Flat Lever Clamps

single and double acting

Table of contents

1 Description of the product

The flat lever clamp is a hydraulic clamping element for fixtures with oil supply through drilled channels.
Due to the minimum space required the flat lever clamp is especially suitable for fixtures with little space for the installation of hydraulic clamping elements.
.
The flat clamping lever allows machining of surfaces that are only a few millimetres above the clamping point.
When pressurising the flat lever clamp, a piston moves upwards against the rear edge of the clamping lever and swivels the clamping lever to the clamping position. The piston force is deviated by 180° onto the workpiece. The clamping force depends on the operating pressure and the length of the clamping lever.
When unclamping the flat lever clamp, the clamping lever is swivelled back to the off-position by means of a hook-shaped carrier on the piston. Unclamping is made either hydraulically or when using a single-acting element with spring force.
The pneumatic position monitoring of the double-acting flat lever clamp allows the monitoring of both final positions of the clamping lever.
Beside the short clamping lever, also a long clamping lever is available, that is provided for reworking to the desired length and contour.

2 Validity of the documentation

This document applies to the following products:

Flat lever clamp of the data sheet B1829. The following types or part numbers are concerned:

Double acting with clamping lever
without pneumatic position monitoring
- 1829 710D18
- 1829 720D24
- 1829 730D28
- 1829 740D33

Double acting with clamping lever
with pneumatic position monitoring
- 1829 713D18
- 1829 723D24
- 1829 733D28
- 1829 743D33

Double acting without clamping lever
without pneumatic position monitoring
- 1829 710D00
- 1829 720D00
- 1829 730D00
- 1829 740D00

Double acting without clamping lever
with pneumatic position monitoring
- 1829 713D00
- 1829 723D00
- 1829 733D00
- 1829 743D00

Single acting without clamping lever
without pneumatic position monitoring
- 1829 710E00

- 1829 720E00
- 1829 730E00
- 1829 740E00

Single acting with clamping lever
without pneumatic position monitoring

- 1829 710E18
- 1829 720E24
- 1829 730E28
- 1829 740E33

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

The products are used in industrial applications to transform hydraulic pressure to a radial 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!

- 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.
- If due to physical / chemical effects (vibrations, welding currents or others) damages of the products or seals can be caused.
- In machines, on pallets or machine tool tables that are used to change the characteristics of the material (magnetise, radiation, photochemical procedures, etc.).
- In areas for which special guidelines apply, especially installations and machines:
  - For the use on fun fairs and in leisure parks.
  - In food processing or in areas with special hygiene regulations.
  - For military purposes.
  - In mines.
  - In explosive and aggressive environments (e.g. ATEX).
  - In medical engineering.
  - In the aerospace industry.
  - For passenger transport.
- For other operating and environmental conditions e.g.:
  - Higher operating pressures than indicated on the data sheet or installation drawing.
  - With hydraulic fluids that do not correspond to the specifications.
  - Higher flow rates than indicated on the data sheet or installation drawing.

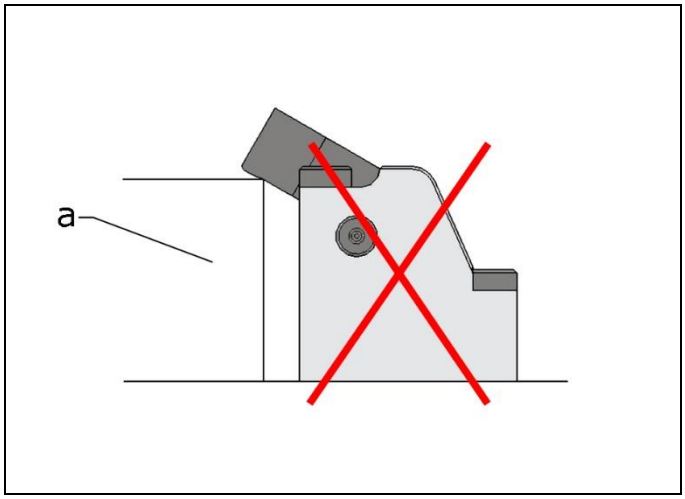

Figure 1: Inappropriate use

a	Workpiece

The use outside the indicated clamping range (see data sheet B1.829) is not permitted, because this can damage the lever mechanism.

