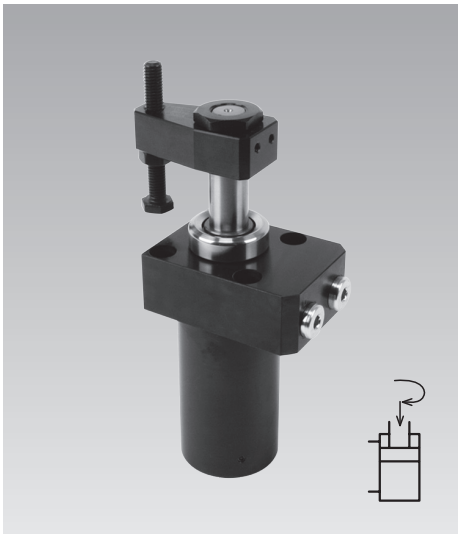
ROEMHELD

B 1.853

Swing Clamps with Sturdy Swing Mechanism

Top flange type, with optional position monitoring, double acting, max. operating pressure 350 bar

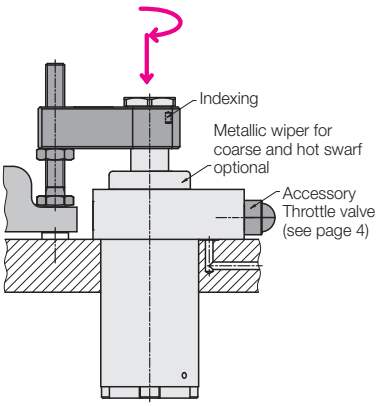


Note

The existing sizes 1 – 4 are included in data sheet **B 1.8350**

Advantages

- 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 realisable
- Standard FKM wiper
- Metallic wiper optional
- Throttle valves available as accessory
- 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

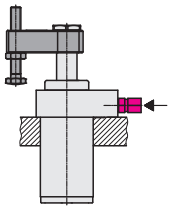
The hydraulic swing clamp is a pull-type cylinder where a part of the total stroke is used to swing the piston.
The favourable area ratio (piston/piston rod) allows high clamping forces already at relatively low oil pressures.
Due to the sturdy swing mechanism the angle position of the clamping arm remains 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.
For connection via drilled channels, adjustable throttle valves can be screwed instead of the screw plugs.
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

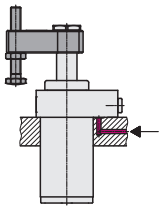
Pipe thread

1847**A**



Drilled channels

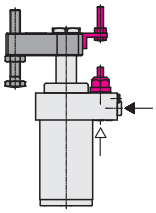
1847**A**



Pneumatic position monitoring integrated

Monitoring of the clamping arm in clamping position (adjustable)

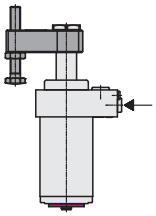
1847 **C** **P**



Position monitoring as accessories

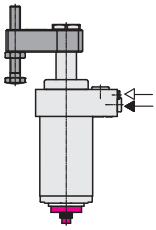
Switch rod for external sensors

1847**B**



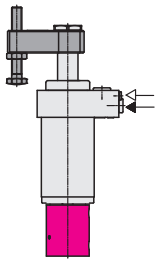
Monitoring of the piston in unclamping position

1847**D**



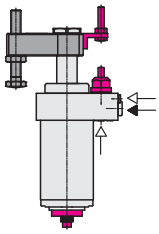
Pneumatic position monitoring in clamping and unclamping position

