

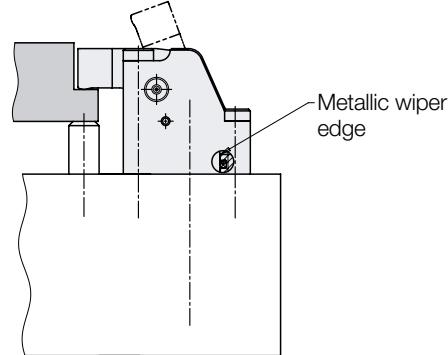


## **Hinge Clamps with Flat Clamping Lever** with pneumatic position monitoring\*, single and double acting, max. operating pressure 250 bar



### **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 (standard only double acting))
- Metallic wiper edge for piston rod
- Mounting position: any



### **Application**

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

Due to the minimum space required, the hinge clamp with flat clamping lever 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.

Typical applications are:

- Multiple clamping fixtures with many workpieces that are closely arranged
- Rotary indexing fixtures in horizontal and vertical machining centres
- Assembly lines

### **Description**

When pressurising the hinge 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 hinge 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**

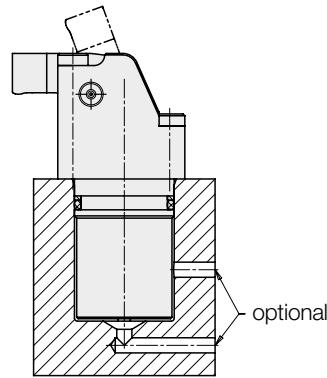
Hinge clamps with flat clamping lever must only be used for clamping of workpieces in industrial applications and may only be operated with hydraulic oil. Considerable injuries can be caused to fingers in the effective area of the clamping arm.

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.

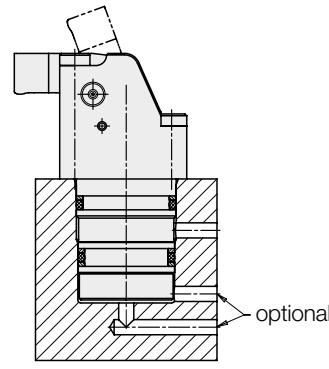
In order to permanently secure correct functioning, the hinge clamps with flat clamping lever must be regularly cleaned and greased. This applies especially for dry machining, minimum quantity lubrication and in case of accumulation of very small swarf.

### **Installation and connecting possibilities**

#### **Single acting**



#### **Double acting**



### **Available versions**

#### **1. Single acting, without position monitoring**

- 1.1 Without clamping lever 18296X0E00  
For the installation of a special clamping lever, which can be produced from the clamping lever blank.

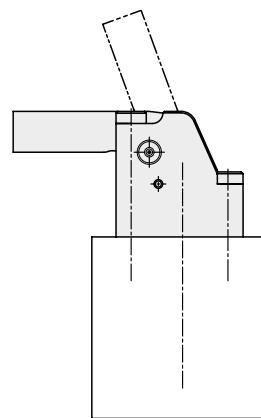
- 1.2 With clamping lever 18296X0EXX  
The clamping lever with length L as per chart (page 3) is installed.

#### **2. Double acting, with position monitoring**

- 2.1 Without clamping lever 18296X3D00  
For the installation of a special clamping lever, which can be produced from the clamping lever blank.

- 2.2 With clamping lever 18296X3DXX  
The clamping lever with length L as per chart (page 3) is installed.

