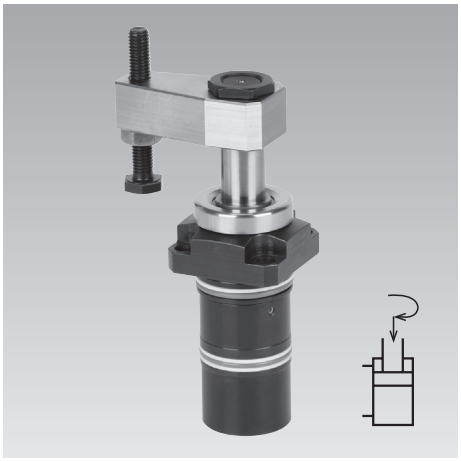
ROEMHELD

B 1.852

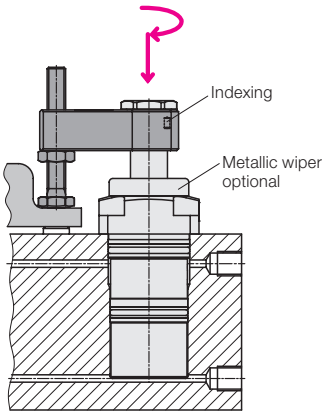
Swing Clamps with Sturdy Swing Mechanism

Cartridge type, position monitoring optional, double acting, max. operating pressure 350 bar



Advantages

- 4 sizes available
- Short version without bottom cover
- Minimum flange dimensions
- High clamping force at low pressures
- Sturdy swing mechanism
- Insensitive against high flow rates
- Indexing of the clamping arm in a specified position is possible
- Special swing angle easily realizable
- Standard FKM wiper
- Metallic wiper optional
- Mounting position: any



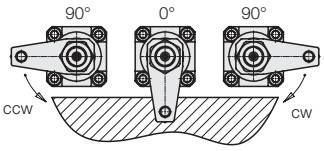
Application

Hydraulic swing clamps are used for clamping of workpieces, when it is essential to keep the clamping area free of straps and clamping components for unrestricted workpiece loading and unloading.
Due to the sturdy swing mechanism these swing clamps are particularly suited for:

- Automatic manufacturing systems
- Clamping fixtures with workpiece loading via handling systems
- Transfer lines
- Test systems for motors, gears and axes
- Assembly lines
- Special machine tools

Swing direction

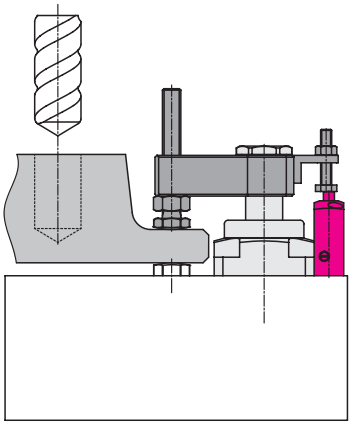
The units are available with clockwise and counterclockwise swing motion or without swing motion (0°).



The swing angle can be limited by the insertion of distance plates (see page 2).

Position monitoring as accessory

Clamping arm complete with angle bracket (page 4).
Pneumatic position monitoring (page 5).



Description

The hydraulic swing clamp is a pull-type cylinder where a part of the total stroke is used to swing the piston.
The favourable area ratio (piston/piston rod) allows high clamping forces already at relatively low oil pressures.
For high flow rates the swing speed is limited by an orifice in the clamping port. Thus, uniform clamping of several swing clamps is also possible when oil supply is effected through a common bore.
Due to the sturdy swing mechanism the angle position of the clamping arm remains the same after a slight collision with the workpiece during loading or unloading. Also a collision during the clamping process is not critical.

Wiper system

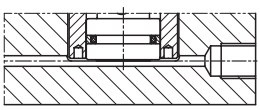
The standard FKM wiper has a high chemical resistance against most cooling and cutting fluids.
The optional metallic wiper protects the FKM wiper against mechanical damage due to big or hot swarf.
It consists of a radially floating wiping disk and a retaining disk.
The metallic wiper can be delivered already mounted ("M") or as an accessory for retrofitting (see page 4).