1847**B**
+
Accessories
Page 5



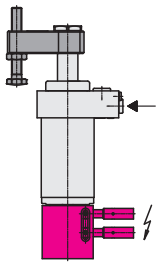
Both controls combined

1847 **H** **Q**

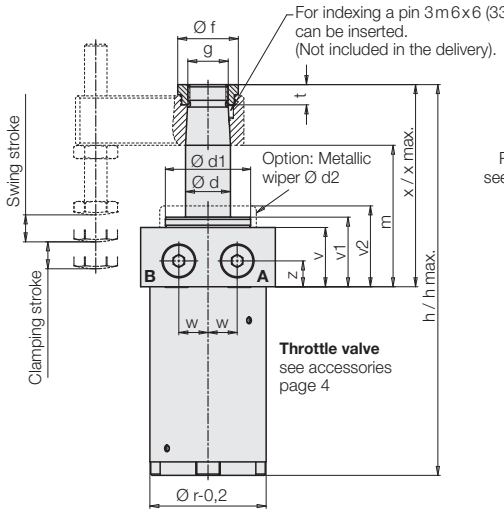


Electrical position monitoring in clamping and unclamping position

1847**B**
+
Accessories
Page 6

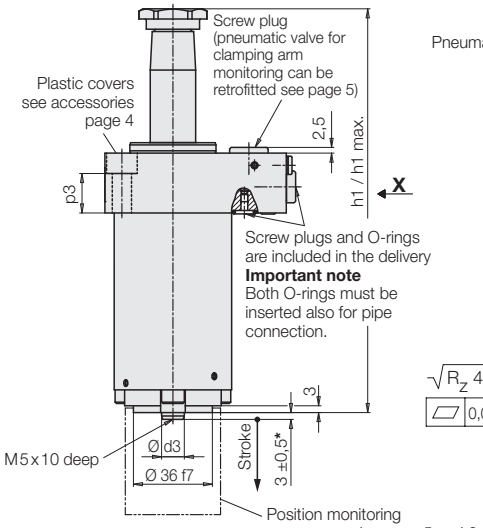


A (without monitoring)

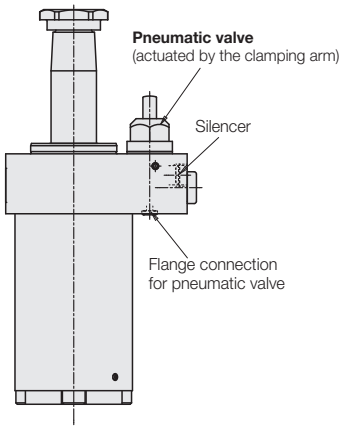


A = Clamping
B = Unclamping
E = Unclamped (pneumatic)
S = Clamped (pneumatic)

B (with switch rod)

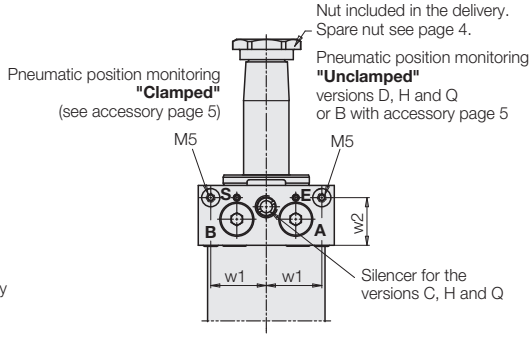


(Monitoring "Clamped")
C Switching area 2 ÷ 9 mm
P Switching area 2 ÷ 10 mm

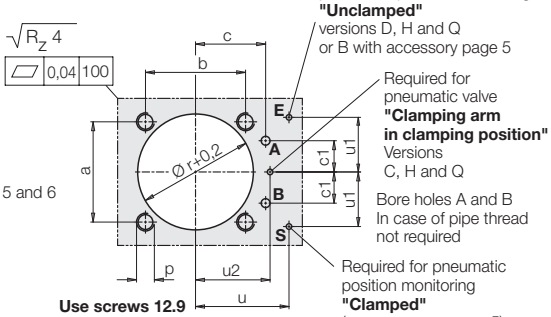


Attention danger of collision!
The contact bolt for the actuation of the pneumatic valve must be completely screwed into the angle bracket for start up (see page 4 dimension 3.5 mm)
The adjustment is made with clamped workpiece to approx. 5 mm valve stroke.

