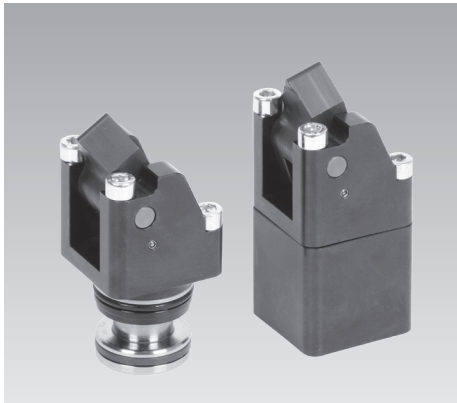




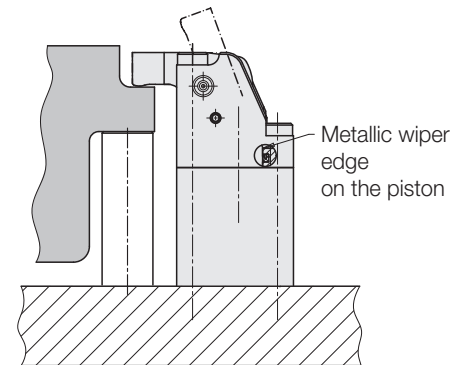
## Flat Lever Clamps

**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



### 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.

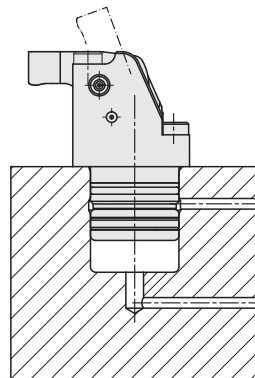
### Important notes

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.

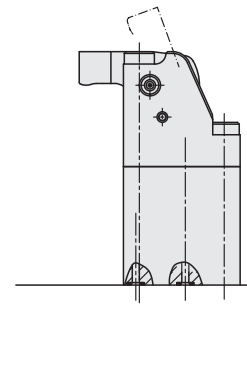
The manufacturer of the fixture or the machine is obliged to provide effective protection devices. The clamping lever must not be impeded during swivelling. The clamping height  $h$  must be in the indicated tolerance range. To permanently secure correct functioning, the flat lever clamps must be regularly 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

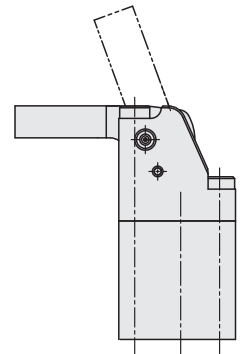
#### Built-in type



#### 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

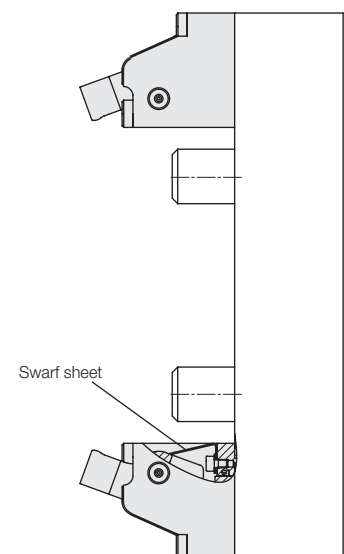
##### 2.1 Without clamping lever 18295X3D00

