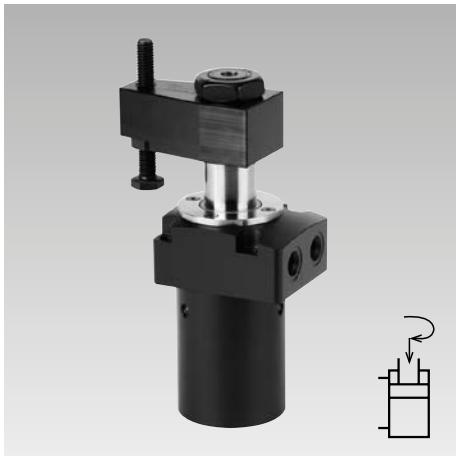




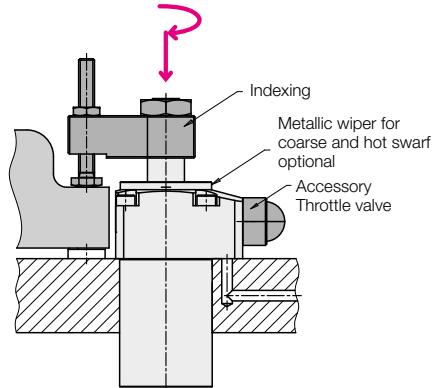
## **Swing Clamps with Sturdy Swing Mechanism**

**Top flange type, with optional position monitoring, double acting, max. operating pressure 120 bar**



### **Advantages**

- 4 sizes available
- Compact design partially recessible
- Very high clamping force already at 120 bar
- Sturdy swing mechanism
- Very short clamping time
- Insensitive against high flow rates
- Indexing of the clamping arm in a specified position is possible
- Special swing angle easily realisable
- FKM wiper standard
- Metallic wiper optional
- Throttle valves available as accessory
- Position monitoring available as accessory
- 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.

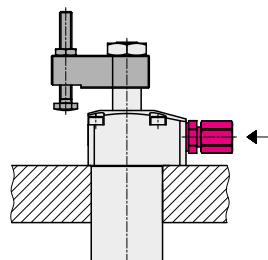
This series obtains very high clamping forces already at 120 bar and can directly be connected to the low-pressure hydraulics of the machine tool. An additional power unit for power workholding is no longer necessary.

With the sturdy swing mechanism and the optional position monitoring these swing clamps are particularly suitable for:

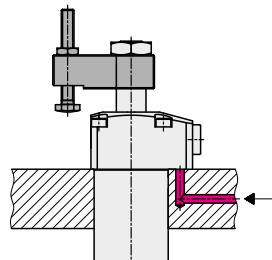
- Automatic manufacturing systems with very short cycle times
- Clamping fixtures with workpiece loading by handling systems
- Transfer lines
- Test systems for motors, gears and axes
- Assembly lines
- Special machine tools

### **Installation and connecting possibilities**

#### **Pipe thread**

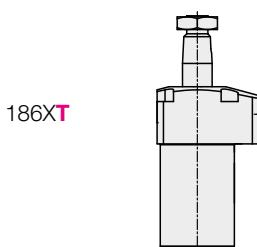


#### **Drilled channels**

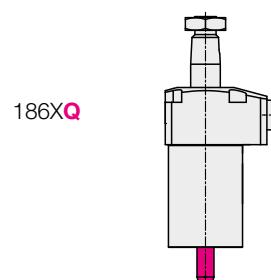


### **Versions**

#### **Without switch rod**



#### **With switch rod**



### **Description**

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

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 and unloading or during clamping.

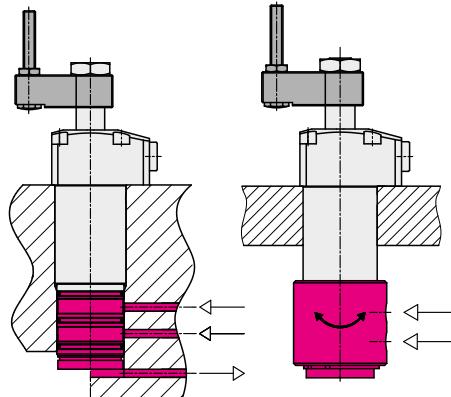
The angle position of the clamping arm is fixed with a dowel pin.