View X

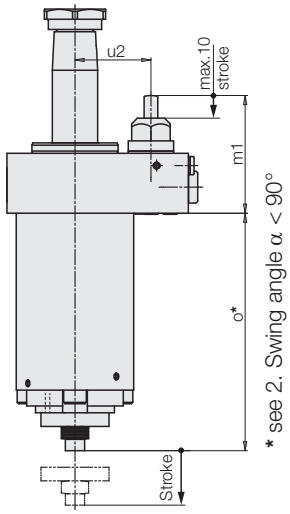


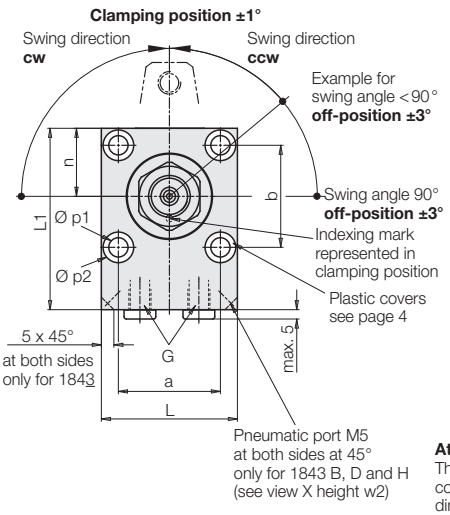
Connecting scheme



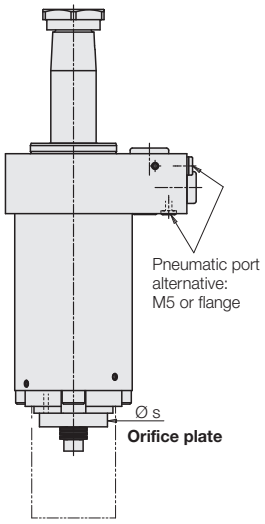
Connecting holes: 2 x hydraulics (A, B) max. Ø 5
Spare-O-ring 8 x 1.5 part no. 3000343
3 x pneumatics max. Ø 2.5 (only as required)
Spare-O-ring 3.68 x 1.78 part no. 3000334

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





D (Monitoring "Unclamped")



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.

Swing angle

1. Swing angle 90° (standard)

	Part no.
90° cw	**1847 X090 RXXD**
90° ccw	**1847 X090 LXXD**
0°	**1847 X000 0XXD**

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:

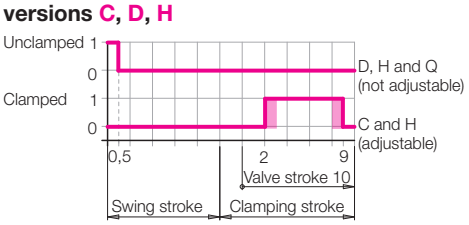
Swing clamp	1847 A090 L30D
Desired swing angle	**45° ccw**
Part no.	**1847 A045 L30D**

Shortening:
y = (90° – 45°) * 0.12 mm/° = 5.4 mm

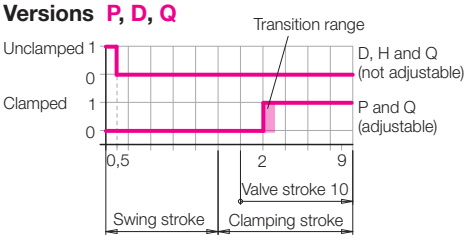
3. Swing angle > 90°

Available on request!

