

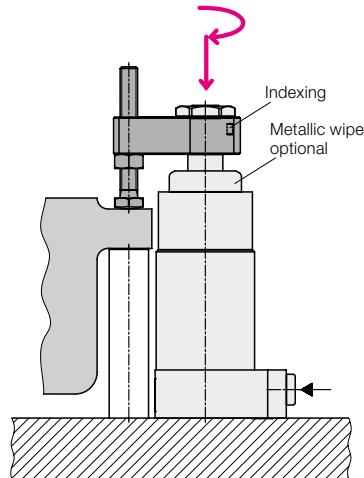


Swing Clamps with Sturdy Swing Mechanism
Bottom flange type, with optional position monitoring,
double acting, max. operating pressure 350 bar



Advantages

- 4 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



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).

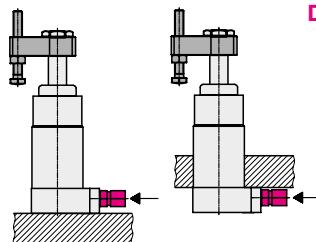
The different possibilities of the position monitoring are presented at the side.

Important notes see page 6.

Installation and connecting possibilities

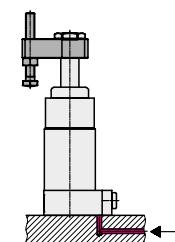
Pipe thread

184XL



Drilled channels

184XL

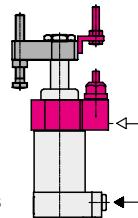


Pneumatic position monitoring

Monitoring of the clamping arm in clamping position (adjustable)

184XL

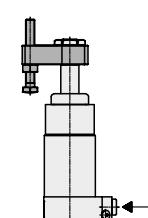
+
Accessories
Page 5



Position monitoring as accessories

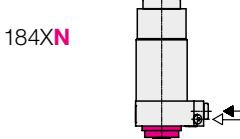
Switch rod for external sensors

184XM



Monitoring of the piston in unclamping position

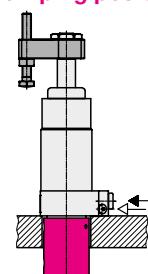
184XN



Pneumatic position monitoring in clamping and unclamping position

184XM

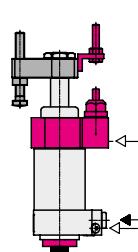
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Accessories
Page 5



Both controls combined

184XN

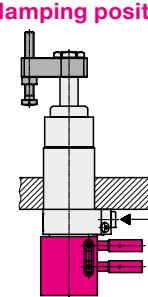
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Accessories
Page 5



Electrical position monitoring in clamping and unclamping position

184XM

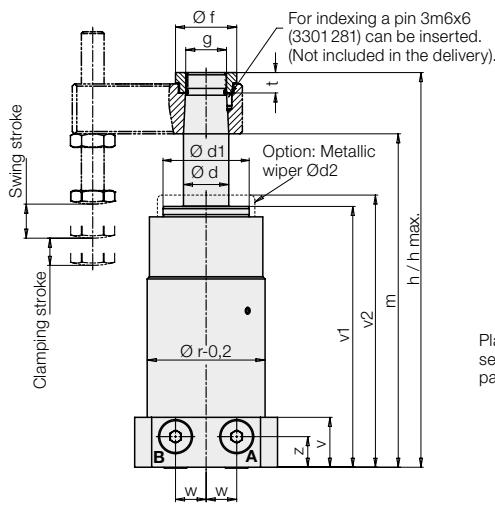
+
Accessories
Page 6



Versions: Code letters L, M, N

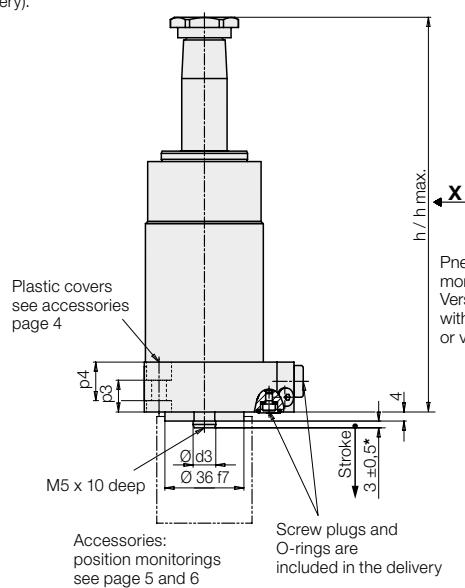
Dimensions • Swing angles

L (without monitoring)