Attention!

The metallic wiper is not suitable for dry machining or minimum quantity lubrication. Also in applications with very little grinding swarf, the standard FKM wiper has a better protection effect.
If there is any danger that small particles stick to the piston rod, the metallic wiper disk can also be replaced by a hard plastic disk.

Version without bottom cover

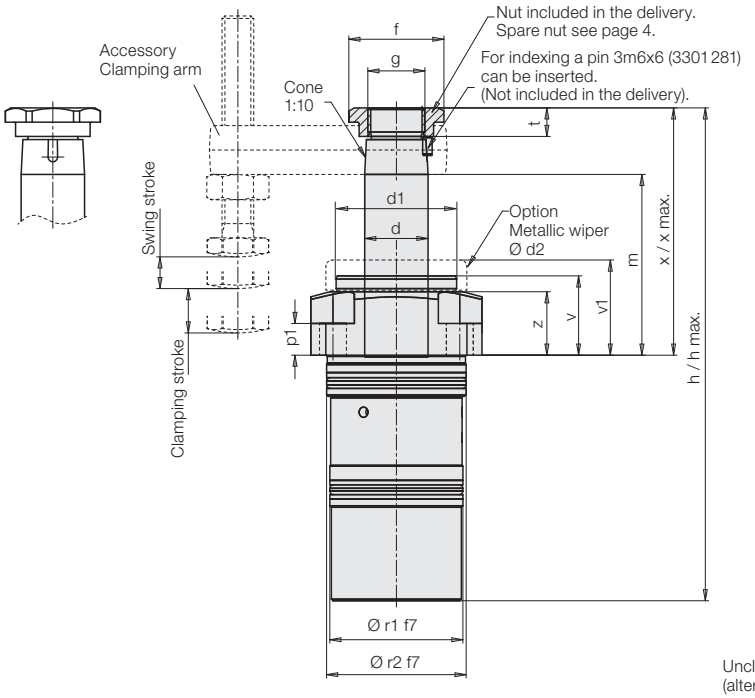
Focusing on a short length, the bottom cover had been omitted. The piston contacts the bottom of the cartridge-type hole.



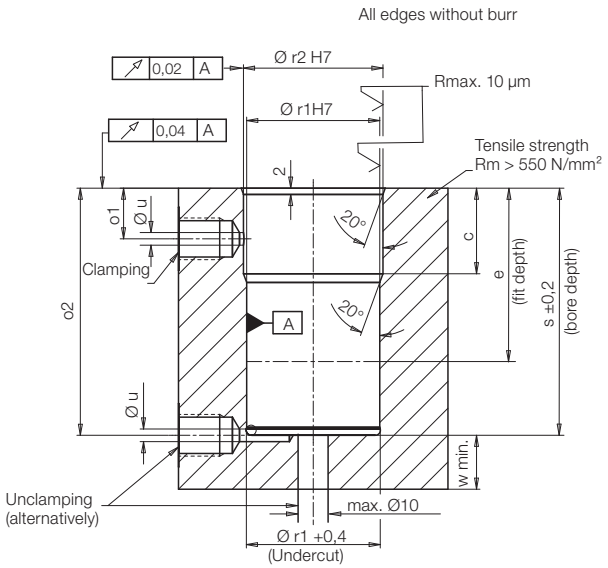
Important notes!

Swing clamps must only be used for clamping of workpieces in industrial applications and may only be operated with hydraulic oil.
They can generate very high forces. The workpiece, the fixture or the machine must be in the position to compensate these forces.
In the effective area of piston rod and clamping arm there is the danger of crushing.
The manufacturer of the fixture or the machine is obliged to provide effective protection devices.
The swing clamp has no overload protection device. When mounting the clamping arm, the clamping arm or the hexagon socket in the piston have to be backed up for tightening or untightening the fixing nut.
During loading and unloading of the fixture and during clamping a collision with the clamping arm has to be avoided.
Remedy: Mount position adaptor.