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.

Injury by falling parts!

- Keep hands and other parts of the body out of the working area.
- Wear personal protection equipment!

Poisoning due to contact with hydraulic oil!

Wear, damage of the seals, ageing 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.

⚠ CAUTION

Great weight may fall

Some product types have a considerable weight. These have to be secured against working free during transport.
Weight specifications see chapter "Technical characteristics".

7.1 Design

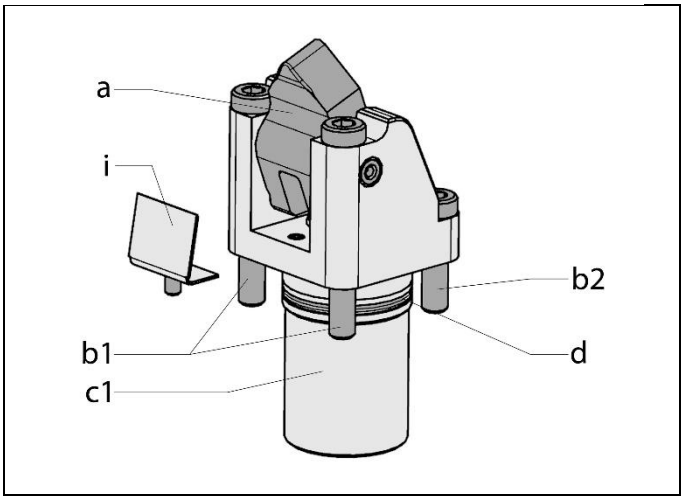

Figure 2: Single-acting components

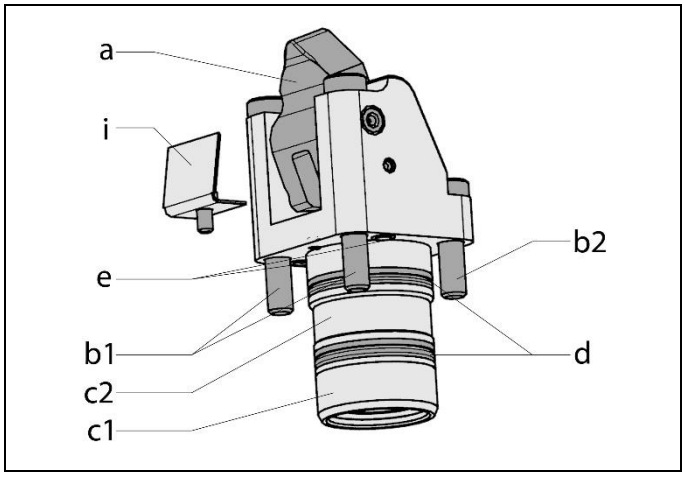

Figure 3: Double-acting components

a Clamping lever	c2 Hydraulic port unclamping)
b1 Front fixing screws	d Hydraulic seals (O-rings and back-up rings)
b2 Rear fixing screws	e O-ring seals for pneumatic position control
c1 Hydraulic port clamping	i Swarf sheet (optional)

7.2 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

Maximum flow rates do not exceed

The maximum flow rate must not be exceeded.

7.2.1 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!

7.2.2 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.

