

## Hydro-Cylinder with Locking Piston

single acting with spring return,  
max. operating pressure 500 bar



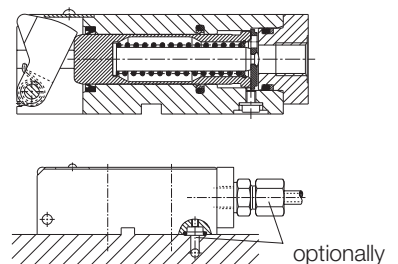
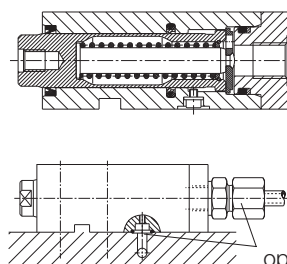
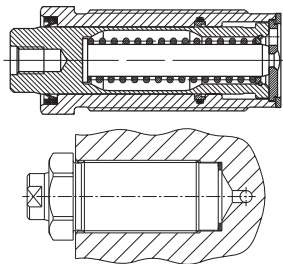
Threaded-body cylinder  
with locking piston (page 2)



Block cylinder  
with locking piston (page 3)



Low-block clamping cylinder  
with locking piston (page 4)

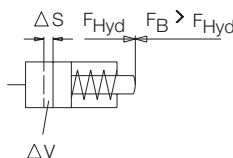


### Description

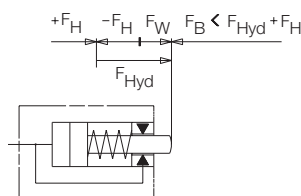
Hydro cylinders with locking piston are single-acting plunger cylinders, similar to the design of the proved threaded-body cylinders as per data sheet B 1.461. When pressurising the element, the piston will be expanded and locked in the cylinder body.

### Function

If a force  $F_B$  higher than the hydraulic clamping force  $F_{Hyd}$ , acts on a standard clamping cylinder, the piston will be pushed back due to the compressibility of the oil.



In such cases the operating pressure has to be increased or a larger clamping cylinder or additional work supports have to be used. The hydro cylinder with locking piston does not only clamp the workpiece, but compensates also the machining forces which are up to five times higher and are directed against the clamping force.



- $F_{Hyd}$  = Hydraulic clamping force  
= Piston surface x oil pressure
- $F_W$  = Effective clamping force  
 $F_{Hyd} - F_H$
- $F_H$  = Retention force, resulting from  
non-positive locking of the piston  
in the cylinder body
- $F_B$  = Force against the clamping force,  
e.g. machining forces

### Application

Hydro cylinders with locking piston have a relatively little clamping force, but a high retention force in opposite direction. Therefore they are particularly suitable for clamping of thin-walled workpieces with minimum deformation as well as for "floating clamping".

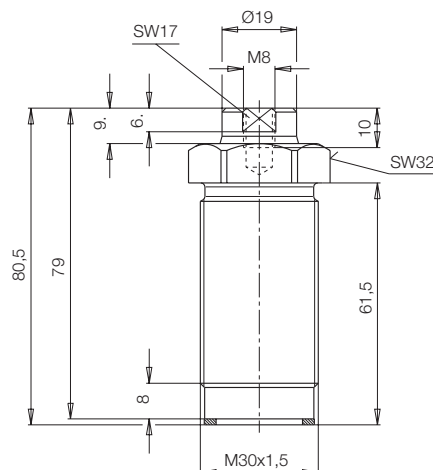
### Advantages

- "Clamping" and "Supporting" with one element
- Admissible support force up to five times the clamping force
- Clamping with minimum deformation due to relatively little clamping force, but high retention force
- Particularly suitable for "floating clamping"
- 3 variants of bodies
- Plunger design impedes penetration of fluids into the spring area.
- Spacings between cylinders can be minimised when cylinders are arranged in a row
- Fixtures without tubes are possible