Pneumatic position monitoring versions C, D, H



Versions P, D, Q



0 = Passage 1 = Closed

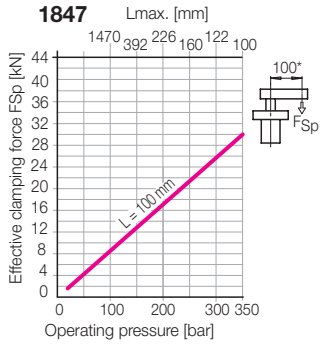
Max. pulling force (350 bar)		[kN]	39.1
Effective clamping force		[kN]	See the diagram below, or calculation of the clamping force on page 4
Clamping stroke		[mm]	15
Swing stroke		[mm]	24
Total stroke ± 0.2		[mm]	39
Min. operating pressure		[bar]	30
Max. flow rate	Clamping	[cm³/s]	87
(see page 4)	Unclamping	[cm³/s]	185
Effective piston area	Clamping	[cm²]	11.19
	Unclamping	[cm²]	23.75
Oil volume / stroke		[cm³]	43.7
Oil volume / return stroke		[cm³]	92.7
Piston Ø		[mm]	55
a		[mm]	76
b		[mm]	76
c		[mm]	56
c1		[mm]	20.5
Ø d		[mm]	40
Ø d1		[mm]	60
Ø d2		[mm]	75
Ø d3		[mm]	12
Ø f		[mm]	55
g		[mm]	M35x1.5
G			G 1/4
h +0.4/–0.3 / h max.[1]		[mm]	254/255.7
h1 +0.4/–0.3 / h1 max.[1]		[mm]	257/258.7
k		[mm/°]	0.183
L		[mm]	100
L1		[mm]	120
m +0.4/–0.7[2]		[mm]	84.8
m1		[mm]	56
n		[mm]	50
o		[mm]	146
p		[mm]	M12
Ø p1		[mm]	13
Ø p2 H13		[mm]	20
p3		[mm]	17.4
Ø r		[mm]	90
Ø s		[mm]	33
t		[mm]	11
u		[mm]	62
u1		[mm]	35
u2		[mm]	53.5
v		[mm]	30.4
v1		[mm]	36
v2		[mm]	41
w		[mm]	20.5
w1		[mm]	35
w2		[mm]	26
x +0.3/–0.2 / x max.[1]		[mm]	128/129.6
z		[mm]	15
Weight, approx.		[kg]	8.9
Part-no.	Swing direction 90° cw		**1847 X090 R39DM**
	Swing direction 90° ccw		**1847 X090 L39DM**
	0 degree		**1847 X000 039DM**

Code letter **X** see page 2.

[1] h / h1 / x = upper edge piston h max. / h1 max. / x max. = upper edge nut

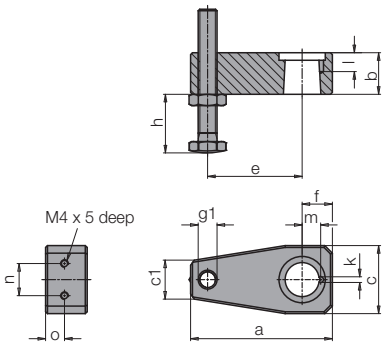
[2] m = lower edge clamping arm

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

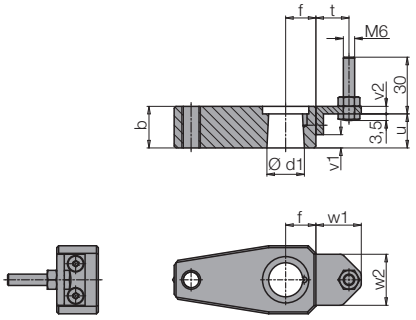


* Clamping force for other lengths see page 4

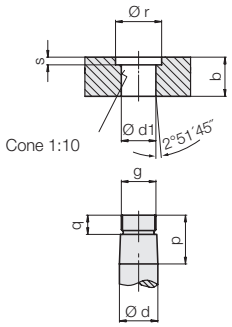
Clamping arm, max. 350 bar



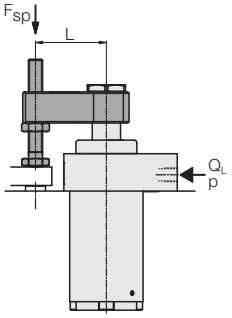
Clamping arm complete with angle



Special clamping arm
1. Connecting dimensions



2. Admissible flow rate Q*



***** Only for vertical mounting position!

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:

Swing clamps		**1847**
a	[mm]	154
b	[mm]	38
c	[mm]	72
c1	[mm]	36
Ø d f7	[mm]	40
Ø d1 +0.1/+0.05	[mm]	39.8
e	[mm]	100
f	[mm]	34
g	[mm]	M35x1.5
g1	[mm]	M20
h min/max	[mm]	12/100
Ø k +0.1	[mm]	3
l +0.5	[mm]	12
m ±0.05	[mm]	19
n	[mm]	20
o	[mm]	20
p	[mm]	44
q	[mm]	12.7
Ø r	[mm]	46
s	[mm]	5
t	[mm]	19
u	[mm]	25
v1	[mm]	12
v2	[mm]	5
w1	[mm]	26
w2	[mm]	30
Part no. Clamping arm		
– with contact bolt		**0354259**
Weight, approx.	[kg]	2.64
Moment of inertia of J_e	[kgm²]	0.01198
– without thread g1		**3548919**
Weight, approx.	[kg]	2.34
Moment of inertia of J_e	[kgm²]	0.00896
– complete with angle		**0354175**
Angle bracket complete		**0184005**
Plastic cover**		**3300682**
Metallic wiper		**0341101**
Spare nut		**3527048**
Tightening torque	[Nm]	160

