



Electric Clamp - Swing Clamp Version

Parallel drive, position and clamping force monitoring, IO-link connection optional
 DC voltage 24 V, minimum energy demand



Version

This electric clamp is an electrically operated swing clamp.

Application

Electric clamps are used for clamping or holding of workpieces

- when the clamping and holding points shall be free for loading and unloading of the fixture
- when clamping elements have to be controlled individually
- where the clamping force must be maintained also after the separation from the energy supply

Thus electric clamps are particularly suited for:

- Packaging industry
- Test systems
- Assembly equipments and robotics
- Automatic manufacturing systems

Description

The electric clamp is driven by a wear-resistant brushless DC motor. The motor speed is transformed by means of a gear and a threaded spindle into the swing and stroke movement of the piston rod. For swinging the clamping arm by 180°, an axial stroke of only 3 mm is required.

If the clamping arm collides during the swing motion with a workpiece, the mechanism is protected against overload. The direct current motor is automatically and immediately switched off. When unclamping, the clamping arm always swings back to the off-position.

Integrated control

The electronic control for the DC motor is on a board in the housing of the electric clamp.

Electric connection

Power supply and signal exchange for external control are transmitted by two short cables with plug-type connector. Cable sockets are available for the customer's connection (see connection accessories).

Safe touch voltage

The used DC voltage 24 V is considered to be a "low voltage" and thus it is not dangerous for people in case of contact.

Advantages

- High clamping force
- Adjustable clamping force
- Clamping force control
- Can be controlled individually or in common
- High operating safety by self-locking spindle drive
- Mechanical reclamping by Belleville springs
- Swing angle up to 180° available
- Overload protection device in the case of collisions with the clamping arm
- Electrical position monitoring and extended self-monitoring with diagnostic options
- Clamping stroke control possible
- Low voltage 24 V
- Leakage free
- Maintenance free (500,000 cycles)
- Code class IP 67

Power supply

For motor and electronic control a DC voltage of 24 V with a residual ripple of max. 10 % is required.

For the DC motor, we recommend the use of a switching power supply with a current output of 15 A per connected electric clamp. When operating several electric clamps at the same time, the line is to be enlarged correspondingly.

The electronic control has to be supplied by a separate power supply (24 V DC/ 100 mA).

Adjusting ranges

After removal of the protection cover, the following adjustments can be made on the control board:

- Clamping force
- Swing speed
- Compensation of the clamping arm elasticity

The clamping force can also be adjusted via analogue input.

Important notes

Electric clamps are designed exclusively for clamping or holding of workpieces in industrial applications. They can generate very high clamping 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.

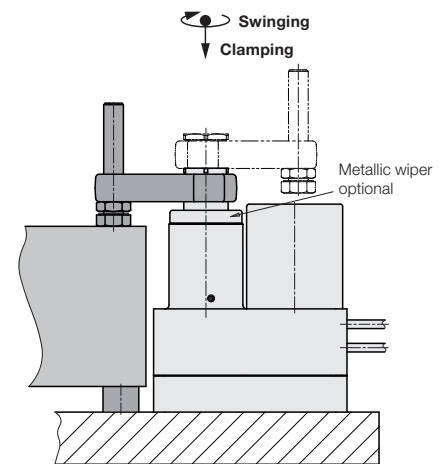
The manufacturer of the fixture or the machine is obliged to provide effective protection devices. During loading and unloading of the fixture and during clamping, collision with the clamping arm must be avoided.

For the positioning of workpieces, the admissible displacement force as per diagram on page 3 has to be considered.

If there is any danger that fluids penetrate into the electric clamp, the screw plug at the venting port G 1/8 has to be removed and a vent hose has to be connected. The other end of the hose has to be placed to an absolutely dry area.

It is recommended to connect a dry positive air pressure protection with 0.2 bar.

