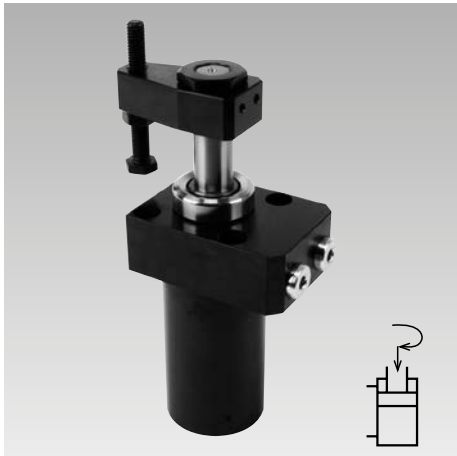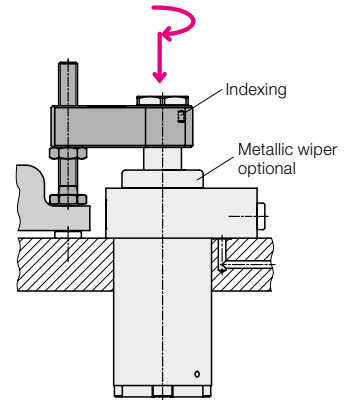# Swing Clamps with Sturdy Swing Mechanism
Top flange type, with optional position monitoring, double acting, max. operating pressure 350 bar

Advantages

- 5 sizes available
- Compact design partially recessible
- 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
- Screw counterbores coverable
- Position monitoring available in six variants
- Hydraulic and pneumatic ports integrated in the flange
- Mounting position: any

Indexing
Metallic wiper optional

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 and the manifold possibilities of position monitoring 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

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.

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.

When using high flow rates the swing speed is limited by installed throttle points.
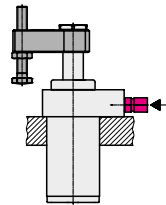
The FKM wiper at the piston rod can be protected against coarse and hot swarf by an optionally available metallic wiper (see page 6). The different possibilities of the position monitoring are presented at the side.

Important notes see page 6.
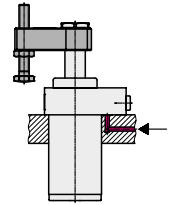
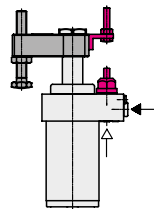## Installation and connecting possibilities
Pipe thread

184X**A**

Drilled channels

184X**A**

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

184X**C**
    P

Position monitoring as accessories
Switch rod for external sensors

184X**B**
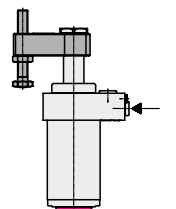
Monitoring of the piston in unclamping position

184X**D**
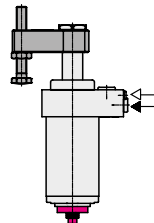
Pneumatic position monitoring in clamping and unclamping position

184X**B**
+
Accessories
Page 5

Both controls combined

184X**H**
     Q

Electrical position monitoring in clamping and unclamping position

184X**B**
+
Accessories
Page 6

Subject to modifications

Versions: Code letters A, B, C, D, H, P, Q
Dimensions • Swing angles

A (without monitoring)

For indexing a pin 3m6x6 (3301 281) can be inserted. (Not included in the delivery).

