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

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.
A (without monitoring)

- For indexing a pin 3mmx6 (3301 281) can be inserted. (Not included in the delivery).

B (with switch rod)

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

View X

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

Connecting scheme

- Required for pneumatic valve "Unclamped" versions D, H and Q or B with accessory page 5.

Accessories: position monitoring page 5 and 6

Example for swing angle < 90° off-position α3°

Swing angle

1. Swing angle 90° (standard)

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Swing Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>184XX090RXX</td>
<td>90° cw</td>
</tr>
<tr>
<td>184XX090LXX</td>
<td>90° ccw</td>
</tr>
<tr>
<td>184XX0000XX</td>
<td>0°</td>
</tr>
</tbody>
</table>

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:
     
     \[ y = (90° - \alpha) \times k \]  
     
     \( k \) see chart page 3

   - Example:
     
     Swing clamp: 1845A090L30
     
     Desired swing angle: 45° ccw
     
     Part no.: 1845A045L30
     
     Shortening:
     
     \[ y = (90° - 45°) \times 0.12 \text{ mm/°} = 5.4 \text{ mm} \]

3. Swing angle > 90°

   - Available on request!

D (Monitoring "Unclamped")

- With blind hole port 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.

Pneumatic position monitoring versions C, D, H

- Unclamped

- Clamped

- Transition range

Versions P, D, Q

- Unclamped

- Clamped

- Transition range
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 15 21
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] 2.14 3.01 5.27 7.8 11.19
(see page 4) Unclamping [cm³/s] 4.15 6.15 10.17 15.9 23.75
Clamping force for other lengths see page 4.

Effective clamping force FSp [kN]

Operating pressure [bar]

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

Code letter X see page 2.

Part no.

Effective clamping force FSp [kN]

Operating pressure [bar]

Subject to modifications
Swing clamps

<table>
<thead>
<tr>
<th></th>
<th>1843</th>
<th>1844</th>
<th>1845</th>
<th>1846</th>
<th>1847</th>
</tr>
</thead>
<tbody>
<tr>
<td>a [mm]</td>
<td>38</td>
<td>79</td>
<td>93</td>
<td>120</td>
<td>154</td>
</tr>
<tr>
<td>b [mm]</td>
<td>17</td>
<td>22</td>
<td>26</td>
<td>32</td>
<td>38</td>
</tr>
<tr>
<td>c [mm]</td>
<td>28</td>
<td>36</td>
<td>45</td>
<td>60</td>
<td>72</td>
</tr>
<tr>
<td>c1 [mm]</td>
<td>14</td>
<td>20</td>
<td>23</td>
<td>28</td>
<td>36</td>
</tr>
<tr>
<td>0d f7 [mm]</td>
<td>16</td>
<td>20</td>
<td>25</td>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>0d1 +0.1/0.05</td>
<td>15.8</td>
<td>19.8</td>
<td>24.8</td>
<td>31.8</td>
<td>39.8</td>
</tr>
<tr>
<td>e [mm]</td>
<td>35</td>
<td>50</td>
<td>60</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>f [mm]</td>
<td>16</td>
<td>18</td>
<td>22</td>
<td>26</td>
<td>34</td>
</tr>
<tr>
<td>g [mm]</td>
<td>M14x1.5</td>
<td>M18x1.5</td>
<td>M20x1.5</td>
<td>M28x1.5</td>
<td>M35x1.5</td>
</tr>
<tr>
<td>g1 [mm]</td>
<td>M8</td>
<td>M10</td>
<td>M12</td>
<td>M16</td>
<td>M20</td>
</tr>
<tr>
<td>h min/max [mm]</td>
<td>5.46</td>
<td>6.64</td>
<td>7.77</td>
<td>9.85</td>
<td>12/100</td>
</tr>
<tr>
<td>0 k +0.1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>l +0.5</td>
<td>9.5</td>
<td>11</td>
<td>11</td>
<td>11.5</td>
<td>12</td>
</tr>
<tr>
<td>m +0.05</td>
<td>7.8</td>
<td>9.8</td>
<td>12</td>
<td>15</td>
<td>19</td>
</tr>
<tr>
<td>n</td>
<td>11</td>
<td>17</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>o</td>
<td>6</td>
<td>10</td>
<td>12</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>p</td>
<td>22.5</td>
<td>27</td>
<td>32</td>
<td>39</td>
<td>44</td>
</tr>
<tr>
<td>q</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12.7</td>
<td>12.7</td>
</tr>
<tr>
<td>r</td>
<td>20</td>
<td>24.5</td>
<td>31</td>
<td>34.5</td>
<td>48</td>
</tr>
<tr>
<td>s</td>
<td>2.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>t</td>
<td>11</td>
<td>17</td>
<td>19</td>
<td>19</td>
<td>19</td>
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<td>u</td>
<td>17</td>
<td>18</td>
<td>21</td>
<td>19</td>
<td>25</td>
</tr>
<tr>
<td>v</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>v2</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>w</td>
<td>18</td>
<td>24</td>
<td>26</td>
<td>26</td>
<td>26</td>
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<tr>
<td>w2</td>
<td>21</td>
<td>27</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Part no. Clamping arm

