Flat Lever Clamps
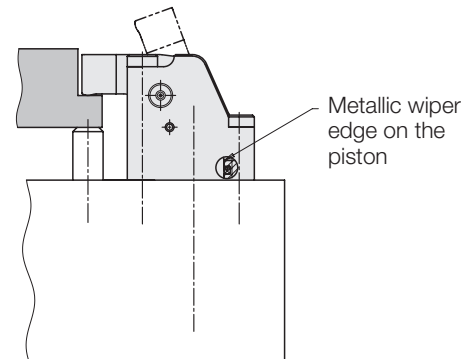## Advanced Link System, pneumatic position monitoring optional
single and double acting, max. operating pressure 250 bar

Application

The flat lever clamp is a compact hydraulic clamping element for fixtures with oil supply through drilled channels.

Due to the minimum space required, the flat lever clamp is especially suitable for fixtures with little space for the installation of hydraulic clamping elements.

The flat clamping lever allows machining of surfaces that are only a few millimetres above the clamping point.

Double-acting versions are advantageous for time and cycle-dependent installations, since the return stroke is effected in a precisely defined time and the pneumatic position monitoring of the clamping lever is possible.

Advanced Link System

The newly developed lever kinematics enable trouble-free, process-safe operation.

Description

When pressurising the flat lever clamp, a piston moves upwards against the rear edge of the clamping lever and swivels the clamping lever to the clamping position. The piston force is deviated by 180° onto the workpiece. The clamping force depends on the operating pressure and the length of the clamping lever.

When unclamping the flat lever clamp, the clamping lever is swivelled back to the off-position by means of a hook-shaped carrier on the piston. Unclamping is made either hydraulically or when using a single-acting element with spring force.

The pneumatic position monitoring allows the monitoring of both final positions of the clamping lever.
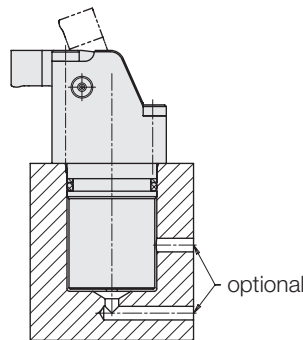
Important notes

Flat lever clamps must only be used for clamping of workpieces in industrial applications and may only be operated with hydraulic oil. Considerable injuries can be caused to fingers in the effective area of the clamping arm.

The manufacturer of the fixture or the machine is obliged to provide effective protection devices.
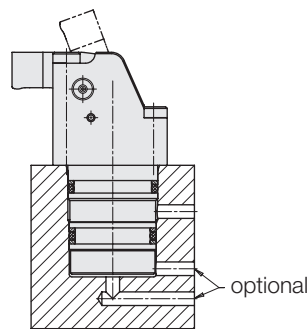
The clamping lever must not be impeded during swivelling. The clamping height h must be in the indicated tolerance range. To permanently secure correct functioning, the flat lever clamps must be regularly cleaned and greased. This applies especially for dry machining, minimum quantity lubrication and in case of accumulation of very small swarf.
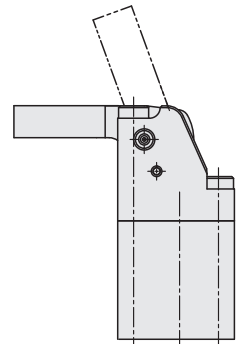
Advantages

- Minimum dimensions
- Partially immersed body
- Mounting without pipes
- Unimpeded loading and unloading of the fixture
- Workpiece clamping without any side loads
- Flat clamping lever can be swivelled into small recesses
- Long clamping lever (blank) adaptable to the workpiece
- Pneumatic control of the clamping lever position (optional only double acting)
- Metallic wiper edge for piston rod
- Swarf sheet retrofittable
- Mounting position: any

Metallic wiper edge on the piston

Installation and connecting possibilities

Single acting	Double acting	Long clamping lever (blank)

optional

optional

Available versions

1. Single acting, without position monitoring

1.1 Without clamping lever 18297X0E00
For the installation of a special clamping lever, which can be produced from the clamping lever blank.

