Swing clamp without swing stroke

top flange type, with optional switch rod for position monitoring, with reinforced swing mechanism, double acting

Table of contents

1 Description of the product

Double-acting swing clamp with reinforced swing mechanism with and without switch rod for position monitoring.
This line is a further development of the proved ROEMHELD swing clamps with the aim to improve process safety in linked clamping systems. The most important characteristics are as follows:

- Swinging without axial stroke
  This version can clamp workpieces in recesses that are only insignificantly higher than the clamping arm.
- Reinforced swing mechanism
  The reinforced swing mechanism without overload protection device endures a collision of the clamping arm with the workpiece during clamping up to a pressure of 100 bar.

- FKM wiper
  This wiper has a high chemical resistance when using aggressive cutting fluids.

2 Validity of the documentation

This document applies to the following products:

Swing clamps without swing stroke of data sheet B 1.8806. The following types or part numbers are concerned:

- Clockwise rotation 90°:
  1893-N90R-12XX, 1895-N90R-16XX, 1896-N90R-20XX,
- Counterclockwise rotation 90°:
  1893-N90L-12XX, 1895-N90L-16XX, 1896-N90L-20XX,

XX: Design:
DH = without switch rod, without metallic wiper
DM = without switch rod, with metallic wiper
MH = with switch rod, without metallic wiper
MM = with switch rod, with metallic wiper

Special swing angles between 20° and 70° are available on request.

Electrical position monitoring:

- 0353-897, 0353-893, 0353-902,
- 0353-909, 0353-908, 0353-907.

Pneumatic position monitoring

- 0353-896, -892, -903

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 / commercial applications to transform hydraulic pressure to a linear 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 admitted:
- For domestic use.
- On pallets or machine tool tables in primary shaping and metal forming machine tools.
- In areas for which special guidelines apply, especially installations and machines:
  - For the use on fun fairs and in amusement parks.
  - In food processing or in areas with special hygiene regulations.
  - In mines.
  - In explosive and aggressive environments (e.g. ATEX).
- For other operating and environmental conditions.

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 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".

Poisoning due to contact with hydraulic oil.

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

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

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

7.1 Design

This hydraulic clamping element is a pull-type cylinder where a part of the total stroke is used to swing the piston.

The swing stroke is not visible.

Thereby the clamping points are free for loading and unloading of the fixture.

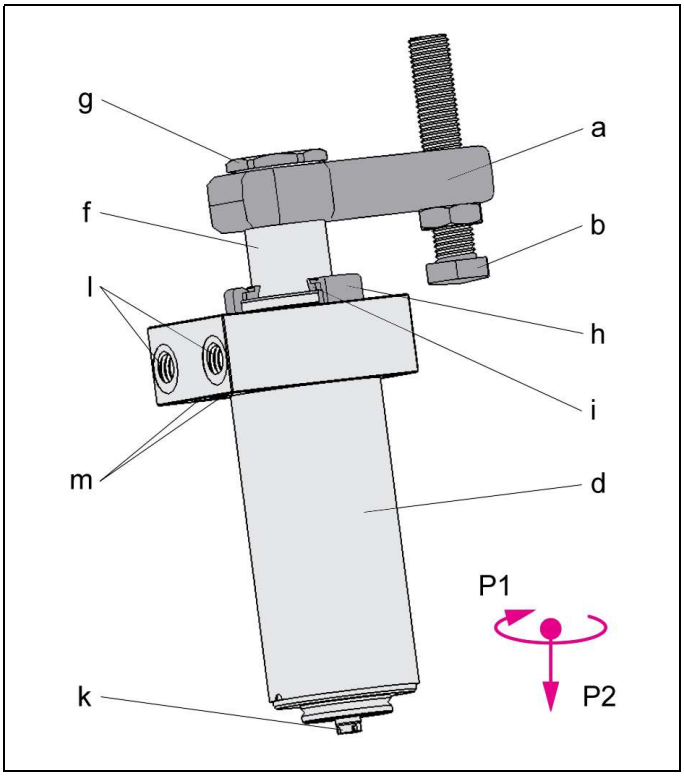

Figure 1: Components

a	Clamping arm (accessory)	k	Switch rod
b	Contact bolt (accessory)	l	Hydraulic ports A and B
f	Piston	m	Hydraulic ports, manifold-mounting version A and B
g	Fixing nut (included in the delivery)	P1	Swing direction
h	Metallic wiper, retaining ring for DM or MM version	P2	Clamping stroke
i	Metallic wiper, wiper ring for DM or MM version		

The versions MH and MM are equipped with a piston rod that protrudes through the bottom and allows a pneumatic or electrical control of the piston position outside the swarf area.

7.2 Swing angle and direction

The swing clamps are available with standard swing angle of 90°. Special swing angles between 20° and 70° are available on request.

"Swing direction cw" means clockwise rotation, looking from above onto the piston (from unclamped position to clamped position).