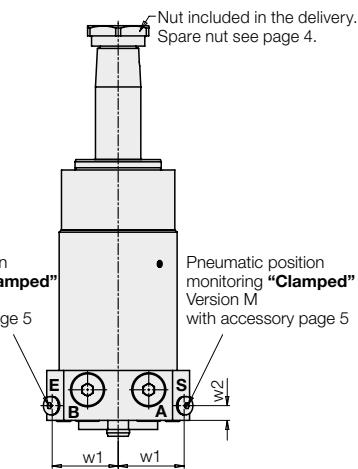


A = Clamping
B = Unclamping
E = Unclamped (pneumatic)
S = Clamped (pneumatic)

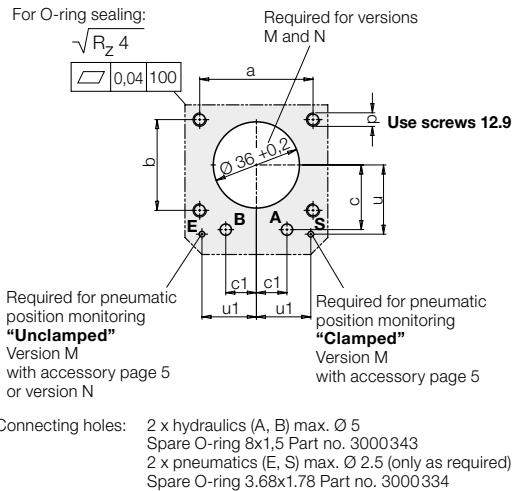
M (with switch rod)



View X



Connecting scheme



Swing angle

1. Swing angle 90° (standard)

Part no.

90° cw 184XX090RXX

90° ccw 184XX090LXX

0° 184XX0000XX

2. Swing angle $\alpha < 90^\circ$

$\alpha = 15^\circ$ 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, and m are reduced by y:

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

Dimensions 3 ± 0.5 and o of the switch rod are lengthened by the value y.

Example:

Swing clamp 1845L090L30

Desired swing angle 45° ccw

Part no. 1845L045L30

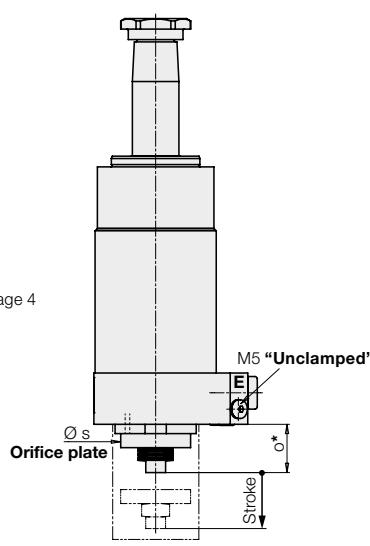
Shortening:

$y = (90^\circ - 45^\circ) * 0.12 \text{ mm} / {}^\circ = 5.4 \text{ mm}$

3. Swing angle $\alpha > 90^\circ$

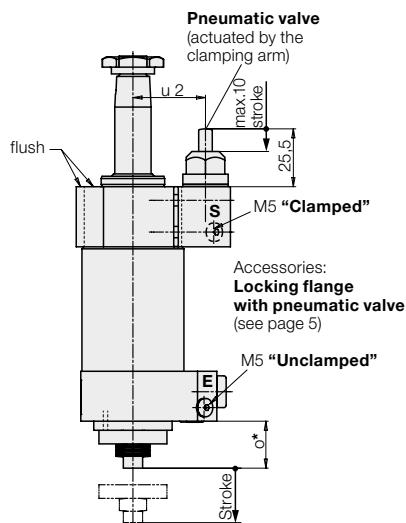
Available on request!

N (Monitoring "Unclamped")



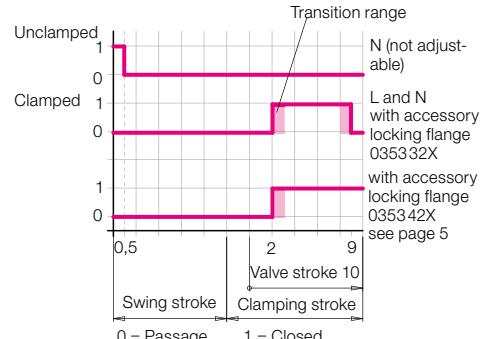
With blind hole, port S can be used for venting.