1.2 With clamping lever 18297X0EXX
The clamping lever with length L as per chart (page 3) is installed.

2. Double acting, without and with position monitoring
With the pneumatic position monitoring, the clamping and/or unclamping position is queried directly at the clamping lever. A description can be found on page 5.

2.1 Without clamping lever, without position monitoring 18297X0D00
For the installation of a special clamping lever, which can be produced from the clamping lever blank.

2.2 Without clamping lever, with position monitoring 18297X3D00
The position monitoring can also be used with the clamping lever blank.

2.2 With clamping lever, without position monitoring 18297X0DXX
The clamping lever with length L as per chart (page 3) is installed.

2.3 With clamping lever, with position monitoring 18297X3DXX
The clamping lever with length L as per chart (page 3) is installed.

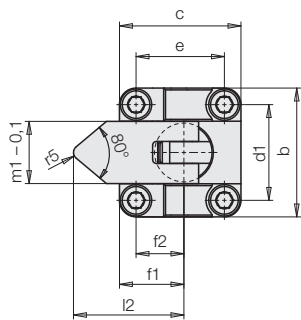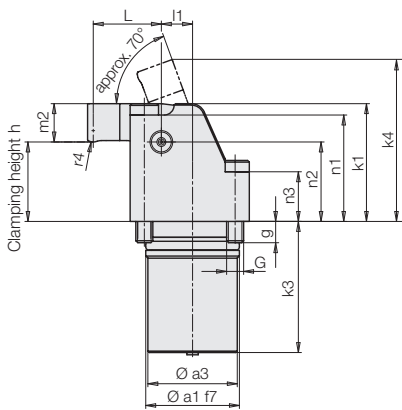## Application example
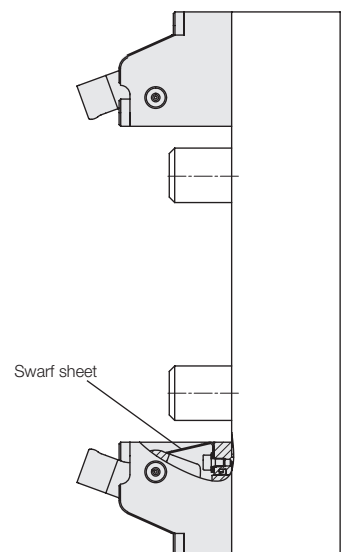
Swarf sheet

Installation instructions:

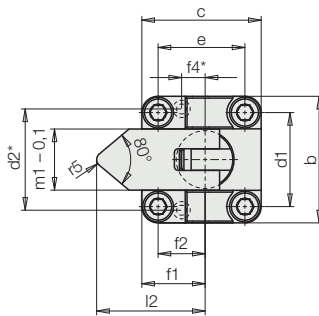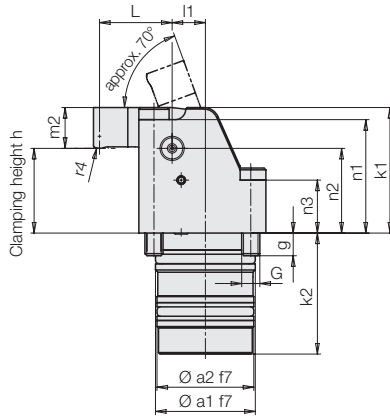The flat lever clamp is suitable for any installation position. If the selected installation position can cause swarf nests to form in the swivel area of the clamping lever, the swarf sheet available as an accessory can be retrofitted.

Römheld GmbH · Postfach 1253 · 35317 Laubach, Germany · Tel.: +49 (0) 6405 / 89-0 · info@roemheld.de · www.roemheld.com