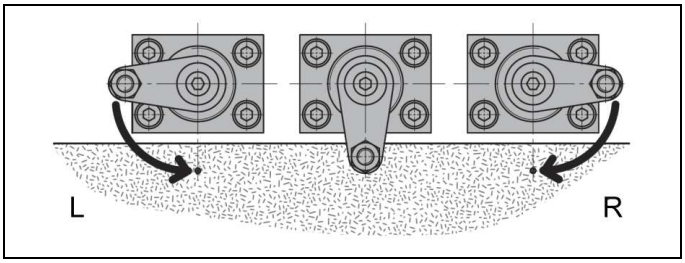

Figure 2: Swing direction (L =counterclockwise "ccw", R = clockwise "cw")

7.3 Assembly of the position monitoring (accessory)

1. Screw on position monitoring at the flange and at the piston rod.

Note

See operating instructions of the position monitoring.

7.4 Mounting types

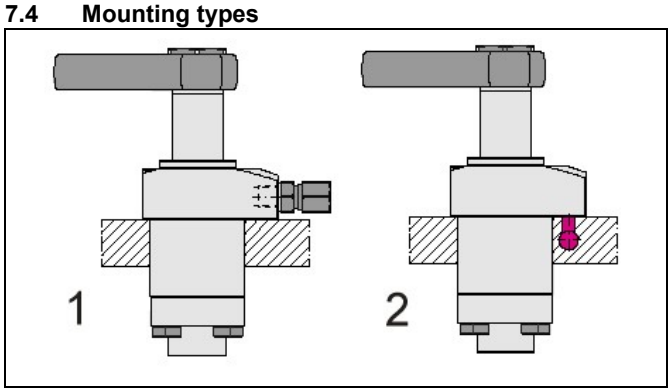

Figure 3: Mounting types

1	Flange type, hydraulic connection by pipes.	2	Manifold-mounting type, hydraulic connection without pipes.

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:

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

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.

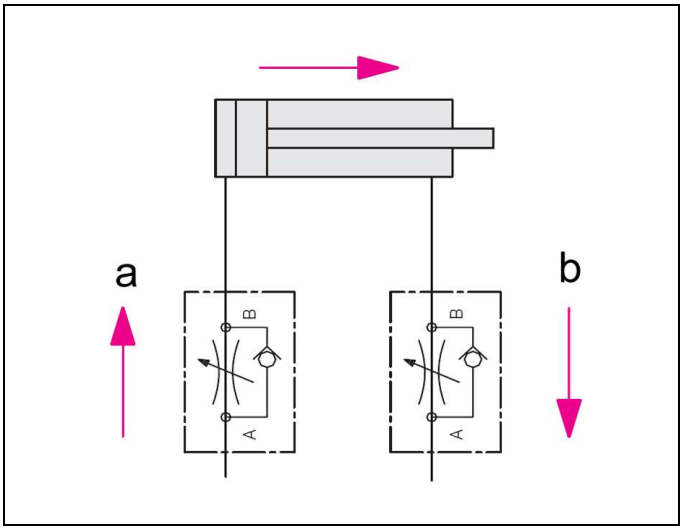

Figure 4: Hydraulic circuit diagram without flow control valves

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.

7.6 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".

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

7.7 Installation of manifold-mounted types

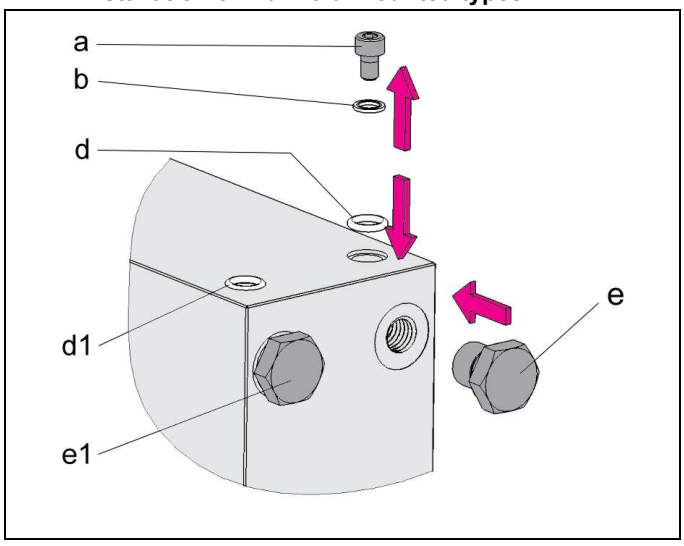

Figure 5: Example of the preparation for hydraulic ports without pipes

NOTE

Arrangement of the ports

- The figure shown is a schematic sketch. 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)
d	O-ring (accessory, according to the version)	e1	Mounted screw plug

1. Drill the holes for hydraulic oil supply and return in the fixture (see also data sheet or installation drawing).
2. Grind or finish mill flange surface (Ra ≤ 0.8 and a flatness of 0.04 mm to 100 x 100 mm. Marks, scratches, shrink holes are not admissible on the surface.)

For some versions:

3a. Remove socket head cap screws and sealing rings. Insert O-rings (accessory, if required).

3b. Seal pipe ports with screw plug (accessory, if required)

4. Clean the support surfaces.
5. Position and fix on the fixture.
6. Install bleeding screws at the upper ends of the piping.

