Position flexible clamps
double acting, separate locking port, max. operating pressure 250 bar

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1 Description

The position flexible clamp is a small vice with two movable jaws, which are operated by a common hydraulic port. Independently of its position within the clamping area, the workpiece will be clamped nipper-like (floating).

By means of a separate locking port, both jaws are hydraulically locked. The clamped workpiece can no longer ”float”, if the machining forces are introduced.

Oil supply to the locking port can be controlled by a sequence valve or a second clamping circuit.

2 Validity of the documentation

This document applies to the following products:

Position flexible clamp of data sheet B1.732. The following types or part numbers are concerned:

- 4412-974

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

	⚠ **DANGER** **Danger of life / heavy health damages** Stands for an imminent danger. If it is not avoided, death or very severe injuries will result.

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

⚠ CAUTION

Easy injuries / property damage

Stands for a possibly dangerous situation.

If it is not avoided, minor injuries or material damages will result.

Hazardous to the environment

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

Mandatory sign!

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

▶ **Note**

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

5 Safety instructions

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 result in:

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

▶ **Note**

These operating instructions are not a replacement for the operating instructions of the entire machine.

5.2 General safety tips

⚠ 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.

⚠ 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.

⚠ WARNING

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.

⚠ WARNING

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

Damage of components!

The maximum operating pressure of 250 bar must not be exceeded.

⚠ CAUTION

Damage of components!

With hydraulic pressure very high forces are generated.

The fixture or machine must be in the position to compensate these forces.

▶ **Note - qualification of the user**

All works may only be effected by qualified personnel familiar with the handling of hydraulic components.

6 Application

6.1 Intended use

The products are designed exclusively for clamping of workpieces in industrial applications. They must only be operated with hydraulic oil.

Furthermore the following are possible uses:

- Use within the capacity indicated in the technical characteristics (see data sheet).
- 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.
- Only HLP hydraulic oils may be used.
- Solely clamping jaws may be moved.

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 vibrations or other physical / chemical effects 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.

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.

⚠ WARNING

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.

⚠ WARNING

Injury by falling parts!

Keep hands and other parts of the body out of the working area.

Wear personal protection equipment!

⚠ 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

Damage of components!

Some product types have a considerable weight. These have to be secured against working free during transport.

Weight specifications see chapter "Technical characteristics".

Important note

If there is the possibility that aggressive cutting fluids and coolants with swarf can penetrate in the area of the clamping jaws of single-acting fixture clamps, this has to be prevented by the customer.