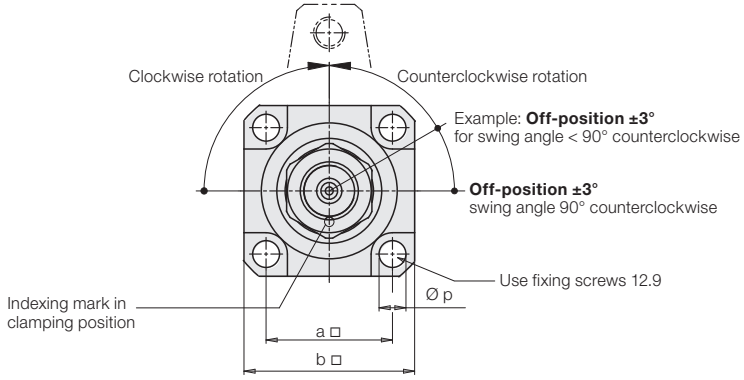
Operating conditions, tolerances and other data see data sheet A 0.100.

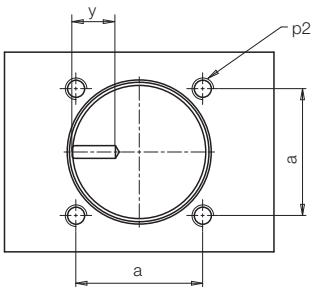


Location hole



Clamping position ±1°





Swing angle

1. Swing angle 90° (standard)

	Part no.
90° cw	**184XF090RXX**
90° ccw	**184XF090LXX**
0°	**184XF0000XX**

2. Swing angle α < 90°

α = 15° to 75° in gradation of 5°

By insertion of a distance plate the return stroke of the piston is reduced and thus the swing angle is reduced.
Clamping stroke and clamping position remain the same. The swing stroke and the dimensions h, m and x are reduced by y:

$y = (90° - \alpha°) * k$ (k see chart page 3)

Example:

Swing clamp	1845F090L30
Desired swing angle	**45° ccw**
Part no.	**1845F045L30**

Shortening:
$y = (90° - \alpha°) * 0.12$ mm/° = 5.4 mm

3. Swing angle > 90°

Available on request!