⚠ CAUTION

Product not properly tightened

Product can loosen during operation.

- Fix and/or secure with sufficient tightening torque.

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".

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

7.8 Assembly and disassembly of the clamping arm

⚠ 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 or functional failure

Internal components can be damaged when tightening and loosening the fixing nut.

- It is imperative to back up the piston.
- No torques must be introduced into the piston.
- The conical surfaces of the piston and the clamping arm must be clean and grease free!

Note

When tightening and untightening the fixing nut, the clamping arm or the hexagon socket in the piston have to be backed up. It is recommended to effect tightening and untightening in the swing range.

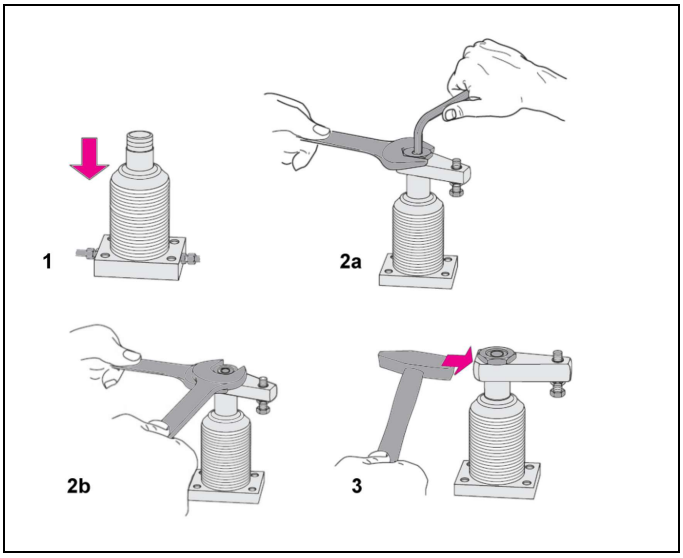

Figure 6: Assembly / disassembly (example)

7.8.1 Assembly of the clamping arm - with pressure

1. Retract piston and pressurise clamping line (port A) (Fig. Assembly, **Pos. 1**).
2. Put the clamping arm in the intended clamping position.
3. Fasten fixing nut and hold clamping arm with an Allen key (Tightening torque of the fixing nut for the clamping arm see technical characteristics. Fig. Assembly, **Pos. 2**).
4. Clamp several times.
5. Check if the clamping point is within the clamping stroke (Fig. Adjustment of the clamping arm, **Pos. 2**).

7.8.2 Assembly of the clamping arm - without pressure

1. Put the clamping arm onto the piston.
2. Move the piston manually to the clamping position.
3. Align clamping arm.
4. Fasten fixing nut with an Allen key and hold the clamping arm with an open-ended wrench (Tightening torque of the fixing nut for the clamping arm see technical characteristics. Fig. Assembly, **Pos. 2**).
5. Clamp several times.
6. Check if the clamping point is within the clamping stroke (Fig. Adjustment of the clamping arm, **Pos. 2**).

NOTE

Tightening torque of the fastening nut

- Tightening torque of the fixing nut for the clamping arm see technical characteristics.

7.8.3 Disassembly of the clamping arm - without pressure

⚠ CAUTION

Damage or functional failure of the piston rod guide

Hard blows may impair the function of the product or lead to failure.

- No direct or indirect blows may be used to loosen the clamping arm.

1. Loosen the fixing nut one revolution. Hold the clamping arm with an Allen key (**Pos. 2b**).
2. Hammer **slightly** onto the front face to loosen the clamping arm (**Pos. 3**).

7.8.4 Adjustment of contact bolt

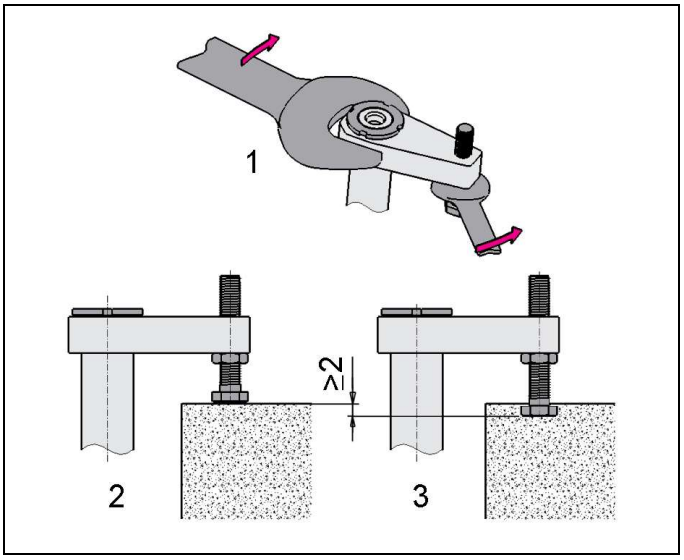

Figure 7: Adjustment of the clamping arm (example)

1. Loosen the lock nut at the contact bolt and completely turn back the contact bolt. (Fig. Adjustment of the clamping arm, **Pos. 1**).
2. Move the clamping arm to the clamping position above the workpiece. (Pay attention to the tolerance of the swing angle)
3. Screw out the contact bolt until it contacts the workpiece. (Fig. Adjustment of the clamping arm, **Pos. 2**).
4. Move the clamping arm back to the unclamping position.
5. Unscrew the contact bolt again by the half of the clamping stroke.
6. Tighten the lock nut at the contact bolt. Hold the clamping arm with an open-ended wrench. (Fig. Adjustment of the clamping arm, **Pos. 1**).