** Order 4 off per swing clamp

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 determined with the help of the CAD model in the computer

2.2. Accessory
Throttle valve

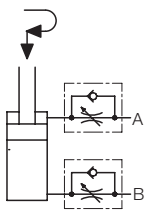
Throttle valves are used
- in order to reduce the swing speed of the clamping arm;
- in order to improve the synchronism of several swing clamps.

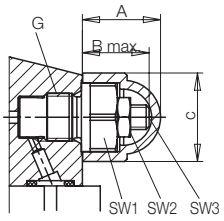
This application is only possible for manifold-mounting connection through drilled channels.

Important note

If throttling is too strong, the back pressure can trigger premature switching of pressure switches and sequence valves.

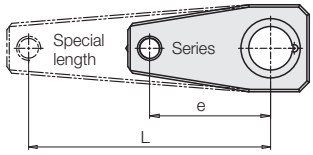
Hydraulic symbol





Swing clamps		**1847**
A	[mm]	21
B max.	[mm]	17.5
C	[mm]	23.6
G		G 1/4
SW1	[mm]	19
Tightening torque	**[Nm]**	35
SW2	[mm]	8
SW3	[mm]	2.5
Weight	[kg]	0.036
Part no.		**2957210**

Special clamping arm



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	**1847**
A	8.93
B	0.027
C	3000
D	26805
E	81.78

Example: Swing clamps 1847
L = 100 mm

1. Admissible clamping force

$$F_{adm} = \frac{C}{L} = \frac{3000}{100} = 30\ \text{kN}$$

2. Admissible operating pressure

$$p_{adm} = \frac{D}{L} + E = \frac{26805}{100} + 81.78 = 350\ \text{bar}$$

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.

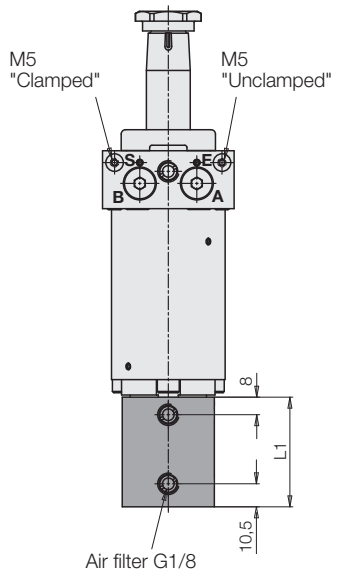
Pneumatic port

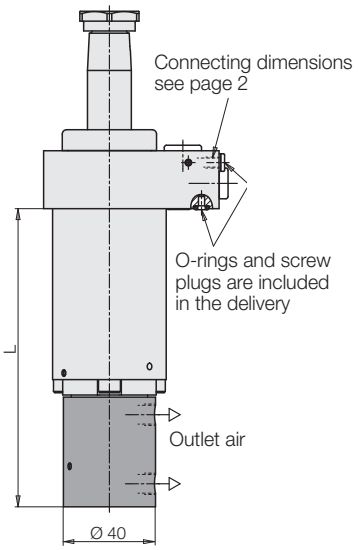
Drilled channels

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.