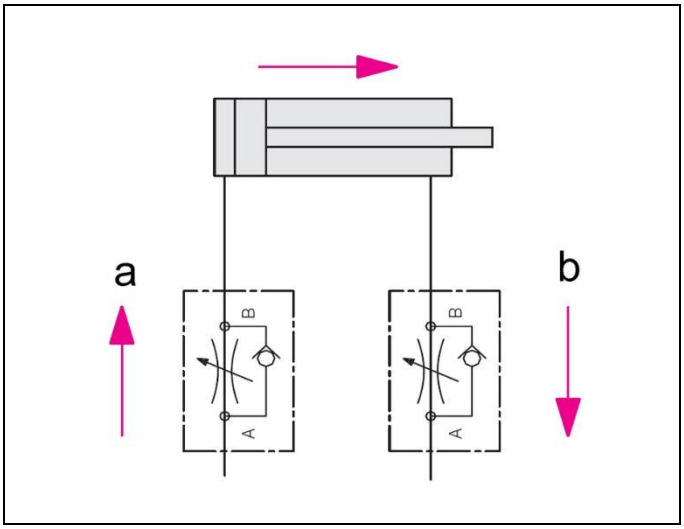

Figure 4: Hydraulic circuit diagram without flow control valves

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.

7.3 Installation of products with external sealing

7.3.1 Design

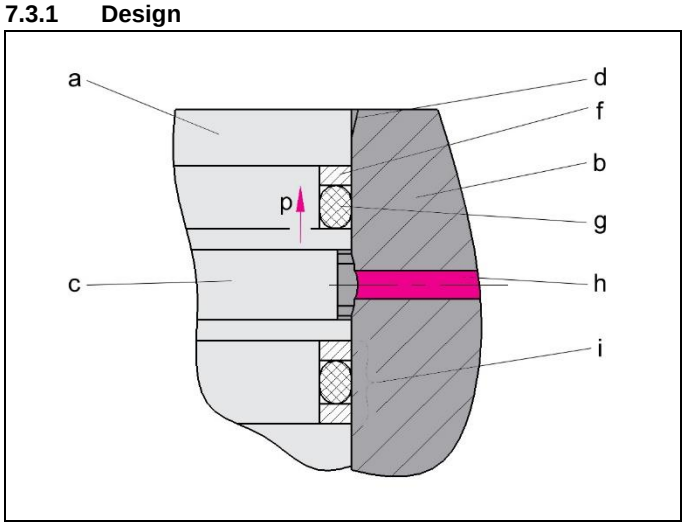

Figure 5: Components

a	Housing of the element	g	O-ring sealing
b	Fixture body	h	Supply hole in the fixture body
c	Slot for transmission of the pressure medium	i	Combination with applied pressure from both sides
d	Insertion chamfer	p	Pressure direction
f	Back-up ring on the side that is not subject to pressure		

7.3.2 Installation

⚠ WARNING

Injury by crushing!

- Due to protruding components there can be pinch points during installation.
- Keep hands and fingers away from pinch points!

Injury by cutting!

- Sharp-edged threads can cause cut injuries.
- Wear personal protection equipment!

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

Before mounting the following points are to be checked:

- Is the location hole prepared according to the specifications on the data sheet?
  - Are the tolerances and surfaces met?
  - Is the wall thickness of the fixture sufficient?
- Are the insertion chamfers in the fixtures realised according to the drawing?
- Are the bore holes in the installation geometry deburred and chamfered?
- Are machining residues such as swarf, dirt and foreign particles removed?
- Are the threaded tips covered?
- Are the seals and components greased or oiled prior to assembly?
  - Pay attention to media compatibility of the sealings!
  - ROEMHELD recommends to use the sealing medium for lubrication.
- Do not use grease with additions of solids as molybdenum disulphide or zinc sulphide.
- Do not use sharp objects for mounting!
- Pay attention to protruding back-up rings. Use special tools for correct positioning.
- Wherever possible use assembly aids.

Procedure for mounting

1. Insert in bore hole
2. Pay attention that the seals will not be damaged.
3. Evenly tighten the fixing screws (fixing screws 10.9 – DIN 7984 are included in the delivery) with the corresponding tightening torque.
   See chapter Technical characteristics.