7.8.5 Check adjustment of the contact bolt

1. Move the clamping arm, with throttled flow rate and low pressure to the clamping position onto the workpiece. Pay attention that the contact bolt touches the workpiece only after completion of the swing stroke.
2. Measure and note the distance between clamping arm and upper edge of the workpiece in clamped condition (**Pos. 2**).
3. Unclamp swing clamp again.
4. Unload workpiece out of the fixture.
5. Clamp swing clamp again.
6. Measure the distance as described below item 2. The distance measured now should be at least 2 mm smaller .

7.8.6 Assembly of the metallic wiper

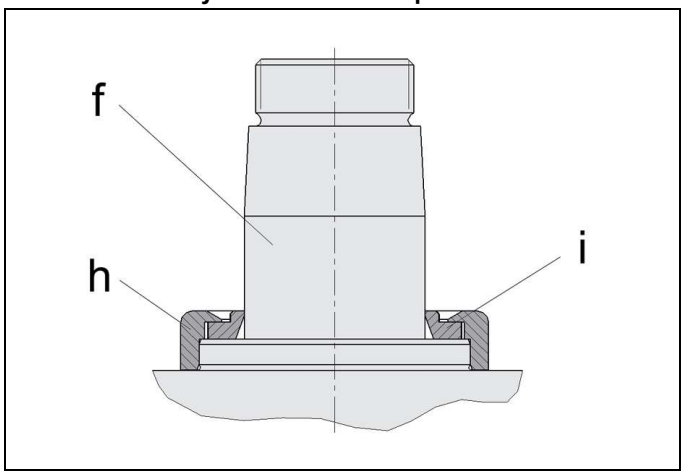

Figure 8: Metallic wiper

f	Piston with integrated swing mechanism	i	Metallic wiper, wiper ring (accessory)
h	Metallic wiper, retaining ring (accessory)		

The swing clamp is optionally supplied with mounted metallic wiper.
The metallic wiper can also be mounted later as an accessory:

1. Put the wiper ring onto the piston rod until the ring touches the body, pay attention to smooth running.
2. If the wiper ring is too stiff, the hard sealing edge must be ground with emery since otherwise the piston rod will be damaged in the long run.
3. Uniformly press the retaining ring without jamming, onto the collar of the body.

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 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

Clamping time

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

- Start up of position monitoring.

Note

See operating instructions of the position monitoring.

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!

8.3 Admissible operating pressure

NOTE

Various Clamps

- The swing clamps are designed for a maximum pressure (see chapter Technical characteristics).
- According to the version of the used clamping arm, the operating pressure must be reduced considerably.
- Please pay attention to the clamping force diagrams on the data sheet.

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.

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, cleaning must be made at shorter intervals.

Note

Special care must be taken with:

- dry machining
- minimum quantity lubrication and
- small grinding swarf

Small swarf and dust can stick to the rod / plunger of the element and be pulled into the sealing gap of the metallic wiper edge.
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 cleaning of the piston rod/support plunger in the effective area of the wiper.

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 has to be made in case of external leakages. For high availability we recommend to change the seals at the latest after 500,000 cycles or 2 years.
Due to the complex design a seal exchange must only be effected by ROEMHELD service personnel.

⚠ CAUTION

Maintenance and repair work

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

10 Trouble shooting

Trouble	Cause	Remedy
Piston rod with clamping arm does not retract	Clamping pressure is not available or too low	Check at the pressure generator, if pressure is available and high enough (minimum pressure: 50 bar)
Swing angle is not completely effected or exceeded (tolerance of end position ± 2°):	Too much clearance in the swing mechanism	Repair required by ROEMHELD
Piston rod has too much play:	Guide or piston rod are worn out	Exchange swing clamp, if necessary to be checked by ROEMHELD service personnel.
Clamping pressure reduces due to leakages at the swing clamp:	Wear at the seals	Exchange swing clamp, if necessary to be checked by ROEMHELD service personnel.

11 Accessory

11.1 Selection of the clamping arm

⚠ CAUTION

Material damage or functional failure

Use of an incorrectly dimensioned clamp can lead to damage on the product.

- When dimensioning, consider length, mass and the resulting max. operating pressure and flow rate (see data sheet or installation drawing).

When selecting the clamping arm, the corresponding operating pressures as shown in the clamping force diagram (see ROEMHELD data sheet) must not be exceeded. If longer clamping arms will be used, not only the operating pressure but also the flow rate has to be reduced.

11.2 Position monitoring

NOTE

- Position monitoring

NOTE

- See ROEMHELD data sheet.

