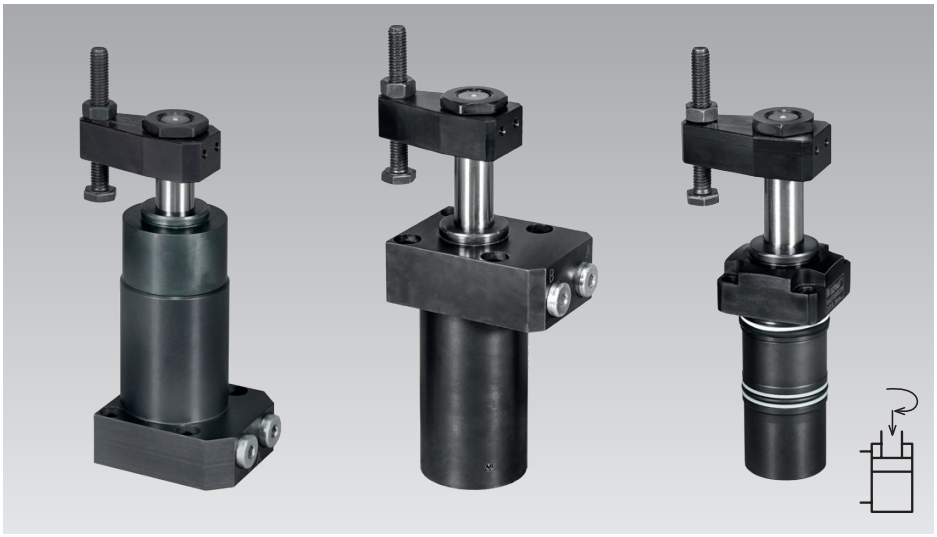
Swing Clamp with Sturdy Swing Mechanism

Bottom flange, top flange, cartridge type, metal-protected wiper, double-acting, max. operating pressure 350 bar



Advantages

- 4 sizes available
- Compact design
- High clamping force at low operating pressure
- Sturdy swing mechanism
- Not affected by high flow rates
- Indexing of the clamping arm in specified position
- Special swivel angles easy to achieve
- Metal-protected wiper, standard
- Optional position control for flanged versions
- Mounting position: any
- The bottom flange and top flange configurations can be equipped with throttle valves → Pages 5/9

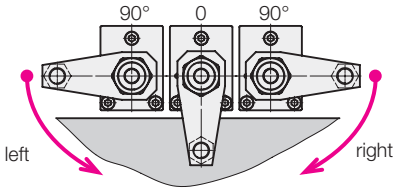
Application

Hydraulic swing clamps are used for clamping workpieces when it is essential to keep the clamping points free for unrestricted fixture 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°).



Description

The hydraulic swing clamp is a pull-type cylinder where a part of the total stroke is used to swing the piston.

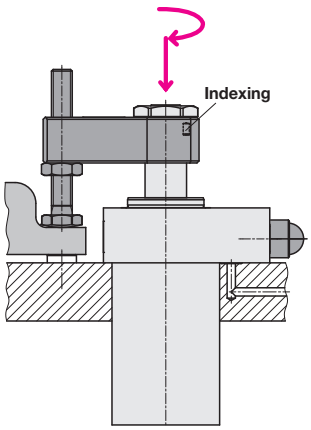
The favourable area ratio (piston/piston rod) enables high clamping forces even at relatively low oil pressures.
For high flow rates the swing speed is limited by an orifice in the clamping port. This also enables uniform clamping of several swivel clamps when oil is supplied via a common bore hole.
Due to the sturdy swing mechanism the angle position of the clamping arm remains the same after a minor collision with the workpiece during loading or unloading. Even a collision during the clamping process is not critical.

Seals

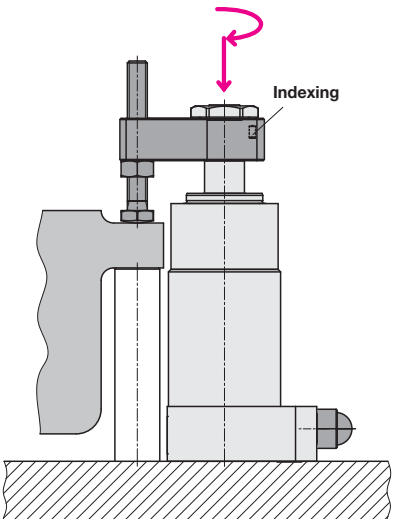
NBR = nitrile butadiene rubber (standard)
FKM seals on request

Versions

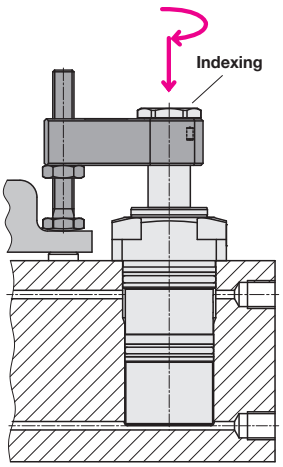
Top flange
→ Page 2



Bottom flange
→ Page 6



Cartridge type
→ Page 10

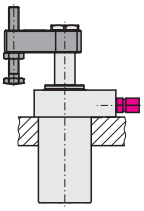


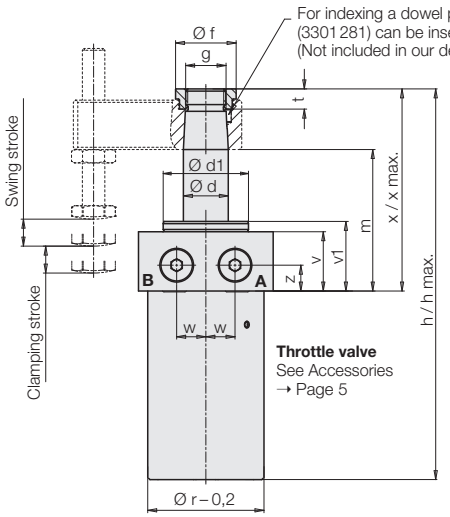
Operating conditions, tolerances and other data, see data sheet A 0.100