- with contact bolt 0354152 0354153 0354154 0354155 0354259
- without thread g1 3548660 3548661 3548603 3548604 3548919
- complete with angle 0354156 0354157 0354158 0354159 0354110
- Plastic cover** 3300685 3300684 3300683 3300682 3300682
- Metallic wiper 3341104 3341107 3341108 3341109 33411011
- Spare nut 3527092 3527014 3527099 3527015 3527048

Order 4 off swing clamps

Clamping force and admissible operating pressure

Effective clamping force (general)

\[ F_{\text{eff}} = \frac{A}{A + (B 
L)} \leq F_{\text{adm}} \]

[kN]

Admissible clamping force

\[ F_{\text{adm}} = \frac{C}{L} \leq \]

[kN]

Admissible operating pressure

\[ P_{\text{adm}} = \frac{D}{L} + E \leq \]

[bar]

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

** 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

\[ Q_e = 10 \text{ cm}^3/\text{s} \]

(as per chart page 3)

1. Extension factor

\[ x = \frac{L}{e} = \frac{70}{35} = 2 \]

2. Flow rate factor

as per diagram \( \rightarrow y = 0.35 \)

3. Max. flow rate

\[ Q = y 
Q_e = 3.5 \text{ cm}^3/\text{s} \]

4. Min. clamping time

as per diagram \( \rightarrow \approx \text{approx. 1.4 s} \)

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

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:

1. Moments of inertia are known

\[ J_a = \sqrt{2} \cdot \text{cm}^3/\text{s} \]

\[ J_a = \text{Moment of inertia of the clamping arm} \]

\[ J_L = \text{Moment of inertia special clamping arm} \]

* Only for vertical mounting position!
Accessory for 184XB0XX • Pneumatic position monitoring (not adjustable)

**Pneumatic Valve**

**Application**

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

**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.

**Technical data**

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

*) 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.

**Part no.**

<table>
<thead>
<tr>
<th>Swing clamps</th>
<th>1843B0XX</th>
<th>1844B0XX</th>
<th>1845B0XX</th>
<th>1846B0XX</th>
<th>1847B0XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>L [mm]</td>
<td>129</td>
<td>136</td>
<td>172</td>
<td>190</td>
<td>200</td>
</tr>
<tr>
<td>L1 [mm]</td>
<td>50</td>
<td>50</td>
<td>73</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td>Swing angle (see page 2)</td>
<td>0 or 90°</td>
<td>0353913</td>
<td>0353913</td>
<td>0353913</td>
<td>0353913</td>
</tr>
<tr>
<td>15 to 75° = XX</td>
<td>03539130XX</td>
<td>03539130XX</td>
<td>03539130XX</td>
<td>03539140XX</td>
<td>03539160XX</td>
</tr>
</tbody>
</table>

(graduation of 5°)

**Pneumatic valve**

Spare part for versions C, H, P and Q

| 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. After untightening of the locking 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.

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

**Part no.**

<table>
<thead>
<tr>
<th>Swing clamps</th>
<th>1843B0XX</th>
<th>1844B0XX</th>
<th>1845B0XX</th>
<th>1846B0XX</th>
<th>1847B0XX</th>
</tr>
</thead>
<tbody>
<tr>
<td>L [mm]</td>
<td>131</td>
<td>138</td>
<td>172</td>
<td>190</td>
<td>200</td>
</tr>
<tr>
<td>L1 [mm]</td>
<td>52</td>
<td>52</td>
<td>73</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td>With switch and plug plug</td>
<td>0353905</td>
<td>0353905</td>
<td>0353915</td>
<td>0353915</td>
<td>0353915</td>
</tr>
<tr>
<td>Without switch and plug</td>
<td>0353906</td>
<td>0353906</td>
<td>0353917</td>
<td>0353917</td>
<td>0353917</td>
</tr>
</tbody>
</table>

**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.

**Wiper system**

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).

**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.

**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.