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 version with extended switch rod is provided for mounting of pneumatic or electrical position monitorings (accessory).

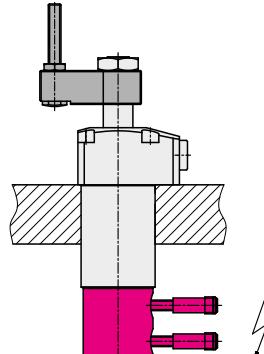
Important notes see page 6.

### **Accessories**

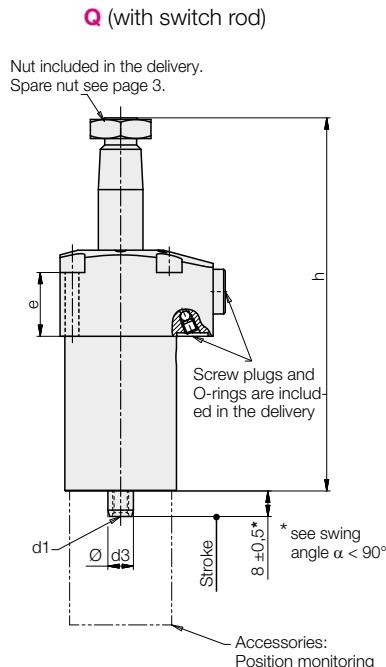
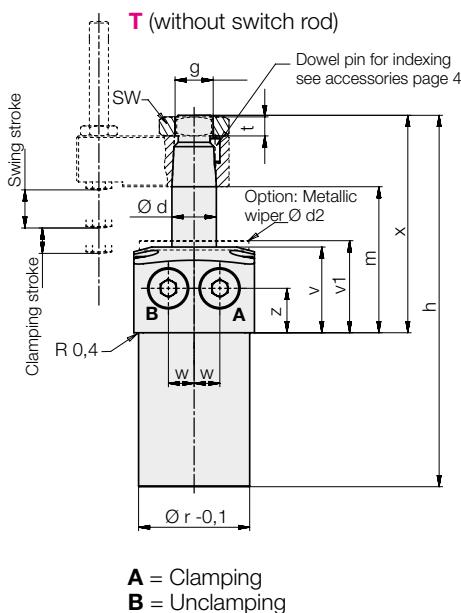
#### **Pneumatic position monitoring**



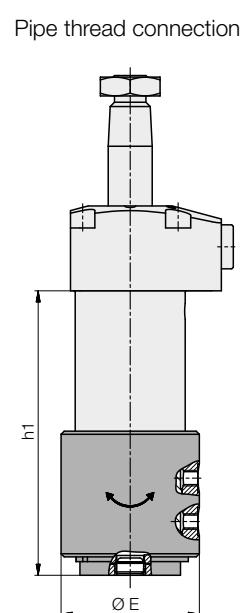
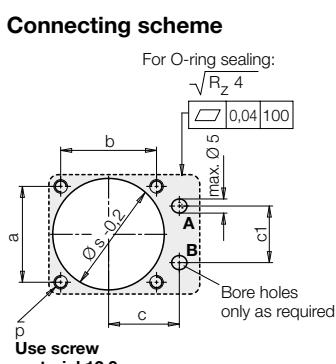
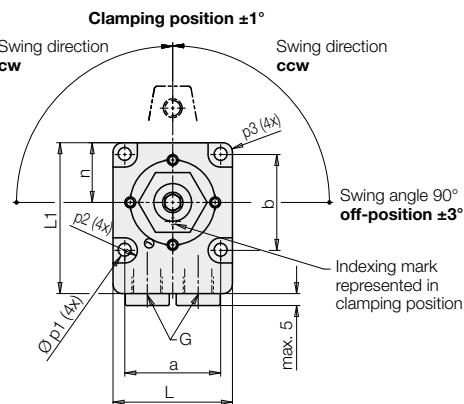
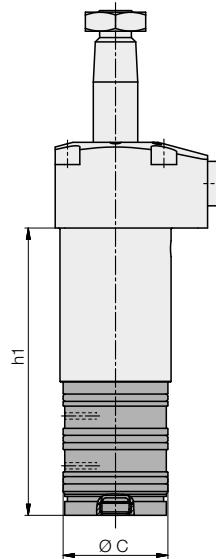
#### **Electrical position monitoring**



**Versions: Code letters T, Q**  
**Accessories • Dimensions • Swing Angles**



**Accessories**  
**Pneumatic position monitoring** (page 5)  
 Cartridge type



#### Swing angle

##### 1. Swing angle 90° and 0° (standard)

###### Part no.

90° cw  
90° ccw  
0°

###### Part no.

186XX090RXX  
186XX090LXX  
186XX000XX

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

$\alpha = 15^\circ$  to  $75^\circ$  in gradation of  $5^\circ$

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

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

Dimension 8 ± 0.5 is lengthened by the value y.