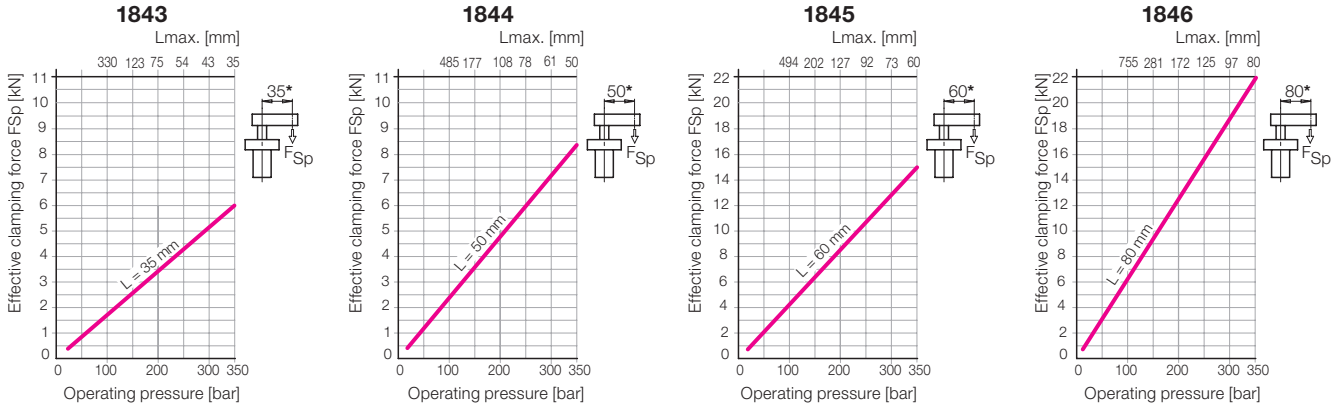
Subject to modifications

Max. pulling force	[kN]	7.5	10.5	18.4	27.5
Effective clamping force	[kN]		see diagram		
Clamping stroke	[mm]	12	12	15	15
Swing stroke	[mm]	11	12	15	21
Total stroke +0.4/-0.3	[mm]	23	24	30	36
Min. operating pressure	[bar]	30	30	30	30
Max. flow rate					
Clamping	[cm³/s]	10	14	32	57
Unclamping	[cm³/s]	20	28	60	110
Effective piston area					
Clamping	[cm²]	2.14	3.01	5.27	7.86
Unclamping	[cm²]	4.15	6.15	10.17	15.90
Oil volume/stroke	[cm³]	4.9	7.2	15.8	28.3
Oil volume/return stroke	[cm³]	9.6	14.8	30.5	57.2
Piston Ø	[mm]	23	28	36	45
a □	[mm]	33	40	50	57
b □	[mm]	43	54	67	77
c	[mm]	23	27	25	32
Ø d	[mm]	16	20	25	32
Ø d1	[mm]	28	38	45	48
Ø d2	[mm]	33	42	54	54.5
e (fit depth)	[mm]	45	50	53	53
Ø f	[mm]	27	30	36	40
g		M14x1.5	M18x1.5	M20x1.5	M28x1.5
h +0.4/-0.5 / h max.[1]	[mm]	150.5 / 151.8	161.5 / 163.3	188.5 / 190.3	216.9 / 217.4
k	[mm/°]	0.091	0.093	0.12	0.152
m +0.4/-0.7 [2]	[mm]	56.4	57.9	68.9	78.3
o1 min./max.	[mm]	16/17	16/23	20/20	21/26
o2 min./max.	[mm]	50/73	53/78	57/89	58/101
Ø p	[mm]	6.6	8.5	10.5	13.0
p1	[mm]	13	10	14	16
p2		M6	M8	M10	M12
Ø r1	[mm]	35	42	52	63
Ø r2	[mm]	36	44	55	65
s ±0.2	[mm]	73.3	78.3	89.3	101.3
t	[mm]	7.5	9	10	10
Ø u max.	[mm]	10	6	8	10
v	[mm]	25	25	29	34
v1 metallic wiper	[mm]	30	30	34	39
w min. [thickness of the bottom]	[mm]	14	16	16	20
x +0.3/-0.2 / x max.[1]	[mm]	78 / 79.2	84 / 85.8	100 / 101.6	116.5 /116.8
y min.	[mm]	8	9	10	12
z	[mm]	20.4	20.4	24.4	28.4
Weight, approx.	[kg]	0.9	1.4	2.3	3.65
Part no.					
Clockwise rotation 90°		**1843 F090 R23M**	**1844 F090 R24M**	**1845 F090 R30M**	**1846 F090 R36M**
Counterclockwise rotation 90°		**1843 F090 L23M**	**1844 F090 L24M**	**1845 F090 L30M**	**1846 F090 L36M**
0 degree		**1843 F000 023M**	**1844 F000 024M**	**1845 F000 030M**	**1846 F000 036M**

[1] h / x = upper edge piston h max. / x max. = upper edge nut
[2] m = lower edge clamping arm

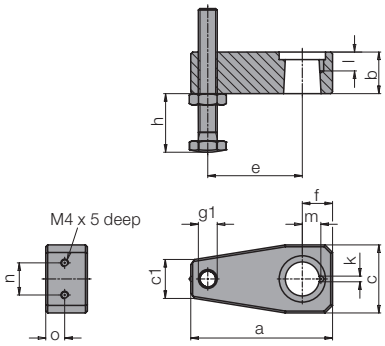
M = Option metallic wiper (see also page 1)