Functional principle



Function control

Unclamped

- Clamping arm in off-position and unclamping process completed

Clamped

- Clamping arm within clamping area and clamping force obtained
- Clamping stroke control possible by output signal

Diagnostic options

- Extensive review on error conditions
- Signalling via error code (flashing signal) internally on control board or via external interface signal
- Error messages can be reset
- Review display after 500,000 cycles

You will find a complete description in the supplied operating manual.

Use  **IO-Link**
 Universal · Smart · Easy

Optionally with cable and 4-pin connector for connection to an IO-Link master. Via this interface, commands and information are exchanged between the electric clamp and a higher-level control.

Advantages

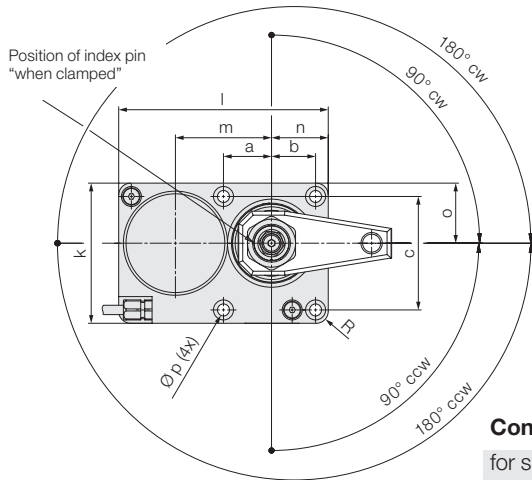
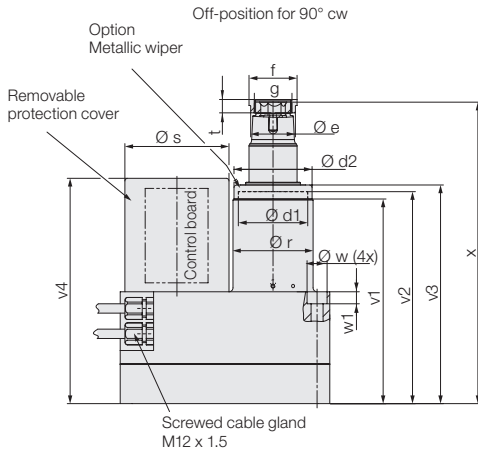
- Reduced cabling effort
- Simplified commissioning
- More extensive diagnostic options
- Interference immunity through digital signal transmission
- All settings can be made conveniently via the IO-Link interface

Technical information

Further information on the application and operating conditions is available on request.



Clamping arm see page 4

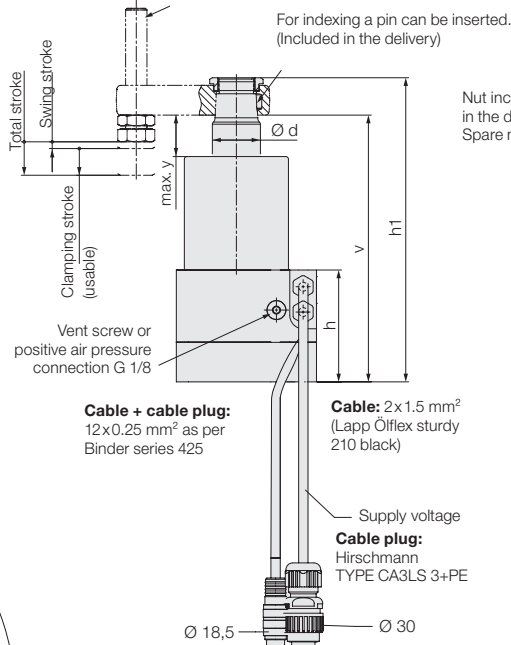


Connecting cable

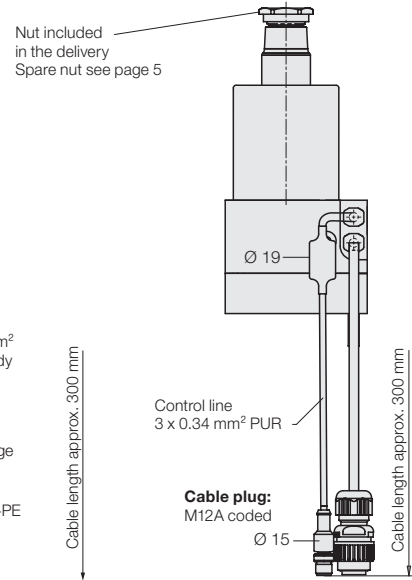
for supply of the DC motor

Cable length	Cable cross section
< 12 m	2 x 1.5 mm ²
< 20 m	2 x 2.5 mm ²
< 30 m	2 x 4 mm ²