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

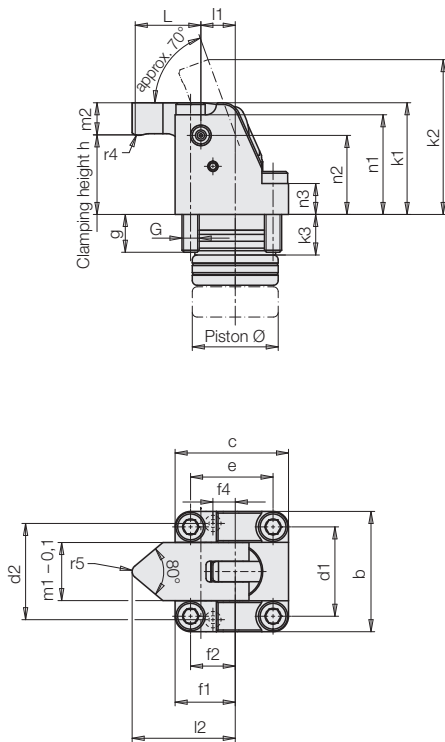


### Installation instructions:

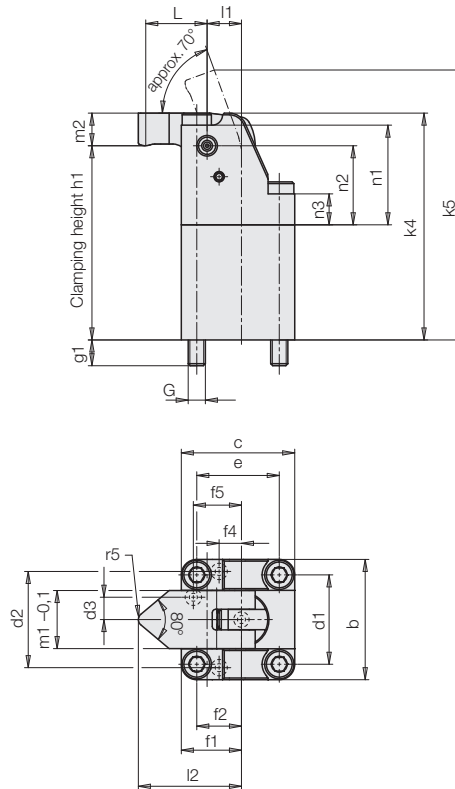
The flat lever clamp is suitable for any installation position. If the selected installation position can cause swarf nests to form in the swivel area of the clamping lever, the swarf sheet available as an accessory can be retrofitted.

## Dimensions

### Built-in type 1829 4X3DXX

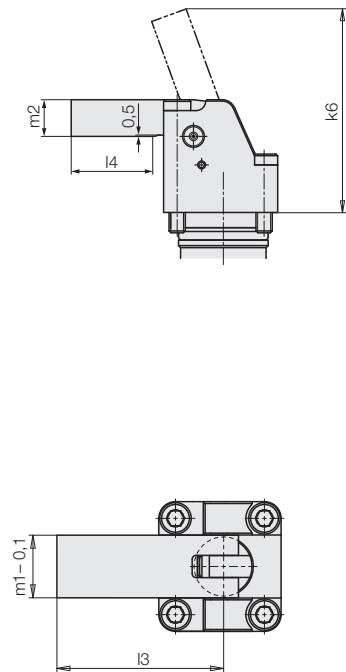


### Block type 1829 5X3DXX

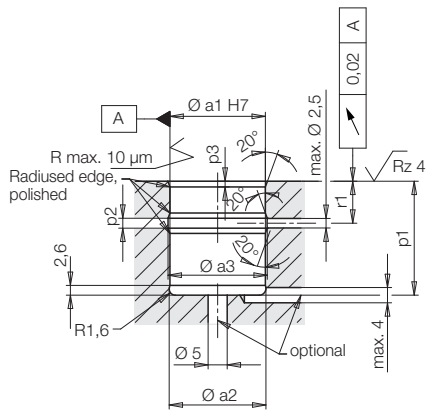


### Long clamping lever (blank) see accessories

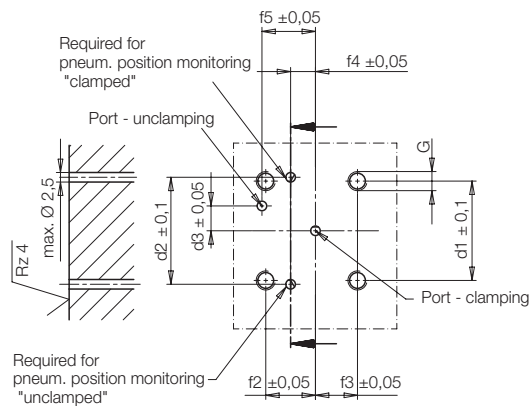
Material: 42 Cr Mo S4 + QT nitrocarburized



### Location hole



### Manifold-mounting surface

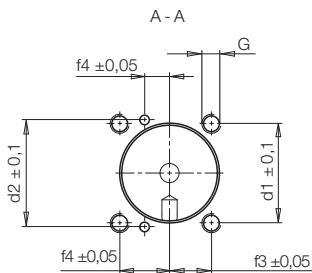


All required O-rings are included in the delivery.  
Spare O-rings see chart.