N (Monitoring "Unclamped" and "Clamped")



* see 2. Swing angle $\alpha < 90^\circ$

Pneumatic position monitoring for versions L and N with accessory locking flange



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.

Important note!

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

Technical data

Max. pulling force (350 bar)	[kN]	7.5	10.5	18.4	27.5
Effective clamping force	[kN]	see diagram page 3 or calculation of the clamping force on page 4			
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 (see page 4)	Clamping [cm ³ /s]	10	14	32	57
	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 to return	[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 d2	[mm]	33	42	54	54.5
Ø d3	[mm]	10	10	12	12
e	[mm]	8.5	7.5	9	8 x 50°
Ø f	[mm]	27	30	36	40
g	[mm]	M14x1.5	M18x1.5	M20x1.5	M28x1.5
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
v2	[mm]	113	120	137	156
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
Part no.	Clockwise rotation 90°	1843 X090 R23M	1844 X090 R24M	1845 X090 R30M	1846 X090 R36M
	Swing direction 90° ccw	1843 X090 L23M	1844 X090 L24M	1845 X090 L30M	1846 X090 L36M
	0 degree	1843 X000 023M	1844 X000 024M	1845 X000 030M	1846 X000 036M

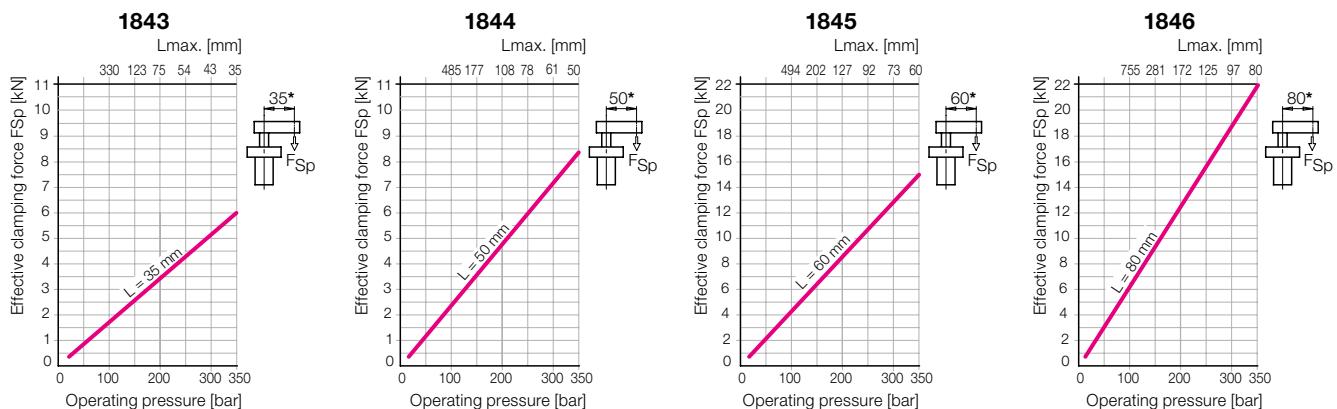
Code letter **X** see page 2.

¹⁾ h = upper edge piston / h max. = upper edge nut

²⁾ = lower edge clamping arm

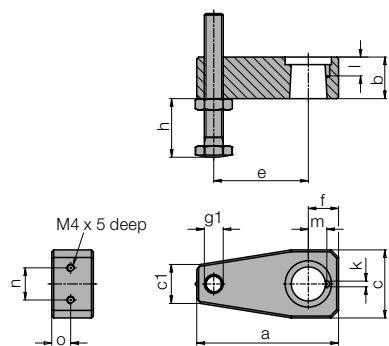
M = Option metallic wiper (see also page 6)

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

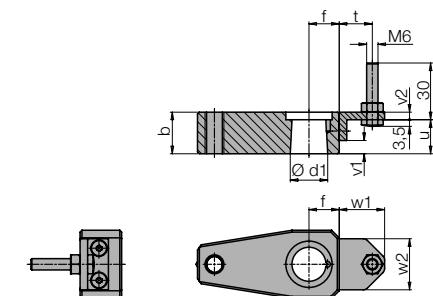


* Clamping force for other lengths see page 4.

