Flat Lever Clamps
## Advanced Link System, pneumatic position monitoring built-in and block-type, double acting, max. operating pressure 120 bar

Advantages
- Minimum dimensions
- 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 monitoring of the clamping lever position
- Metallic wiper edge at the piston rod
- Swarf sheet retrofittable
- Mounting position: any

Metallic wiper edge on the piston
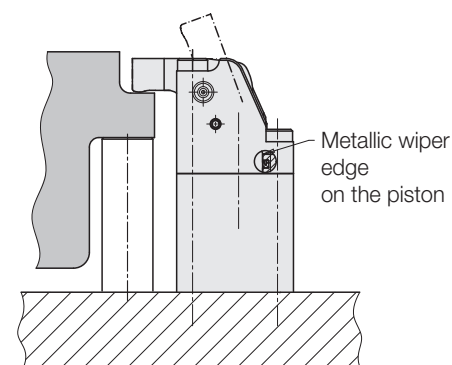
Application

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

This series can be directly connected to the low pressure hydraulics of machine tools with 70 to 120 bar.

Advanced Link System

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

Description

When pressurising the hinge clamp, the 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. 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.
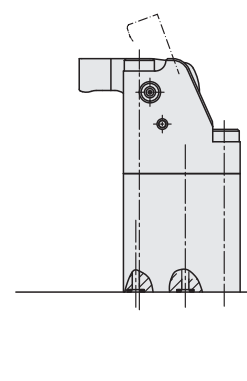
The manufacturer of the fixture or the machine is obliged to provide effective protection devices.

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.
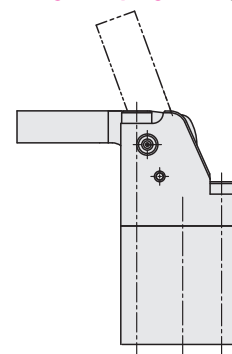
Installation and connecting possibilities
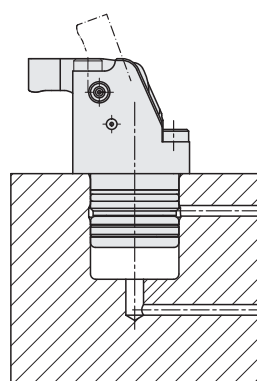
Built-in type   **Block type**   **Long clamping lever** (blank)

Available versions
1. Built-in type
1.1 Without clamping lever 18294X3D00

For the installation of a special clamping lever, which can be produced from the clamping lever blank.

1.2 With clamping lever 18294X3DXX

The clamping lever with length L as per chart (page 3) is installed.
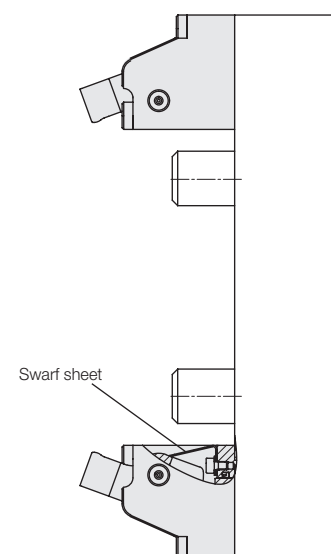
2. Block type
2.1 Without clamping lever 18295X3D00

For the installation of a special clamping lever, which can be produced from the clamping lever blank.

2.2 With clamping lever 18295X3DXX

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

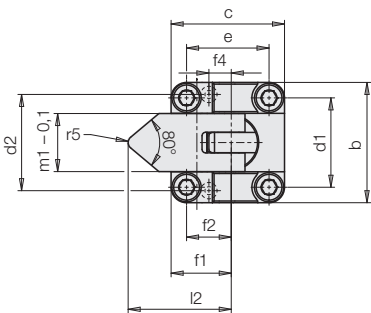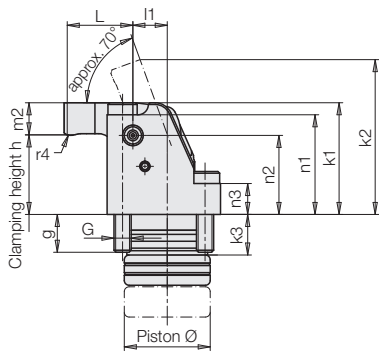### Application example

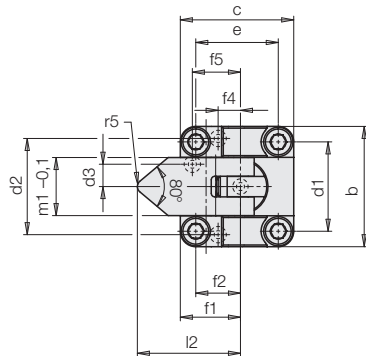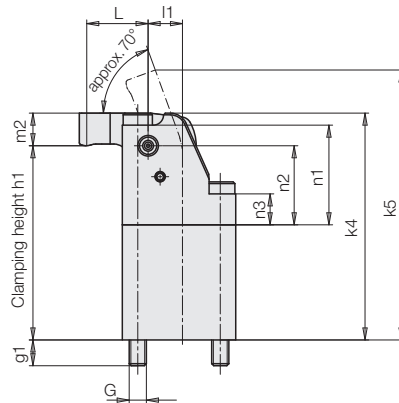Swarf sheet

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.