Option: Metallic wiper Ød2
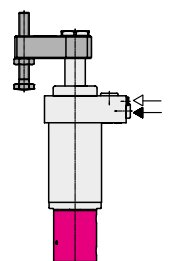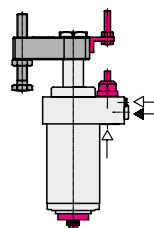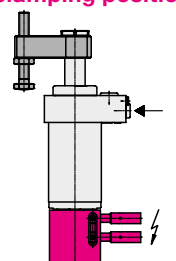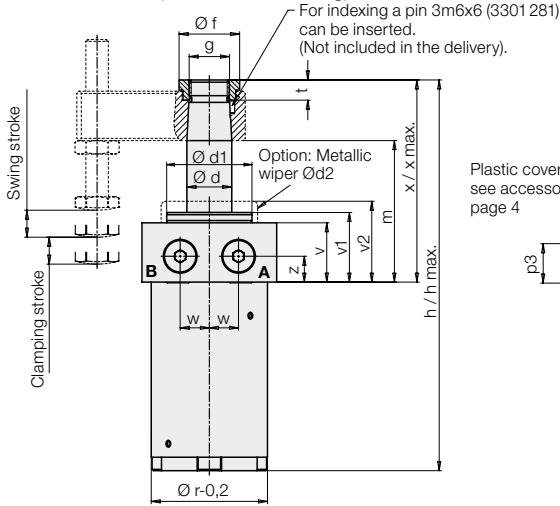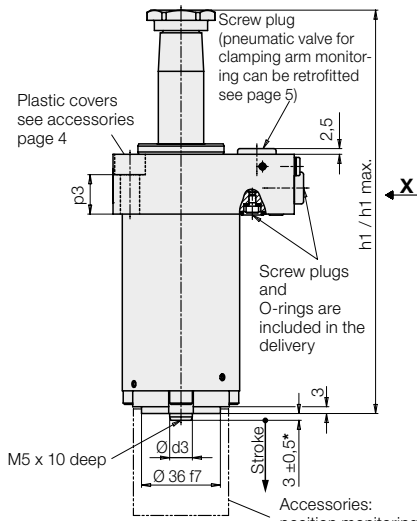
A = Clamping
B = Unclamping
E = Unclamped (pneumatic)
S = Clamped (pneumatic)

Clamping position ±1°

Swing direction **cw**

Swing direction **ccw**

Example for swing angle < 90° **off-position ±3°**

Swing angle 90° **off-position ±3°**

Indexing mark represented in clamping position

Plastic covers see page 4

Pneumatic port M5 at both sides at 45° only for 1843 B, D and H (see view X height w2)

5 x 45° at both sides only for 1843

Swing angle

1. Swing angle 90° (standard)

	Part no.
90° cw	184XX**090R**XX
90° ccw	184XX**090L**XX
0°	184XX**0000**XX

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:

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

Example:
Swing clamp   1845A090L30
Desired swing angle   **45° ccw**
Part no.   1845A**045L**30

Shortening:
$y = (90° - 45°) * 0.12 \text{ mm/°} = 5.4 \text{ mm}$

3. Swing angle > 90°
Available on request!

B (with switch rod)

Screw plug (pneumatic valve for clamping arm monitoring can be retrofitted see page 5)

Plastic covers see accessories page 4

Screw plugs and O-rings are included in the delivery

M5 x 10 deep

Accessories: position monitorings see page 5 and 6

X

(Monitoring "Clamped")

C Switching area 2 ÷ 9 mm
P Switching area 2 ÷ 10 mm

Pneumatic valve (actuated by the clamping arm)

Silencer

Flange connection for pneumatic valve

Attention danger of collision!
The contact bolt for the actuation of the pneumatic valve must be completely screwed into the angle bracket for start up (see page 4 dimension 3.5 mm)
The adjustment is made with clamped workpiece to approx. 5 mm valve stroke.

D (Monitoring "Unclamped")

Pneumatic port alternative: M5 or flange

Ø s
Orifice plate

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

* see swing angle α < 90°

View X

Nut included in the delivery. Spare nut see page 4.

Pneumatic position monitoring **"Clamped"** (see accessory page 5)

Pneumatic position monitoring **"Unclamped"** versions D, H and Q or B with accessory page 5

Silencer for the versions C, H and Q

Connecting scheme

For O-ring sealing:
$\sqrt{R_z\ 4}$
0,04 | 100

Required for pneumatic position monitoring **"Unclamped"** versions D, H and Q or B with accessory page 5

Required for pneumatic valve **"Clamping arm in clamping position"** Versions C, H and Q