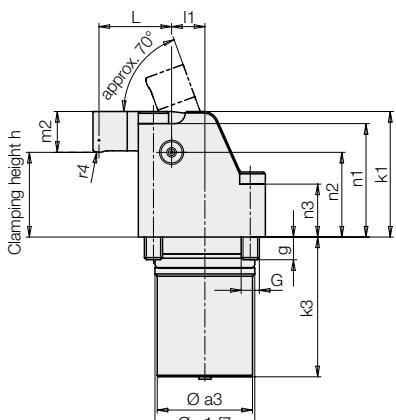
### **Long clamping lever (blank)**



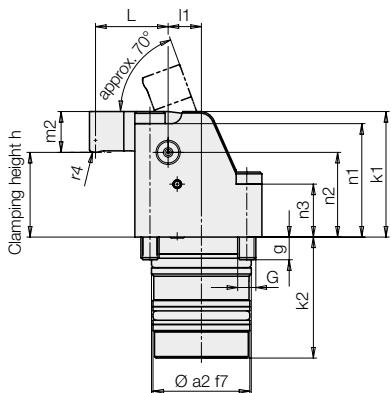
\* Only for double-acting versions

## Versions: single-acting / double-acting

### Single acting 18296X0EXX

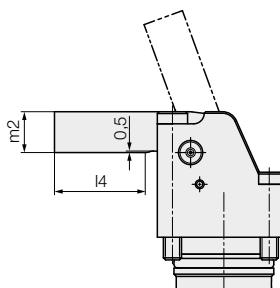


### Double acting with position monitoring 18296X3DXX

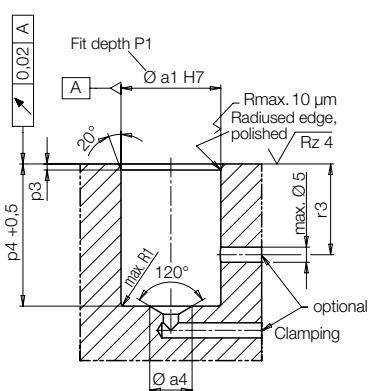


### Long clamping lever (blank)

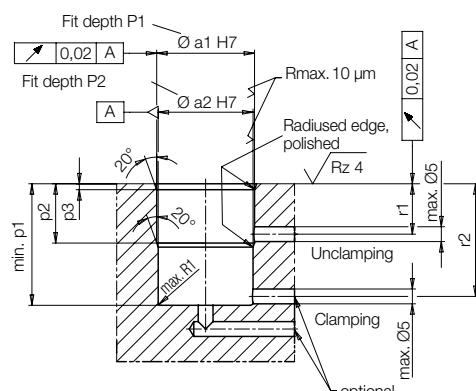
Material: 42CrMoS4+QT nitrocarburized



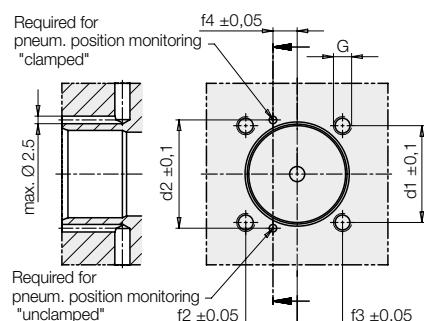
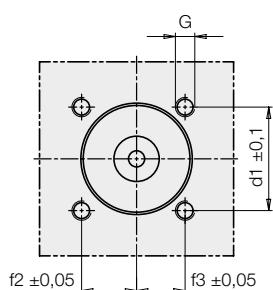
### Location hole



### Location hole



Fixing screws 10.9 – DIN 7984  
Included in our delivery  
Tightening torque see chart.



2 O-rings 3 x 1 (part no. 3001758).  
Included in our delivery

Pneumatic position monitoring see page 5

## Technical data

Size			1	2	3	4
Clamping force at 250 bar and length of clamping lever L	single acting	approx. [kN]	2.5	3.3	5.8	9.8
	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
a1 H7/f7		[mm]	25	33	40	46
a2 H7/f7		[mm]	24	32	38	44
a3		[mm]	23.8	31.5	37.5	43.5
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
L		[mm]	18	24	28	33
I1		[mm]	10	11	16	20
I2		[mm]	30	37	48	57
I3		[mm]	45	56	71	85
I4		[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
P1		[mm]	11	14	14	14
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	<b>1829610E00</b>	<b>1829620E00</b>	<b>1829630E00</b>	<b>1829640E00</b>
Weight, approx.		[kg]	0.263	0.544	1.040
Part no.	with clamping lever length L	<b>1829610E18</b>	<b>1829620E24</b>	<b>1829630E28</b>	<b>1829640E33</b>
Weight, approx.		[kg]	0.305	0.630	1.225

### Double acting, with position monitoring

Part no.	without clamping lever	<b>1829613D00</b>	<b>1829623D00</b>	<b>1829633D00</b>	<b>1829643D00</b>
Weight, approx.		[kg]	0.246	0.491	0.962
Part no.	with clamping lever length L	<b>1829613D18</b>	<b>1829623D24</b>	<b>1829633D28</b>	<b>1829643D33</b>
Weight, approx.		[kg]	0.288	0.577	1.147

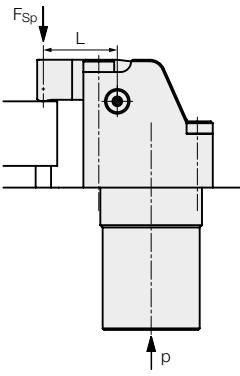
### Accessories

Part no.	clamping lever length L	<b>0354974</b>	<b>0354975</b>	<b>0354976</b>	<b>0354977</b>
Weight, approx.		[kg]	0.042	0.086	0.185
Part no.	long clamping lever (blank)	<b>0354978</b>	<b>0354979</b>	<b>0354980</b>	<b>0354981</b>
Weight, approx.		[kg]	0.066	0.140	0.290