Installation and connecting possibilities

Pipe thread

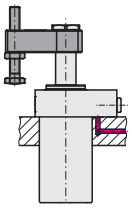
Design E

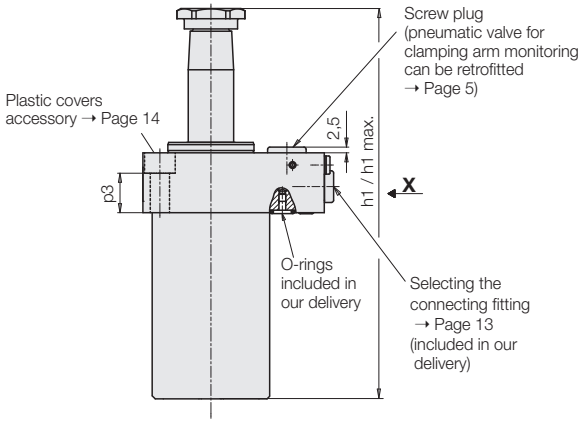




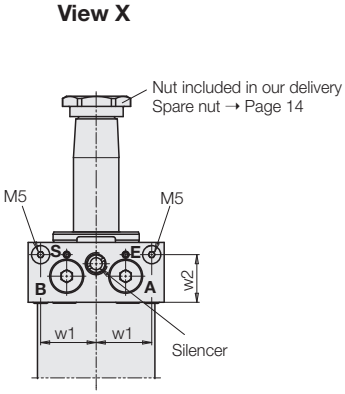
Drilled channels

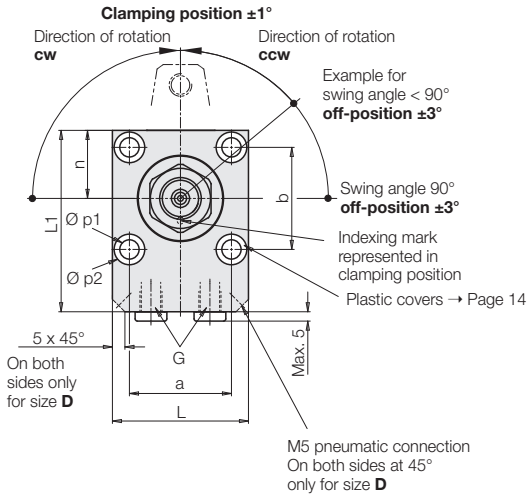
Design B



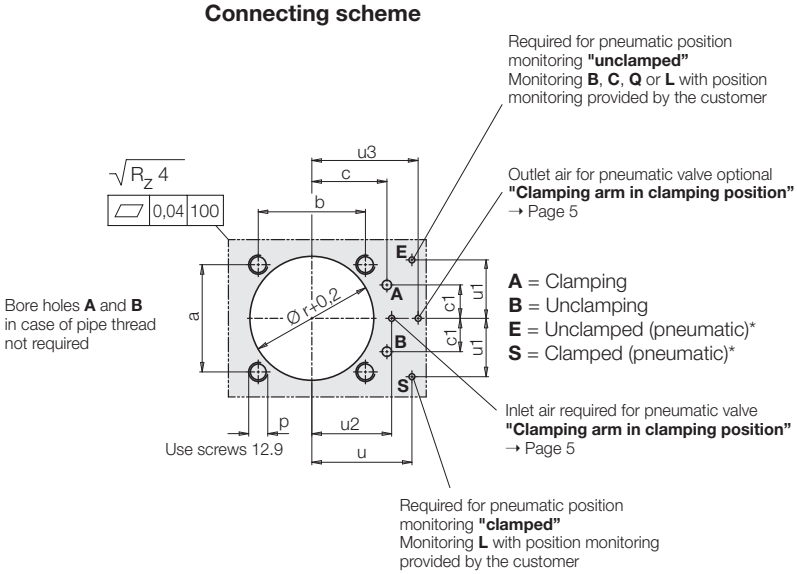


View X





Connecting scheme



Connecting holes: 2 × hydraulic (**A**, **B**) max. Ø 5
Replacement O-ring 8 × 1.5 part no. 3000 343

4 × pneumatic max. Ø 2.5 (only required for
monitoring **A**, **P**, **B**, **C**, **Q** and **L**)
Spare O-ring 3.68 × 1.78 part no. 3000 334

O-ring is included in our delivery

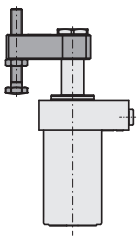
*** Note**

If position monitoring is provided by the customer, the following applies:
E = unclamped (pneumatic)
S = clamped (pneumatic)

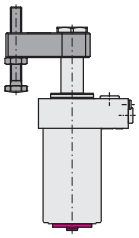
Operating conditions, tolerances and other data, see data sheet A 0.100

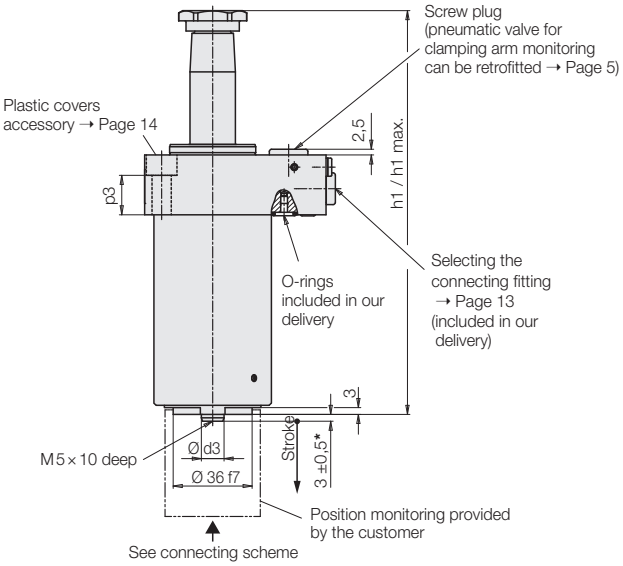
Top Flange
Versions for Designs E and B

Without monitoring
Query 0

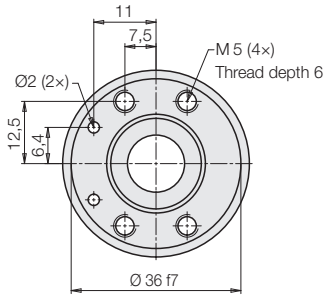


Switch rod for external sensors
Query L

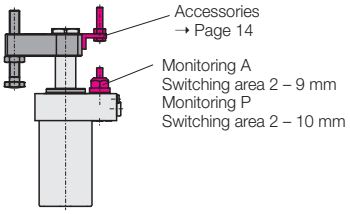


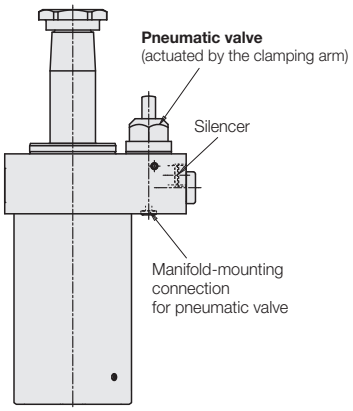


Connecting scheme
Position monitoring provided by the customer



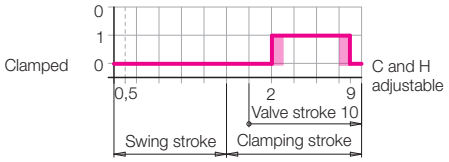
Pneumatic position monitoring integrated
Monitoring of the clamping arm in clamping position (adjustable)
Monitoring A, P



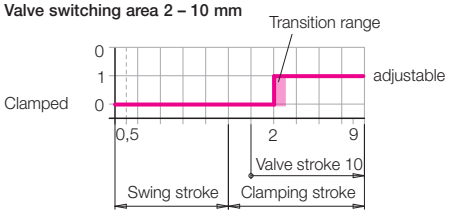


Attention: danger of collision!
The contact bolt for the actuation of the pneumatic valve must be completely screwed into the angle bracket for startup (→ Page 14 dimension 3.5 mm).
The adjustment is made with a clamped workpiece to approx. 5 mm valve stroke.

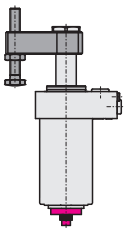
Valve switching area 2 – 9 mm

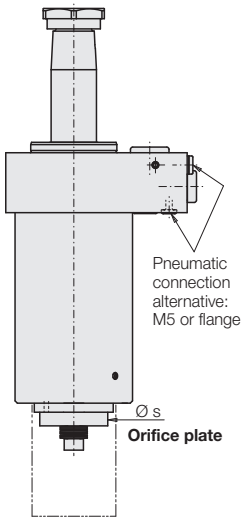


Valve switching area 2 – 10 mm



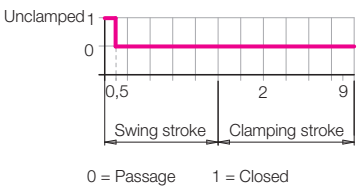
Querying the clamping arm in the unclamping position
Query B





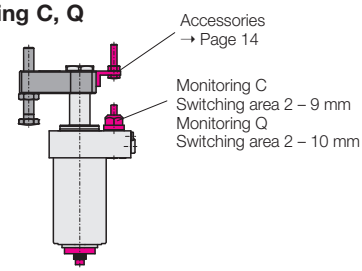
With pocket holes, connection S can be used for venting.

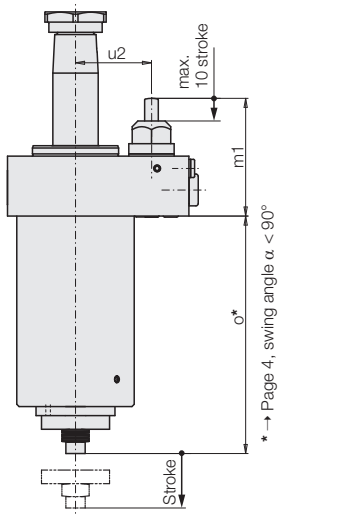
Important note
The lower part of the swing clamp must be protected against swarf and dirt for trouble-free functioning of the orifice plate.