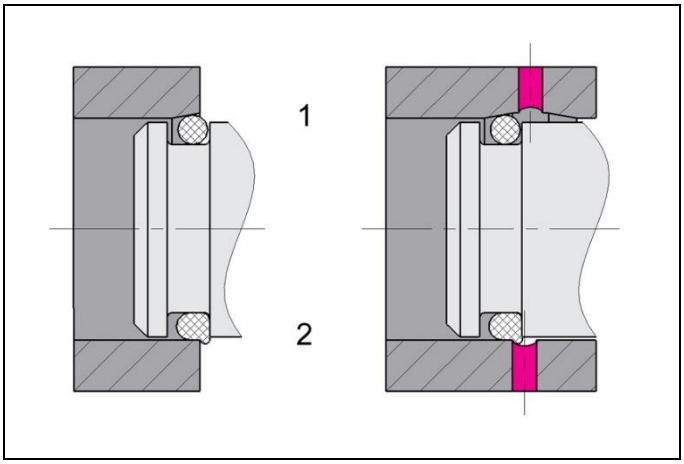

Figure 6: Installation with insertion chamfer and cross hole

1	Correct with chamfer	2	Incorrect without chamfer

7.4 Connection of the hydraulic equipment

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

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.

7.5 Assembly / Disassembly of the clamping lever

Assembly/Disassembly of the clamping lever

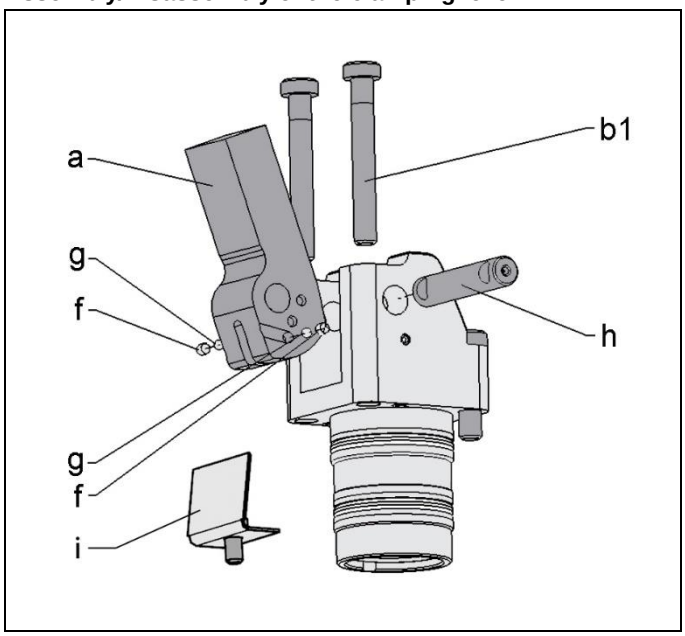

Figure 7: Assembly/Disassembly of the clamping lever

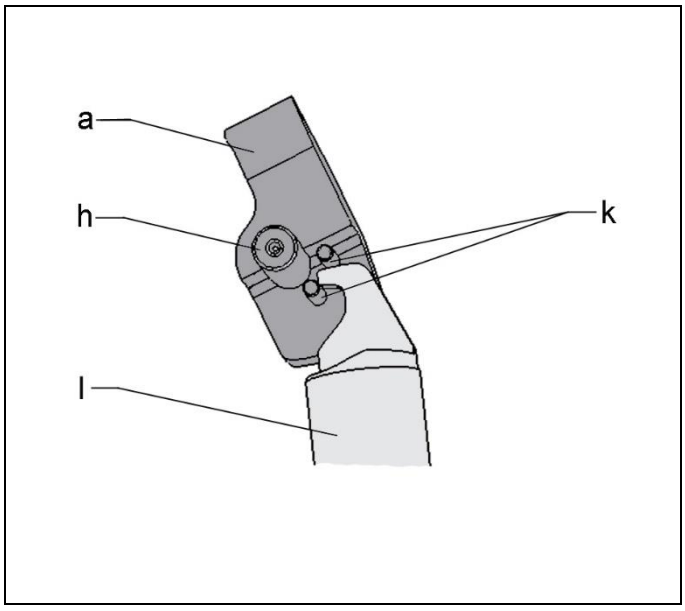

Figure 8: Assembly/Disassembly of the clamping lever

a	Clamping lever	g	Elastic preload element (only for version with position monitoring)
b1	Front fixing screws	h	Axis
f	Washer (only for version with position monitoring)	i	Swarf sheet
		k	Set screws
		l	Clamping piston