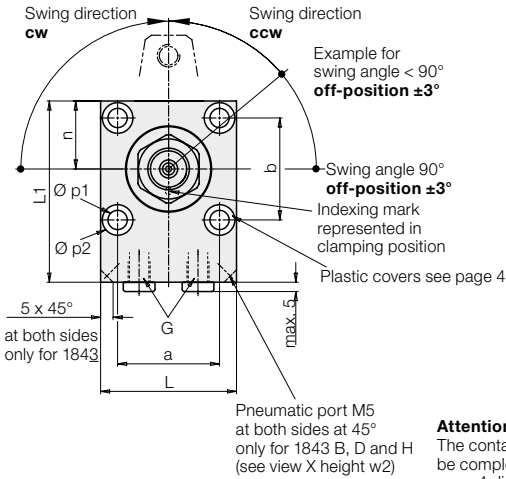Required for pneumatic position monitoring **"Clamped"** (see accessory page 5)

Use screws 12.9

Connecting holes: 2 x hydraulics (A, B) max. Ø 5
Spare O-ring 8x1,5 Part no. 3000343
3 x pneumatics max. Ø 2.5 (only as required)
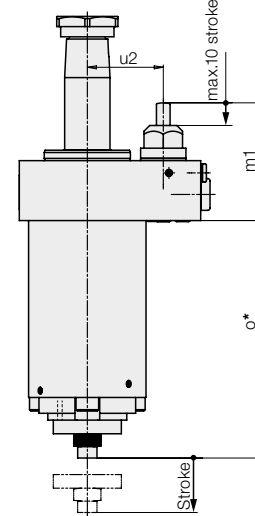Spare O-ring 3.68x1.78 Part no. 3000334

H (Combination C+D)
Q (Combination P+D)

max.10 stroke

Stroke

Pneumatic position monitoring versions C, D, H

Unclamped

Clamped

D, H and Q (not adjustable)

C and H (adjustable)

Valve stroke 10

Swing stroke | Clamping stroke

Versions P, D, Q

Transition range

Unclamped

Clamped

D, H and Q (not adjustable)

P and Q (adjustable)

Valve stroke 10

Swing stroke | Clamping stroke
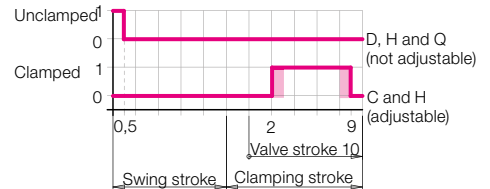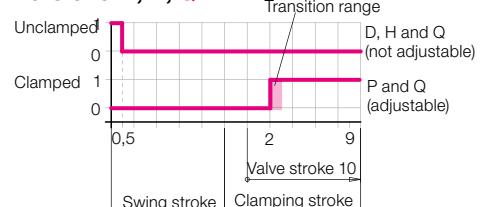
0 = Passage   1 = Closed