Example:

Swing clamp 1866T090L27  
Desired swing angle 45° ccw  
Part no. 1866T045L27

Shortening:

$$y = (90^\circ - 45^\circ) * 0.125 \text{ mm/}^\circ = 5.625 \text{ mm}$$

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

Available on request!

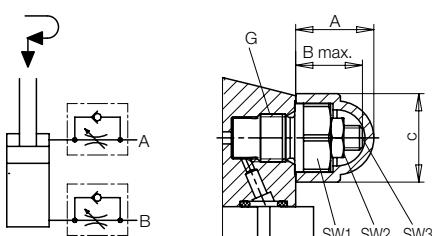
#### Accessory Throttle valve

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 manifold-mounting connection through drilled channels.

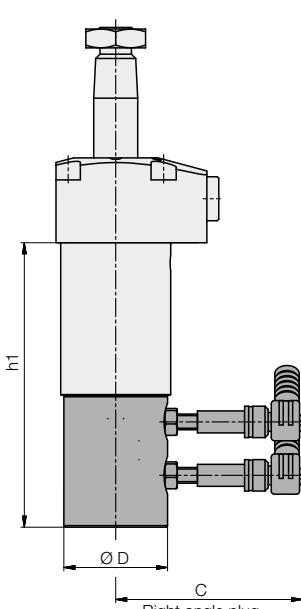
#### Hydraulic symbol



#### Swing clamps

	1863	1866
Part no.	1864	1867
A	[mm]	16
B max.	[mm]	13.5
C	[mm]	18
G		G 1/8 G 1/4
SW1	[mm]	14
Tightening torque	[Nm]	18
SW2	[mm]	8
SW3	[mm]	2.5
Weight	[kg]	0.025 0.036
Part no.	2957209	2957210