1. Pull out the front fixing screws (b1) upwards.
2. Push the axis (h) sidewards.
3. Push the clamping lever (a) forwards.
4. Assemble the clamping lever in reverse order.
   Important is:
   The hook of the clamping piston (l) must engage between the two set screws (k) of the clamping lever!
   In the case of versions with pneumatic position monitoring pay attention that the preload elements (g) and the washers (f) are correctly inserted in the clamping lever!
5. Insert the axis (h) so that the fixing screws (b1) have a free passage.

Mounting the swarf sheet

1. Pull out the front fixing screws (b1) upwards.
2. Push the axis (h) sidewards.
3. Push the clamping lever (a) forwards.
4. Mount the swarf sheet (i) with the supplied washer and hexagon socket screw. Press the swarf sheet in the centre towards the clamping piston.
5. Assemble the clamping lever in reverse order.
   Important is:
   The hook of the clamping piston (l) must engage between the two set screws (k) of the clamping lever!
   In the case of versions with pneumatic position monitoring pay attention that the preload elements (g) and the washers (f) are correctly inserted in the clamping lever!
6. Insert the axis (h) so that the fixing screws (b1) have a free passage.

8 Start up

⚠ WARNING

Poisoning due to contact with hydraulic oil!

Wear, damage of the seals, ageing 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.

⚠ CAUTION

Operating pressure should not exceed

The max. operating pressure must not be exceeded (see technical characteristics).

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 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!

8.2 Pneumatic position monitoring

On both sides of the clamping lever is a bore hole in which a disk with an elastic preload element is positioned. In the guide for the clamping lever in the housing, two bore holes are arranged so that the clamping or unclamping position of the clamping lever will be closed by the preloaded disk.

NOTE

Required minimum pressures

Required minimum pressures for position monitoring:

Hydraulics	>20 bar
Pneumatics	3 bar

NOTE

When mounting the clamping lever, the preload elements and the disks must be inserted on both sides into the provided bore holes in the clamping lever, even if the position monitoring is not used.

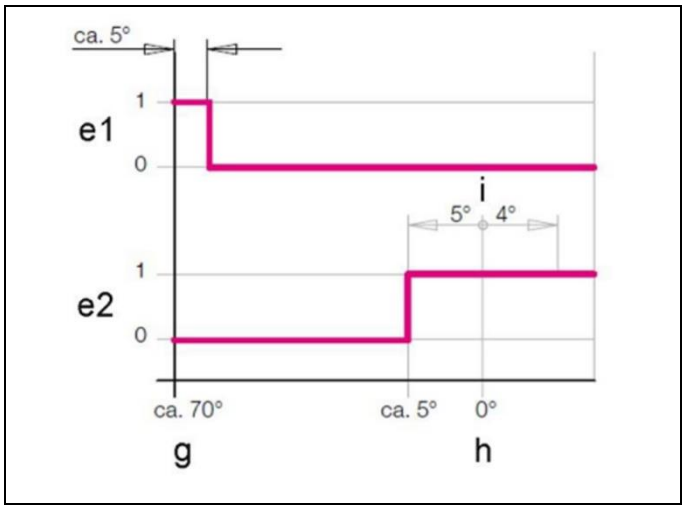

Figure 9: Function chart

e1 unclamped	g Unclamping position
e2 clamped	h Clamping position
0 = Passage	i Clamping range approx.
1 = Closed	

8.3 Monitoring by pneumatic pressure switch

For the evaluation of the pneumatic pressure increase, standard pneumatic pressure switches can be used. With one pressure switch up to 8 flat lever clamps can be queried.