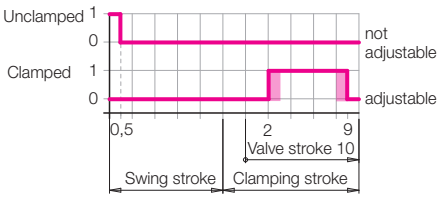
0 = Passage 1 = Closed

Both controls combined
Monitoring C, Q





Valve switching area 2 – 9 mm



Valve switching area 2 – 10 mm

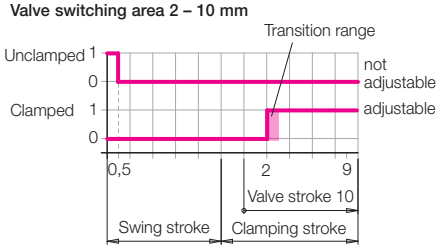
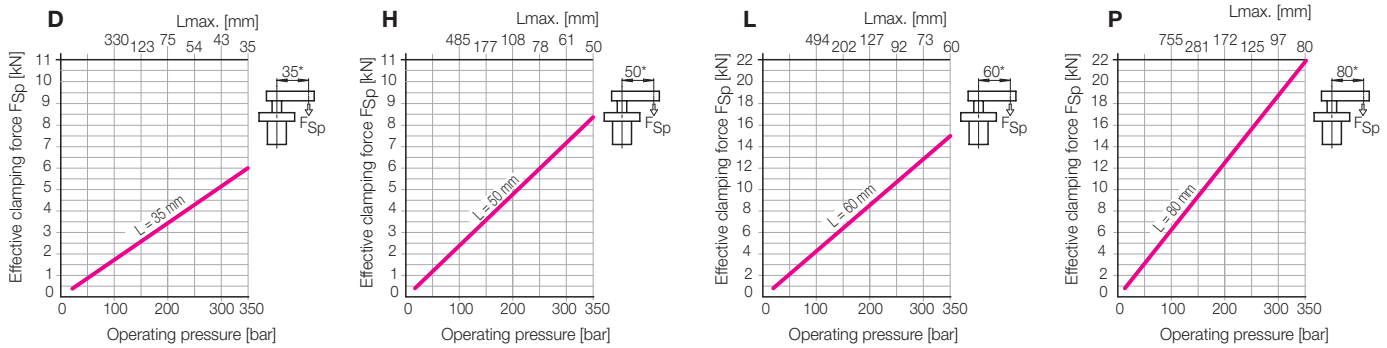


Illustration of swivel angle 0° version
Operating conditions, tolerances and other data, see data sheet A 0.100

Size			D	H	L	P
Max. pulling force (350 bar)		[kN]	7.5	10.5	18.4	27.5
Effective clamping force		[kN]	See diagram below			
Clamping stroke		[mm]	12	12	15	15
Swing stroke		[mm]	11	12	15	21
Total stroke ±0.2		[mm]	23	24	30	36
Min. operating pressure		[bar]	30	30	30	30
Max. flow rate	Clamping	[cm³/s]	10	14	32	57
(→ Page 5)	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	15.9
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]	37	45	54	66
b		[mm]	40	45	54	66
c		[mm]	28.5	31.5	35	43
c1		[mm]	12	14	14	18
Ø d		[mm]	16	20	25	32
Ø d1		[mm]	28	38	45	48
Ø d3		[mm]	10	10	12	12
Ø f		[mm]	27	30	36	40
g		[mm]	M 14 × 1.5	M 18 × 1.5	M 20 × 1.5	M 28 × 1.5
G			G 1/8	G 1/8	G 1/4	G 1/4
h +0.4/−0.3/h max.[1]		[mm]	161/162.3	174/175.8	203/204.8	233.5/233.9
h1 +0.4/−0.3/h1 max.[1]		[mm]	165/166.3	178/179.8	207/208.8	237.5/237.9
k		[mm/°]	0.091	0.093	0.12	0.152
L		[mm]	50	62	75	88
L1		[mm]	70	81	95	105
m +0.4/−0.7[2]		[mm]	62.4	63.9	74.9	80.3
m1		[mm]	52	52	56	56
n		[mm]	26.5	31	37	44
o		[mm]	98	105	118	136
p		[mm]	M6	M8	M10	M12
Ø p1		[mm]	6.6	9	11	13
Ø p2 H13		[mm]	11	15	18	20
p3		[mm]	18.4	15.4	17.4	15.4
Ø r		[mm]	45	52	60	76
Ø s		[mm]	30	30	33	33
t		[mm]	7.5	9	10	10
u		[mm]	36.5	42	50	53
u1		[mm]	18.5	24.5	28	32
u2		[mm]	27	33.5	41.5	44.5
u3		[mm]	37	43.5	51.5	54.5
v		[mm]	26.4	26.4	30.4	30.4
v1		[mm]	31	31	35	36
w		[mm]	12	13	17	20
w1		[mm]	22.5	24.5	28	32
w2		[mm]	22	21	24.5	25
x +0.3/ −0.2/x max.[1]		[mm]	84/85.2	90/91.7	106/107.7	118.5/118.8
z		[mm]	11	11.5	12	12
Weight, approx.		[kg]	1.7	2.3	3.9	6

[1] h / h1 / x = upper edge piston h max. / h1 max. / x max. = upper edge nut
[2] m = lower edge clamping arm

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



* Clamping force for special length clamping arm → Page 14

Swing angle

1. Standard swing angle

90° right
90° left
0°

2. Swing angle α < 90°

α = 15° to 75° in gradation of 5°

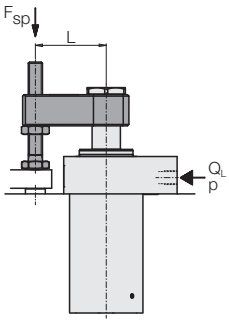
By insertion of a distance plate the return stroke of the piston is reduced and thus the swing angle is reduced.

Clamping stroke and clamping position remain the same. The swing stroke and the dimensions h, h1, m and x are reduced by y:

$y = (90° - \alpha°) * k$

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

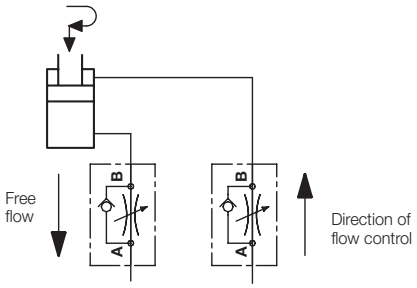
2. Admissible flow rate Q



In the chart on page 4, 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 prevent an overload of the swing mechanism, the flow rate has to be reduced:

Throttling of the flow rate

The throttling must take place at the supply line, i.e., on the side facing the swivel clamp. This is the only way to prevent pressure intensification and thus pressures exceeding 350 bar.



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 = Volume flow rate according to chart → Page 4
J_e = Moment of inertia of the accessory clamping jaw with pressure screw according to table → Page 14
J_L = Moment of inertia of the special clamping jaw determined using the CAD model on the computer

2.2. Accessory throttle valve

Throttle valves are used
- To reduce the swing speed of the clamping arm;
- To improve the synchronism of several swing clamps.

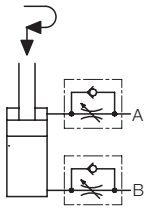
This application is only possible for connection through drilled channels.

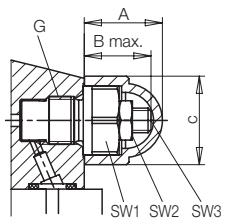
Important note

If throttling is severe, the backing-up pressure can cause pressure switches
and control valves to activate prematurely.

Size		D H	L P
A	[mm]	16	21
B max.	[mm]	13.5	17.5
C	[mm]	18	23.6
G		G 1/8	G 1/4
SW1	[mm]	14	19
Tightening torque	**[Nm]**	**18**	**35**
SW2	[mm]	8	8
SW3	[mm]	2.5	2.5
Weight	[kg]	0.025	0.036
Part no.		**2957209**	**2957210**

Hydraulic symbol



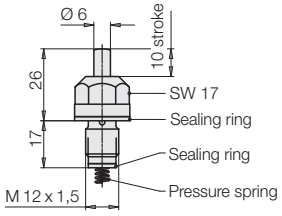


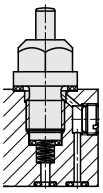
A = Clamping
B = Unclamping

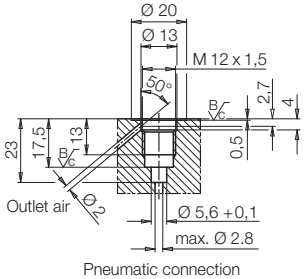
Pneumatic valve

	Part no.
Switching area 2 – 9 mm	**0353933**
Switching area 2 – 10 mm	**0353934**
Max. operating pressure	10 bar
Max. tightening torque	25 Nm
Additionally, 2 O-rings 3.68 × 1.78 are required	**3000334**

Function chart → Page 3





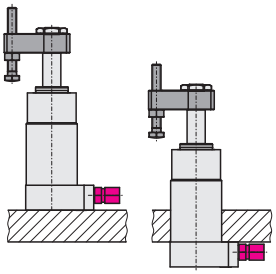


Operating conditions, tolerances and other data, see data sheet A 0.100

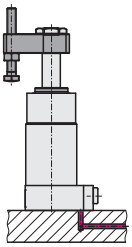
Installation and connecting possibilities