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.



## 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
Max. pressure in the return line		[bar]	0.5	0.5	0.5	0.5
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

<b>Part no.</b> without clamping lever		<b>1829 413D00</b>	<b>1829 423D00</b>	<b>1829 433D00</b>	<b>1829 443D00</b>
Weight, approx.	[kg]	0.24	0.47	0.93	1.54
<b>Part no.</b> with clamping lever		<b>1829 413D18</b>	<b>1829 423D24</b>	<b>1829 433D28</b>	<b>1829 443D33</b>
Weight, approx.	[kg]	0.27	0.55	1.1	1.83

### Block type

<b>Part no.</b> without clamping lever		<b>1829 513D00</b>	<b>1829 523D00</b>	<b>1829 533D00</b>	<b>1829 543D00</b>
Weight, approx.	[kg]	0.41	0.79	1.53	2.59
<b>Part no.</b> with clamping lever		<b>1829 513D18</b>	<b>1829 523D24</b>	<b>1829 533D28</b>	<b>1829 543D33</b>
Weight, approx.	[kg]	0.45	0.87	1.7	2.88

### Accessories

<b>Part no.</b> clamping lever length L		<b>0354 1025</b>	<b>0354 1026</b>	<b>0354 1027</b>	<b>0354 1028</b>
Weight, approx.	[kg]	0.042	0.086	0.185	0.319
<b>Part no.</b> long clamping lever (blank)		<b>0354 1029</b>	<b>0354 1030</b>	<b>0354 1031</b>	<b>0354 1032</b>
Weight, approx.	[kg]	0.066	0.14	0.29	0.537
<b>Part no.</b> swarf sheet		<b>0353 81404</b>	<b>0353 81405</b>	<b>0353 81406</b>	<b>0353 81407</b>

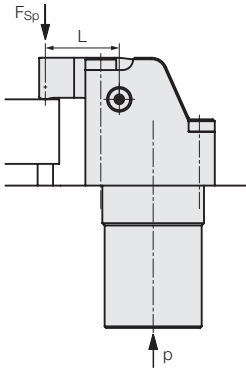
### Spare O-rings

for flange position monitoring		3x1	3x1	3x1	3x1
<b>Part no.</b>		<b>3001 758</b>	<b>3001 758</b>	<b>3001 758</b>	<b>3001 758</b>
for flange hydraulic port		3x1	3x1	2.9x1.78	3.68x1.78
<b>Part no.</b>		<b>3001 758</b>	<b>3001 758</b>	<b>3000 019</b>	<b>3000 876</b>

\* 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

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

- 1.2 Effective clamping force

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

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

2. Min. length of clamping lever

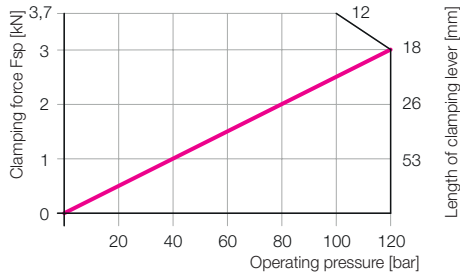
$$L_{min} = \frac{C}{\frac{B}{p} - 1} \quad [\text{mm}]$$

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

## Constants

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

## Size 1



### Example 1: Flat lever clamp 1829423D24

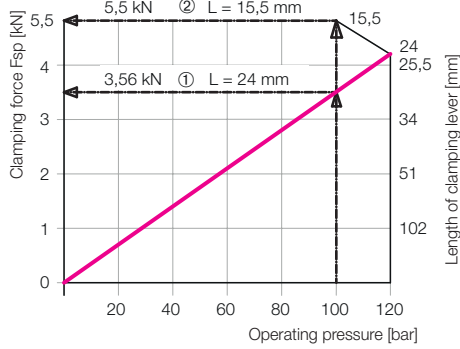
Operating pressure 100 bar

Standard clamping lever  $L = 24$  mm

### Effective clamping force at 100 bar

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

## Size 2



### Example 2: Flat lever clamp 182953D00

Operating pressure 100 bar

### Minimum length of clamping lever

$$L_{min} = \frac{C}{\frac{B}{p} - 1} = \frac{13}{\frac{185}{100} - 1} = 15.29 \rightarrow 15.5 \text{ mm}$$

