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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, 17.06.2024