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

# Clamping force diagrams

## Calculation of the clamping force



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

$$\begin{aligned} \text{DA} \quad p_{\text{adm}} &= \frac{B}{(C/L) + 1} \leq 250 \quad [\text{bar}] \\ \text{SA} \quad p_{\text{adm}} &= \frac{B^*}{(C/L) + 1} + 5 \leq 250 \quad [\text{bar}] \end{aligned}$$

1.2 Effective clamping force

$$\begin{aligned} \text{DA} \quad (p_{\text{adm}} > 250 \text{ bar}) \quad F_{\text{sp}} &= \frac{A}{L} * 250 \quad [\text{kN}] \\ (p_{\text{adm}} \leq 250 \text{ bar}) \quad F_{\text{sp}} &= \frac{A}{L} * p \quad [\text{kN}] \\ \text{SA} \quad (p_{\text{adm}} > 250 \text{ bar}) \quad F_{\text{sp}} &= \frac{A^*}{L} * (250 - 5) \quad [\text{kN}] \\ (p_{\text{adm}} \leq 250 \text{ bar}) \quad F_{\text{sp}} &= \frac{A^*}{L} * (p - 5) \quad [\text{kN}] \end{aligned}$$

2. Min. length of clamping lever

$$\begin{aligned} \text{DA} \quad L_{\text{min.}} &= \frac{C}{(B/p) - 1} \quad [\text{mm}] \\ \text{SA} \quad L_{\text{min.}} &= \frac{C}{[B^*/(p-5)] - 1} \quad [\text{mm}] \end{aligned}$$

L, L<sub>min.</sub> = length of clamping lever

p, p<sub>adm.</sub> = operating pressure

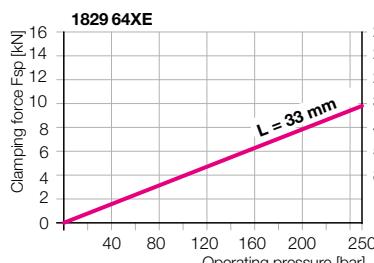
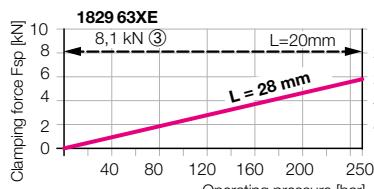
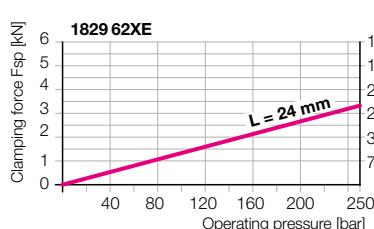
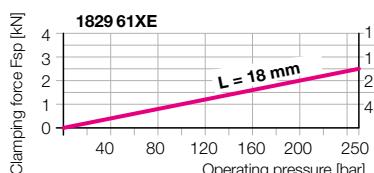
A, B, C = constants for DA

A\*, B\*, C = constants for SA

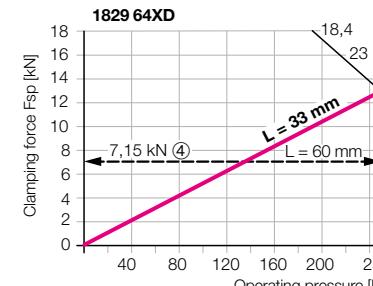
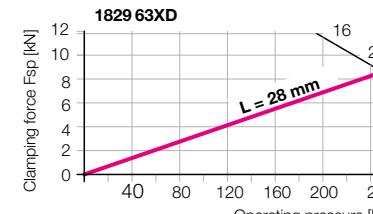
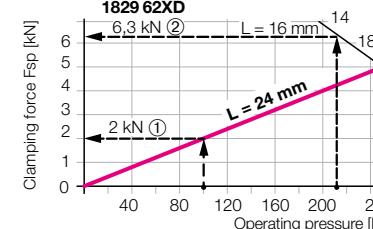
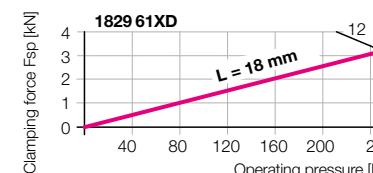
DA = double acting