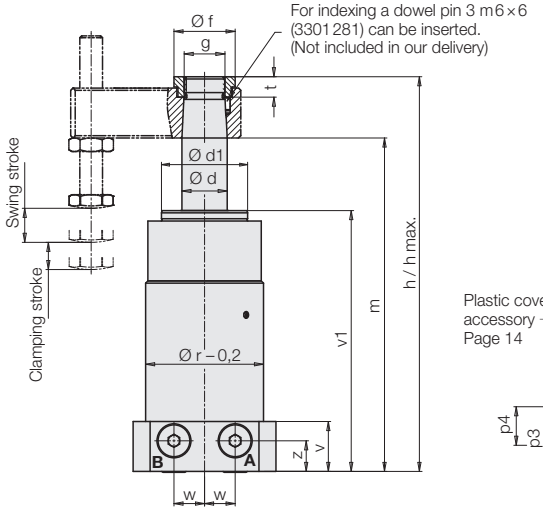
Design G

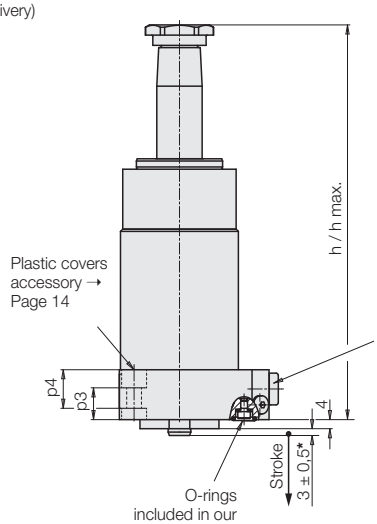
Pipe thread



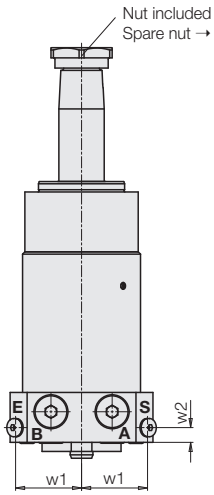
Drilled channels





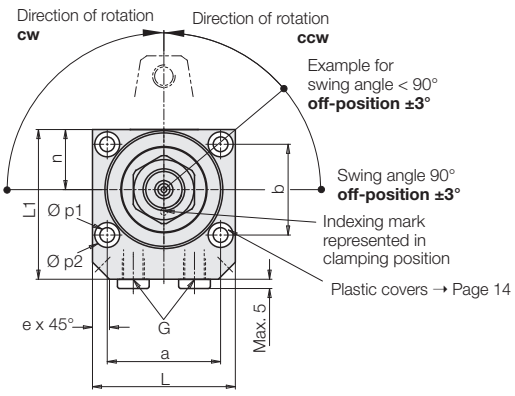


View X

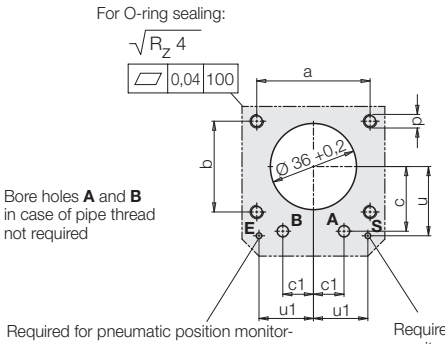


* → Page 8, swing angle α < 90°

Clamping position ±1°



Connecting scheme



Connecting holes:

2 × hydraulic (**A**, **B**) max. Ø 5
Replacement O-ring 8 × 1.5 part no. 3000 343

4 × pneumatic max. Ø 2.5 (only required for monitoring **A**, **P**, **B**, **C**, **Q** and **L**)
Spare O-ring 3.68 × 1.78 part no. 3000 334

O-ring is included in our delivery

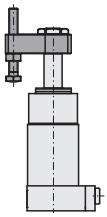
*** Note**

If position monitoring is provided by the customer, the following applies:
E = unclamped (pneumatic)
S = clamped (pneumatic)

Illustration of swivel angle 0° version
Operating conditions, tolerances and other data, see data sheet A 0.100

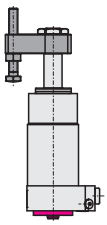
Without monitoring

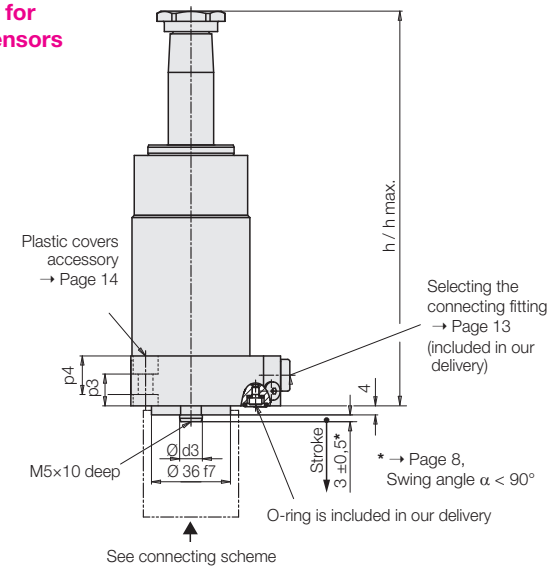
Query 0



Switch rod for external sensors

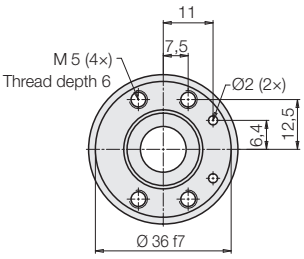
Query L





Connecting scheme

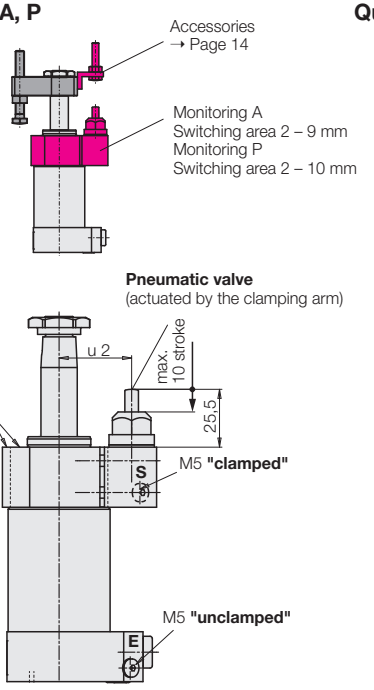
Position monitoring provided by the customer



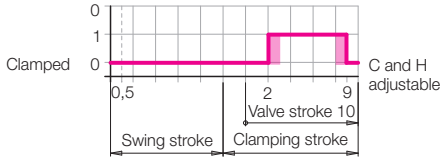
Pneumatic position monitoring integrated

Monitoring of the clamping arm in clamping position (adjustable)

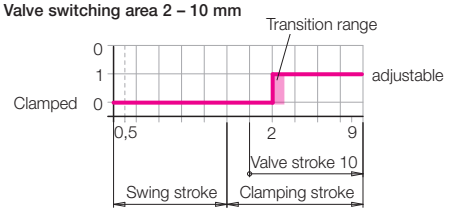
Monitoring A, P



Valve switching area 2 – 9 mm

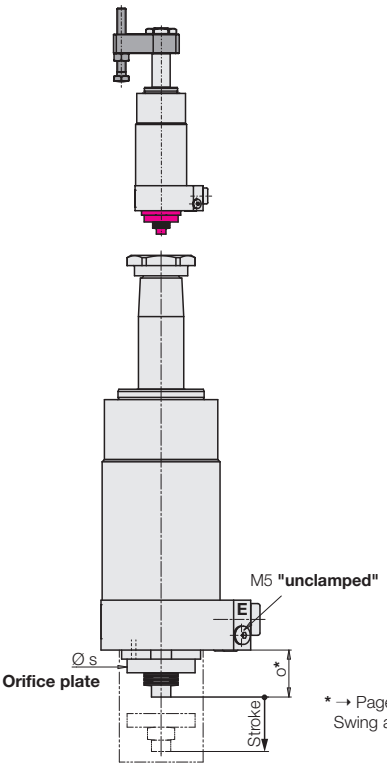


Valve switching area 2 – 10 mm

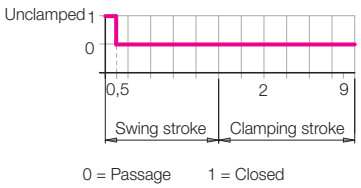


Monitoring of the piston in unclamping position

Query B



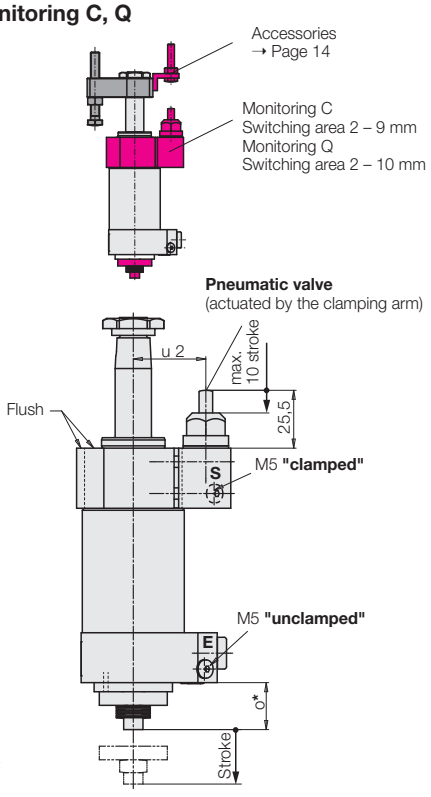
With pocket holes, connection S can be used for venting.