Technical data

|							
Max. pulling force (350 bar)		[kN]	7.5	10.5	18.4	27.5	39.1
Effective clamping force		[kN]	see diagram page 3 or calculation of the clamping force on page 4				
Clamping stroke		[mm]	12	12	15	15	15
Swing stroke		[mm]	11	12	15	21	24
Total stroke ±0.2		[mm]	23	24	30	36	39
Min. operating pressure		[bar]	30	30	30	30	30
Max. flow rate	Clamping	[cm³/s]	10	14	32	57	87
(see page 4)	Unclamping	[cm³/s]	20	28	60	110	185
Effective	Clamping	[cm²]	2.14	3.01	5.27	7.86	11.19
piston area	Unclamping	[cm²]	4.15	6.15	10.17	15.9	23.75
Oil volume / stroke		[cm³]	4.9	7.2	15.8	28.3	43.7
Oil to return		[cm³]	9.6	14.8	30.5	57.2	92.7
Piston Ø		[mm]	23	28	36	45	55
a		[mm]	37	45	54	66	76
b		[mm]	40	45	54	66	76
c		[mm]	28.5	31.5	35	43	56
c1		[mm]	12	14	14	18	20.5
Ø d		[mm]	16	20	25	32	40
Ø d1		[mm]	28	38	45	48	60
Ø d2		[mm]	33	42	54	54.5	75
Ø d3		[mm]	10	10	12	12	12
Ø f		[mm]	27	30	36	40	55
g		[mm]	M14x1.5	M18x1.5	M20x1.5	M28x1.5	M35x1.5
G			G 1/8	G 1/8	G 1/4	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	254 / 255.7
h1 +0.4/-0.3 / h1max.[1]		[mm]	165 / 166.3	178 / 179.8	207 / 208.8	237.5 / 237.9	257 / 258.7
k		[mm/°]	0.091	0.093	0.12	0.152	0.183
L		[mm]	50	62	75	88	100
L1		[mm]	70	81	95	105	120
m +0.4/-0.7[2]		[mm]	62.4	63.9	74.9	80.3	84.8
m1		[mm]	52	52	56	56	56
n		[mm]	26.5	31	37	44	50
o		[mm]	98	105	118	136	146
p		[mm]	M6	M8	M10	M12	M12
Ø p1		[mm]	6.6	9	11	13	13
Ø p2 H13		[mm]	11	15	18	20	20
p3		[mm]	18.4	15.4	17.4	15.4	17.4
Ø r		[mm]	45	52	60	76	90
Ø s		[mm]	30	30	33	33	33
t		[mm]	7.5	9	10	10	11
u		[mm]	36.5	42	50	53	62
u1		[mm]	18.5	24.5	28	32	35
u2		[mm]	27	33.5	41.5	44.5	53.5
v		[mm]	26.4	26.4	30.4	30.4	30.4
v1		[mm]	31	31	35	36	36
v2		[mm]	36	36	40	41	41
w		[mm]	12	13	17	20	20.5
w1		[mm]	22.5	24.5	28	32	35
w2		[mm]	22	21	24.5	25	26
x +0.3/-0.2 / x max.[1]		[mm]	84 / 85.2	90 / 91.7	106 / 107.7	118.5 / 118.8	128 / 129.6
z		[mm]	11	11.5	12	12	15
Weight, approx.		[kg]	1.7	2.3	3.9	6	8.9
Part no.	Swing direction 90° cw		**1843 X090 R23 M**	**1844 X090 R24 M**	**1845 X090 R30 M**	**1846 X090 R36 M**	**1847 X090 R39 M**
	Swing direction 90° ccw		**1843 X090 L23 M**	**1844 X090 L24 M**	**1845 X090 L30 M**	**1846 X090 L36 M**	**1847 X090 L39 M**
	0 degree		**1843 X000 023 M**	**1844 X000 024 M**	**1845 X000 030 M**	**1846 X000 036 M**	**1847 X000 039 M**

Code letter **X** see page 2.
[1] h / h1 / x = upper edge piston   h max. / h1 max. / x max. = upper edge nut
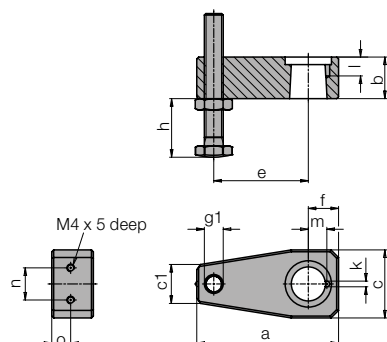[2] m = lower edge clamping arm

M = Option metallic wiper (see also page 6)