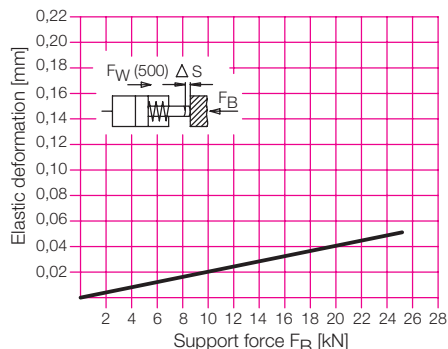


### Technical characteristics

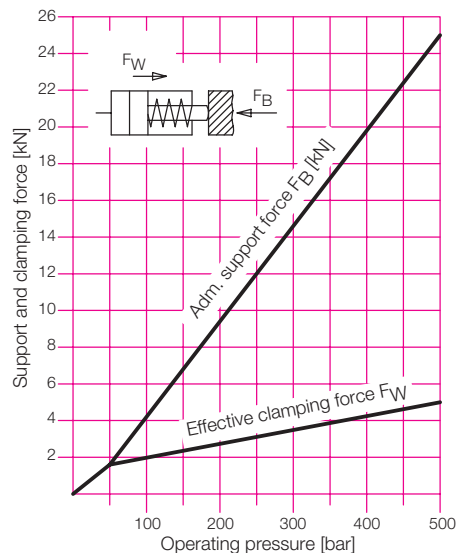
Piston Ø	[mm]	20
Stroke	[mm]	10
Oil volume/stroke	[cm³]	3.14
Min. spring return force	[N]	90
Min. operating pressure	[bar]	50
Recom. pressure range	[bar]	100-500
Seating torque	[Nm]	60
Weight	[kg]	0.25
<b>Part-no.</b>		<b>1462-847</b>
<b>Part-no. additional seal</b>		<b>3000-842</b>



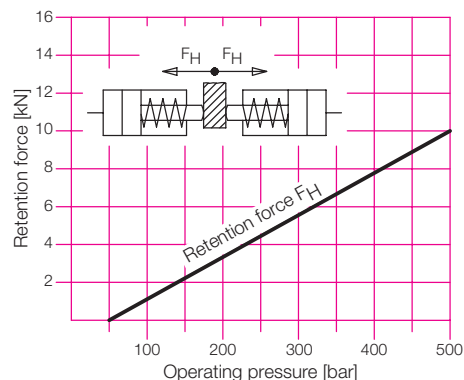
Elastic deformation as a function of the support force of the piston at an operating pressure of 500 bar



Effective clamping force and admissible load



Retention force for "floating clamping"

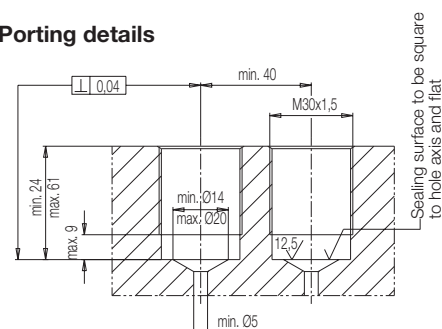


### Important notes

Threaded-body cylinders must not be loaded in retracted position. Operating conditions, tolerances and other data see data sheet A 0.100.

In case of "floating clamping" pay attention to an identical stroke of the oppositely-arranged pistons. A difference in stroke of 1 mm causes a difference in clamping force of approx. 5 N.

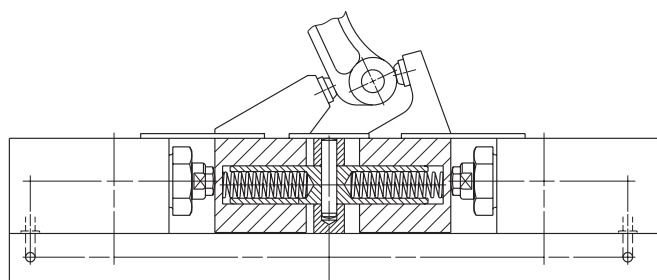
### Porting details



### Application example

#### Simple collet for "floating clamping"

Two clamping bars with **threaded-body cylinders with locking piston** are fixed on a base plate and hydraulically connected by drilled channels. The axial block fixed in the centre is used as guide for both clamping jaws. An installed return spring moves the clamping jaws to its off-position. "Floating" clamping, i.e. the uniform and tongs-type contact at the workpiece independent of its position is possible due to the hydraulic pressure compensation between the cylinders. Only different spring forces can influence the uniformity. After the pressure increase, the two locking pistons avoid a "further floating" of the clamping point.