Actual issue see ws.roemheld.com

Subject to modifications

Dimensions

Single acting
1829 7X0EXX

Double acting
1829 7X0DXX

* Only available for position monitoring

Long clamping lever (blank)
see accessories

Material: 42 Cr Mo S4 + QT nitrocarburized
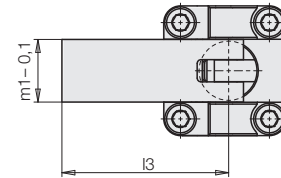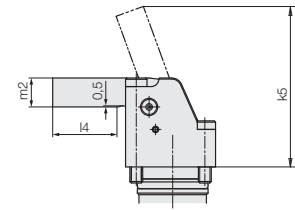
Location hole
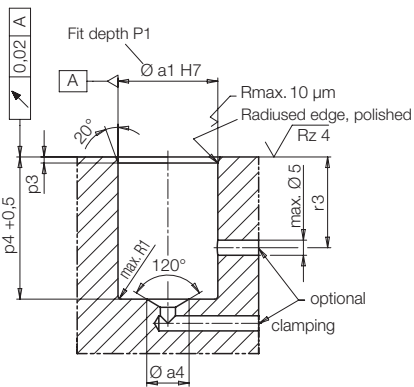
Location hole

Fixing screws 10.9 – DIN 7984
Included in our delivery

Tightening torque see chart.

Required for pneum. position monitoring "clamped"

Required for pneum. position monitoring "unclamped"
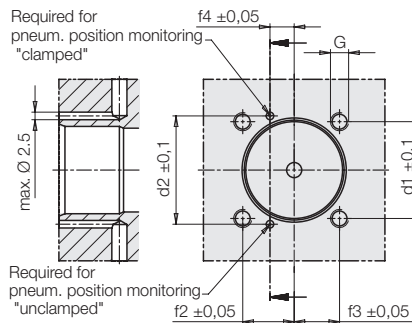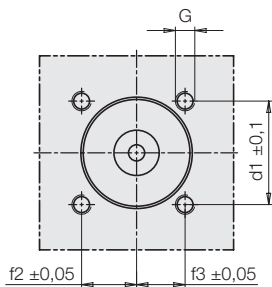
2 O-rings 3 x 1 (part no. 3001 758)
Included in our delivery

Pneumatic position monitoring see page 5

Technical data

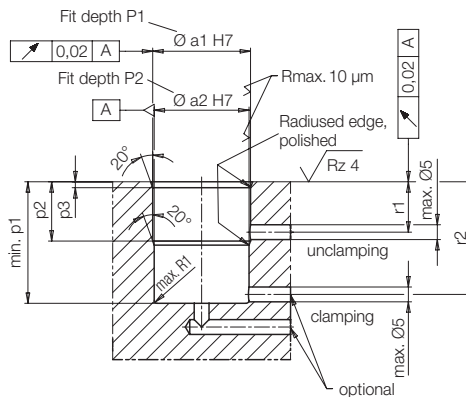| Size			1	2	3	4
Clamping force at 250 bar	single acting	approx. [kN]	2.5	3.3	5.8	9.8
and length of clamping lever L	double acting	approx. [kN]	3.2	5	8.7	13
Piston Ø	single acting	[mm]	16	20	25	32
	double acting	[mm]	18/16	24/20	30/25	36/32
Piston stroke		[mm]	9.5	11.5	15	18
Oil volume clamping	single acting	[cm³]	1.9	3.6	7.4	14.5
	double acting	[cm³]	2.4	5.2	10.6	18.3
Oil volume unclamping	double acting	[cm³]	0.5	1.6	3.3	3.9
Adm. flow rate	single acting	[cm³/s]	4	7	13	32
Adm. flow rate	double acting	[cm³/s]	5	10	20	40
min. operating pressure		[bar]	20	20	20	20
Max. pressure in return line	single acting	[bar]	0.5	0.5	0.5	0.5
Tightening torque (screws 10.9 DIN 7984)		[Nm]	7	12	29	58
Ø a1 H7/f7		[mm]	25	33	40	46
Ø a2 H7/f7		[mm]	24	32	38	44
Ø a3		[mm]	23.8	31.5	37.5	43.5
Ø a4		[mm]	14	14	14	32
b		[mm]	35	42	53	66
c		[mm]	33	42	54	63
d1		[mm]	26	32	40	50
d2		[mm]	28	35.8	40	50
e		[mm]	24	32	41	47
f1		[mm]	17.5	22	29.5	37
f2		[mm]	13	17	23	29
f3		[mm]	11	15	18	18
f4		[mm]	6.5	8	12.5	15
G		[mm]	M5	M6	M8	M10
g		[mm]	11	7.5	11	13
h clamping height*		[mm]	23 +1.5/−1.2	28 +2/−1.6	36 +2.4/−1.9	41 +2.8/−2.3
k1		[mm]	32.5	41.5	54	64
k2		[mm]	34	40	46	48
k3		[mm]	38	46.2	45.3	63.5
k4 approx.		[mm]	45	57	72	83.5
k5 approx.		[mm]	59	75	94	110
L		[mm]	18	24	28	33
l1		[mm]	10	11	16	20
l2		[mm]	30	37	48	57
l3		[mm]	45	56	71	85
l4		[mm]	22	30	34	41.5
m1 −0.1		[mm]	16.9	20.9	25.9	32.9
m2		[mm]	9.5	13.5	18	22.5
n1		[mm]	29	37.5	49	57
n2		[mm]	23	28	36	41
n3		[mm]	9	17.5	24	32
Ø P1		[mm]	11	14	14	14
Ø P2		[mm]	34	32	34	40
p1 min.		[mm]	36	41	46.5	49
p2		[mm]	17	20	20	23.5
p3		[mm]	2	2	3	3
p4 +0.5		[mm]	39	47	46.5	64.5
r1		[mm]	14	17	16.5	18.5
r2		[mm]	33	35−38	40−44	44.5−46
r3		[mm]	16−36	17−44	17−44	18−61
r4		[mm]	4	4	8	8
r5		[mm]	2	2	4	4