Clamping arm, max. 350 bar

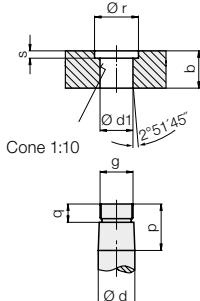


Clamping arm complete with angle

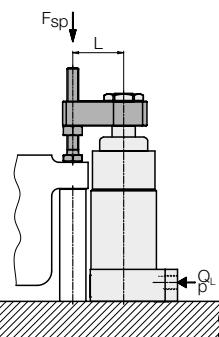


Special clamping arm

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!

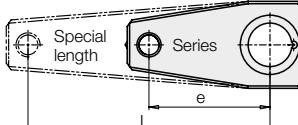
Swing clamps

		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]	9.5	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	0354 152	0354 153	0354 154	0354 155
Weight, approx.	[kg]	0.19	0.39	0.69
Moment of inertia of J_e	[kgm ²]	0.00011	0.00046	0.0011
- without thread g1	3548 660	3548 661	3548 803	3548 804
Weight, approx.	[kg]	0.16	0.34	0.62
Moment of inertia of J_e	[kgm ²]	0.00007	0.00033	0.00084
- complete with angle	0354 156	0354 157	0354 158	0354 159
Angle bracket complete	0184 003	0184 004	0184 005	0184 005
Plastic cover**	3300 686	3300 685	3300 684	3300 684
Metallic wiper	0341 104	0341 107	0341 105	0341 100
Spare nut	3527 092	3527 014	3527 099	3527 015
Tightening torque	[Nm]	16	30	42
				90

Special clamping arm



**Order 4 off swing clamps

2.2 Moments of inertia not known

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

Example: Swing clamps 1843

$L = 70 \text{ mm}$

$e = 35 \text{ mm}$ as per above chart

$Q_e = 10 \text{ cm}^3/\text{s}$ (as per chart page 3)

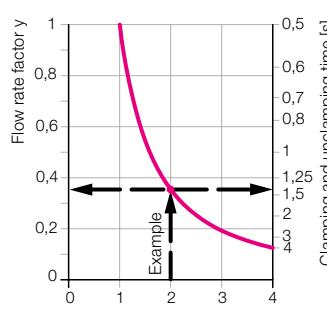
1. Extension factor $x = \frac{L}{e} = \frac{70 \text{ mm}}{35 \text{ mm}} = 2$

2. Flow rate factor as per diagram $\rightarrow y = 0.35$

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 \rightarrow 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

$L = 70 \text{ mm}$

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

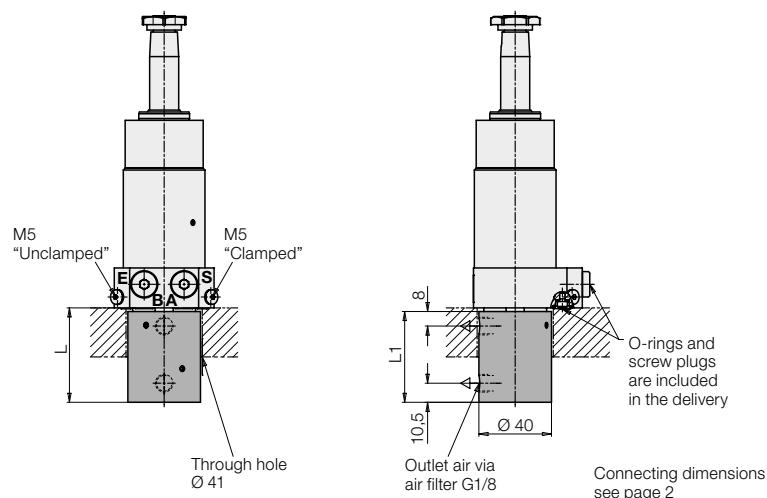
A prerequisite for automated processes of workpiece clamping are hydraulic clamping elements whose position can be monitored at any time.

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.