11.3 Electrical position monitoring

Electrical position monitoring
to be mounted at products with switch rod

11.3.1 Description of the product

The position monitoring will be fixed at the cylinder bottom and can also be mounted in a position rotated by 4 x 90°. The inductive proximity switches are damped by a signal sleeve which is mounted on the extended piston rod.
The position monitoring is alternatively supplied with or without inductive proximity switches.

11.3.2 Validity of the documentation

Electrical position monitoring:
- 0353-897, 0353-893, 0353-902,
- 0353-909, 0353-908, 0353-907.

11.3.3 Target group of this document

- Specialists, fitters and set-up men of machines and installations with expert knowledge in electrical engineering.

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.

11.3.4 For your safety

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

11.3.5 Application

11.3.5.1 Intended use

Position monitorings are used for industrial applications in order to get an electrical feedback from both end positions or intermediate positions of a product.
They are exclusively designed to be mounted at ROEMHELD products and for their control.
In addition, applies the intended use of the products for which they have been designed.

11.3.5.2 Misapplication

Position monitoring systems are not suitable for applications where coolants are used, since swarf can influence the function of the magnetic sensors.

11.3.6 Installation

11.3.6.1 Design

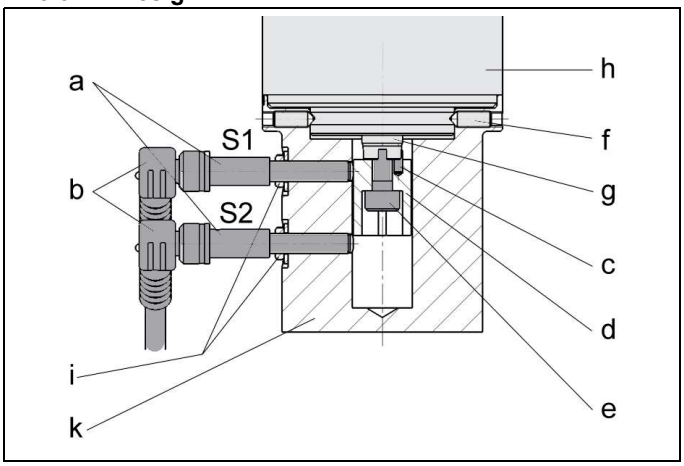

Figure 9: Design of the electrical position monitoring

a	Proximity switch S1 (unclamped) Proximity switch S2 (clamped)	f	Set screw, fixing of the position monitoring at the body (h)
b	Right angle plug	g	Switch rod
c	Dowel pin, anti-torsion device, signal sleeve (d) and switch rod (g)	h	Body of the swing clamp
d	Signal sleeve	i	Lock nut
e	Socket head cap screw, fixation of the signal sleeve (d)	k	Housing of position monitoring

⚠ CAUTION

Damage of components due to incorrect adjustment!
If the proximity switch was too deeply screwed in, it can be squeezed during operation.
Check the position of the proximity switch by manual adjustment of the signal sleeve.

1. Hydraulically move the swing clamp piston with clamping arm to the unclamping position.
2. Insert the threaded pin (c) into the bore of the signal sleeve (d).
3. When placing the signal sleeve (d) on the extended switch rod (g), position the threaded pin (c) in one of the 4 slots (4 x 90°).

NOTE

The angular position of the two proximity switches will later be 180° opposite to the position of the threaded pin (see Fig. Structure of the electrical position monitoring).

4. In this position, the signal sleeve is mounted on the switch rod (g) with the socket head cap screw (e).
5. Carefully push housing (k) without proximity switch onto signal sleeve (d) until the stop of the swing clamp housing (h).
6. Screw in the 4 threaded pins (f) until the stop but tighten them only slightly so that the housing (k) can still be turned by hand.
7. Turn the housing (k) slowly until the narrow cam of the signal sleeve (d) can be seen in the middle of the bore hole S1.
8. Tighten the 4 threaded pins (f).
9. Carefully screw in the proximity switches until the stop of the signal sleeve (d) and turn them back by max. one turn.
10. Lock the proximity switches and put on the plug.
11. When the control voltage is switched on, the setting of the proximity switches can be checked according to the functional diagram in Fig. 11.

NOTE

Position monitoring

The position monitoring is exactly centred at the swing clamp and is fixed after **radial adjustment of the unclamping position** with four threaded pins.

Application of Position Control

- Position monitoring is not suitable for applications where coolants and lubricants are used.
- Install protection covers against possible swarf.