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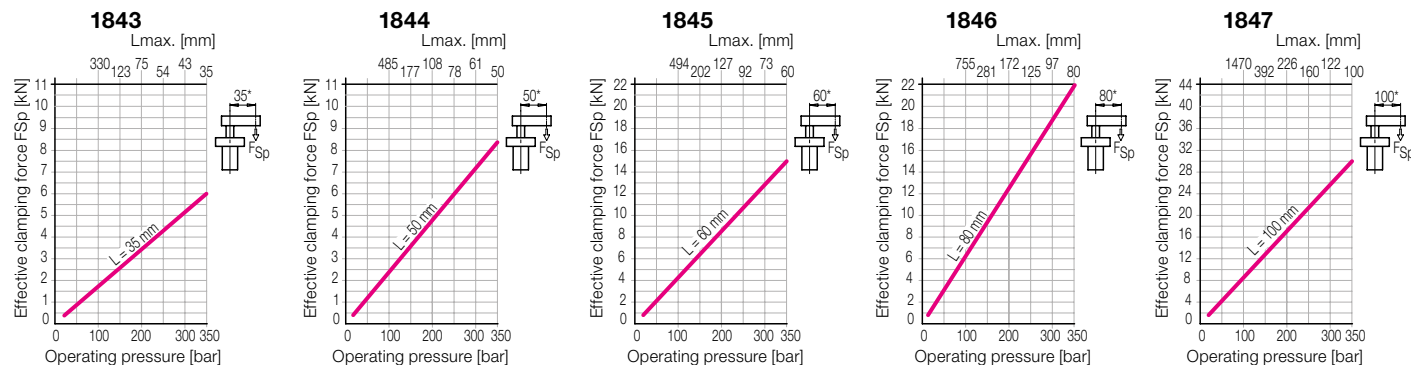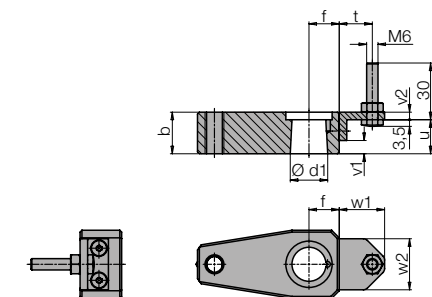

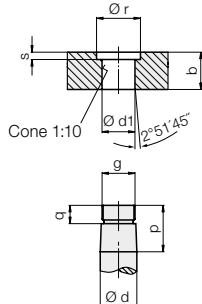***** Clamping force for other lengths see page 4.

Clamping arm, max. 350 bar

M4 x 5 deep

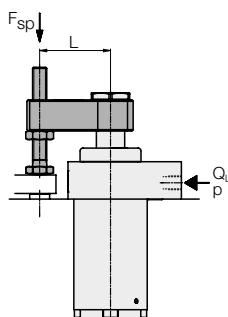### Clamping arm complete with angle

Special clamping arm
1. Connecting dimensions

Cone 1:10

Swing clamps		1843	1844	1845	1846	1847
a	[mm]	58	75	93	120	154
b	[mm]	17	22	26	32	38
c	[mm]	28	36	45	60	72
c1	[mm]	14	20	23	28	36
Ød f7	[mm]	16	20	25	32	40
Ød1 +0.1/+0.05	[mm]	15.8	19.8	24.8	31.8	39.8
e	[mm]	35	50	60	80	100
f	[mm]	16	16	22	26	34
g	[mm]	M14x1.5	M18x1.5	M20x1.5	M28x1.5	M35x1.5
g1	[mm]	M8	M10	M12	M16	M20
h min/max	[mm]	5/45	6/64	7/70	9/85	12/100
Ø k +0.1	[mm]	3	3	3	3	3
l +0.5	[mm]	9.5	11	11	11.5	12
m ±0.05	[mm]	7.8	9.8	12	15	19
n	[mm]	11	17	20	20	20
o	[mm]	6	10	12	20	20
p	[mm]	22.5	27	32	39	44
q	[mm]	9	10	11	12.7	12.7
Ø r	[mm]	20	24.5	31	34.5	46
s	[mm]	2.5	4	4	4.5	5
t	[mm]	11	17.5	19	19	19
u	[mm]	17	18	21	19	25
v1	[mm]	6	7	8	6	12
v2	[mm]	4	4	5	5	5
w1	[mm]	18	24	26	26	26
w2	[mm]	21	27	30	30	30
Part no. Clamping arm						
– with contact bolt		**0354 152**	**0354 153**	**0354 154**	**0354 155**	**0354 259**
Weight, approx.	[kg]	0.19	0.39	0.69	1.43	2.64
Moment of inertia of J_e	[kgm²]	0.00011	0.00046	0.0011	0.00398	0.01198
– without thread g1		**3548 660**	**3548 661**	**3548 803**	**3548 804**	**3548 919**
Weight, approx.	[kg]	0.16	0.34	0.62	1.28	2.34
Moment of inertia of J_e	[kgm²]	0.00007	0.00033	0.00084	0.00298	0.00896
– complete with angle		**0354 156**	**0354 157**	**0354 158**	**0354 159**	**0354 175**
Angle bracket complete		**0184 003**	**0184 004**	**0184 005**	**0184 005**	**0184 005**
Plastic cover**		**3300 685**	**3300 684**	**3300 683**	**3300 682**	**3300 682**
Metallic wiper		**0341 104**	**0341 107**	**0341 105**	**0341 100**	**0341 101**
Spare nut		**3527 092**	**3527 014**	**3527 099**	**3527 015**	**3527 048**
Tightening torque	[Nm]	16	30	42	90	160