#### Electrical position monitoring (page 6)



#### Important notes see page 6.

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

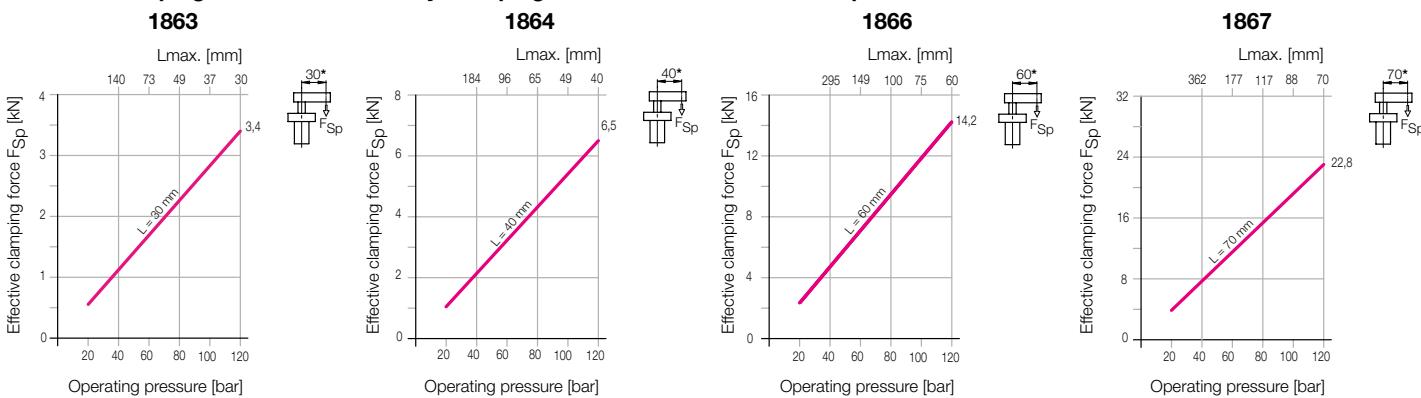
## Technical data

Max. pulling force (120 bar)	[kN]	4.04	7.65	17	27.6
Effective clamping force	[kN]	see diagram or calculation of the clamping force on page 4			
Clamping stroke	[mm]	8	8	10	10
Swing stroke	[mm]	8	13	17	19
Total stroke	[mm]	16	21	27	29
Min. operating pressure	[bar]	20	20	20	20
Max. flow rate	clamping unclamping	[cm <sup>3</sup> /s]	13.5 20	33.5 53.5	96 145
Piston area	clamping unclamping	[cm <sup>2</sup> ]	3.36 4.9	6.37 10.17	14.16 21.23
Oil volume / stroke	[cm <sup>3</sup> ]	5.4	13.4	38.3	66.7
Oil volume / return stroke	[cm <sup>3</sup> ]	7.9	21.4	57.4	102
Piston Ø	[mm]	25	36	52	65
a	[mm]	30.5	40	56	68
b	[mm]	30.5	40	56	68
c	[mm]	22.5	28	36	42
c1	[mm]	18	24	36	45
Ø d	[mm]	14	22	30	36
Ø d1	[mm]	M5 x 14.5 deep	M6 x 11.5 deep	M8 x 16.0 deep	M8 x 16.0 deep
Ø d2	[mm]	34.5	44.5	52.5	58.5
Ø d3 f7	[mm]	8	10	12	12
e	[mm]	20	19.5	19	23.5
SW	[mm]	SW 19	SW 27	SW 36	SW 46
g	[mm]	M12	M18 x 1.5	M24 x 1.5	M30 x 1.5
G		G 1/8	G 1/8	G 1/4	G 1/4
h	[mm]	117	149	178.5	203.5
h1	[mm]	90.5	110	132	141
k	[mm/°]	0.056	0.095	0.125	0.125
L	[mm]	38	50	70	86
L1	[mm]	48	60	82	96
m	[mm]	46	54	64.5	72.5
n	[mm]	19	25	35	43
p	[mm]	M4 (10.9)	M5 (10.9)	M8 (10.9)	M10 (10.9)
Ø p1	[mm]	4.3	5.5	9	11
p2	[mm]	4	5	7	9
p3	[mm]	3	3	6	7
Ø r -0.1	[mm]	35	47	63	78
Ø s -0.2	[mm]	36	48	64	79
t	[mm]	6	9	10	12
v	[mm]	27	29.5	34.5	39
v1	[mm]	29	31.5	36.5	41
w	[mm]	8.1	11	15	19
x	[mm]	68.5	88	101.5	119.5
z	[mm]	14	13.5	15.5	15.5
Weight, approx.	[kg]	0.7	1.5	3.0	5.0
<b>Part no.</b>	Clockwise rotation 90°	<b>1863 X090 R16M</b>	<b>1864 X090 R21M</b>	<b>1866 X090 R27M</b>	<b>1867 X090 R29M</b>
	Swing direction 90° ccw	<b>1863 X090 L16M</b>	<b>1864 X090 L21M</b>	<b>1866 X090 L27M</b>	<b>1867 X090 L29M</b>
	0 degree	<b>1863 X000 016M</b>	<b>1864 X000 021M</b>	<b>1866 X000 027M</b>	<b>1867 X000 029M</b>
Spare O-ring	[mm]	7 x 1.5	7 x 1.5	8 x 1.5	8 x 1.5
<b>Part no.</b>		<b>3000 342</b>	<b>3000 342</b>	<b>3000 343</b>	<b>3000 343</b>
Spare nut DIN 936		M12	M18 x 1.5	M24 x 1.5	M30 x 1.5
Tightening torque	[Nm]	12	30	62	110
<b>Part no.</b>		<b>3302 115</b>	<b>3301 663</b>	<b>3302 104</b>	<b>3302 139</b>

Code letter **X** see page 2.

**M** = Option metallic wiper (see also page 6)

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

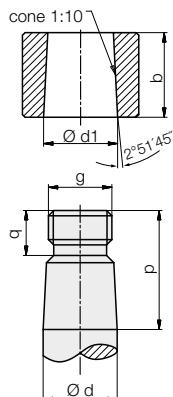


\* Clamping force for other lengths see page 4.