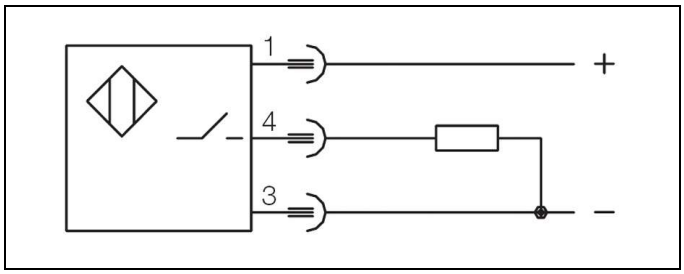

Figure 10: Circuit diagram for pnp (+) inductive sensors

1	brown +
3	blue -
4	black (signal pnp)

11.3.7 Start up

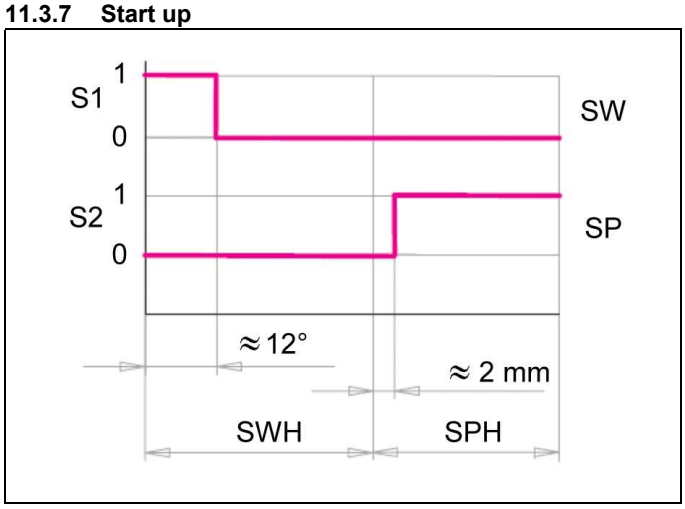

Figure 11: Signal course clamping and unclamping process

1	Signal ON	SP	Clamping
0	Signal OFF	SPH	Clamping stroke
S1	Proximity switch 1, unclamped	SW	Swinging
		SWH	Swing stroke
S2	Proximity switch 2, clamped		

The two figures show the signal course at both proximity switches during one clamping and unclamping process (max. = total stroke).

⚠ 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!

11.3.8 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.

11.3.8.1 Cleaning

The position monitoring must be cleaned at regular intervals.

11.3.8.2 Regular checks

- Check position monitoring if there are damages.
- Check tight seating of the position monitoring.
- The position monitoring itself is maintenance free.

11.3.9 Trouble shooting

Trouble	Cause	Remedy
No signal when extending or retracting the piston:	No supply voltage	Check supply voltage and switch on again, if necessary
Incorrect signals:	Proximity switch or position monitoring has become loose	Adjust and fix again proximity switch or position monitoring
No signal:		

11.3.10 Technical characteristics

11.3.10.1 Technical characteristics for proximity switches

Ambient temperature:	-25 °C to +70 °C
Rated operating distance Sn	0.8 mm
Secured operating distance:	0 … 0.65 mm
Hysteresis:	max. 15 %
Repeatability:	max. 5%
Material of housing:	stainless steel
Code class:	IP 67
Type of connection:	Plug S49
Voltage:	DC
Switching function:	Interlock
Switching output:	**PNP**
Operating voltage UB:	10. 30 V
Rated operating voltage:	24 V
Rated current:	100 mA
Residual ripple:	max. 10%
Switching frequency:	3 kHz
Protection against reverse battery:	yes
Protected against short circuits:	yes
Tightening torque:	1 Nm

NOTE

Further technical data with reference to the position monitoring are included in the data sheet.

11.3.11 Accessory

- Plug with cable
- Spare proximity switch

Note

See ROEMHELD data sheet

11.4 Pneumatic position monitoring

Pneumatic position monitoring
to be mounted at products with extended piston rod

11.4.1 Description of the product

The position monitoring will be screwed on at the cylinder bottom and can also be mounted in a position rotated by 4 x 90°. Different versions are available according to the application conditions. A switching cam is provided at the extended piston rod causing the signalling of the jets.

11.4.2 Validity of the documentation

Pneumatic position monitoring

- 0353-896, -892, -903

11.4.3 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.

11.4.4 For your safety

Qualification of the user

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

11.4.5 Application

11.4.5.1 Intended use

Pneumatic position monitorings are used for industrial applications in order to get a feedback from both end positions of the stroke range of a product.
They are exclusively designed to be mounted at ROEMHELD products and for their control.
In addition, applies the intended use of the products for which they have been designed.

11.4.5.2 Misapplication

Position monitoring systems are not suitable for applications where coolants are used.

