Clamping unit Ratio-Clamp®
Securing and fixation of round rods
The patented clamping unit Ratio-Clamp®
fixes round rods without energy supply for unlimited time. The clamping unit is
used worldwide as a safety component for the protection of persons and systems
as well as a holding element for tools and workpieces in production processes or
during testing procedures in numerous industries.

• Machine tools
• Presses
• Foundry
• Shipbuilding and offshore

• Plastic injection molding machines
• Steel/rolling mill
• Testing technology
The Ratio-Clamp® operates mechanically according to the principle of frictional contact. The force stored in helical disc springs is deflected by a cone and clamps the rod through friction.

**Versatile use. Numerous advantages.**

**Use**
Hänchen clamping units can be used both for precise locking and for securing against unintentional movements.

- Fixation of all types of round rods in any position
- Out of standstill, for braking in the occasional case of an emergency, even while moving
- Clamping force without energy supply for unlimited time
- In case of uncontrolled pressure drop, emergency shutdown, power failure or system damage
- Fixes axes precisely, even when external forces act on the rod

**Advantages**
- Can be used horizontally and vertically
- Can take tension and pressure in any direction
- Immediate clamping effect without further rod movement
- Releasing the clamping without back movement
- Clamping unit and hydraulic cylinder from one source

**Locking and securing loads**
If the releasing pressure drops, the force stored in the springs is released and causes the rod to clamp. Thus the load is secured and the Ratio-Clamp® is ready to take over the load.

**Loading**
Loading is possible immediately after clamping. No axial movement of the rod is required. In the clamped state, the forces in both directions can be kept free of play.

**Releasing**
The locking piston moves against the spring power by hydraulically releasing pressure and releases the clamping force. The rod can be moved in both directions.

**Overloading**
Short-term overloading with slipping of the rod is possible without damaging the rod or the clamping unit.

You can find further details on the clamping unit Ratio-Clamp® in the book “Hydraulic Systems.”

You can find the video for the functional principle of the clamping unit Ratio-Clamp® at www.youtube.com/Haenchen.

![Clamping unit Ratio-Clamp®: sectional view with sealing system Servocop®](image)

![Functional principle](image)

Locked state
- Locking piston
- Housing
- Clamping sleeve
- Spring
- Rod

Released state
- Releasing pressure

You can find the video for the functional principle of the clamping unit Ratio-Clamp® at www.youtube.com/Haenchen.
CHARACTERISTICS

Absolute efficiency.
Safety without compromise.

Our specialists have been developing, manufacturing and optimising the clamping unit Ratio-Clamp® 100% in Germany since 1965. Functionality, precision and highest quality are a matter of course to us.

Energy efficiency
Do you have an application where a round rod has to be held in a specific position? There are different ways to achieve this: by electronic control, shutting off all ports, locking with pivot pins or by using the clamping unit Ratio-Clamp®.

The Ratio-Clamp® scores with numerous advantages:
- Stepless clamping without energy supply
- Fixes precisely at the desired positions
- Holds position at temperature fluctuations
- Savings in energy costs through clamping with spring power

Safety
The clamping unit is a reliable technological solution if hazards due to external forces or loads must be taken into account in accordance with EN ISO 13849-1. In case of fluctuations or loss of the pressure energy, the clamping unit immobilises round rods under an axial load.

- As a secure position retention element in case of a line break
- As a locking element if cylinders or valves have internal leakages, e.g. through gap seals
- As an additional safety component for axes strained by gravity, if the load causes hazards, e.g. in hold-up devices when lowering a load associated with hazards

The clamping unit, with its frictional contact function, is permitted as a redundant safety component in accordance with EN ISO 13849-2. For example, a non-return valve can be used as a primary safety element.

The Ratio-Clamp® is approved in the version with DGUV Test certification for use on hydraulic presses according to EN 693 or on injection moulding machines according to EN 201.

Energy efficiency – + +
Position accuracy + – +
Independence from external influences + – +
Effort – + – +
Flexible positioning + – +

Comparison of fixation options for round rods

<table>
<thead>
<tr>
<th>Electronic control</th>
<th>Port lock-off</th>
<th>Pivot pin locking</th>
<th>Clamping unit Ratio-Clamp®</th>
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</thead>
<tbody>
<tr>
<td>Energy efficiency</td>
<td>–</td>
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<tr>
<td>Position accuracy</td>
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Performance level calculation

To use the clamping unit as a safety component, you can request the $B_{33}$ value from us to determine your performance level.

PL = performance level
S = severity of injury
F = frequency of hazard
P = probability of hazard avoidance
For every application. The right solution.

There are many situations that require rods to be held in a particular position: for example to protect people, machines and tools in case of power failures or plant shutoffs. But even in production, to fix axes during a process and in all highly dynamic applications and test procedures. Here are some practical examples:

1. **Grinding machine > production**  
   During the production process of ICE rail sleepers, extremely large and heavy concrete workpieces must be positioned for grinding safely and with an accuracy of 0.01 mm. Hänchen’s hydraulic cylinders and Ratio-Clamp® clamping units are designed exactly for these requirements.

2. **Aviation > testing technology**  
   The setups for aviation tests have been refined to the last detail. Hänchen cylinders are used in different fields of testing, simulating ambient conditions and loads during different flight phases. Ratio-Clamp® clamping units are used to protect the intricately constructed and expensive systems.

3. **Press > production**  
   Hänchen lock cylinders guarantee safe movements of the press. Clamping units ensure safety during the pressing process in moulding and injection presses for the production of synthetic and rubber moulded parts in accordance with EN 289.