## A black and white photograph of a rectangular metal block, likely a hydraulic valve or manifold. The block has four circular holes arranged in a 2x2 grid on its top surface. On the left side, there is a threaded port with a hexagonal nut. The block is shown from a three-quarter perspective against a light background.

Piston Ø	[mm]	20
Stroke	[mm]	10
Oil volume/stroke	[cm³]	3.14
Min. spring return force	[N]	90
Min. operating pressure	[bar]	50
Recom. pressure range	[bar]	100-500
Weight	[kg]	1.05

Technical drawing of a mechanical part, likely a pump housing, showing dimensions and features. The drawing includes a top view and a side view. Key dimensions include: overall width 100, overall height 36, internal width 91, internal height 18, and various hole diameters ( $\varnothing 13.5$ ,  $\varnothing 19$ ,  $\varnothing 8.5$ ,  $\varnothing 8H8$ ). A section line A-A is indicated.

The graph shows a linear relationship between support force  $F_B$  and elastic deformation. The x-axis ranges from 2 to 28 kN, and the y-axis ranges from 0 to 0.22 mm. A schematic diagram of the test setup is included, showing a force  $F_W(500)$  applied to a spring, which is supported by a base with a support force  $F_B$ . The displacement  $\Delta S$  is indicated.

Support force $F_B$ [kN]	Elastic deformation [mm]
2	0.01
4	0.02
6	0.03
8	0.04
10	0.05
12	0.06
14	0.07
16	0.08
18	0.09
20	0.10
22	0.11
24	0.12
26	0.13

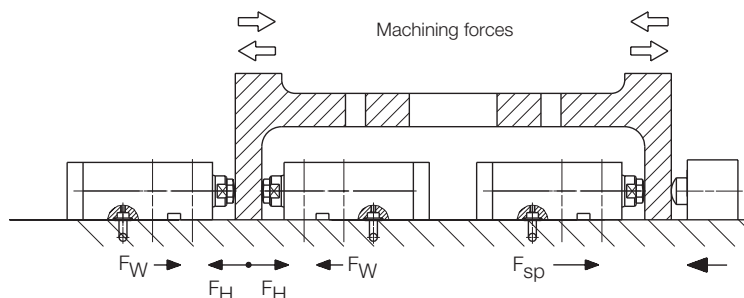
The graph illustrates the relationship between operating pressure and clamping force for a hydraulic cylinder. The y-axis represents 'Support and clamping force [kN]' from 0 to 26. The x-axis represents 'Operating pressure [bar]' from 0 to 500. A schematic shows a cylinder with force  $F_W$  to the right and  $F_B$  to the left. Two curves are shown: 'Adm. support force  $F_B$  [kN]' (steeper) and 'Effective clamping force  $F_W$ ' (flatter).

Operating pressure [bar]	Adm. support force $F_B$ [kN]	Effective clamping force $F_W$ [kN]
0	0	0
100	4	1.8
200	8.8	2.5
300	13.2	3.2
400	17.6	3.9
500	22	4.6

The graph shows the relationship between Retention force  $F_H$  (N) and Operating pressure [bar] for a 2-way, 3-position solenoid valve. The retention force increases linearly with operating pressure.

Operating pressure [bar]	Retention force $F_H$ [N]
100	1.6
200	3.2
300	4.8
400	6.4
500	8.0

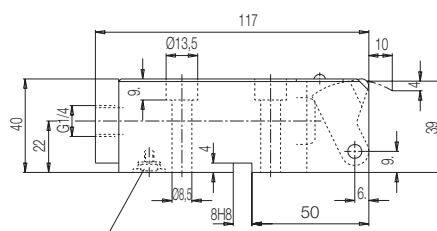
The workpiece is pre-clamped against the stop and thereby positioned by a standard block cylinder. Then, controlled by a sequence valve, the two **block-cylinders with locking piston** are pressurised. The effective clamping force  $F_W$  is uniformly generated by hydraulic pressure at both sides. A “further floating” of the web due to machining forces is avoided due to locking of both pistons. The maximum retention force  $F_H$  can be taken from the diagram. This arrangement is particularly suitable to absorb vibrations at ribs and webs.