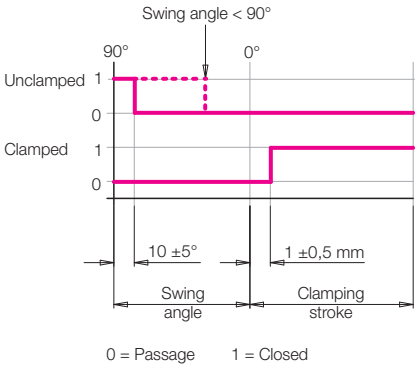


Technical data

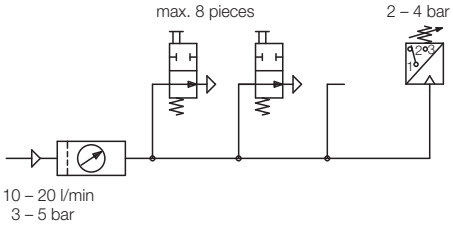
Port		O-ring or thread M5
Nominal diameter	[mm]	2
Max. air pressure	[bar]	10
Range of operating pressure	[bar]	3…5
Differential pressure ***)** at		
3 bar system pressure	[bar]	min. 1.5
5 bar system pressure	[bar]	min. 3.5
Air flow rate ****)**	[l/min]	10…20

***)** 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



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 characteristics.

Part no.

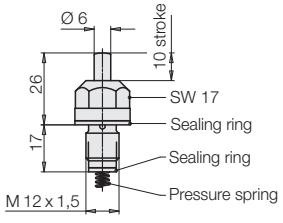
Swing clamps		1847B0XX
L	[mm]	200
L1	[mm]	73
Swing angle (see page 2)		
0 or 90°		**0353956**
15 to 75° = **XX**		**0353956 0XX**
(graduation of 5°)		

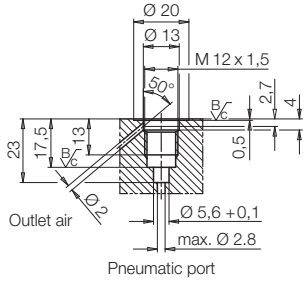
Pneumatic valve

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.



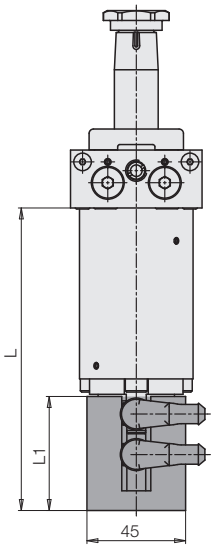


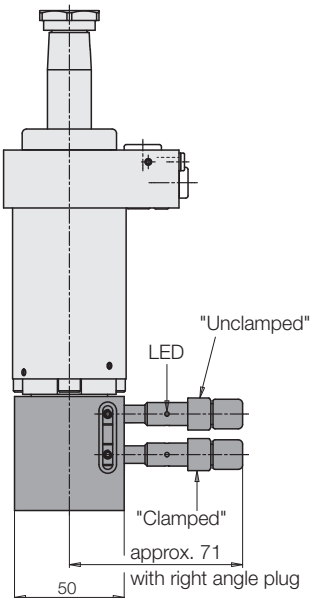
Application

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.

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.

Technical data

Operating voltage	10…30 VDC
Max. residual ripple	15 %
Max. constant current	200 mA
Switching function	interlock
Output	PNP
Material of housing	stainless steel
Thread	M8x1
Code class	IP 67
Ambient temperature	–25…+70 °C
LED function display	yes
Protected against short circuits	yes
Type of connection	right angle plug
Length of cable	5 m

Part no.

Swing clamps		**1847B0XX**
L	[mm]	200
L1	[mm]	73
with switch and plug		**0353915**
without switch and plug		**0353917**

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.

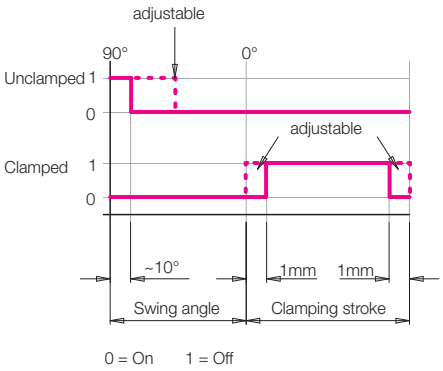
The metallic wiper can be delivered already mounted ("M") or as an accessory for retrofitting (see page 4).

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.

Function chart



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.