Special clamping arm

Special length   Series

** Order 4 off swing clamps

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
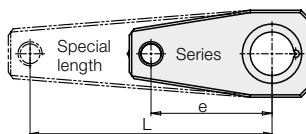
* Only for vertical mounting position!
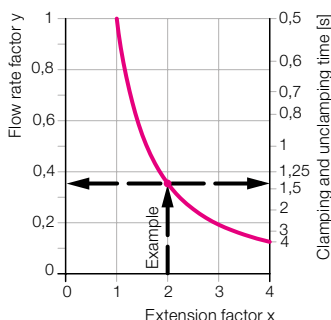
2.2 Moments of inertia not known

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 $x = \dfrac{L}{e} = \dfrac{70 \ mm}{35 \ mm} = 2$

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)

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

Admissible clamping force

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

Admissible operating pressure

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

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

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

Constant

	1843	1844	1845	1846	1847
A	46.64	33.15	18.98	12.72	8.93
B	0.335	0.17	0.073	0.04	0.027
C	210	420	900	1760	3000
D	9795	13926	17078	22386	26805
E	70.26	71.33	65.44	70.36	81.78

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

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

Römheld GmbH   **Actual issue see www.roemheld-group.com**   **4**

Application

A prerequisite for automated processes of workpiece clamping are hydraulic clamping elements whose position can be monitored at any time.

The pneumatic position monitorings signal the following conditions by closing two bore holes:

1. Piston extended, clamping arm in off-position.
2. Piston in clamping area, clamping arm in clamping position.

By the pressure increase in the pneumatic line an electro-pneumatic pressure switch or a differential pressure switch can be actuated.

The electrical switching devices are integrated in the electric control so that on the clamping fixture no electricity is required.

Description

The pneumatic position monitoring consists of the stainless control housing with fit signal sleeve, to be connected to the switch rod of the swing clamp by means of the delivered screw. Four fixing screws are included in our delivery.
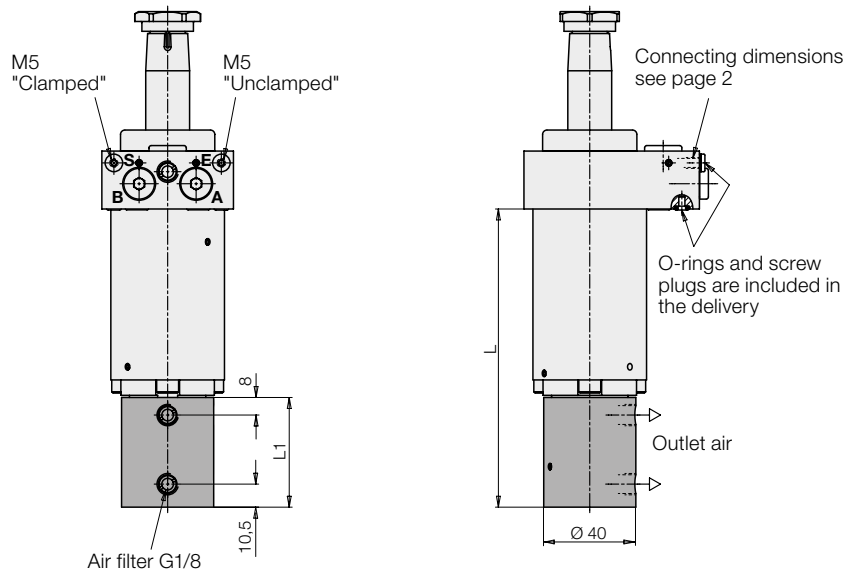
Pneumatic port
Drilled channels

The swing clamp with the mounted position monitoring is inserted into the location hole and is immediately ready for use with the mounted O-rings.