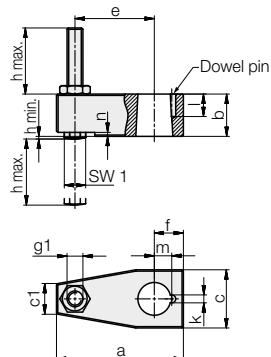
# Accessories - Clamping arms • Metallic wipers

## Calculation of the flow rate • Calculation of the clamping force

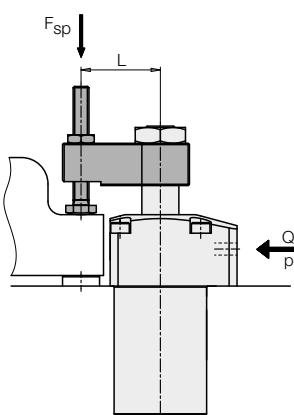
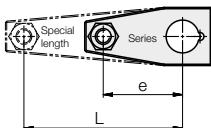
### Dimensions for special clamping arms



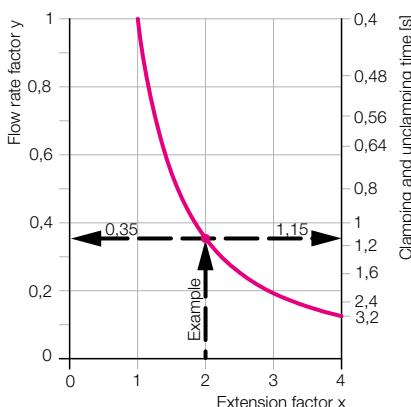
### Clamping arm



### Special clamping arm



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



### Swing clamps

		1863	1864	1866	1867
a	[mm]	48	65	96	114
b	[mm]	16	25	27	35
c	[mm]	22	34	52	60
c1	[mm]	12	19	31	36
Ø d	[mm]	14	22	30	36
Ø d1 -0.05	[mm]	14	22	30	36
e	[mm]	30	40	60	70
f	[mm]	11	17	25	30
g	[mm]	M12	M18 x 1.5	M24 x 1.5	M30 x 1.5
g1	[mm]	M6	M8	M12	M16
h min.	[mm]	1	1	1	1
h max.	[mm]	40	46	54	63
Ø k +0.1	[mm]	3	3	6	6
l +0.5	[mm]	8.5	8.5	12.5	12.5
m ±0.05	[mm]	6.6	10.3	15	18.1
n	[mm]	1.5	2.5	6	8
p	[mm]	22.5	34	37	47
q	[mm]	8.5	11.5	12.5	15.5
SW 1	[mm]	8	10	18	24
Moment of inertia of $J_e$ [kgmm <sup>2</sup> ]		44	230	1284	3247

### Part no.

Clamping arm with contact bolt and dowel pin	0354 243	0354 249	0354 254	0354 256
Dowel pin	3 m 6x8 3301 854	3 m 6x8 3301 854	6 m 6x12 3300 325	6 m 6x12 3300 325
Metallic wiper	0341 227	0341 228	0341 229	0341 230

### Admissible flow rate

With the accessory clamping arm and the admissible flow rate as per chart (page 3) the shortest clamping time is approx. 0.4 seconds. 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:

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

$Q_e$  = Flow rate as per chart (page 3)

$Q_L$  = Flow rate with special clamping arm

$J_L$  = Torque of inertia accessory clamping arm

$J_e$  = Torque of inertia special clamping arm

If the torques of inertia are not known, the admissible flow rate can be determined according to the following example:

Conditions: The special clamping arm is longer, has however the form (cross section) of the accessory clamping arm, as shown on the left.

**Example:** Swing clamp 1863 T090 R16

$L = 60 \text{ mm}$

$e = 30 \text{ mm}$  as per above chart

$Q_e = 13.5 \text{ cm}^3/\text{s}$  (as per chart page 3)

### Calculation of the clamping force

The diagrams on page 3 show the effective clamping force with accessory clamping arm ( $L = e$ ).

With longer clamping arms ( $L > e$ ) the degree of efficiency is reduced. This is considered in the following calculation.

The constants (A....E) for the 4 sizes are shown in the chart.