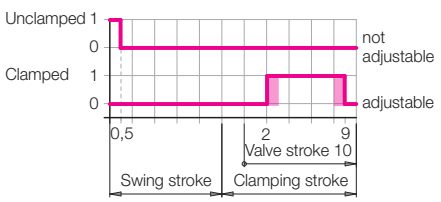
0 = Passage 1 = Closed

Both controls combined

Monitoring C, Q



Valve switching area 2 – 9 mm



Valve switching area 2 – 10 mm

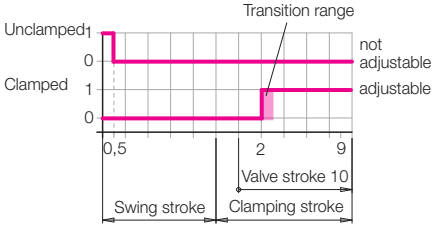


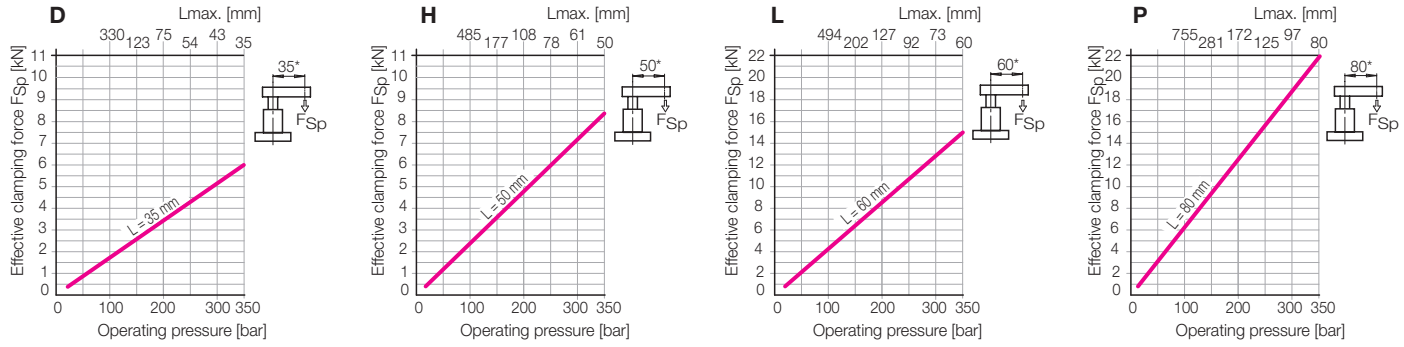
Illustration of swivel angle 0° version

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

Size			D	H	L	P
Max. pulling force (350 bar)		[kN]	7.5	10.5	18.4	27.5
Effective clamping force		[kN]	See diagram below			
Clamping stroke		[mm]	12	12	15	15
Swing stroke		[mm]	11	12	15	21
Total stroke ±0.2		[mm]	23	24	30	36
Min. operating pressure		[bar]	30	30	30	30
Max. flow rate	Clamping	[cm^3/s]	10	14	32	57
(→ Page 9)	Unclamping	[cm^3/s]	20	28	60	110
Effective piston area	Clamping	[cm^2]	2.14	3.01	5.27	7.86
	Unclamping	[cm^2]	4.15	6.15	10.17	15.9
Oil volume / stroke		[cm^3]	4.9	7.2	15.8	28.3
Oil volume / return stroke		[cm^3]	9.6	14.8	30.5	57.2
Piston Ø		[mm]	23	28	36	45
a		[mm]	44	50	60	68
b		[mm]	35	40	46	62
c		[mm]	26	28.5	28.5	35.5
c1		[mm]	11	13.5	14	17
Ø d		[mm]	16	20	25	32
Ø d1		[mm]	28	38	45	48
Ø d3		[mm]	10	10	12	12
e		[mm]	8.5	7.5	9	8×50°
Ø f		[mm]	27	30	36	40
g		[mm]	M14×1.5	M18×1.5	M20 × 1.5	M28×1.5
G			G 1/8	G 1/8	G 1/4	G 1/4
h +0.4/−0.3/h max.[1]		[mm]	161 / 162.3	174 / 175.8	203 / 204.8	233.5 / 233.9
k		[mm/°]	0.091	0.093	0.12	0.152
L		[mm]	55	63	77	85
L1		[mm]	60	66	75	90
m +0.5/−0.8[2]		[mm]	139.3	147.8	171.8	195.3
n		[mm]	23	26.5	31.5	39.5
o		[mm]	21	21	21	21
p		[mm]	M5	M6	M8	M8
Ø p1		[mm]	5.5	6.5	9	9
Ø p2 H13		[mm]	10	11	15	15
p3		[mm]	15	14	14	14
p4		[mm]	18	17	18	18
Ø r		[mm]	45	52	60	76
Ø s		[mm]	30	30	33	33
t		[mm]	7.5	9	10	10
u		[mm]	27	30.5	35	43
u1		[mm]	21	24	29	32.5
u2		[mm]	32	36	41	48
v		[mm]	22	22	25	25
v1		[mm]	108	115	132	151
w		[mm]	11	13.5	14	17
w1		[mm]	25	28.5	33.5	36
w2		[mm]	6	6.5	7	7
z		[mm]	13	13.5	14	14
Weight, approx.		[kg]	1.7	2.3	3.4	5.7

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

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



* Clamping force for special length clamping arm → Page 14

Swing angle

1. Standard swing angle

90° right
90° left
0°

2. Swing angle α < 90°

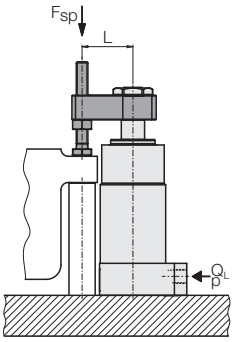
α = 15° to 75° in gradation of 5°

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, h1, m and x are reduced by y: $y = (90° - \alpha°) * k$
Dimensions 3 ± 0.5 and o of the switch rod are lengthened by the value y.

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

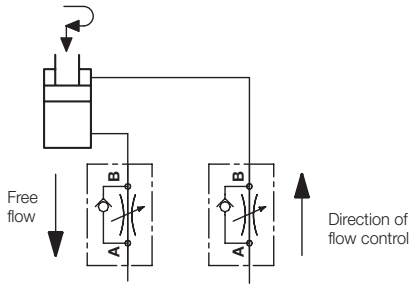
2. Admissible flow rate Q



In the chart on page 8, 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 prevent an overload of the swing mechanism, the flow rate has to be reduced:

Throttling of the flow rate

The throttling must take place at the supply line, i.e., on the side facing the swivel clamp. This is the only way to prevent pressure intensification and thus pressures exceeding 350 bar.



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 8
J_e = Moment of inertia of the clamping arm (accessory) with contact bolt as per the chart) → Page 14
J_L = Moment of inertia special clamping arm determined with the help of the CAD model in the computer

2.2. Accessory throttle valve

Throttle valves are used
- To reduce the swing speed of the clamping arm;
- To improve the synchronism of several swing clamps.

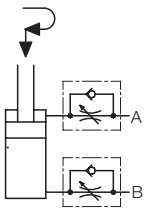
This application is only possible for connection through drilled channels.

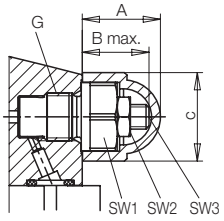
Important note

If throttling is severe, the backing-up pressure can cause pressure switches
and control valves to activate prematurely.