11.4.6 Installation

11.4.6.1 Design

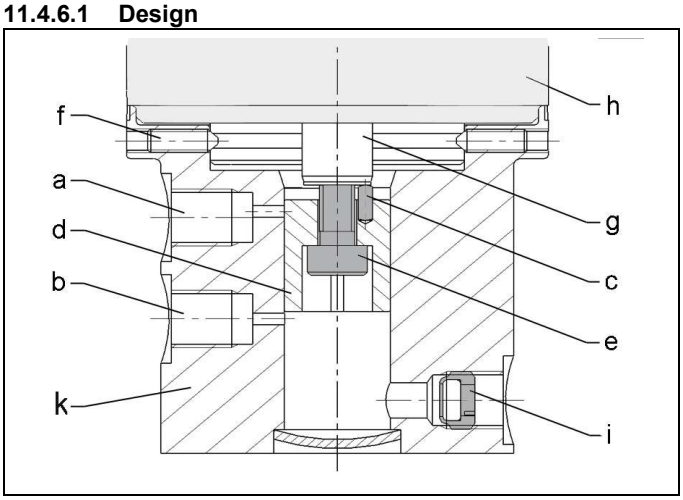

Figure 12: Design

a	Pneumatic port E1 (at the top), monitoring unclamped	f	Set screw, fixing of the position monitoring at the body (h)
b	Pneumatic port E2 (at the bottom), monitoring clamping range	g	Switch rod
c	Dowel pin, anti-torsion device, signal sleeve (d) and switch rod (g)	h	Body of the swing clamp
d	Signal sleeve	i	Venting by means of the filter element
e	Socket head cap screw, fixation of the signal sleeve (d)	k	Housing of position monitoring

1. Hydraulically move the swing clamp piston with clamping arm to the unclamping position.
2. Insert the threaded pin (c) into the bore of the signal sleeve (d).
3. When placing the signal sleeve (d) on the extended switch rod (g), position the threaded pin (c) in one of the 4 slots (4 x 90°).

NOTE

The angular position of both pneumatic outputs will later be 180° opposite to the position of the threaded pin (see Fig. 12).

4. In this position, the signal sleeve (d) is mounted on the switch rod with the socket head cap screw (e) (tightening torque 6 Nm).
5. Carefully push the housing (k) onto the signal sleeve (d) until the stop of the swing clamp housing (h).

Please note

Clockwise swing motion:
The connecting bore (a) must be in segment 1 (see fig. representation positioning signal sleeve).
Counterclockwise swing motion:
The connecting bore (a) must be in segment 2 (see fig. representation positioning signal sleeve).

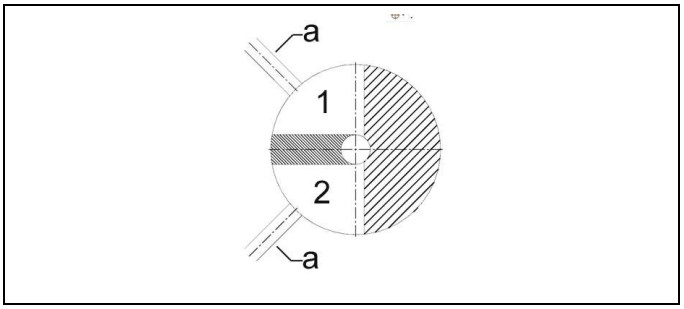

Figure 13: Representation positioning signal sleeve

6. Screw in the 4 set screws (f) until the stop but tighten them only slightly so that the housing (k) can still be turned easily by hand.
7. Pressurise port (a) with pneumatic pressure and connect pressure switch, there should be no back pressure.

7a. Slowly turn the housing (k) in the direction of unclamping until the required switching pressure is reached.

7b. Turn the housing (k) further by approx. 4° in the direction of unclamping (see fig. signal curve for clamping and unclamping). The switching pressure must not drop.

8. Tighten the 4 threaded pins (f).
9. When the pneumatic system and control voltage for the pressure switches are switched on, the setting can be checked as shown in the function diagram (see fig. signal curve for clamping and unclamping).

NOTE

Position monitoring

The position monitoring is exactly centred at the swing clamp and is fixed after **radial adjustment of the unclamping position** with four threaded pins.

Evaluation of the pneumatic pressure

For interpretation of the pneumatic pressure we recommend to use a differential pressure switch.
Parallel connection for up to 8 swing clamps is possible. For a greater number there are special solutions. Please contact us.

11.4.7 Start up

Control by pneumatic pressure switch

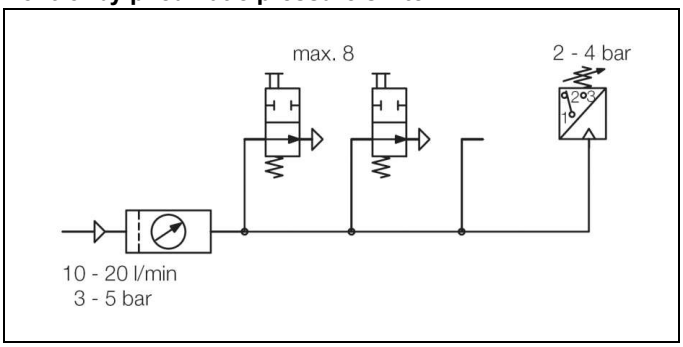

Figure 14: Circuit diagram max. position monitorings

Note

For the evaluation of the pneumatic pressure built-up standard pneumatic pressure switches can be used. It is possible to control with one pressure switch up to 8 position monitorings connected in series (see circuit diagram).

Note

It has to be considered that process-safe functioning of pneumatic position monitorings is only guaranteed with throttled air and system pressure. The nominal values are indicated below technical characteristics.

Procedure

1. Manually unclamp the piston - extend.
2. Insert dowel pin (c) in signal sleeve (d) and the slot of the switch rod.
   The position of the dowel pin with signal sleeve is 180° compared with to the terminals (a)
3. Secure signal sleeve with socket head cap screw (e).
   For this purpose the element can be clamped.
4. Connect pressure switch / differential pressure switch.
5. The piston position will be signalled by the pressure build up at the upper or lower monitoring.