NOTE

Air pressure and air volume

Pneumatic position monitorings are only process-safe when air pressure and air volume are precisely adjusted.

For measuring the air volume, appropriate devices are available. Please contact us.

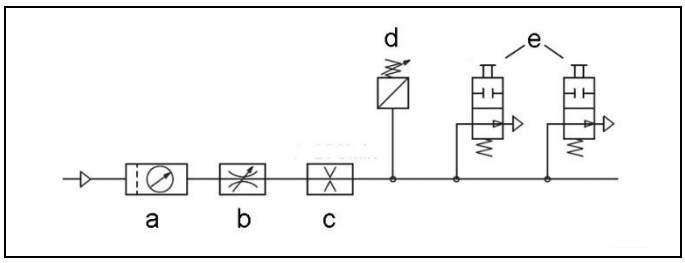

Figure 10: Circuit diagram

a Service unit 3-6 bar	d Pressure switch 3-6 bar
b Flow control valve	e Position monitorings max. 8 pieces
c Flow sensor 10-40 l/min	

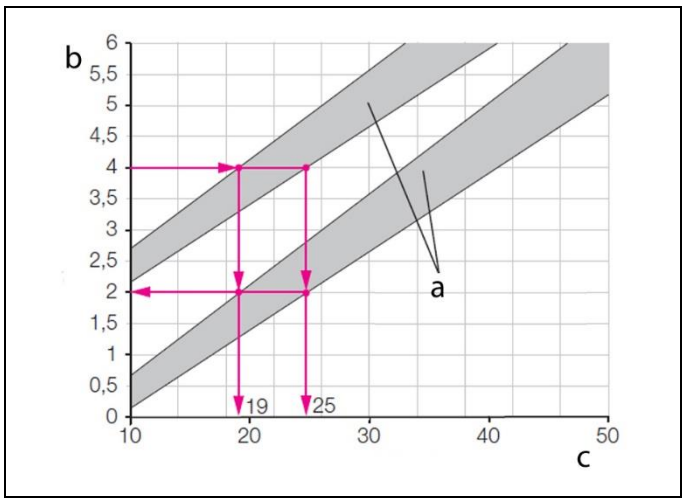

Figure 11: clamping monitoring

Required flow rate depending on the switching pressure of the pneumatic pressure switch for a pressure drop Δp 2 bar.

a Tolerance range for 1-8 flat lever clamps	b Pressure switch Switching pressure [bar]
	c Required flow rate [l/min]

Example

Required switching pressure 4 bar
Pressure drop, if the clamping or unclamping position has not yet been reached approx. 2 bar
As per diagram:
Required flow rate*

1 element	approx. 19 l/min
8 elements	approx. 25 l/min

*) add air leakage, if necessary

9 Maintenance

⚠ WARNING

Burning due to hot surface!

- In operating conditions, surface temperatures of more than 70 °C can appear at the product.
- All maintenance and repair works must only be effected in cooled mode or with safety gloves.

9.1 Cleaning

⚠ CAUTION

Avoid damages of the moved components

Avoid damages of the moved components (rods, plungers, bolts, etc.) as well as of wiper and seal.

Aggressive cleaning agents

The product must not be cleaned with:

- Corrosive or corroding components or
- Organic solvents as halogen or aromatic hydrocarbons and ketones (cellulose thinner, acetone, etc.), because this can destroy the seals.

The element must be cleaned at regular intervals. Especially the area of the piston, the clamping lever and the housing has to be cleaned of swarf and other liquids.

In the case of heavy contamination, cleaning must be made at shorter intervals.