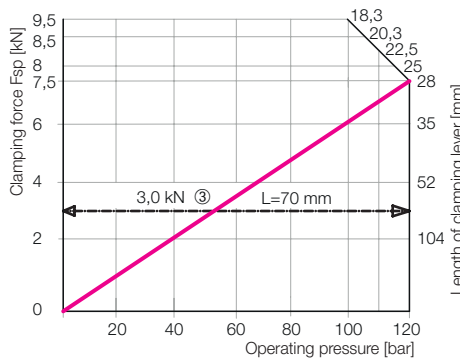
### Admissible operating pressure (review)

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

### Effective clamping force at 100 bar

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

## Size 3



### Example 3: Flat lever clamp 1829433D00

Special clamping lever  $L = 70$  mm

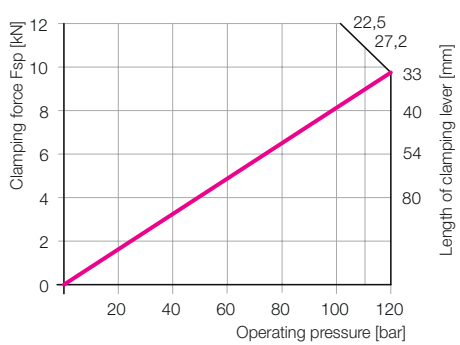
### Admissible operating pressure

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

### Effective clamping force at 120 bar

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

## Size 4



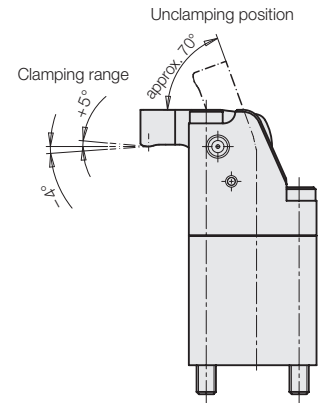
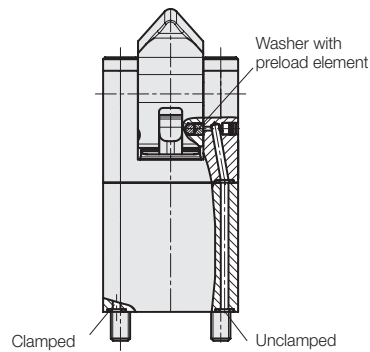
## Pneumatic position monitoring

The double-acting flat lever clamps

### 1829XX3DXX

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.



## 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!

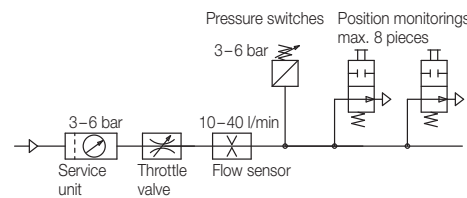
When mounting the clamping lever, the preload elements and the washers must be inserted into the provided bore holes in the clamping lever.

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

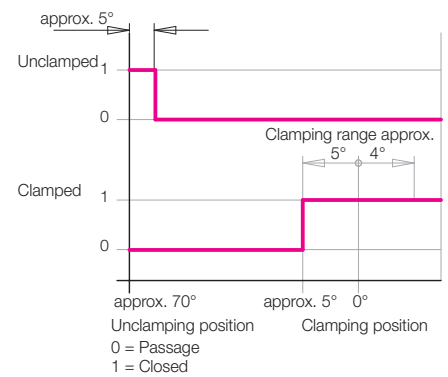
## Monitoring by pneumatic pressure switch

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

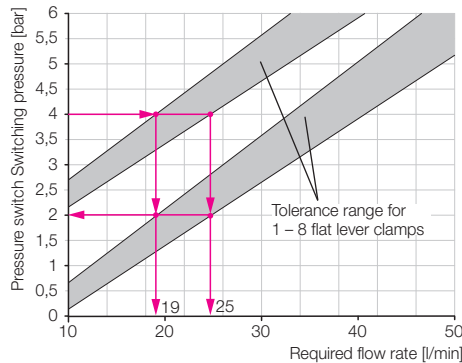
## Pneumatic port



## Function chart



## Required flow rate depending on the switching pressure of the pneumatic pressure switch for a pressure drop $\Delta p$ 2 bar



## 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.