4. **Railway technology > maintenance**  
   For maintenance purposes, trains must be fixed in the raised state – the Ratio-Clamp® is ideally suited for this purpose. The clamping units hold the train securely in position until the work has been completed and it can return to the rails.

5. **Profiling machine > production**  
   Hänchen clamping units ensure precise machining and consistent quality in the production of metal profiles. During the production process, they facilitate the machining of the profiles by locking the forming tools in place. Ecological and efficient, purely with spring power.

**APPLICATIONS**
EQUIPMENT

Clamping unit installed on a Hänchen hydraulic cylinder series 120
Clamping unit Ratio-Clamp®:
sectional view with sealing system of pressure piston seal

EQUIPMENT

Releasing pressure

+ Basic design
The basic releasing pressure required for releasing the clamping unit is between the minimum pressure and the maximum admissible pressure of 160 bar.

+ Reduced design
For application cases with low supply pressure, a version designed with a reduced releasing pressure is available.

Locking

+ With spring force
Usually, energy stored in springs is used to clamp a rod. This means that the rod can be held for unlimited periods of time without any energy supply.

+ Hydraulic
When very high holding loads are required, the clamping unit can also be locked hydraulically. For the release, hydraulic pressure is used as usual.

Sealing system

+ Servocop®: compact seal, lip seal, wiper ring
The basic type of Ratio-Clamp® uses the friction-optimised sealing system Servocop®. Here, the primary seal touches the rod. The maximum speed of the rod is 1 m/s.

+ Pressure piston seal, lip seal, wiper ring
For very sensitive applications, we recommend the design with pressure piston seal, where no pressurised seal touches the rod. Thus, the sliding friction is very low and remains constant regardless of the releasing pressure. The maximum speed of the rod is 2 m/s.

Certification

+ TÜV
Every Ratio-Clamp® is type tested by TÜV SÜD.

+ DGUV Test
The clamping unit is also available with a DGUV Test certification (testing and certification system of the “Deutsche Gesetzliche Unfallversicherung”). Ratio-Clamp® has a B<sub>10D</sub> value according to EN ISO 13849-1 for use as a redundant safety component. The double safety requirement by the DGUV for the maximum holding load is already taken into account in the load specification on page 13.
### TECHNICAL DATA

#### RATIO-CLAMP®

<table>
<thead>
<tr>
<th>Rod Ø (mm)</th>
<th>Max. holding load (kN)</th>
<th>Releasing pressure min. (bar)</th>
<th>Max. holding load (kN)</th>
<th>Releasing pressure min. (bar)</th>
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Other holding forces and rod Ø on request.

Hydraulic locking is possible up to 2,000 kN holding load and 300 mm rod Ø.

The stated values apply to operation with mineral oil. The holding load may differ when using other fluids.

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Quality taken to the next level. Application made easy.

**Intended use**
The clamping unit Ratio-Clamp® clamps round rods out of standstill:
- As a separate constructive unit
- As an attachment element to a hydraulic cylinder

**Improper use**
The clamping unit Ratio-Clamp® must not be used:
- For frequently clamping out of motion, i.e. as a brake
- For clamping rotating rods or shafts

**Rod requirements**
The round rod to be clamped shall have a hard surface and must meet the minimum requirements when installing the Ratio-Clamp®. A honed rod is recommended.

**Functional test**
The Ratio-Clamp® shall be inspected at the factory after 2 million switching cycles. This is reduced to 1 million cycles if safety-relevant functions are overtaken. Depending on the load, the clamping unit must be checked regularly, but at least every 6 months and after prolonged standstill. This includes checking for leaks and ensuring that the holding load is maintained according to the values specified in the documentation.

**Operating conditions**
Unless otherwise specified, the following operating conditions must be observed:
- Relative humidity < 70%
- Working temperatures from -30 °C to +80 °C
- Max. releasing pressure: 160 bar
- Max. rod speed: 1 m/s with Servocop®, 2 m/s with pressure piston seal
- Fluids: mineral oils, others like water, HFC or Skydrol® on request
- Recommended cleanliness class 19/16/13 in accordance with ISO 4406

**Control**
When controlling a Ratio-Clamp®, it must first be released by applying pressure to the releasing port – only then may the rod be moved. When using a clamping unit together with a hydraulic cylinder, it can be done by means of a hydraulic sequential control or by electronic monitoring. For example, in order to build up counterpressure, sensors in an electronic control system can measure the load on vertically installed cylinders. This prevents the rod from jolting when releasing.

This can also be achieved with a hydraulic control block: first the releasing pressure is built up, then the cylinder is pressurised. Matching valves locks the pressure in the cylinder so that the Ratio-Clamp® can be unlocked almost without jolts even when handling vertical loads.

**State check**
The respective state – rod locked or released – can be monitored via inductive proximity switches. The device for mounting a proximity switch is available as standard. On request, the clamping unit can be equipped with two proximity switches. When using the Ratio-Clamp® as a safety component or with required DGUV Test certification, it is obligatory to have a proximity switch with diagnostic output installed. This also monitors the function of the switch and supply line.

**Attachment**
A fixed flange is used for attachment to Hänschen hydraulic cylinders or cylinders pursuant to ISO 6020-1, ISO 6020-2 and other makes. For this purpose, the rod must be extended according to the length of the clamping unit. If attached separately, the clamping unit can also be loosely installed using a collar flange to compensate for axis misalignment.