NOTE

Pay special attention in the case of
- dry machining
- minimum quantity lubrication and
- small grinding swarf

Small swarf and dust can stick to the rod / bolt / clamping lever and be pulled into the sealing gap of the metallic wiper or the clamping lever can get jammed.

Thus a sticky / pasty mass of swarf / dust can arise, that hardens during standstill.

Result: Malfunction due to deadlock / bonding and increased wear.

Remedy: Regular disassembly, cleaning and lubrication of the lever mechanism.

9.2 Regular checks

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

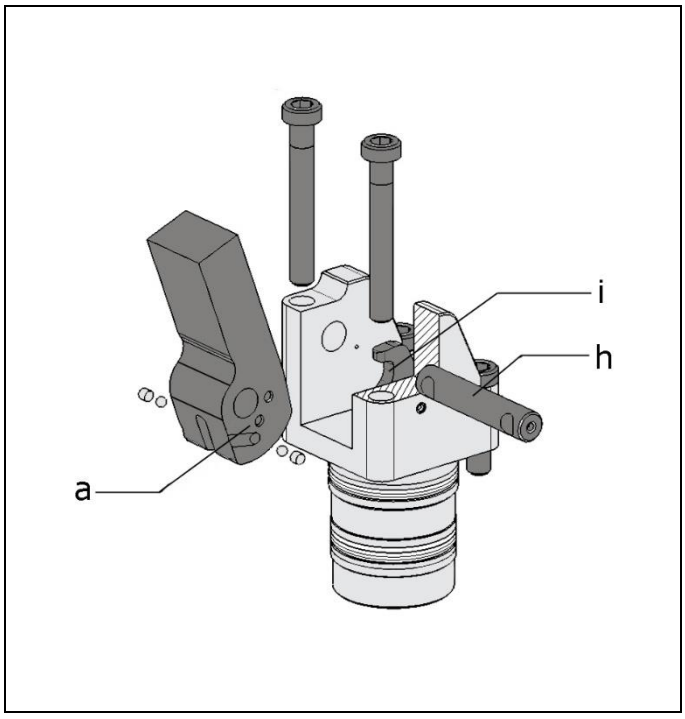

Figure 12: Flat lever clamp

6. Clamping lever bearing (**a,h**) and hook (**i**) have to be greased every six months with RENOLIT HLT 2.

NOTE

See chapter Disassembly/assembly of the clamping lever.

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 500,000 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	Max. operating pressure [bar]	Max. flow rate [cm³/s]	Max. clamping force 1.3 kN [kN]
1829 710 EXX	250	4	2.5
1829 720 EXX	250	7	3.3
1829 730 EXX	250	13	5.8
1829 740 EXX	250	32	9.8
1829 71X DXX	250	5	3.2
1826 72X DXX	250	10	5.0
1829 73X DXX	250	20	8.7
1829 74X DXX	250	40	13.0

Weights

Type	Clamping lever, short [kg]	without clamping lever [kg]
1829 710 EXX	0.305	0.263
1829 720 EXX	0.630	0.544
1829 730 EXX	1.225	1.040
1829 740 EXX	2.180	1.861
1829 71X DXX	0.288	0.246
1826 72X DXX	0.577	0.491
1829 73X DXX	1.147	0.962
1829 74X DXX	1.895	1.576

Proposal, tightening torques for screws as per DIN 7984 of tensile strength 10.9

NOTE

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

Thread	Tightening torques (MA) [Nm]
	10.9
M5	7
M6	12
M8	29
M10	58

Note: Valid for workpieces and set screws made of steel with metric thread and connecting surface dimensions as per DIN 7984
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.

13 Storage

⚠ CAUTION

Storage of components!

- The product may not be exposed to direct solar radiation, because the UV light can destroy the seals.
- A storage differing from the storage conditions is inadmissible.
- In case of improper storage, the seals can embrittle and resinification of the anti-corrosive oil or corrosion at the element can occur.

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.

Römheld GmbH
Friedrichshütte

Laubach, 07.01.2021