7.1 Design

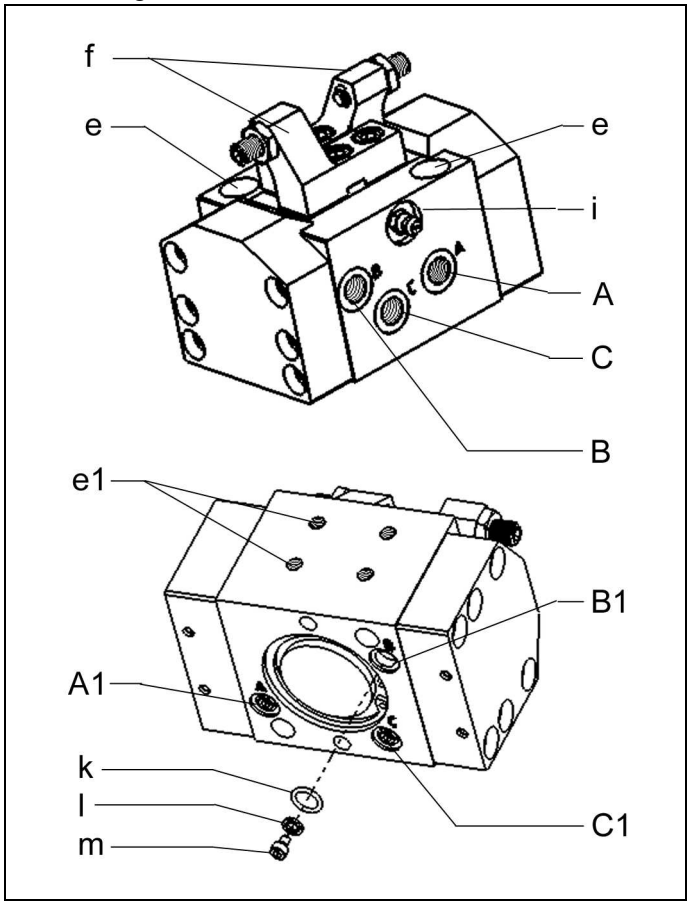

Figure 1: Components

e	Mounting holes	A1	Clamping, for manifold mounting
e1	Mounting thread	B1	Unclamping, for manifold mounting
f	Clamping lever with ball pressure screw (accessory)	C1	Locking, for manifold mounting
i	Lubricating nipple		
k	O-ring (accessory)		
l	Sealing ring		
m	Socket head cap screw		

7.2 Mounting types

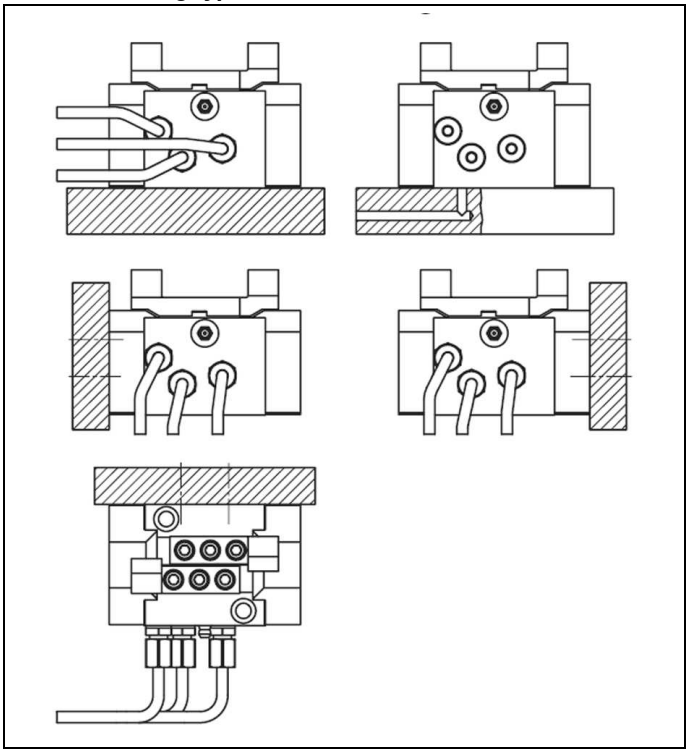

Figure 2: Installation and connecting possibilities

The position flexible clamping element, can be fixed alternatively at the bottom or at the back.

It can also be fixed at both sides. For this purpose per screw row two of the three available screws have to be removed and replaced by the fixing screws (dimensions see data sheet).

For manifold mounting remove socket head cap screws with sealing rings and screw-in plugs G 1/8 in the body.

O-rings and screw plugs see accessories (see data sheet).

7.3 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

Damage of components!

The maximum flow rate must not be exceeded.

7.3.1 Calculation of the admissible flow rate

The admissible flow rate or the admissible stroke speed (see chapter Technical characteristics and/or data sheet A 0.100) is valid for the horizontal mounting position in combination with standard add-on parts of the clamping jaw.

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:

$$Q_{Pumpe} < \frac{\dot{V}_{Zul} * 60 * n}{1000} \text{ and/or } Q_{Pumpe} < \frac{v_{Zul} \cdot A_{Kolb} \cdot n}{166{,}67 \cdot 1000}$$

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

or $v_{max.} < \frac{Q_{Pumpe} \cdot 166{,}67 \cdot 1000}{A_{Kolb} \cdot n}$

for cylinders (see A 0.100).

With

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

Q_{Pumpe} = Flow rate of the pump in [l/min]

$v_{Zul} = v_{max.}$ = Admissible stroke speed in [m/s]

A_{Kolb} = Piston area in [cm²]

n = Number of elements

7.3.2 Throttling of the flow rate

The throttling always has to be effected in the supply line to the swing clamp. 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.