Hose connection

Remove the plugs M5 and screw-in connecting nipple M5 (accessory) Sealing to the flange area is made by the two O-rings.
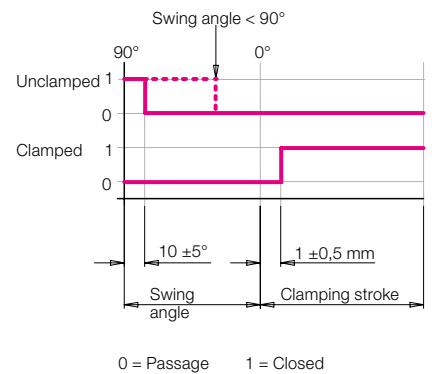
M5 "Clamped" M5 "Unclamped"

Connecting dimensions see page 2

O-rings and screw plugs are included in the delivery

Outlet air

Ø 40

Air filter G1/8

Technical data

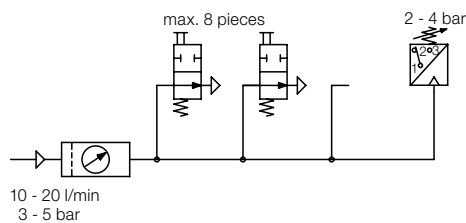| Connection		O-ring or thread M5
Nominal diameter	[mm]	2
Max. air pressure	[bar]	10
Range of operating pressure	[bar]	3....5
Differential pressure *) at		
3 bar system pressure	[bar]	min. 1.5
5 bar system pressure	[bar]	min. 3.5
Air flow rate **)	[l/min]	10....20

*) Required pressure drop if one or several position monitorings are not operated.

**) For measuring the air flow rate appropriate devices are available. Please contact us.

Function chart

Swing angle < 90°

90° 0°

Unclamped 1

0

Clamped 1

0

10 ±5°   1 ±0,5 mm

Swing angle   Clamping stroke

0 = Passage   1 = Closed

Monitoring by pneumatic pressure switch

max. 8 pieces   2 - 4 bar

10 - 20 l/min
3 - 5 bar

For the evaluation of the pneumatic pressure built-up standard pneumatic pressure switches can be used. It is possible to monitor with one pressure switch up to 8 position monitorings connected in series (see circuit diagram). It has to be considered that process-safe functioning of pneumatic position monitorings is only guaranteed with throttled air and system pressure. The nominal values are indicated below technical data.

Part no.

Swing clamps		1843B0XX	1844B0XX	1845B0XX	1846B0XX	1847B0XX
L	[mm]	129	136	172	190	200
L1	[mm]	50	50	73	73	73
Swing angle (see page 2)						
0 or 90°		0353913	0353913	0353914	0353916	0353956
15 to 75° = XX (graduation of 5°)		0353913 0XX	0353913 0XX	0353914 0XX	0353916 0XX	0353956 0XX

Pneumatic valve

Spare part for versions C, H, P and Q

	Part no.
Switching range 2 - 9 mm	0353933
Switching range 2 - 10 mm	0353934
Max. operating pressure	10 bar
Max. tightening torque	25 Nm
Function charts see page 2.	
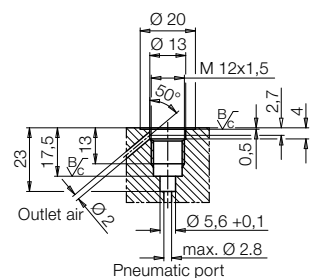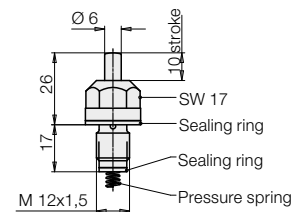
Ø 6   10 stroke