Single acting, without position monitoring

Part no. without clamping lever			**1829710E00**	**1829720E00**	**1829730E00**	**1829740E00**
Weight, approx.		[kg]	0.263	0.544	1.040	1.861
Part no. with clamping lever length L			**1829710E18**	**1829720E24**	**1829730E28**	**1829740E33**
Weight, approx.		[kg]	0.305	0.630	1.225	2.180

Double acting, without clamping lever

Part no. without position monitoring			**1829710D00**	**1829720D00**	**1829730D00**	**1829740D00**
Part no. with position monitoring			**1829713D00**	**1829723D00**	**1829733D00**	**1829743D00**
Weight, approx.		[kg]	0.246	0.491	0.962	1.576

Double acting, with clamping lever

Part no. without position monitoring			**1829710D18**	**1829720D24**	**1829730D28**	**1829740D33**
Part no. with position monitoring			**1829713D18**	**1829723D24**	**1829733D28**	**1829743D33**
Weight, approx.		[kg]	0.288	0.577	1.147	1.895

Accessories

Part no. clamping lever length L			**0354 1025**	**0354 1026**	**0354 1027**	**0354 1028**
Weight, approx.		[kg]	0.042	0.086	0.185	0.319
Part no. long clamping lever (blank)			**0354 1029**	**0354 1030**	**0354 1031**	**0354 1032**
Weight, approx.		[kg]	0.066	0.140	0.290	0.537
Part no. swarf sheet			**035381404**	**035381405**	**035381406**	**035381407**

* The clamping height h must be in the indicated tolerance range.

Clamping force diagrams

Calculations of the clamping force
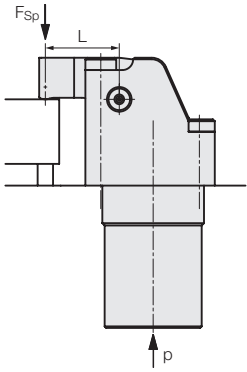
1. Length L of clamping lever is known

1.1 Admissible operating pressure

DA $\quad p_{adm} = \dfrac{B}{(C/L) + 1} \leq 250 \quad$ [bar]

SA $\quad p_{adm} = \dfrac{B^*}{(C/L) + 1} + 5 \leq 250 \quad$ [bar]

1.2 Effective clamping force

DA $\quad (p_{adm} > 250\ bar)\quad F_{sp} = \dfrac{A}{L} * 250 \quad$ [kN]

$\quad\quad (p_{adm} \leq 250\ bar)\quad F_{sp} = \dfrac{A}{L} * p \quad$ [kN]