Size		D H	L P
A	[mm]	16	21
B max.	[mm]	13.5	17.5
C	[mm]	18	23.6
G		G 1/8	G 1/4
SW1	[mm]	14	19
Tightening torque	**[Nm]**	**18**	**35**
SW2	[mm]	8	8
SW3	[mm]	2.5	2.5
Weight	[kg]	0.025	0.036
Part no.		**2957209**	**2957210**

Hydraulic symbol

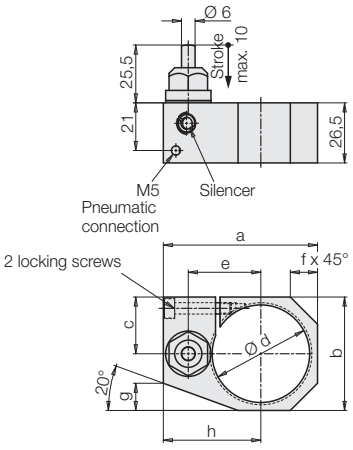


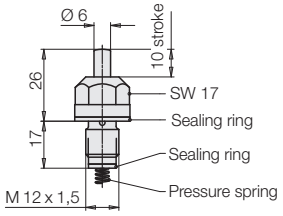


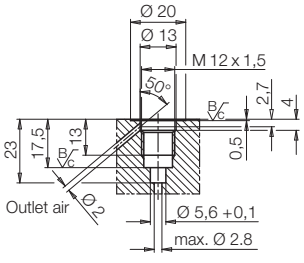
A = Clamping
B = Unclamping

Locking flange with pneumatic valve

With the integrated pneumatic valve the clamping position can be monitored directly at the clamping arm.
It is attached to the swing clamp by tightening the two locking screws.
The exact adjustment is made in the clamping position with the workpiece clamped. The valve tappet must be pushed approx. 5 mm.

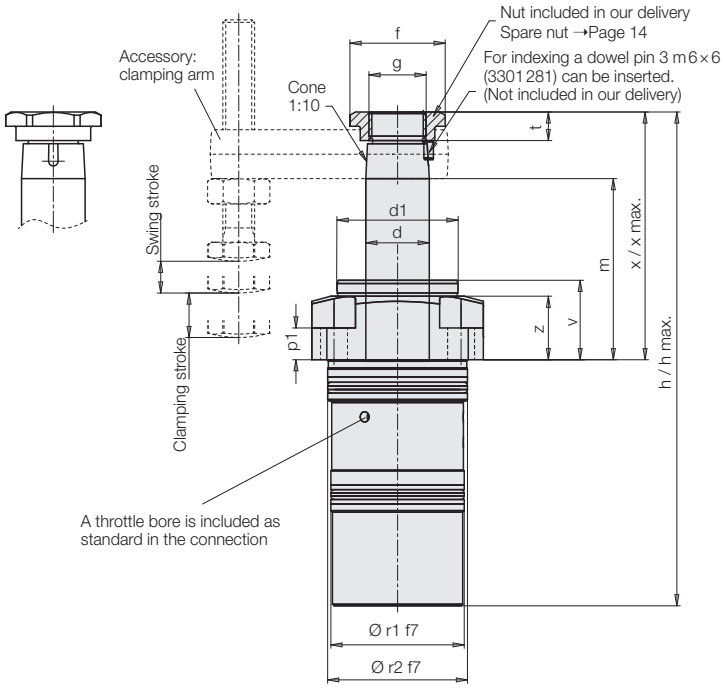




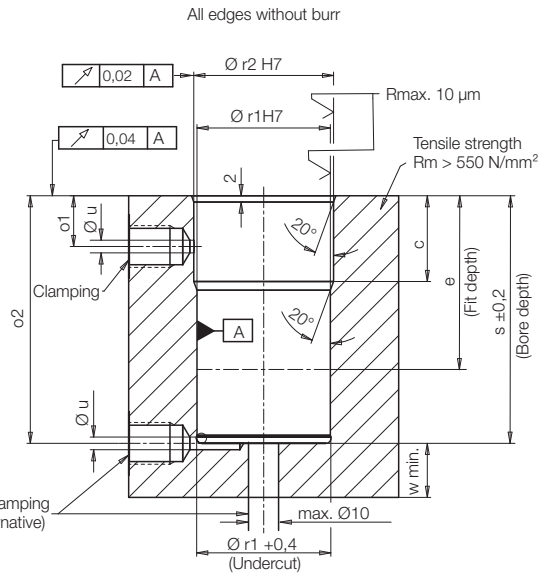


Size		D	H	L	P
a	[mm]	68	76	85.5	100
b	[mm]	50	58	66	82
c	[mm]	25	29	33	41
Ø d	[mm]	43	50	58	74
e	[mm]	32	36	41.5	48
f	[mm]	12	16	18	22
g	[mm]	12	14	16	18
h	[mm]	43	47	52.5	89
Switching area 2 ÷ 9 mm					
Part no. complete		**0353320**	**0353321**	**0353322**	**0353323**
Pneumatic valve		**0353933**	**0353933**	**0353933**	**0353933**
Switching area 2 ÷ 10 mm					
Part no. complete		**0353420**	**0353421**	**0353422**	**0353423**
Pneumatic valve		**0353934**	**0353934**	**0353934**	**0353934**

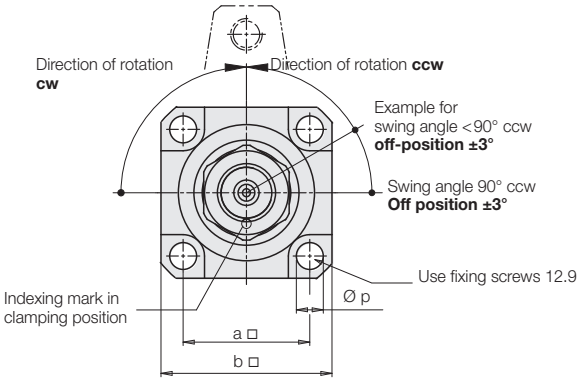
Operating conditions, tolerances and other data, see data sheet A 0.100

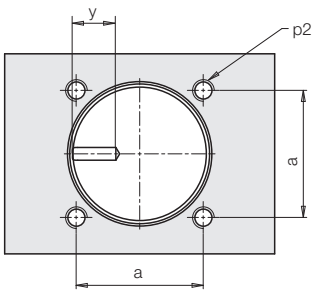


Location hole



Clamping position ±1°





Version without bottom cover

To keep the overall length short, a bottom cover was omitted. The piston contacts the bottom of the cartridge-type hole.

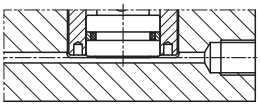


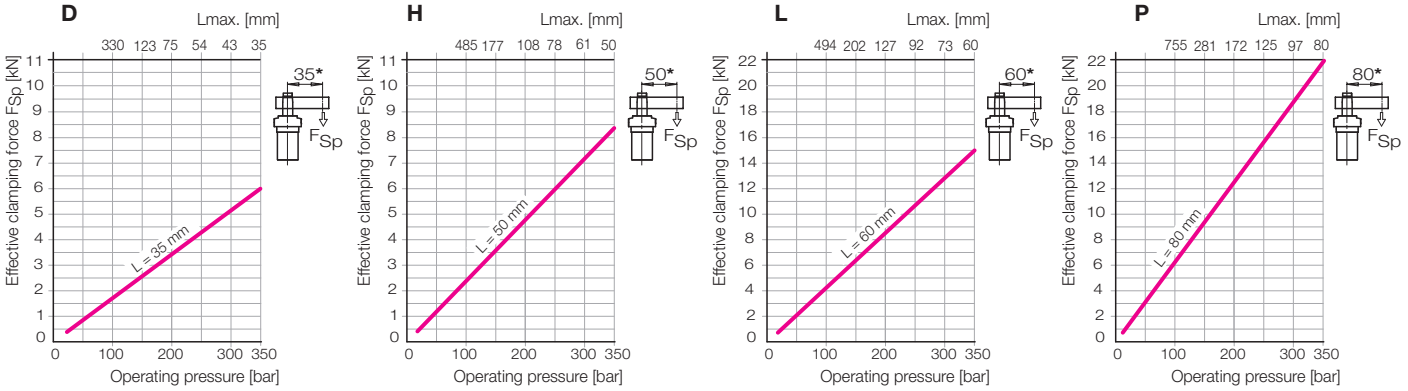
Illustration of swivel angle 0° version

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

Size			D	H	L	P
Max. pulling force		[kN]	7.5	10.5	18.4	27.5
Effective clamping force		[kN]	See diagram below			
Clamping stroke		[mm]	12	12	15	15
Swing stroke		[mm]	11	12	15	21
Total stroke + 0.7		[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
e (fit depth)		[mm]	45	50	53	53
Ø f		[mm]	27	30	36	40
g			M14 × 1.5	M18 × 1.5	M20 × 1.5	M28 × 1.5
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
w min. [bottom thickness]		[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

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

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



* Clamping force for special length clamping arm → Page 14

Swing angle

1. Standard swing angle

90° right
90° left
0°

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, h1, m and x are reduced by y: $y = (90° - \alpha°) * k$

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

Accessory Cartridge Type
Pneumatic Position Monitoring (Adjustable) • Throttling of the Flow Rate

Application

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

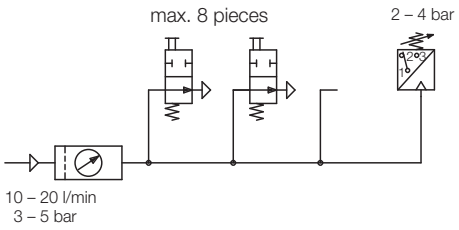
Clamping arm in clamping position and piston in clamping area

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

Monitoring by pneumatic pressure switch



To evaluate the pressure build-up, commercially available electro pneumatic pressure switches can be used.
It is possible to monitor up to 8 position monitorings connected in series (see circuit diagram).