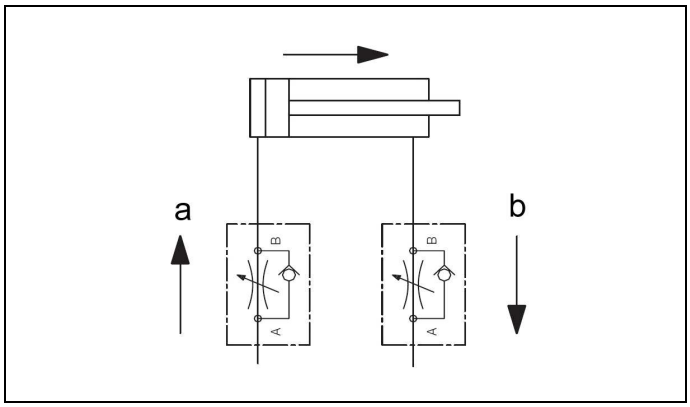

Figure 3: Hydraulic circuit diagram without flow control valves

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.

7.4 Installation of pipe-mounted types

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

⚠ WARNING

Injury by falling products!

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

Note

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

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".

7.4.1 Installation of manifold-mounted types

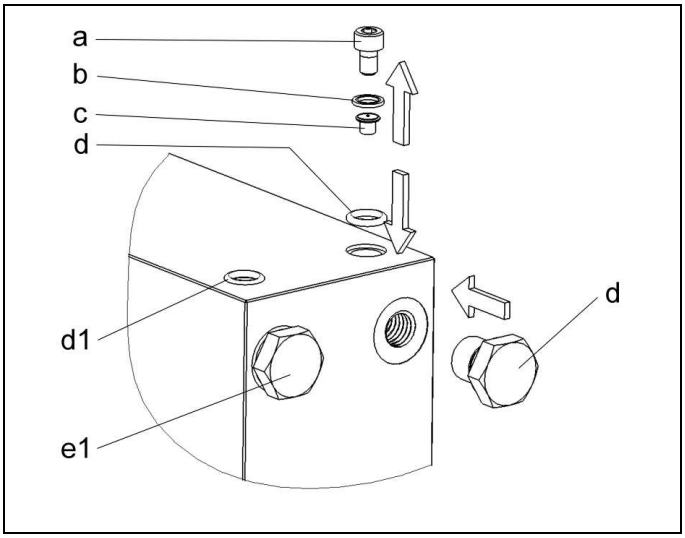

Figure 4: Example, preparation for hydraulic ports without pipes

Note

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

a	Socket head cap screw	d1	Mounted O-ring
b	Sealing ring	e	Screw plug (accessory)
c	Countersunk plug against dirt during transport	e1	Mounted screw plug
d	O-ring (accessory, depending on the version)		

1. Drill the holes for hydraulic oil supply and return in the fixture (see also data sheet).
2. Grind or finish mill the manifold-mounting surface (Ra □0.8 and a flatness of 0.04 mm to □100 mm, marks, scratches, shrink holes, concentric machining marks are inadmissible).

For some versions:

3a. Remove socket head cap screws, countersunk plugs and sealing rings, insert o-rings (accessories, if required).

3b. Tighten pipe ports with screw plugs (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

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".

7.4.2 Installation of manifold-mounted types

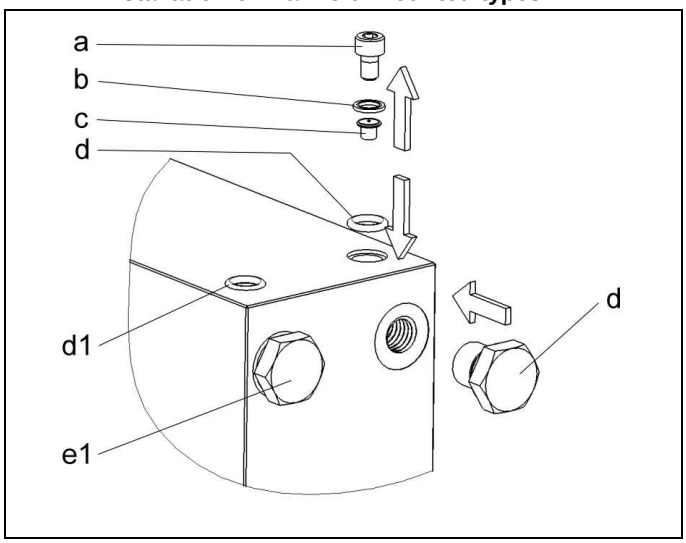

Figure 5: Example, preparation for hydraulic ports without pipes

Note

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

a	Socket head cap screw	d1	Mounted O-ring
b	Sealing ring	e	Screw plug (accessory)
c	Countersunk plug against dirt during transport	e1	Mounted screw plug
d	O-ring (accessory, depending on the version)		