Pressure build-up	Piston position
Monitoring E1 (at the top)	extended / retracted
Monitoring E2 (at the bottom)	Clamping range

6. Test the function of the monitoring.

NOTE

Evaluation of the pneumatic pressure

- The dependence between pipe length, jet diameter, leakage, pressure and flow rate determines the measurable pressure differential. In case of a too high flow rate the pressure differential is too low.
- For the interpretation of the pneumatic pressure we recommend to use a differential pressure switch. Parallel connection of up to four elements is possible.

Impurities in the compressed air

- The pollution of the compressed air can lead to interferences in the measurement .

11.4.8 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.

11.4.8.1 Cleaning

The position monitoring must be cleaned at regular intervals.

11.4.8.2 Regular checks

- Check position monitoring if there are damages.
- Check tight seating of the position monitoring.
- The position monitoring itself is maintenance free.

11.4.9 Trouble shooting

Trouble	Cause	Remedy
No signal	Insufficient pressure differential	Throttle flow rate, reduce pressure
	Position monitoring has become loose	Fix again position monitoring
	Leakage in the system	Check supply lines
Incorrect signals:	Position monitoring has become loose	Fix again position monitoring

11.4.10 Technical characteristics

Technical characteristics

Port	G 1/8
Nominal diameter [mm]	2
Max. air pressure [bar]	10
Range of operating pressure [bar]	3…5
Differential pressure* at 3 bar system pressure [bar]	min. 1.5
Differential pressure* at 5 bar system pressure [bar]	min. 3.5
Air flow rate** [l/min]	10…20

* Pressure drop when controlling the function "Clamped", if one or several position monitorings are not operated.
** For measuring the air flow rate appropriate devices are available. Please contact us.

12 Technical characteristics

General characteristics

Part-no.	Max. operating pressure [bar]	Max. effective clamping force*) [kN]
1893 N90X 12XX	350	6.1
1895 N90X 12XX		15.8
1896 N90X 12XX		24.7

*) Values dependent on the used clamping arm, see clamping force diagram in the catalogue.

Part-no.	1893 N90X 12XX	1895 N90X 12XX	1896 N90X 12XX
Clamping stroke, P2 [mm]	12	16	20
Min. operating pressure [bar]	50		
Max. operating pressure [bar]	350		
Admissible flow rate [cm^3/s]	5	17	36
Tolerance of the swing angle (degree)	± 2°		
Screw material	12.9		

Types	Tightening torque of the fixing nut of the clamping arm [Nm]
1893 N90X 12XX	**30**
1895 N90X 12XX	**90**
1896 N90X 12XX	**160**

NOTE

Further information

- For further technical data see ROEMHELD data sheet. B18806

13 Storage

⚠ CAUTION

Damage due to incorrect storage of components

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

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

The elements are tested by default with mineral oil. The exterior of the elements is treated with a corrosion inhibitor.
The oil film remaining after the test provides for a six-month interior corrosion protection, if stored in dry and uniformly tempered rooms.
For longer storage times, the element has to be filled with a non-resinifying corrosion inhibitor and the outside surfaces must be treated.

14 Disposal

Hazardous to the environment

Due to possible environmental pollution, the individual components must be disposed only by an authorised expert company.

The individual materials have to be disposed as per the existing regulations and directives as well as the environmental conditions.
Special attention has to be drawn to the disposal of components with residual portions of hydraulic fluids. The instructions for the disposal at the material safety data sheet have to be considered.

For the disposal of electrical and electronic components (e.g. stroke measuring systems, proximity switches, etc.) country-specific legal regulations and specifications have to be kept.

15 Declaration of manufacture

Manufacturer
Römheld GmbH Friedrichshütte
Römheldstraße 1-5
35321 Laubach, Germany
Tel.: +49 (0) 64 05 / 89-0
Fax: +49 (0) 64 05 / 89-211
E-mail: info@roemheld.de
www.roemheld.com

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

Declaration of manufacture of the products

They are designed and manufactured in line with the relevant versions of the directives **2006/42/EC**(EC MSRL) and in compliance with the valid technical rules and standards.
In accordance with EC-MSRL, these products are components, that are not yet ready for use and are exclusively designed for the installation in a machine, a fixture or a plant.

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

The products may only be put into operation after it was assessed that the incomplete machine / machine, in which the product shall be installed, corresponds to the machinery directives (2006/42/EC).

The manufacturer commits to transmit the special documents of the products to state authorities on request.
The technical documentation as per appendix VII part B was prepared for the products.

15.1 Declaration on design and manufacture in relation to ISO 13849 Part 2: Validation

Their design and manufacture took into account fundamental and proven safety principles of ISO 13849-2:2013.

- Appendix A - Mechanical systems
- Appendix C - Hydraulic systems

The above products are not designed as safety components.

The parameters, limitations, environmental conditions, characteristic values, etc. for the intended operation are defined in the documentation.

Laubach, 03.05.2022