SA $\quad (p_{adm} > 250\ bar)\quad F_{sp} = \dfrac{A^*}{L} * (250 - 5) \quad$ [kN]

$\quad\quad (p_{adm} \leq 250\ bar)\quad F_{sp} = \dfrac{A^*}{L} * (p - 5) \quad$ [kN]

2. Min. length of clamping lever

DA $\quad\quad L_{min.} = \dfrac{C}{(B/p) - 1} \quad$ [mm]

SA $\quad\quad L_{min.} = \dfrac{C}{[B^*/(p-5)] - 1} \quad$ [mm]

$L, L_{min.}$ = length of clamping lever [mm]
$p, p_{adm.}$ = operating pressure [bar]
A, B, C = constants for DA
A*, B*, C = constants for SA
DA = double acting
SA = single acting

Single acting

1829 71XE — L = 18 mm

1829 72XE — L = 24 mm

1829 73XE — L = 28 mm — 8,1 kN ③ L=20mm

1829 74XE — L = 33 mm

Double acting

1829 71XD — L = 18 mm

1829 72XD — 6,3 kN ② L = 16 mm — L = 24 mm — 2 kN ①

1829 73XD — L = 28 mm

1829 74XD — L = 33 mm — L = 60 mm — 7,15 kN ④

Constants

1829	71	72	73	74
A	0.23	0.48	0.975	1.716
A*	0.184	0.323	0.663	1.322
B	402.78	385.41	401.77	397.73
B*	509.76	555	578.57	503.37
C	11	13	17	19.5
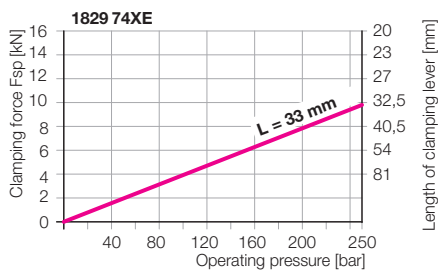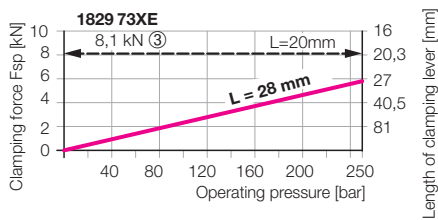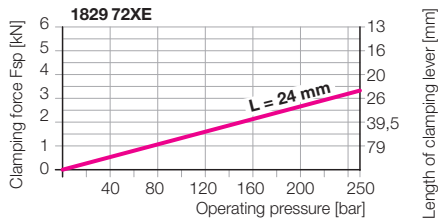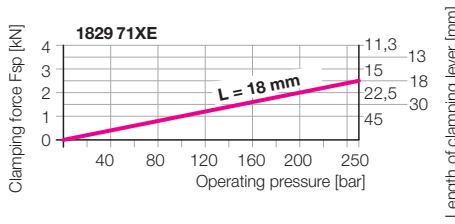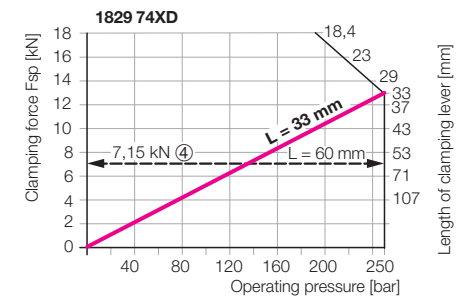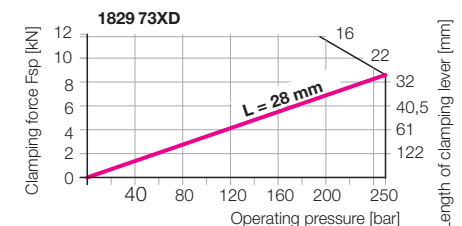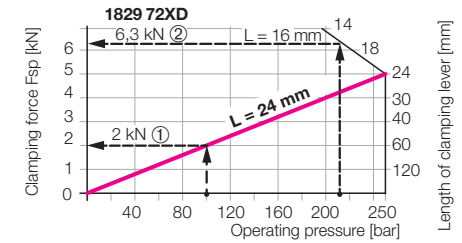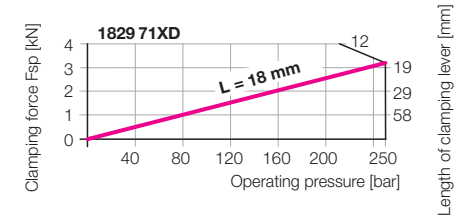
Example 1: Flat lever clamp 1829 723**D**24
$\quad\quad\quad\quad$ p = 100 bar; L = 24 mm (standard)