Dimensions

Built-in type
1829**4**X3**D**XX

Block type
1829**5**X3**D**XX

Long clamping lever (blank)
see accessories

Material: 42 Cr Mo S 4 + QT nitrocarburized

Location hole

A - A
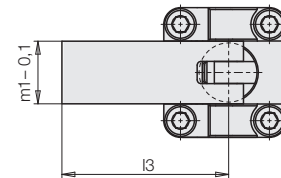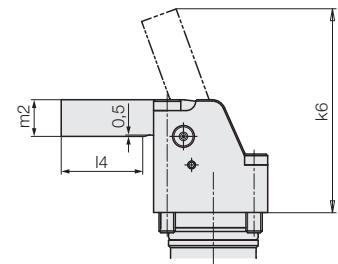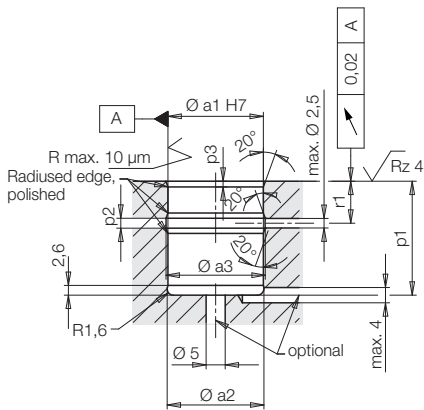
Manifold-mounting surface

Required for pneum. position monitoring "clamped"

Port - unclamping

Required for pneum. position monitoring "unclamped"

Port - clamping
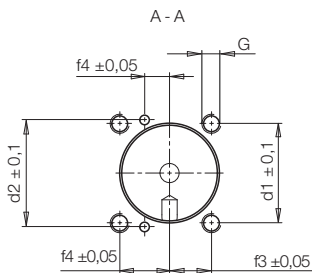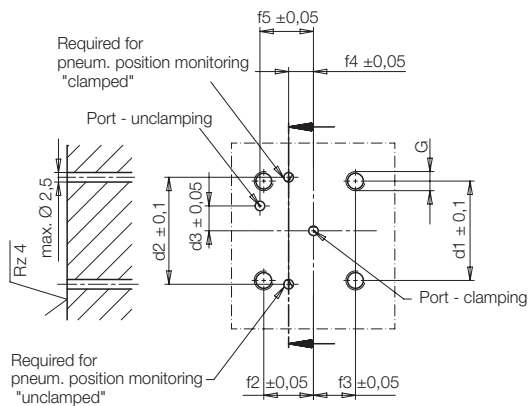
All required O-rings are included in the delivery.
Spare O-rings see chart.

Pneumatic position monitoring see page 5.

Fixing screws 8.8 - DIN 912 and 7984 are included in the delivery.

Tightening torque as per chart on page 3.

Subject to modifications

Technical data

| Size			1	2	3	4
Clamping force approx.	at 120 bar	[kN]	2.96	4.27	7.41	9.75
and clamping lever length L	at 70 bar	[kN]	1.27	2.48	4.35	5.68
Piston / piston rod diameter		[mm]	25/16	32/20	40/25	45/32
Piston stroke		[mm]	9.5	11.5	15	18
Oil volume clamping		[cm³]	4.66	9.25	18.85	28.63
Oil volume unclamping		[cm³]	2.75	5.64	11.49	14.15
Admissible flow rate		[cm³/s]	5	10	20	40
Min. operating pressure		[bar]	20	20	20	20
Tightening torque (screws 8.8)		[Nm]	4.7	10	25	39
a1 H7/f7		[mm]	25	32	40	45
a2		[mm]	25.4	32.4	40.4	45.4
a3 +0.2		[mm]	26	33	41	46
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
d3		[mm]	6.5	9.5	11.5	13
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
f5		[mm]	14	18	20	25
G		[mm]	M5	M6	M8	M10
g		[mm]	11	9.5	14	13
g1		[mm]	7.5	12	14	18
h clamping height*		[mm]	23+1.5/−1.2	28+2/−1.6	36+2.4/−1.9	41+2.8/−2.3
h1 clamping height*		[mm]	56.5+1.5/−1.2	68.5+2/−1.6	81+2.4/−1.9	91+2.8/−2.3
k1		[mm]	32.5	41.5	54	64
k2 approx.		[mm]	45	57	72	83.5
k3		[mm]	11.8	15.25	15.05	14.75
k4		[mm]	66	82	99	114
k5 approx.		[mm]	78.5	97.5	117	133.5
k6 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	35.5	46	57
n2		[mm]	23	28	36	41
n3		[mm]	9	17.5	24	32
P1 min.		[mm]	10	12.5	12.5	13
p1+/−0.1		[mm]	29.8	35.8	39.7	43.1
p2		[mm]	2.6	2.6	3.2	3.2
p3		[mm]	1.5	2.5	2.5	3
r1		[mm]	11	13.9	13.3	13.5
r4		[mm]	4	4	8	8
r5		[mm]	2	2	4	4