1835 CXXXX26P
1835 CXXXX26PM



IO-Link connection
1835 CXXXX26POI
1835 CXXXX26PMI



Accessory

Control line

Cable socket customized to requirements 12 POL.

Part no. 3141992

Cable socket 5 m cable 12 POL.

Part no. 3823375 L 05000

Supply line

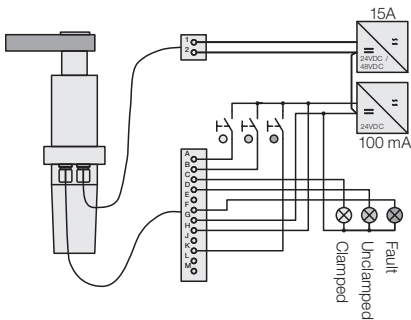
Cable socket Hirschmann CA3LD

Part no. 3141 991



Connecting examples

Minimum configuration



Supply voltage 24 V DC - 15 A

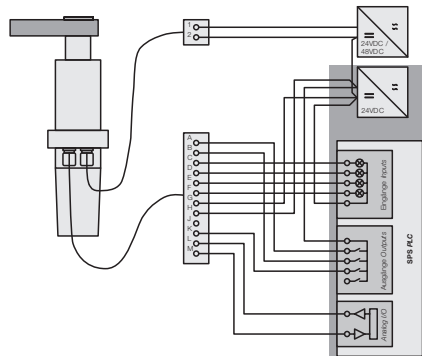
- +24 V DC
- GND (ground)

Control line

Pin Function

- A Command clamping
- B Command unclamping
- C Message clamped
- D Message unclamped
- F Message error code
- K Command error reset

Programmable logic control PLC



Supply voltage 24 V DC - 15 A

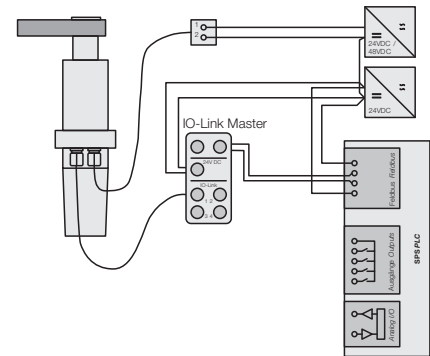
- +24 V DC
- GND (ground)

Control line

Pin Function

- A Command clamping
- B Command unclamping
- C Message clamped
- D Message unclamped
- E Message number of cycles
- F Message error code
- G GND (ground)
- H +24 V DC (control)
- K Command error reset
- L Analogue input clamping force (0-10 V)
- M Analogue output clamping stroke (0-10 V)

IO-Link connection



IO-Link connection

Supply voltage 24 V DC - 15 A

- +24 V DC
- GND (ground)