Effective clamping force with accessory clamping arm as a function of the oil pressure

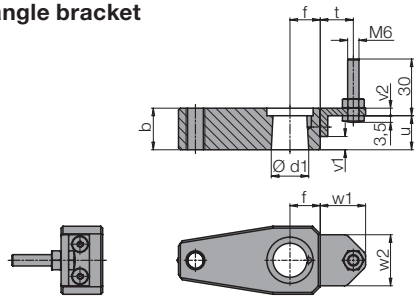


* Clamping force for other lengths see page 4

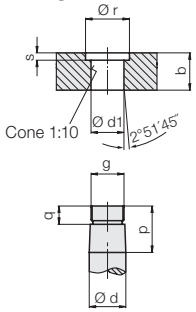
Clamping arm, max. 350 bar



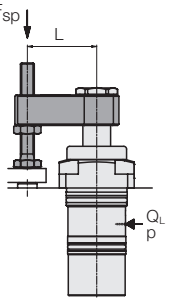
Clamping arm complete with angle bracket



Special clamping arm
1. Connecting dimensions



2. Admissible flow rate Q*



In the chart on page 3, the admissible flow rates for clamping and unclamping with the clamping arms (accessories) are specified. Longer special clamping arms have a higher torque of inertia. To avoid an overload of the swing mechanism, the flow rate has to be reduced:

2.1 Moments of inertia are known

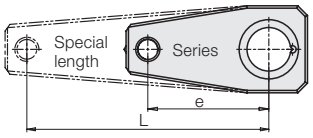
$$Q_L = Q_e * \sqrt{\frac{J_e}{J_L}} \text{ cm}^3/\text{s}$$

Q_L = Flow rate with special clamping arm
Q_e = Flow rate as per chart (page 3)
J_e = Moment of inertia of the clamping arm (accessory) with contact bolt (chart)
J_L = Moment of inertia special clamping arm

***** Only for vertical mounting position!

Swing clamps		**1843**	**1844**	**1845**	**1846**
a	[mm]	58	75	93	120
b	[mm]	17	22	26	32
c	[mm]	28	36	45	60
c1	[mm]	14	20	23	28
Ød f7	[mm]	16	20	25	32
Ød1 +0.1/+0.05	[mm]	15.8	19.8	24.8	31.8
e	[mm]	35	50	60	80
f	[mm]	16	16	22	26
g	[mm]	M14x1.5	M18x1.5	M20x1.5	M28x1.5
g1	[mm]	M8	M10	M12	M16
h min/max	[mm]	5/45	6/64	7/70	9/85
Ø k +0.1	[mm]	3	3	3	3
l +0.5	[mm]	9	10	10	10.5
m ±0.05	[mm]	7.8	9.8	12	15
n	[mm]	11	17	20	20
o	[mm]	6	10	12	20
p	[mm]	22.5	27	32	39
q	[mm]	9	10	11	12.7
Ø r	[mm]	20	24.5	31	34.5
s	[mm]	2.5	4	4	4.5
t	[mm]	11	17.5	19	19
u	[mm]	17	18	21	19
v1	[mm]	6	7	8	6
v2	[mm]	4	4	5	5
w1	[mm]	18	24	26	26
w2	[mm]	21	27	30	30
Part no. clamping arm					
– with contact bolt		**0354152**	**0354153**	**0354154**	**0354155**
Weight, approx.	[kg]	0.19	0.39	0.69	1.43
Moment of inertia of J_e	[kgm²]	0.00011	0.00046	0.0011	0.00398
– without thread g1		**3548660**	**3548661**	**3548803**	**3548804**
Weight, approx.	[kg]	0.16	0.34	0.62	1.28
Moment of inertia of J_e	[kgm²]	0.00007	0.00033	0.00084	0.00298
– complete with angle		**0354156**	**0354157**	**0354158**	**0354159**
Angle bracket complete		**0184003**	**0184004**	**0184005**	**0184005**
Metallic wiper		**0341104**	**0341107**	**0341105**	**0341100**
Spare nut		**3527092**	**3527014**	**3527099**	**3527015**
Tightening torque	[Nm]	16	30	42	90