Built-in type
Part no. without clamping lever			**1829413D00**	**1829423D00**	**1829433D00**	**1829443D00**
Weight, approx.		[kg]	0.24	0.47	0.93	1.54
Part no. with clamping lever			**1829413D18**	**1829423D24**	**1829433D28**	**1829443D33**
Weight, approx.		[kg]	0.27	0.55	1.1	1.83

Block type
Part no. without clamping lever			**1829513D00**	**1829523D00**	**1829533D00**	**1829543D00**
Weight, approx.		[kg]	0.41	0.79	1.53	2.59
Part no. with clamping lever			**1829513D18**	**1829523D24**	**1829533D28**	**1829543D33**
Weight, approx.		[kg]	0.45	0.87	1.7	2.88

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	0.14	0.29	0.537
Part no. swarf sheet			**0353 81404**	**0353 81405**	**0353 81406**	**0353 81407**

Spare O-rings
for flange position monitoring			3 x 1	3 x 1	3 x 1	3 x 1
Part no.			**3001758**	**3001758**	**3001758**	**3001758**
for flange hydraulic port			3 x 1	3 x 1	2.9 x 1.78	3.68 x 1.78
Part no.			**3001758**	**3001758**	**3000019**	**3000876**

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

Subject to modifications

Calculations of the clamping force
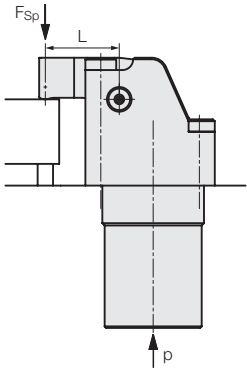
1. Length L of clamping lever is known
1.1 Admissible operating pressure

$$p_{adm} = \frac{B}{\frac{C}{L}+1} \leq 120 \quad [bar]$$

1.2 Effective clamping force

$$p_{adm} > 120\ bar \quad F_{Sp} = \frac{A}{L} \times 120 \quad [kN]$$

$$p_{adm} \leq 120\ bar \quad F_{Sp} = \frac{A}{L} \times p \quad [kN]$$
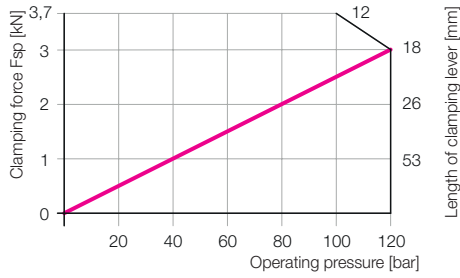
2. Min. length of clamping lever

$$L_{min} = \frac{C}{\frac{B}{p}-1} \quad [mm]$$

L, L$_{min.}$ = length of clamping lever [mm]
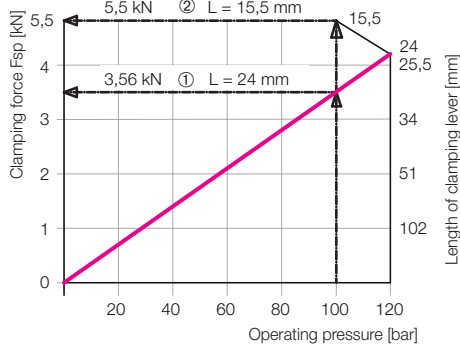p, p$_{adm.}$ = Operating pressure [bar]
A, B, C, = constants

Constants

Size	1	2	3	4
A	0.443	0.853	1.74	2.681
B	193.33	185	192.85	190.91
C	11	13	17	19.5

Size 1

Size 2

Size 3

Size 4

Example 1: Flat lever clamp 1829 4 23**D**24
Operating pressure 100 bar
Standard clamping lever L = 24 mm