Effective clamping force

$F_{Sp} = \dfrac{A}{L} * p = \dfrac{0.48}{24} * 100 = 2\ kN$

Example 2: Flat lever clamp 1829 720**D**00
$\quad\quad\quad\quad$ p = 210 bar

Min. length of clamping lever

$L_{min} = \dfrac{C}{(B/p) - 1} = \dfrac{13}{(385.41/210) - 1} = 15.56 \rightarrow 16\ mm$

Admissible operating pressure (review)

$p_{adm} = \dfrac{B}{(C/L) + 1} = \dfrac{385.41}{(13/16) + 1} = 213\ bar$

Effective clamping force at 210 bar

$F_{Sp} = \dfrac{A}{L} * p = \dfrac{0.48}{16} * 210 = 6.3\ kN$

Example 3: Flat lever clamp 1829 730**E**00
$\quad\quad\quad\quad$ Special clamping lever L = 20 mm

Admissible operating pressure

$p_{adm} = \dfrac{B^*}{(C/L) + 1} = \dfrac{578.57}{(17/20) + 1} = 312\ bar > 250\ bar!$

Effective clamping force at 250 bar

$F_{Sp} = \dfrac{A^*}{L} * (p - 5) = \dfrac{0.663}{20} * (250 - 5) = 8.12\ kN$

Example 4: Flat lever clamp 1829 740**D**00
$\quad\quad\quad\quad$ Special clamping lever L = 60 mm

Admissible operating pressure

$p_{adm} = \dfrac{B}{(C/L) + 1} = \dfrac{397.73}{(19.5/60) + 1} = 300\ bar > 250\ bar!$

Effective clamping force at 250 bar

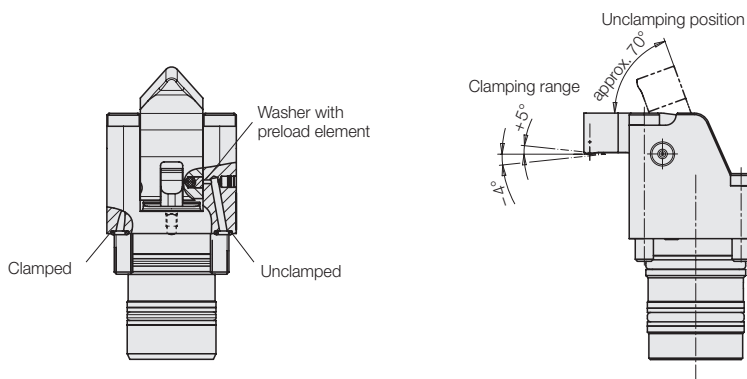$F_{Sp} = \dfrac{A}{L} * p = \dfrac{1.716}{60} * 250 = 7.15\ kN$

Pneumatic position monitoring

The double-acting flat lever clamps

1829 7X3DXX

are delivered with optional position monitoring. Depending on requirements, the compressed air is supplied via one or two drilled channels (see page 2).
The required O-rings in the flange are included in the delivery.

Washer with preload element

Clamped   Unclamped

Unclamping position

Clamping range

approx. 70°

+5°

-4°

Description

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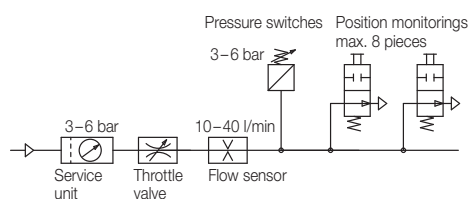
Important note!

When mounting the clamping lever, the preload elements and the washers must be inserted into the provided bore holes in the clamping lever.