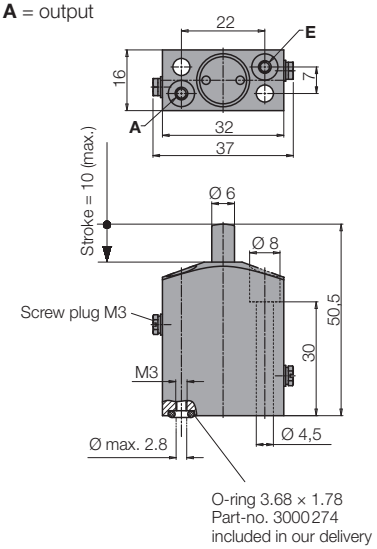
Please note!
Functioning of the pneumatic position monitorings is only process-safe if the air volume and the system pressure are throttled. The nominal values are indicated below technical characteristics.

Technical characteristics

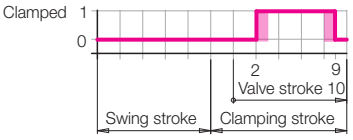
Connection		O-ring or thread M3
Nominal diameter	[mm]	2
Max. air pressure	[bar]	10
Range of operating pressure	[bar]	3 to 5
Differential pressure ***)** at		
3 bar System pressure	[bar]	Min. 1.5
5 bar System pressure	[bar]	Min. 3
Air flow rate ****)**	[l/min]	10 to 20
Actuating force *****)**	[N/bar]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

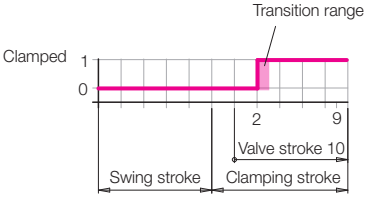


Switching area 2 … 9 mm



Part no. 0353921

Switching area 2 … 10 mm



0 = Passage 1 = Closed

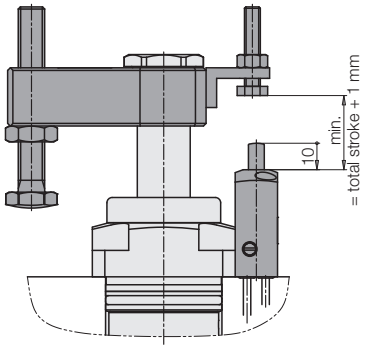
Part no. 0353937

Accessories

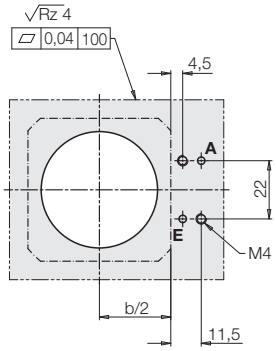
Insertion nipple fitting M3
Part no. 3890188

Mounting example

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



Connecting scheme



2 connecting bores max. Ø 2.8

Pneumatic connection

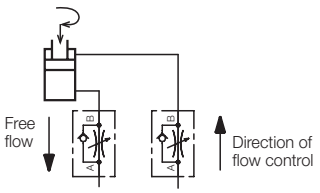
Drilled channels
Position monitoring is fixed to the above connecting scheme with inserted O-rings.
With the indicated distance dimensions, position monitoring is located directly at the flange of the swing clamp and has thus the correct distance for operation of the clamping arm.
Hose connection
Remove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

Important notes

When adjusting the control cam ensure 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

The throttling must take place at the supply line, i.e., on the side facing the swivel clamp. This is the only way to prevent pressure intensification and thus pressures exceeding 350 bar.



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

Code for Part Numbers
Connecting Fitting

V 1 S A K - X X K 6 - X X X X - H X X X - X N E X

Size

D = Size 1 (Ø23/16 – 7.5 kN)
H = Size 2 (Ø28/20 – 10.5 kN)
L = Size 3 (Ø36/25 – 18.4 kN)
P = Size 4 (Ø45/32 – 27.5 kN)

Design

B = top flange – drilled channels and pipe threads
E = top flange – pipe threads only
G = bottom flange
N = cartridge type

Swing direction

R = clockwise
L = counterclockwise
0 = without swing motion

Swing angle

015 = 15°
020 = 20°
025 = 25°
030 = 30°
035 = 35°
040 = 40°
045 = 45°
050 = 50°
055 = 55°
060 = 60°
065 = 65°
070 = 70°
075 = 75°
090 = 90°
000 = 0° (without swing motion)

Clamping stroke

For size D
012 = 12 mm: For swing angle 15° to 90°
023 = 23 mm: For swing angle 0°

For size H
012 = 12 mm: For swing angle 15° to 90°
024 = 24 mm: For swing angle 0°

For size L
015 = 15 mm: For swing angle 15° to 90°
030 = 30 mm: For swing angle 0°

For size P
015 = 15 mm: For swing angle 15° to 90°
036 = 36 mm: For swing angle 0°

Monitoring

For top flange/bottom flange:
A = Pneumatically clamped
Switching area 2 – 9 mm
P = Pneumatically clamped
Switching area 2 – 10 mm
B = Pneumatically unclamped
C = Pneumatically clamped and unclamped
Switching area 2 – 9 mm
Q = Pneumatically clamped and unclamped
Switching area 2 – 10 mm
L = with switch rod

For all designs:
0 = without monitoring

Connecting fitting

For designs B and G
D = screw plug with sealing ring
K = bleeding screw with KDS sealing ring

For designs E and N
0 = without

Ordering example 1

Size 1	= **D**
Bottom flange	= **G**
Cw swing motion	= **R**
Swing angle 75°	= **075**
Clamping stroke: 12 mm	= **012**
Monitoring with switch rod	= **L**
Screw plug	= **D**

Part no.
V1SAK-DGK6-R075-H012-LNED

Ordering example 2

Size 3	= **L**
Top flange – Drilled channels and pipe threads	= **B**
Ccw swing motion	= **L**
Swing angle 90°	= **090**
Clamping stroke: 15 mm	= **015**
Pneumatic monitoring of the clamping arm in the unclamping position	= **B**
Bleeding screw with KDS sealing ring	= **K**

Part no.
V1SAK-LBK6-L090-H015-BNEK

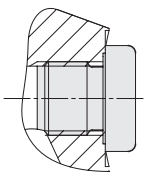
Ordering example 3

Size 4	= **P**
Cartridge type	= **N**
Without swing motion	= **0**
Swing angle 0°	= **000**
Clamping stroke: 15 mm	= **015**
Without monitoring	= **0**
Bleeding screw	= **0**