Effective clamping force at 100 bar

$$F_{Sp} = \frac{A}{L} \times p = \frac{0.853}{24} \times 100 = 3.55\ kN$$

Example 2: Flat lever clamp 1829 5 23**D**00
Operating pressure 100 bar

Minimum length of clamping lever

$$L_{min} = \frac{C}{\frac{B}{p}-1} = \frac{13}{\frac{185}{100}-1} = 15.29 \rightarrow 15.5\ mm$$
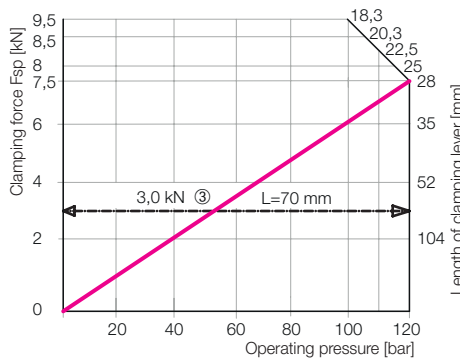
Admissible operating pressure (review)

$$p_{adm} = \frac{B}{\frac{C}{L}+1} = \frac{185}{\frac{13}{15.5}+1} = 100\ bar$$

Effective clamping force at 100 bar

$$F_{Sp} = \frac{A}{L} \times p = \frac{0.853}{15.5} \times 100 = 5.5\ kN$$

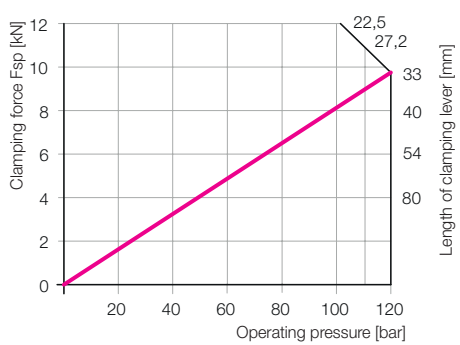**Example 3:** Flat lever clamp 1829 4 3**D**00
Special clamping lever L = 70 mm

Admissible operating pressure

$$p_{adm} = \frac{B}{\frac{C}{L}+1} = \frac{192.85}{\frac{17}{70}+1} = 155\ bar > 120\ bar!$$

Effective clamping force at 120 bar

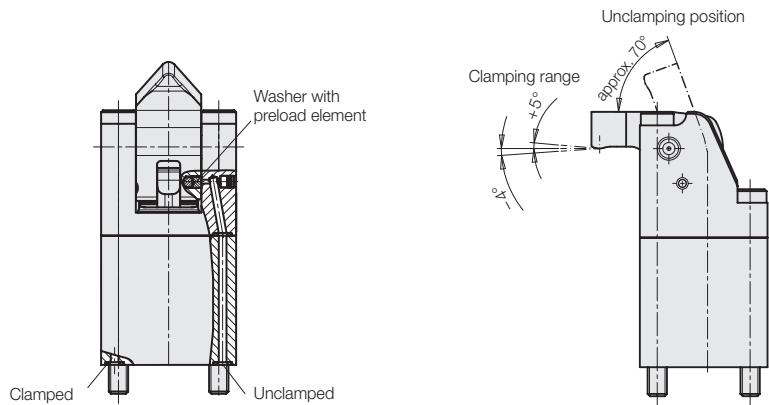$$F_{Sp} = \frac{A}{L} \times p = \frac{1.74}{70} \times 120 = 3\ kN$$

Pneumatic position monitoring

The double-acting flat lever clamps

1829 XX**3D**XX

are delivered with standard 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.
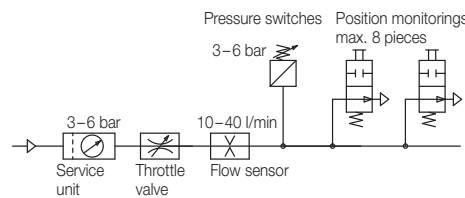
Important note!

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.
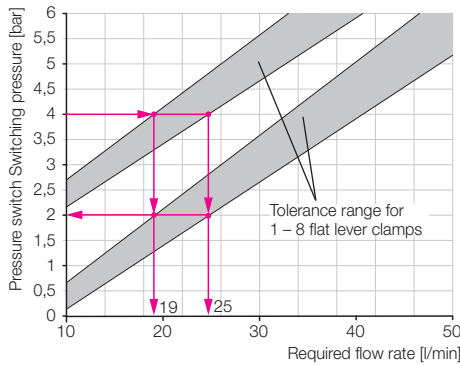
Monitoring by pneumatic pressure switch

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

Pneumatic port

Pressure switches   Position monitorings
3–6 bar   max. 8 pieces

3–6 bar   10–40 l/min
Service   Throttle   Flow sensor
unit   valve

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]

19   25

Required flow rate [l/min]

Function chart

approx. 5°

Unclamped 1

0

Clamping range approx.
5°   4°

Clamped 1

0

approx. 70°   approx. 5° 0°
Unclamping position   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.