These parts are included in the delivery of all double-acting flat lever clamps that are delivered without the clamping lever.
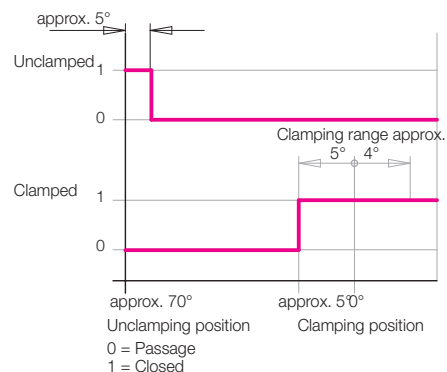
Monitoring by pneumatic pressure switch

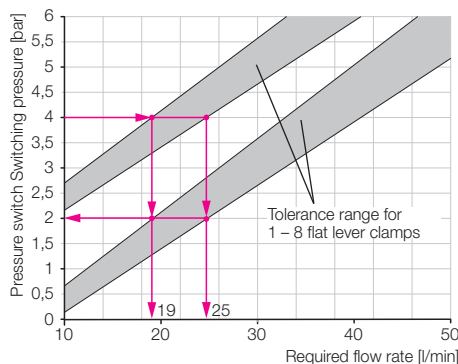For the evaluation of the pneumatic pressure increase standard pneumatic pressure switches can be used.

Pneumatic port

Pressure switches
3–6 bar

Position monitorings max. 8 pieces

3–6 bar
Service unit

Throttle valve

10–40 l/min
Flow sensor

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

Tolerance range for 1 – 8 flat lever clamps

Pressure switch Switching pressure [bar]

Required flow rate [l/min]

19   25

Function chart

approx. 5°

Unclamped 1

0

Clamped 1

0

Clamping range approx. 5° 4°

approx. 70°
Unclamping position

approx. 5°/0°
Clamping position

0 = Passage
1 = Closed

Example

Required switching pressure	4 bar
Pressure drop, if the clamping or unclamping position has not yet been reached.	2 bar
As per diagram: Required flow rate* 1 element	approx. 19 l/min
8 elements	approx. 25 l/min

*) The pneumatic position monitoring is a metallic sealing system in which an air leakage of up to 1.5 l/min per element can occur when closed at 2 bar.
The amount of air leakage depends on the ambient conditions (cleanliness) and should be added to the required volume as per diagram.

Cranked clamping arm
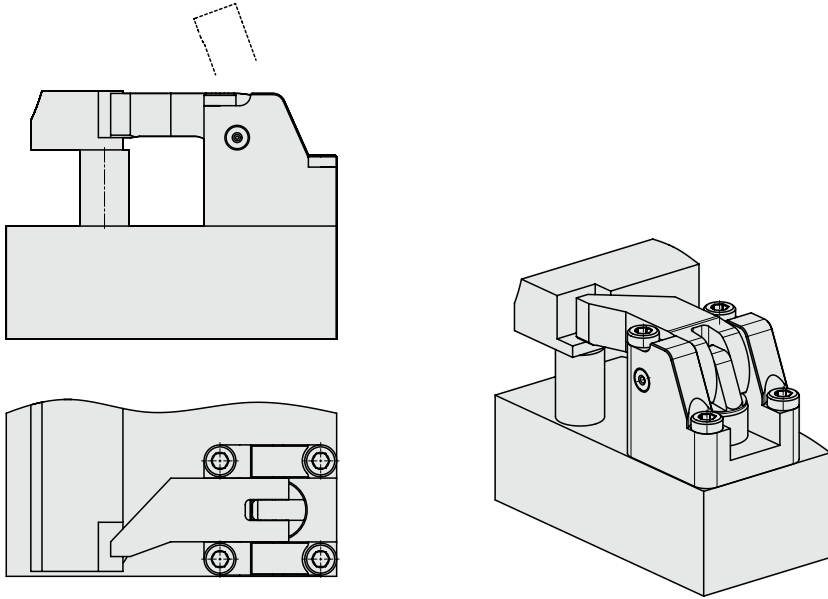
Lateral clamping of workpieces to eliminate the clearance