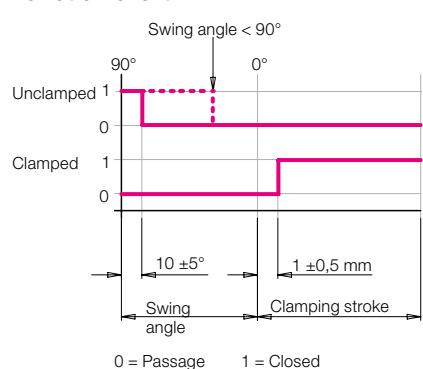
Technical data

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

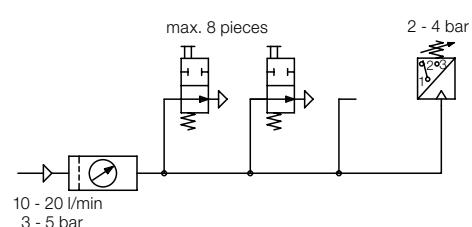
*) Required pressure drop if one or several position monitorings are not operated.

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

Function chart



Monitoring by pneumatic pressure switch



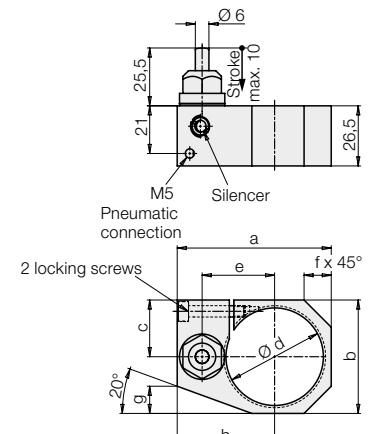
For the evaluation of the pneumatic pressure built-up standard pneumatic pressure switches can be used. It is possible to monitor with one pressure switch up to 8 position monitorings connected in series (see circuit diagram). It has to be considered that process-safe functioning of pneumatic position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

Locking flange with pneumatic valve

With the integrated pneumatic valve the clamping position can be monitored directly at the clamping arm.

The fixing at the swing is made by tightening both locking screws.

The precise adjustment is made in clamping position with clamped workpiece. The valve tappet has to be pushed by approx. 5 mm (function chart see page 2).



Swing clamps

	1843	1844	1845	1846
a [mm]	68	76	85.5	100
b [mm]	50	58	66	82
c [mm]	25	29	33	41
Ød [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

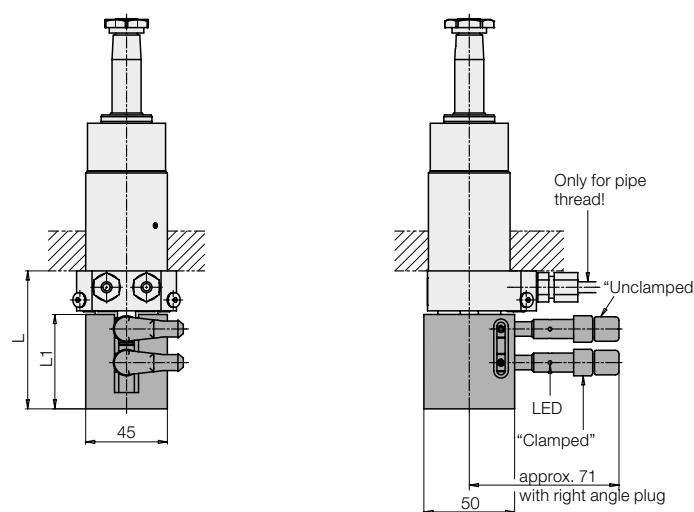
* Installation dimensions for pneumatic valve see B 1.853 page 5

Accessory for 184XMOXX • Electrical position monitoring (adjustable) Important notes • Wiper system • Throttling of flow rate

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).



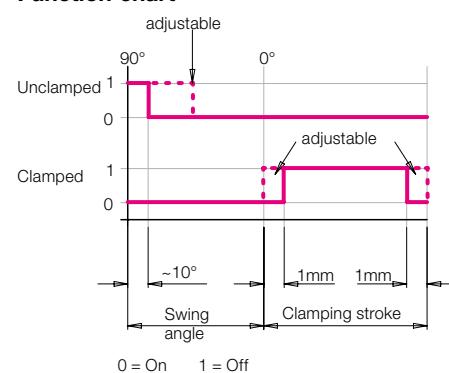
Description

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.

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



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.

Part no.

Swing clamps	1843M0XX	1844M0XX	1845M0XX	1846M0XX
L [mm]	76	76	100	100
L1 [mm]	52	52	73	73
With switch and plug	0353905	0353905	0353915	0353915
Without switch and plug	0353906	0353906	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.