1. Drill the holes for hydraulic oil supply and return in the fixture (see also data sheet).
2. Grind or finish mill the manifold-mounting surface (Ra □0.8 and a flatness of 0.04 mm to □100 mm, marks, scratches, shrink holes, concentric machining marks are inadmissible).

For some versions:

3a. Remove socket head cap screws, countersunk plugs and sealing rings, insert o-rings (accessories, if required).

3b. Tighten pipe ports with screw plugs (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

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".

7.5 Connection of the hydraulic equipment

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

Note

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

Note

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

Note

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

Note

Use hydraulic oil as per ROEMHELD data sheet A 0.100.

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

Damage of components!

The maximum operating pressure of 250 bar must not be exceeded.

- Check tight seating (check tightening torque of the fixing screws, see chapter "Technical characteristics").
- Check tight seating of hydraulic connections (check tightening torque of the hydraulic connections, see chapter "Technical characteristics").
- Bleed the hydraulic system.

Note

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!

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.

Important note

The upper face of the position flexible clamping element has to be checked from time to time with regard to contamination by swarf and cleaned, if required.

Pay attention to identical stroke of both clamping jaws. Already 2 mm difference in stroke can cause an one-sided displacing force of 10 N onto the workpiece.

9.1 Plan for maintenance

Maintenance works	Interval	Realisation
Cleaning	As required With increased dirt and coolant ingress more frequently!	Operator
Regular checks	daily	Operator
Regular lubrication	Every 50,000 clamping cycles, lubricate with RENOLIT HLT 2 * through lubricating nipple **(i)**. **Note** With increased dirt and coolant ingress lubrication must be made more frequently!	**⚠ Caution !** If this lubrication will not be made, this can lead to a failure or interference of the floating clamping! Operator or central lubrication
Repair		Qualified personnel

* Brand name
Description as per DIN 51 502: KPHC 2 N-40.
Description as per ISO 6743-9: ISO-L-X-DDHB 2

9.2 Cleaning

⚠ CAUTION

Damage of components!

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

⚠ CAUTION

Damage of components!

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 clamping slide and the housing have to be cleaned of swarf and other liquids.

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

9.3 Regular checks

1. Check tightness of hydraulic connections (visual control).
2. Leakage control at the housing and the clamping slide.
3. Clamping force control by pressure control.
4. Check the observance of the maintenance intervals.

9.4 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

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
Clamping unit does not approach	• Clamping unit is dirty • Swarf jammed between the clamping unit and mounting body	• Clean and grease • Remove swarf, clean and grease
Clamping unit has too much play:	Guide worn out	Exchange clamping claw, exchange component, if required.
Clamping pressure reduces due to leakages at the fixture clamp:	Wear at the seals	Renew seals.
Clamping unit does not firmly clamp during machining:	Locking of the clamping unit does not function.	• Check connections • Renew seals.

11 Technical characteristics

General characteristics

Type	Maximum operating pressure [bar]	Maximum clamping force [kN]	Maximum retention force [kN]
4412-974	250	**7**	**4**

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**
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 µges = 0.14 - not oiled, utilisation of the minimum yield point = 90%.

▶ **Note**

For further technical data see data sheet.

12 Storage

⚠ CAUTION

Damage 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.

13 Accessory

▶ **Note**

See data sheet.

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

Declaration of manufacture of the products

Position flexible clamp of data sheet B1.732. The following types or part numbers are concerned:

- 4412-974

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 and EN 982, 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.

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

Römheld GmbH
Friedrichshütte
Laubach, 18.07.2012