Constant	1863	1864	1866	1867
A	29.68	15.68	7.06	4.35
B	0.177	0.069	0.023	0.013
C	102.9	260.5	853.8	1596
D	3053	4087	6026	6939
E	18.2	17.86	19.55	20.86

### Effective clamping force

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

### Admissible clamping force<sup>\*)</sup>

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

### Admissible operating pressure

$$p_{adm.} = \frac{D}{L} + E \leq 120 \quad [\text{bar}]$$

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

<sup>\*)</sup> With a desired clamping arm length  $L$  the clamping force must not exceed the admissible value.

**Example:** Swing clamp 1863 T090 R16  
Special clamping arm  $L = 60 \text{ mm}$

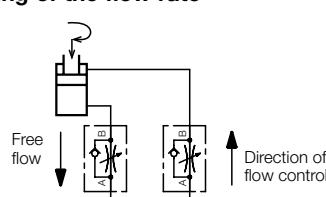
1. Admissible clamping force

$$F_{adm.} = \frac{C}{L} = \frac{102.9}{60} = 1.71 \text{ kN}$$

2. Admissible operating pressure

$$p_{adm.} = \frac{D}{L} + E = \frac{3053}{60} + 18.2 = 69 \text{ bar} < 120$$

### Throttling of the flow rate



# Accessories

## Pneumatic position monitoring • Mounting body

### Application

The pneumatic position monitoring signals the following conditions by closing two bore holes:  
 1. Piston extended and clamping arm in off-position.  
 2. Piston in clamping area and clamping arm in clamping position.

For each control function, a pneumatic line has to be provided at the clamping fixture.

### Description

The cartridge type of the pneumatic position monitoring can be easily retrofitted at all swing clamps with switch rod (186XQ0XX). When moving to a switching position, the air pressure in the supply line increases and operates a differential pressure switch or an electro-pneumatic pressure switch.

### Pneumatic port

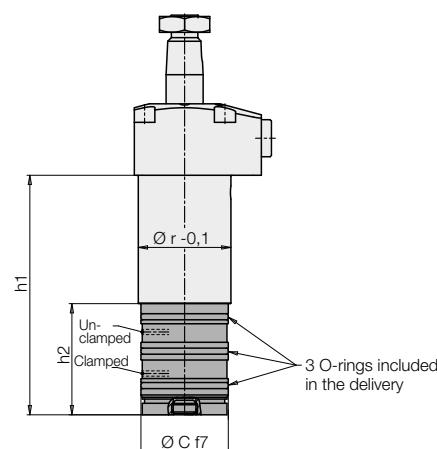
#### Cartridge type

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

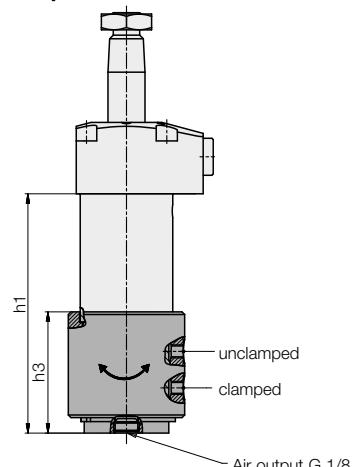
#### Mounting body

The mounting body is put onto the cartridge-type version and held by the supplied safety ring. The pneumatic ports M5 can be rotated by 360°.