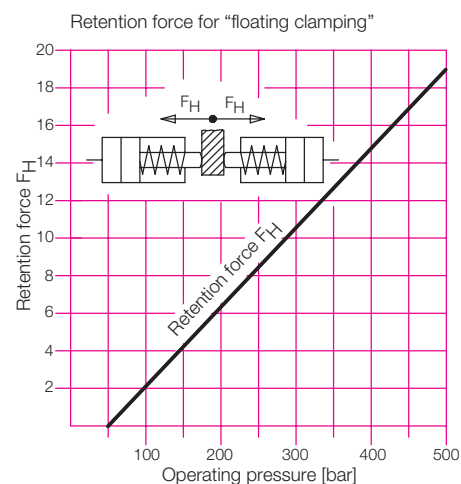
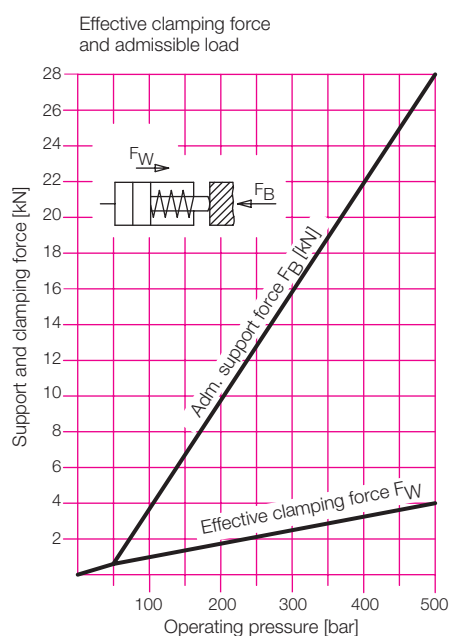
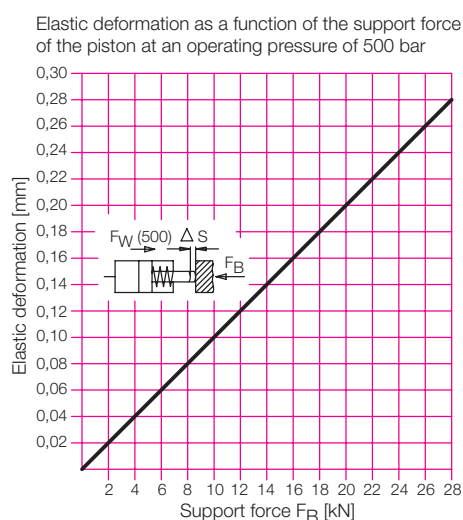
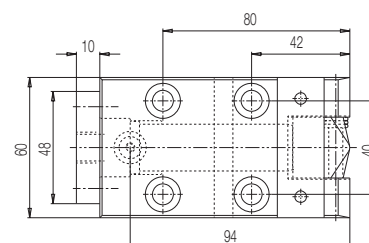


Piston Ø	[mm]	20
Stroke	[mm]	10
Oil volume/stroke	[cm³]	3.14
Min. spring return force	[N]	90
Min. operating pressure	[bar]	50
Recom. pressure range	[bar]	100-500
Weight	[kg]	1.75
<b>Part-no.</b>		<b>1372-800</b>

Plug G 1/4	<b>3610-006</b>
Clamping lever, spare part	<b>3542-081</b>
Leg spring, spare part	<b>3715-104</b>



For manifold mounting remove screw with sealing and insert O-ring 10x2 (**part-no. 3000-347**) into the counterbore. Connecting hole max. Ø 7 mm.  
Screw in plug G 1/4 (**part-no. 3610-006**).



In case of “floating clamping” pay attention to an identical stroke of the oppositely-arranged pistons. A difference in stroke of 1 mm causes a difference in clamping force of approx. 5 N.

### Clamping and supporting with minimum deformation

The workpieces are clamped with minimum deformation and relatively little piston force. Since the admissible support force  $F_B$  is up to five times higher than the effective clamping force, the clamping forces which act against the right-hand **low-block clamping cylinder with locking piston** are securely compensated. With this arrangement the available machining area at the fixture is optimally used.