Special clamping arm

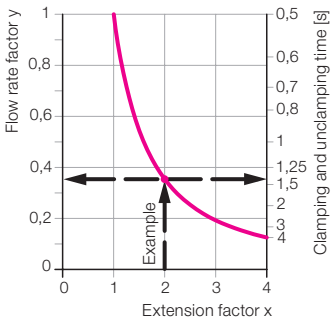


2.2 Moments of inertia not known

This simplified calculation is only applicable for clamping arms of the above shape.

Example: Swing clamps 1843
L = 70 mm
e = 35 mm as per above chart
Q_e = 10 cm³/s (as per chart page 3)

1. Extension factor $x = \frac{L}{e} = \frac{70\text{ mm}}{35\text{ mm}} = 2$
2. Flow rate factor as per diagram → y = 0.35
3. Max. flow rate $Q_L = y * Q_e = 0.35 * 10\text{ cm}^3/\text{s} = 3.5\text{ cm}^3/\text{s}$
4. Min. clamping time as per diagram → approx. 1.4 s



Adm. flow rate and clamping time as a function of the clamping arm extension

Clamping force and admissible operating pressure

Effective clamping force (general)

$$F_{Sp} = \frac{p}{A + (B * L)} \leq F_{adm.} \quad [\text{kN}]$$

Admissible clamping force

$$F_{adm} = \frac{C}{L} \quad [\text{kN}]$$

Admissible operating pressure

$$p_{adm} = \frac{D}{L} + E \leq 350 \quad [\text{bar}]$$

L = special length [mm] p = pressure [bar]

A, B, C, D, E = constants as per chart

Constant	**1843**	**1844**	**1845**	**1846**
A	46.64	33.15	18.98	12.72
B	0.335	0.17	0.073	0.04
C	210	420	900	1760
D	9795	13926	17078	22386
E	70.26	71.33	65.44	70.36

Example: Swing clamps 1843
L = 70 mm

1. Admissible clamping force

$$F_{adm} = \frac{C}{L} = \frac{210}{70} = 3\text{ kN}$$

2. Admissible operating pressure

$$p_{adm} = \frac{D}{L} + E = \frac{9795}{70} + 70.26 = 210\text{ bar}$$

Application

The pneumatic position monitoring signals the following conditions by closing two bore holes:

Clamping arm in clamping position and piston in clamping area

By the pressure increase in the pneumatic line an electro-pneumatic pressure switch or a differential pressure switch can be actuated. These electrical switching devices are integrated in the electric control so that on the clamping fixture no electricity is required.

Description

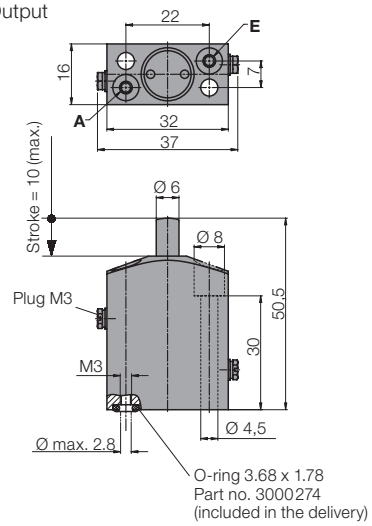
The control bolt is fitted with small clearance into the housing and is maintained by spring force in the off-position.
All components are made of stainless steel.
The pneumatic is preferably supplied and removed through drilled channels; this offers an optimum swarf protection.
Optionally, also pneumatic hoses NW2 can be connected.