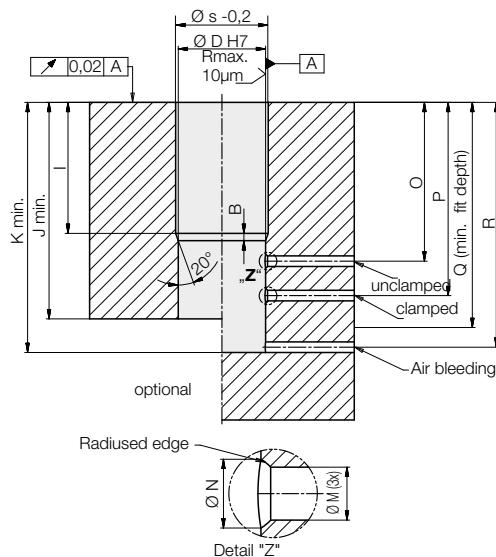
### Cartridge type



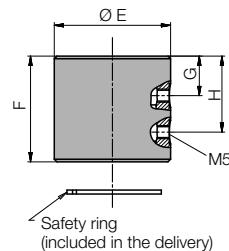
### Pipe thread connection



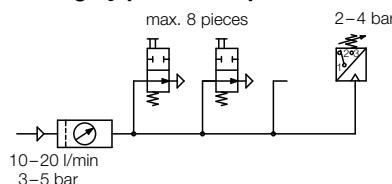
### Location hole



### Mounting body



### Monitoring by pneumatic pressure switch



For the evaluation of the pneumatic pressure increase, standard pneumatic pressure switches can be used. With one pressure switch up to 8 position monitorings can be controlled (see circuit diagram).

It has to be considered that process-safe functioning of pneumatic controls is only guaranteed with throttled air pressure and air flow rate.

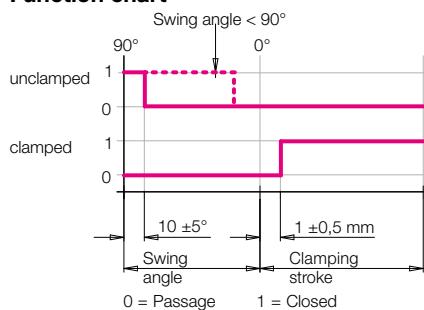
### Technical data

Connection	Drilled channels or threads M5
Nominal diameter	2 mm
Max. air pressure	10 bar
Range of operating pressure	3...5 bar
Differential pressure*) at 3 bar system pressure	min. 1.5 bar
5 bar system pressure	min. 3.5 bar
Air volume **)	10...20 l/min

\*) Minimum pressure difference, if one or several position monitorings are not operated.

\*\*) For measuring of the flow rate appropriate devices are available.

### Function chart



### Swing clamps

	1863Q0XX	1864Q0XX	1866Q0XX	1867Q0XX
Ø A [mm]	35	47	63	78
B [mm]	2.5-0.5	2.5-0.5	2.5-0.5	2.5-0.5
Ø C f7 [mm]	33	42	45	45
Ø D H7 [mm]	33	42	45	45
Ø E [mm]	44	53	56	56
F [mm]	40	47	48.8	50.8
G [mm]	14.95	16.35	13.4	14.05
H [mm]	28.75	33.35	35.4	36.75
h1 [mm]	90.5	110	132	141
h2 [mm]	42	49	55	57
h3 [mm]	46	53	54.8	56.8
I [mm]	49.5	62	78	85
J min. [mm]	83	101.5	123.5	132.5
K min. [mm]	94.5	114	136	145
Ø M [mm]	4	4	4	4
Ø N [mm]	5	5	5	5
O [mm]	60	73.5	89.5	96.5
P [mm]	73	90.5	111.5	118.5
Q min. [mm]	85	103	125	134
R [mm]	92.5	112	134	143
Ø r -0,1 [mm]	35	47	63	78
Ø s -0,2 [mm]	36	48	64	79

### Part no. Cartridge type

Swing angle 0° or 90°	0353918	0353924	0353928	0353941
15° to 75° = XX*)	03539180XX	03539240XX	03539280XX	03539410XX

### Part no. Mounting body for retrofitting of the cartridge type

0353950 0353951

0353952

0353953

\*) in gradation of 5° (see page 2, "swing angle  $\alpha < 90^\circ$ ")

# Accessories

## Electrical position monitoring • Important notes • Wiper system

### Application

The electrical position monitoring signals 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.

For each control function, an electrical line has to be provided at the clamping fixture.

### Description

The electrical position monitoring can be easily retrofitted at all swing clamps with switch rod (186XQ0XX).