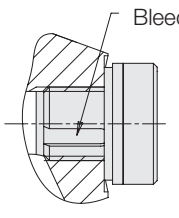
Part no.
V1SAK-PNK6-0000-H015-0NE0

Connecting fitting

Screw plug with sealing ring D

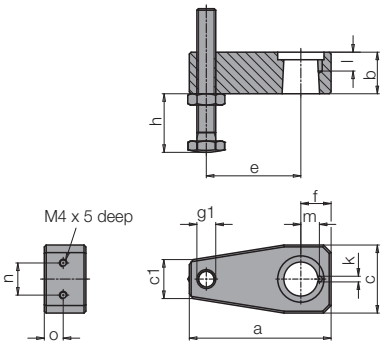


Bleeding screw with KDS sealing ring

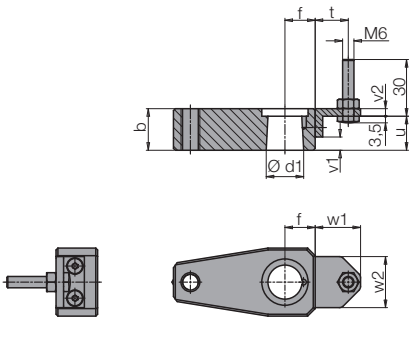


Operating conditions, tolerances and other data, see data sheet A 0.100

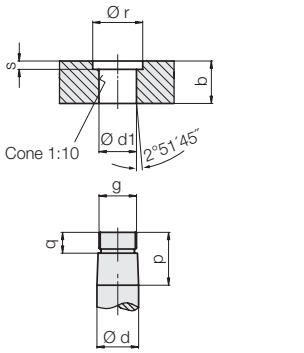
Clamping arm, max. 350 bar

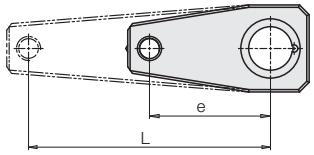


Clamping arm complete with angle



Dimensions for special clamping arm





Size		D	H	L	P
a	[mm]	58	75	93	120
b	[mm]	17	22	26	32
c	[mm]	28	36	45	60
c1	[mm]	14	20	23	28
Ø d f7	[mm]	16	20	25	32
Ø d1 +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]	M14×1.5	M18×1.5	M20×1.5	M28×1.5
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]	9.5	11	11	11.5
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**
Plastic cover**		**3300685**	**3300684**	**3300683**	**3300682**
Spare nut		**3527092**	**3527014**	**3527099**	**3527015**
Tightening torque	[Nm]	16	30	42	90

** Order 4 pcs. per swing clamp

Clamping force and admissible operating pressure

Effective clamping force (general)

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

Admissible clamping force

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

Admissible operating pressure

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

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

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

Constant	Sizes			
	D	H	L	P
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 clamp size D
L = 70 mm

1. Admissible clamping force

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

2. Admissible operating pressure

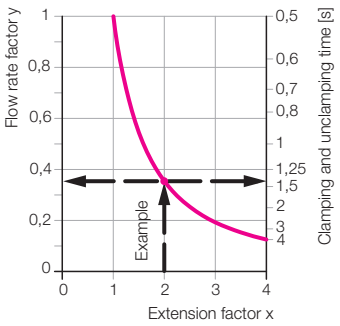
$$p_{adm} = \frac{D}{L} + E = \frac{9795}{70} + 70.26 = 210 \text{ bar}$$

Moments of inertia not known

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

Example: Swing clamp size D
L = 70 mm
e = 35 mm (as per chart)
Q_e = 10 cm³/s (as per chart)

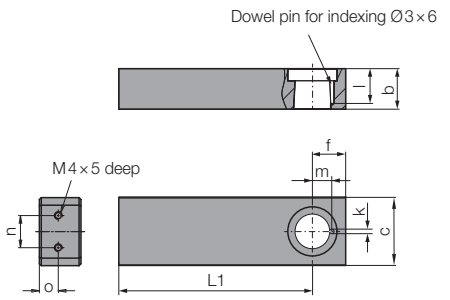
1. Extension factor $x = \frac{L}{e} = \frac{70 \text{ mm}}{35 \text{ mm}} = 2$
2. Flow rate factor as per diagram → y = 0.35
3. Max. flow rate $Q_L = y * Q_e = 0.35 * 10 \text{ cm}^3/\text{s} = 3.5 \text{ cm}^3/\text{s}$
4. Min. clamping time as per diagram → approx. 1.4 s



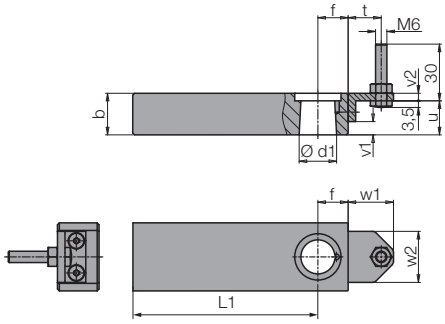
Adm. flow rate and clamping time as a function of the clamping arm extension.

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

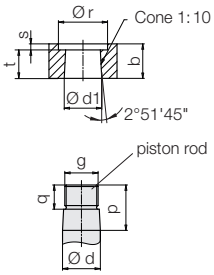
Clamping arm blank, max. 350 bar



Clamping arm blank complete with angle



Dimensions for special clamping arm



The cone seat is part of the clamping arm blank with the required precision. Adapting to the workpiece clamping points is achieved by

- Shortening to the required clamping arm length
- A thread for a hardened contact bolt, which can also be adjustable
- Bevelling on the sides and top/bottom for better swarf flow and to reduce the mass moment of inertia

Moment of inertia of the clamping arm

To prevent the swing mechanism from overload, the swing speed must be reduced by throttling the flow rate depending on the moment of inertia of the clamping arm in use (see Accessory Throttle valve → Pages 5, 9 and 12).

Clamping force and admissible operating pressure

Effective clamping force (general)

$$F_{Sp} = \frac{p}{A + (B * L1)} \leq F_{adm.} \quad [kN]$$

Admissible clamping force

$$F_{adm} = \frac{C}{L1} \quad [kN]$$

Admissible operating pressure

$$p_{adm} = \frac{D}{L1} + E \leq 350 \quad [bar]$$

L1 = Special length up to clamping point [mm]
p = pressure [bar]
A, B, C, D, E = constants as per chart

Constant	Sizes			
	D	H	L	P
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 clamp size D
L1 = 70 mm

1. Admissible clamping force

$$F_{adm} = \frac{C}{L1} = \frac{210}{70} = 3 \text{ kN}$$

2. Admissible operating pressure

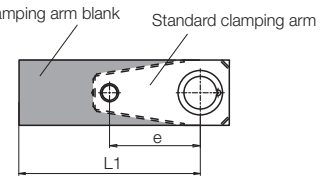
$$p_{adm} = \frac{D}{L1} + E = \frac{9795}{70} + 70.26 = 210 \text{ bar}$$

Size		D	H	L	P
a	[mm]	58	75	93	120
b	[mm]	17	22	26	32
c	[mm]	28	36	45	60
Ø d f7	[mm]	16	20	25	32
Ø d1 +0.1/+0.05	[mm]	15.8	19.8	24.8	31.8
L1	[mm]	87.5	125	150	200
f	[mm]	16	16	22	26
g	[mm]	M14×1.5	M18×1.5	M20×1.5	M28×1.5
Ø k +0.1	[mm]	3	3	3	3
l +0.5	[mm]	9.5	11	11	11.5
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
Clamping arm blank		**35484243**	**35484244**	**35484245**	**35484246**
Angle bracket complete		**0184003**	**0184004**	**0184005**	**0184005**
Plastic cover **		**3300685**	**3300684**	**3300683**	**3300682**
Spare nut		**3527092**	**3527014**	**3527099**	**3527015**
Tightening torque	[Nm]	16	30	42	90

** Order 4 pcs. per swing clamp

Calculation of the swing time

This is based on a short standard clamping arm with a moment of inertia J_e and a swivel time of 0.5 s.



Standard clamping arm

Max. flow rate Q_e	[cm³/s]	10	14	32	57
Moment of inertia of J_e	[kg · mm²]	0.00007	0.00033	0.00084	0.00298
Min. swing time	[s]	0.5	0.5	0.5	0.5

Calculation of the 90° swing time:

$$t_{min} = 1\,s * \sqrt{\frac{J_L}{J_e}} \geq 0.5\,s \quad [s]$$

Calculation of the admissible flow rate:

$$Q_{adm} = Q_e * \sqrt{\frac{J_e}{J_L}} \leq Q_e \quad [cm^3/s]$$

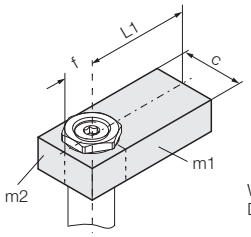
Q_e = max. flow rate for the standard clamping arm according to table [cm³/s]

J_e = moment of inertia of the standard clamping arm according to table [kg · mm²]

J_L = moment of inertia of the desired clamping arm [kg · mm²]

Moment of inertia

The following formula can be used to approximate the moment of inertia and, from that, the permissible flow rate and the swivel time.



Weight m [kg]
Dimensions e, f, c, x [mm]

$$J_L = m1 \frac{4L1^2 + c^2}{12} + m2 \frac{4f^2 + c^2}{12} [kg \cdot mm^2]$$

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