Technical data

Connection		O-ring or thread M3
Nominal diameter	[mm]	2
Max. air pressure	[bar]	10
Range of operating pressure	[bar]	3 … 5
Differential pressure ***)** at		
3 bar system pressure	[bar]	min. 1.5
5 bar system pressure	[bar]	min. 3
Air flow rate ****)**	[l/min]	10 … 20
Actuating force *****)**	[N/bar]	2.8
+ Spring force	[N]	6.5 … 13
Plunger stroke	[mm]	max. 10

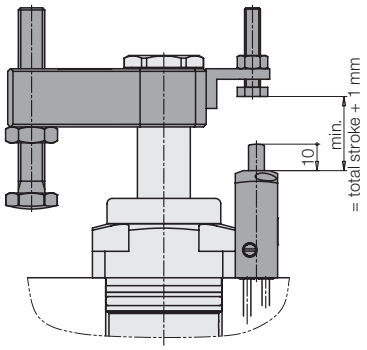
***)** Pressure drop when controlling the function "Clamped", if one or several position monitorings are not operated.
****)** For measuring the air flow rate appropriate devices are available. Please contact us.
*****)** Port A closed.

E = Input
A = Output

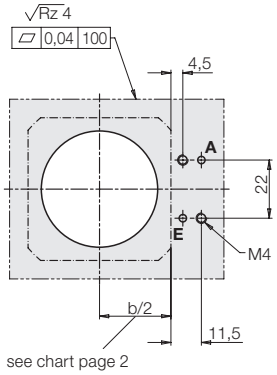


Mounting example

Attention!
Piston extended (unclamped) but clamping arm shown in clamping position.



Connecting scheme



2 connecting bores max. Ø 2.8

Pneumatic port

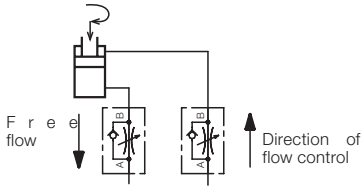
Drilled channels
The position monitoring is fixed to the above connecting scheme with inserted O-rings.
With the indicated distance dimensions the position monitoring is directly located at the flange of the swing clamp and has thus the correct distance for the operation of the clamping arm.
Hose connection
Remove the plugs M3 and screw-in the insertion nipple fitting M5 (accessory). The O-rings remain inserted for sealing at the flange-mounting surface.

Important notes

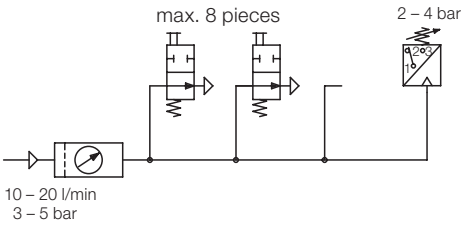
When adjusting the control cam it has to be considered that the control bolt will only be operated after completion of the swing stroke. Within the clamping range the control bolt should have a stroke reserve of approx. 1 mm also for idle strokes (without workpiece) to avoid mechanical damage.

Throttling of the flow rate

A flow rate throttling always has to be effected in the supply line to the swing clamp. This avoids a pressure intensification and thereby pressures exceeding 350 bar.



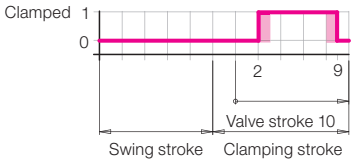
Monitoring by pneumatic pressure switch



For the evaluation of the pressure built-up standard electro-pneumatic pressure switches can be used.
It is possible to monitor up to 8 position monitorings connected in series (see circuit diagram).

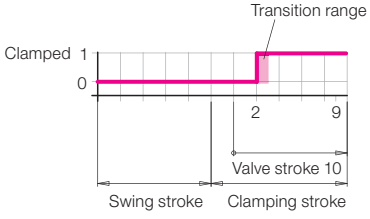
Please note!
Functioning of the pneumatic position monitorings is only process-safe, if the air quantity and the system pressure are throttled. The nominal values are indicated below technical data.

Switching range 2 ÷ 9 mm



Part no. 0353921

Switching range 2 ÷ 10 mm



0 = Passage 1 = Closed

Part no. 0353937

Accessories

Insertion nipple fitting M3
Part no. **3890188**

Subject to modifications