Included in our delivery are:

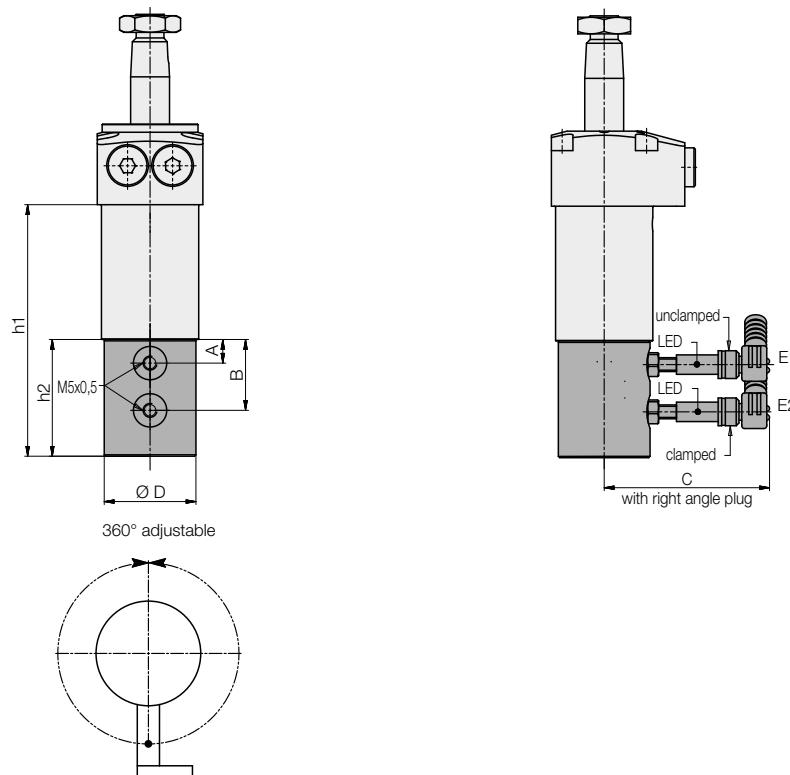
- 1 Signal sleeve with screw
- 1 Adapter with 4 countersunk screws
- 1 Control housing with 3 set screws
- 2 Inductive proximity switches with right angle plug (if ordered)

The signal sleeve is screwed onto the switch rod.

The adapter is mounted with 4 countersunk screws at the bottom cover.

The control housing can be put onto the adapter in any angular position and locked with 3 set screws.

For information on adjustment of proximity switches, see operating manual.



Possible position of the proximity switches

### Important notes

Inductive position monitorings are not suitable for the use in coolant and swarf areas. According to the corresponding application conditions, safety measures have to be planned and checked later on.

### Technical data

Operating voltage	10...30 V DC
Max. residual ripple	10%
Max. constant current	100 mA
Switching function	interlock
Output	PNP
Housing material	stainless steel
Thread	M 5 x 0.5
Code class	IP 67
Ambient temperature	-25...+70°C
LED function display	yes
Protected against short circuits	yes
Type of connection	plug
Length of cable	5 m

Swing clamps	1863Q0XX	1864Q0XX	1866Q0XX	1867Q0XX
A [mm]	8.5	8.5	8.5	8.5
B [mm]	25.5	30.5	37.5	39.5
C approx. [mm]	59.5	61	62	62
Ø D [mm]	33	42	45	45
h1 [mm]	90.5	110	132	141
h2 [mm]	42	49	55	57

Part no. Swing angle 0° or 90°	1863Q0XX	1864Q0XX	1866Q0XX	1867Q0XX
with switch and plug	0353920	0353926	0353930	0353943
without switch and plug	0353923	0353927	0353931	0353944
Part no. 15° to 75° = XX*)				
with switch and plug	03539200XX	03539260XX	03539300XX	03539430XX
without switch and plug	03539230XX	03539270XX	03539310XX	03539440XX
Part no. Spare parts				
Inductive proximity switch	3829198	3829198	3829198	3829198
Right angle plug 5 m	3829099	3829099	3829099	3829099

\*) in gradation of 5° (see page 2, "swing angle  $\alpha < 90^\circ$ ")

### Important notes

Swing clamps must only be used for clamping of workpieces in industrial applications and may only be operated with hydraulic oil. They can generate very high forces. The workpiece, the fixture or the machine must be in the position to compensate these forces.

In the effective area of piston rod and clamping arm there is the danger of crushing.

The manufacturer of the fixture or the machine is obliged to provide effective protection devices. The swing clamp has no overload protection device. When mounting the clamping arm, the clamping arm or the hexagon socket in the piston have to be backed up for tightening or untightening the fixing nut.

During loading and unloading of the fixture and during clamping a collision with the clamping arm has to be avoided.

Remedy: Mount position adaptor.

### 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