SA = single acting

## Single acting



## Double acting



## Constants

1829	61	62	63	64
<b>A</b>	0.23	0.48	0.975	1.716
<b>A*</b>	0.184	0.323	0.663	1.322
<b>B</b>	402.78	385.41	401.77	397.73
<b>B*</b>	509.76	555	578.57	503.37
<b>C</b>	11	13	17	19.5

**Example 1:** Hinge clamp with flat clamping lever 1829 623D24  
p = 100 bar; L = 24 mm (standard)

Effective clamping force

$$F_{\text{sp}} = \frac{A}{L} * p = \frac{0.48}{24} * 100 = 2 \text{ kN}$$

**Example 2:** Hinge clamp with flat clamping lever 1829 620D00  
p = 210 bar

Min. length of clamping lever

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

Admissible operating pressure (review)

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

Effective clamping force at 210 bar

$$F_{\text{sp}} = \frac{A}{L} * p = \frac{0.48}{16} * 210 = 6.3 \text{ kN}$$

**Example 3:** Hinge clamp with flat clamping lever 1829 630E00  
Special clamping lever L = 20 mm

Admissible operating pressure

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

Effective clamping force at 250 bar

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

**Example 4:** Hinge clamp with flat clamping lever 1829 640D00  
Special clamping lever L = 60 mm

Admissible operating pressure

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

Effective clamping force at 250 bar

$$F_{\text{sp}} = \frac{A}{L} * p = \frac{1.716}{60} * 250 = 7.15 \text{ kN}$$

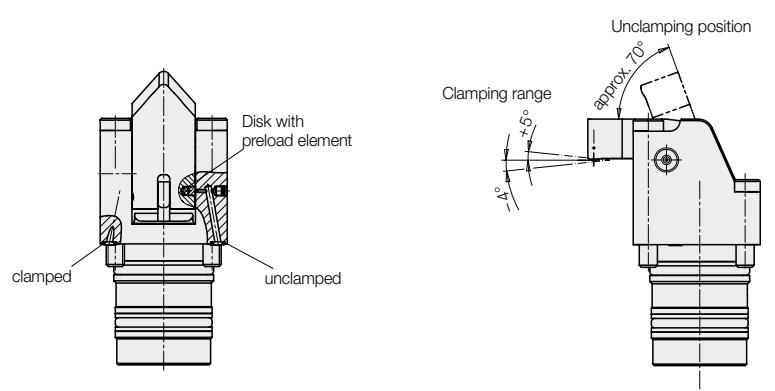
## Pneumatic position monitoring

The double-acting hinge clamps with flat clamping lever

**18296X3DXX**

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

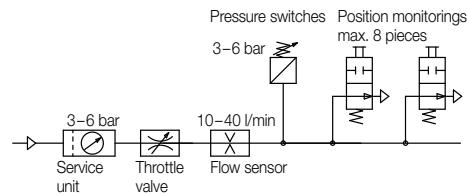


## Monitoring by pneumatic pressure switch

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

With one pressure switch up to 8 hinge clamps with flat clamping lever can be queried.

## Pneumatic port



## Description

On both sides of the clamping lever is a bore hole in which a disk with an elastic preload element is positioned.

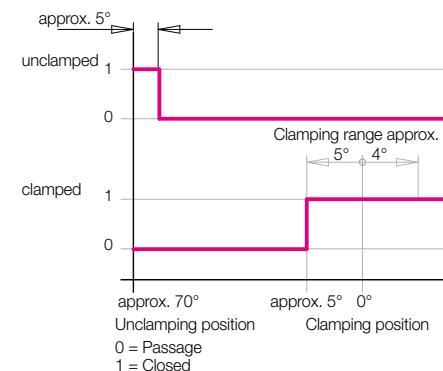
In the guide for the clamping lever in the housing, two bore holes are arranged so that the clamping or unclamping position of the clamping lever will be closed by the preloaded disk.

## Important note!

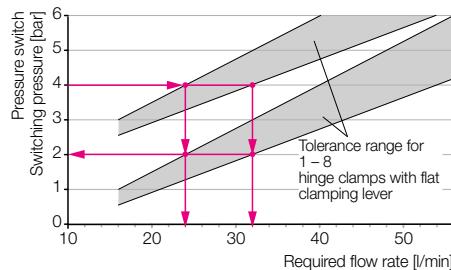
When mounting the clamping lever, the preload elements and the disks must be inserted into the provided bore holes in the clamping lever.

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

## 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 approx. 24-32 l/min  
(depending on the number of connected elements)