Control line

- +24 V DC
- GND (ground)
- C/Q IO-Link



Electric clamp		1835
Axial pulling force adjustable	[kN]	3...9
Effective clamping force	[kN]	see diagram
Admissible displacement force	[kN]	see diagram
Clamping stroke (usable)	[mm]	20
Swing stroke	[mm]	4
Total stroke (mechanical)	[mm]	26
Swing angle	[°]	0°/90°/180°*
Clamping time approx.	[s]	3**
Unclamping time approx.	[s]	3**
Special clamping arm		
Max. clamping arm length	[mm]	150
Max. radial torque	[Nm]	0.5
Max. moment of inertia	[kgm ²]	0.008
Nominal voltage	[V DC]	24
Operating range	[V DC]	22 to 30
Residual ripple	[%]	< 10
Max. current consumption	[A]	15
Power consumption in standby mode approx.	[W]	1.2
Duty cycle	[%]	25 (S3)
Code class		IP 67
Positive air pressure connection max.	[bar]	0.2
Ambient temperature	[°C]	-5...+40
Mounting position		preferably vertical***
Weight, approx.	[kg]	10.75
a	[mm]	36
b	[mm]	33
c	[mm]	85
Ø d	[mm]	36
Ø d1	[mm]	52
Ø d2	[mm]	58.5
Ø e	[mm]	33.5
f	[mm]	SW36
g	[mm]	M28 x 1.5
h	[mm]	83.8
h1 +2	[mm]	227.9
k	[mm]	105
l	[mm]	157
m	[mm]	72
n	[mm]	42.5
o	[mm]	45
Ø p	[mm]	9
Ø r - 0.1	[mm]	60
R	[mm]	9
Ø s	[mm]	78
v - 1	[mm]	199.9
v1	[mm]	153.2
v2	[mm]	158.8
v3	[mm]	163.8
v4	[mm]	168.8
Ø w	[mm]	15
w1	[mm]	9
x +2	[mm]	225.9
y	[mm]	29

Part no.

Swing direction 90° clockwise	1835 C090 R26 PXX
Swing direction 90° counterclockwise	1835 C090 L26 PXX
Swing direction 180° clockwise	1835 C180 R26 PXX
Swing direction 180° counterclockwise	1835 C180 L26 PXX
0 degree	1835 C000 026 PXX

XX = Options
OI = IO-Link
M = Metallic wiper
MI = Metallic wiper + IO-Link

- * More swing angles are available on request (min. 45°).
- ** Additional technical data is available on request
- *** For horizontal mounting position, please see page 4.

Important note

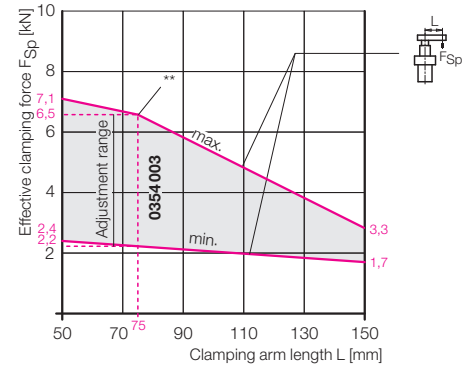
To guarantee a process-safe application, all technical requirements and general conditions must be carefully checked. Please contact our technical consultants (on site or directly in product management, Tel.: +49 6405 89-456).

Effective clamping force F_{Sp} as a function of the clamping arm length L

The effective clamping force is smaller the longer the clamping arm. For longer clamping arms, the clamping force must be reduced so that the admissible bending moment will not be exceeded.

The adjustment of the clamping force is made on the control board or externally via analogue input L.

The default setting of is suitable for the accessory clamping arm L = 75 mm.



** For clamping arm lengths > 75 mm, please observe the setting parameters permitted for the effective clamping force as specified in the operating instructions.

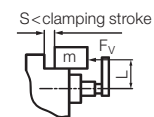
Example

Accessory clamping arm 0354003: L = 75 mm

As per diagram:

- max. clamping force 6.5 kN
- min. clamping force 2.2 kN

The clamping force is continuously adjustable.


Permissible displacement force F_V for the horizontal positioning of a workpiece

The electric clamp can push, i.e. position a workpiece against fixed points.

The permissible displacement force depends on the set clamping force and the length of the clamping arm. It equal to 15 % of the set clamping force.