26   SW 17

17   Sealing ring

Sealing ring

M 12x1,5   Pressure spring

Ø 20
Ø 13   M 12x1,5
50°   2,7
4
23 17,5 13   0,5
Outlet air   Ø 5,6 +0,1
max. Ø 2.8
Pneumatic port

Application

Electrical position monitorings signal the following conditions due to damping of two inductive proximity switches:

1. Piston extended, clamping arm in off-position.
2. Piston in clamping area, clamping arm in clamping position.
3. Piston in final position, no workpiece inserted. ***)**

*) If this function is not desired, e.g. in setting mode, the proximity switch can be adjusted so that the switch is still damped at the stroke end (see function chart).

Description

The electrical position monitoring consists of the housing with two adjustable inductive proximity switches and one switching cam fixed at the switch rod of the swing clamp.

The fixing screws are included in our delivery.

The housing can also be mounted turned by 180°. The radial distance of the proximity switches to the switching cam should be 0.5 mm. It is secured by means of a set screw M4. After untightening of the locking screw M4 the proximity switches can be axially displaced.

Please note:

Careful design is required. According to the corresponding application conditions, safety measures have to be planned and checked later on.

Inductive position monitorings are not suitable for the use in coolant and swarf areas.

"Unclamped"
LED
"Clamped"
approx. 71
with right angle plug
50
45
L
L1

Technical data

Operating voltage	10...30 V DC
Max. residual ripple	15 %
Max. constant current	200 mA
Switching function	interlock
Output	PNP
Body material	stainless steel
Thread	M 8 x 1
Code class	IP 67
Environmental temperature	-25…+70 °C
LED Function display	yes
Protected against short circuits	yes
Connection type	Right angle plug
Length of cable	5 m

Function chart

90° adjustable 0°
Unclamped 1
0
adjustable
Clamped 1
0
~10°
1mm 1mm
Swing angle
Clamping stroke
0 = On   1 = Off

Part no.

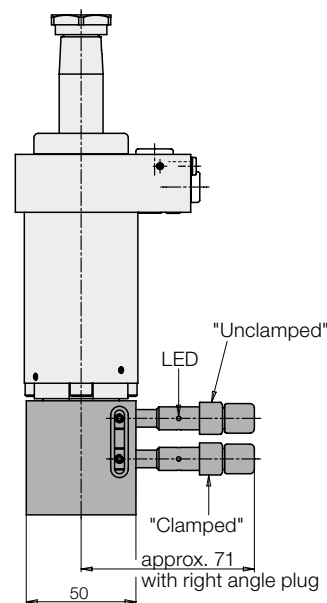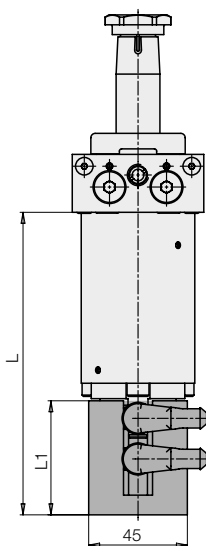| Swing clamps	1843B0XX	1844B0XX	1845B0XX	1846B0XX	1847B0XX
L [mm]	131	138	172	190	200
L1 [mm]	52	52	73	73	73
With switch and plug	**0353905**	**0353905**	**0353915**	**0353915**	**0353915**
Without switch and plug	**0353906**	**0353906**	**0353917**	**0353917**	**0353917**

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 and 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.

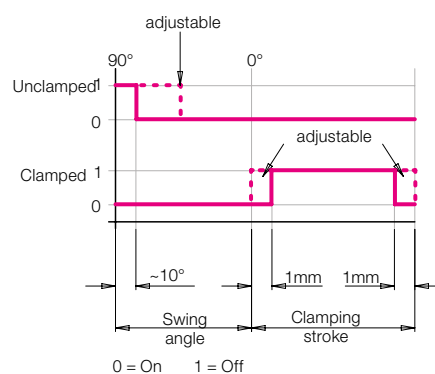Operating conditions, tolerances and other data see data sheet A 0.100.

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.

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.

Free flow
Direction of flow control