Swing Clamps with Sturdy Swing Mechanism
Top flange type, with optional position monitoring, double acting, max. operating pressure 70 bar

Advantages
- 4 sizes available
- Compact design partially recessible
- High clamping force already at 70 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 realizable
- 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 70 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

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.

Installation and connecting possibilities
Pipe thread
Drilled channels

Versions
Without switch rod
With switch rod

185XT
185XQ

Accessories
Pneumatic position monitoring
Electrical position monitoring

Subject to modifications
### Swing angle

1. **Swing angle 90° and 0° (standard)**
   - Part no.:
     - 90° cw: 185XX080RX1
     - 90° ccw: 185XX080LX1
     - 0°: 185XX000RX1

2. **Swing angle α < 90°**
   - \( \alpha = 15° \) 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, m and x are reduced by \( y \):
     - \( y = (90° - \alpha) \times k \) (\( k \) see chart page 3)
   - Dimension \( h \leq 0.5 \) is lengthened by the value \( y \).

   **Example:**
   - Swing clamp 1856 T090L27
   - Desired swing angle 45° ccw
   - Part no.:
     - 1856T045L27
   - Shortening:
     - \( y = (90° - 45°) \times 0.125 \text{ mm/°} = 5.625 \text{ mm} \)

3. **Swing angle > 90°**
   - Available on request!

   **Important notes see page 6.**

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

### Accessories

- **Throttle valves**
  - 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!**
  - In case of strong throttling, the dynamic pressure can cause premature switching of pressure switches and sequence valves.

### Electrical position monitoring (page 6)

- **Swing clamps**
  - Part no.:
    - 1853 1854 1856 1857
  - Dimensions:
    - A [mm] 16 21
    - B max. [mm] 13.5 17.5
    - C [mm] 18 23.6
    - G [mm] 1.8 1.4
    - SW1 [mm] 14 19
    - SW2 [mm] 8 8
    - SW3 [mm] 2.5 2.5
  - Weight [kg] 0.025 0.036
  - Part no.:
    - 2957209 2957210

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**Accessories:**

- Clamping position ±1°
- Swing direction ccw
- Swing angle 90°
- Swing angle ±3°
- Indexing mark represented in clamping position

**Connecting scheme**

- **For O-ring sealing:**
  - Connection: pipe thread
  - Use screw material 10.9

- **Swing direction ccw**
  - Screw plugs and O-rings are included in the delivery

**Right angle plug**

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**Versions: Code letters T, Q**

- Accessories • Dimensions • Swing Angles
### Technical data

<table>
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<tr>
<th>Parameter</th>
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<th>1856</th>
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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

![Effective clamping force graphs](https://example.com/clamping-force-graphs.png)

* Clamping force for other lengths see page 4.
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_\text{e} = Q_\text{a} \cdot \sqrt{\frac{L}{L-e}} \text{ cm}^3/\text{s}

Q_\text{a} = \text{Flow rate as per chart (page 3)}

Q_\text{e} = \text{Flow rate with special clamping arm}

J_\text{a} = \text{Torque of inertia accessory clamping arm}

J_\text{L} = \text{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 1853 T090 R16
L = 60 mm
e = 30 mm as per above chart
Q_\text{a} = 13.5 cm^3/s (as per chart page 3)

1. Extension factor x = \frac{L}{e} = \frac{60}{30} = 2
2. Flow rate factor y = 0.35
3. Max. flow rate Q_\text{e} = y \cdot Q_\text{a} = 0.35 \cdot 13.5 \text{ cm}^3/\text{s} = 4.7 \text{ cm}^3/\text{s}
4. Min. clamping time as per diagram \rightarrow \text{approx. 1.15 s}

Admissible operating pressure
p_\text{adm} = \frac{D + E}{L} \leq 70 \text{ bar}

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.

Effective clamping force
F_{\text{sp}} = \frac{p}{A + (B \cdot L)} \leq F_{\text{adm}} \text{ [kN]}

Admissible clamping force
F_{\text{adm}} = \frac{C}{L} \text{ [kN]}

Example: Swing clamp 1853 T090 R16
Special clamping arm L = 60 mm

1. Admissible clamping force
F_{\text{adm}} = \frac{C}{L} = \frac{102.9}{60} = 1.71 \text{ kN}

2. Admissible operating pressure
p_{\text{adm}} = \frac{D + E}{L} = \frac{3053 + 18.2}{60} = 69 \text{ bar} < 70

3. Effective clamping force
F_{\text{sp}} = \frac{p}{A + (B \cdot L)} = \frac{69}{29.68 + (0.177 \cdot 60)} = 1.71 \text{ kN}
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 (185XQ0XX).
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°.

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 1853Q0XX 1854Q0XX 1856Q0XX 1857Q0XX
\( \Omega A \) [mm] 35 47 63 78
\( \Omega B \) [mm] 2.5-0.5 2.5-0.5 2.5-0.5 2.5-0.5
\( \Omega C \) [mm] 33 42 45 45
\( \Omega D \) [mm] 44 53 56 56
\( \Omega E \) [mm] 44 53 56 56
\( \Omega F \) [mm] 40 47 48.8 50.8
\( \Omega G \) [mm] 14.95 16.35 13.4 14.05
\( \Omega H \) [mm] 28.75 33.35 35.4 36.75
\( h1 \) [mm] 90.5 110 132 141
\( h2 \) [mm] 42 49 55 57
\( h3 \) [mm] 48 53 54.8 56.8
\( l1 \) [mm] 49.5 62 78 85
\( J \) [mm] 85 101.5 123.5 132.5
\( K \) [mm] 94.5 114 136 145
\( O \) [mm] 4 4 4 4
\( N \) [mm] 5 5 5 5
\( O \) [mm] 60 73.5 89.5 96.5
\( P \) [mm] 73 90.5 111.5 118.5
\( Q \) [mm] 85 103 125 134
\( R \) [mm] 92.5 112 134 143
\( \Omega r -0.1 \) [mm] 35 47 63 78
\( \Omega s -0.2 \) [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 \( \alpha < 90\)**)
### Application
The electrical position monitoring signals the following conditions due to clamping 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 (185XQ0XX).
Included in our delivery are:
1. Signal sleeve with screws
2. Adapter with 4 countersunk screws
3. 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.

### 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
- **Connection type**: Plug
- **Length of cable**: 5 m

### Function chart
- **Swing angle < 90°**
- **90°**
- **0°**
- **Swing angle > 90°**

### Swing clamps

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### Part no. 15° to 75° = XX*)

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### Inductive proximity switch

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</table>

*) in gradation of 5° (see page 2, "swing angle α < 90°")

### 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.

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**Subject to modifications**

[Actual issue see www.roemheld-usa.com](http://www.roemheld-usa.com)