A clamping arm with 75 mm centre distance to the clamping point is used. Trimmer F is set to 9. The trimmer E setting is not relevant for the calculation of the displacement force. According to the clamping force diagram, an effective clamping force is achieved at clamping point 6.5 kN. The permissible displacement force F_V is thus:

$$F_V = F_{Sp} \cdot 15\% = 6.5 \text{ kN} \cdot 0.15 = 0.98 \text{ kN}$$

Example

Accessory clamping arm 0354003: L = 75 mm

As per diagram:

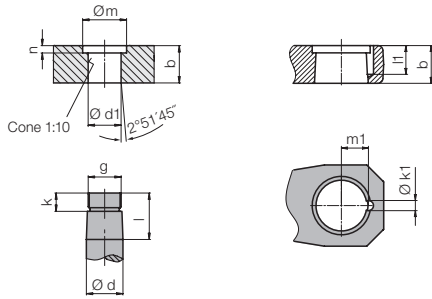
- Max. clamping force 6.5 kN
- Displacement force F_V 0.98 kN

With a friction coefficient $\mu = 0.4$, this is sufficient for a workpiece mass m:

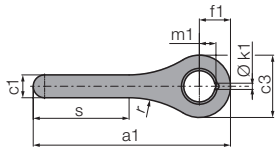
$$m = \frac{F_V}{g \cdot \mu} = \frac{980 \text{ N}}{9.81 \cdot 0.4} = 250 \text{ kg}$$



Dimensions for special clamping arms and indexing

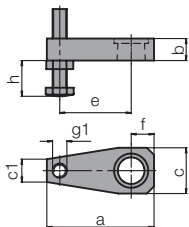


Clamping arm blank with indexing

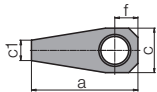


Clamping arm without indexing

Clamping arm with contact bolt



Clamping arm without thread g1



Horizontal mounting position

The electric clamp can be operated with the accessory clamping arm 0354 003 (e=75 mm) in every mounting position.

In the case of longer and heavier special clamping arms, the admissible radial torque M1 of 0.4 Nm will be exceeded, which can lead to malfunctions and increased wear.

Remedy:

Provide the clamping arm with a counterweight as explained in the opposite example.

Electric clamp

a	[mm]	115
a1	[mm]	190
b	[mm]	23
c	[mm]	48
c1	[mm]	22
c3	[mm]	60
Ød f7	[mm]	32
Ød1 +0.05	[mm]	31.85
e	[mm]	75
f	[mm]	25
f1	[mm]	30
g	[mm]	M28 x 1.5
g1	[mm]	M16
h min to max	[mm]	15 ... 79
k	[mm]	12
Ø k1 +0.1	[mm]	6
l	[mm]	28
l1	[mm]	17
Ø m	[mm]	34
m1 +0.05	[mm]	16
n	[mm]	5
r	[mm]	100
s	[mm]	92.3

Part no.

Clamping arm with contact bolt		0354003
Weight, approx.	[kg]	0.8
Moment of inertia	[kgm ²]	0.002295
Radial torque	[Nm]	0.32

Clamping arm without thread g1		3921017
Weight, approx.	[kg]	0.65
Moment of inertia	[kgm ²]	0.00134
Radial torque	[Nm]	0.20

Clamping arm blank		3548902A
Weight, approx.	[kg]	0.95
Moment of inertia	[kgm ²]	0.0035
Radial torque	[Nm]	0.5
Material: High alloy steel 1000 ... 1200 N/mm ²		

Spare nut M28x1.5		3527015
Max. tightening torque	[Nm]	90
Weight, approx.	[kg]	0.05

Metallic wiper		0341231
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Indexing pin		6 m 6x12
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		3300325
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Clamping arm S1 with weight compensation S2

Required counterweight m2 = $\frac{M1}{l2}$ [kg]

M1 = First-order torque around the piston axis (control of the CAD model) [kgm]

m2 = Mass of counterweight [kg]

l2 = Centre of gravity of the mass m2 [m]

Important note

The additional counterweight increases the moment of inertia J around the piston axis, what can be easily determined by querying of the CAD model. To avoid an overload of the swing drive, the flow rate has to be reduced. The setting is described in the operating manual.

Mounting position - horizontal

Attention: Observe the height of the protection cover.

