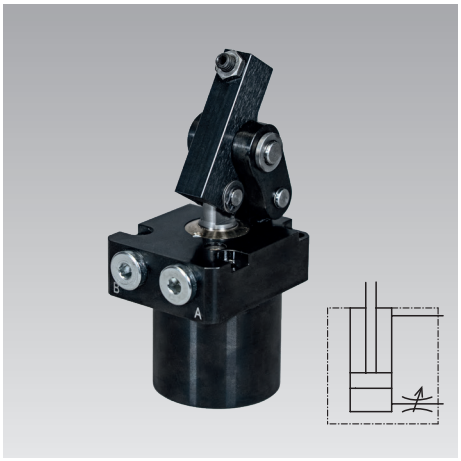
ROEMHELD

NEW Approved up to 120 bar

B 1.8268

Hinge Clamps 70 bar/120 bar

with throttle valve, metallic wiper edge and optional position monitoring double acting, max. operating pressure 120 bar



Application

Hydraulic hinge clamps are used for clamping workpieces when it is essential to keep the clamping points free for unrestricted fixture loading and unloading.
A clamping recess in the workpiece slightly wider than the clamping lever is sufficient as clamping surface.
The special kinematics allow clamping without side loads of workpieces which are very sensitive against deformation.
This series, with an operating pressure of 120 bar, is designed for direct connection to the low-pressure hydraulics of machine tools.
In combination with the optional pneumatic or electrical position monitorings, hinge 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

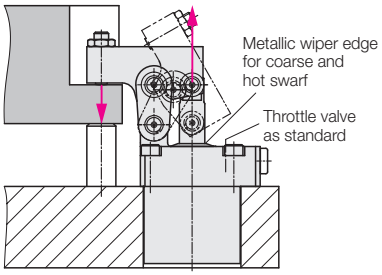
Description

The hinge clamp is a double acting hydraulic cylinder with integrated clamping lever. When pressurising the element, the piston moves upwards and swivels the clamping lever over the hinges forwards and at the same time downwards onto the workpiece. The piston force is deviated by 180° and, depending on the lever length, is available as a clamping force (→ Page 5).
The kinematics are so designed that no side loads act on the workpiece if the clamping surface is at the same height as the centre of rotation of the clamping lever (see comparison "Forces at the clamping point").
The 3 available clamping directions (L, G, R) make it easier to adapt to the workpiece shape or the hydraulic connectivity.
All sizes are available with a switch rod for external position monitoring as an option.
Electrical and pneumatic position monitorings for the clamping and unclamping position are available as accessories. → Page 7

Advantages

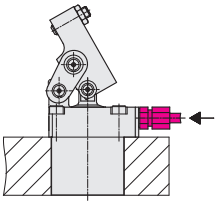
- High clamping force in the low-pressure range
- Very short clamping time (min. 0.5 s)
- Throttle valve as standard, easily adjustable from the top
- Compact design partially recessible
- Lever bolt plain bearing
- 3 clamping directions selectable
- Clamping possible without side loads
- The clamping lever can be swivelled into small recesses
- Long clamping lever adaptable to the workpiece contour
- FKM wiper protected by metallic wiper edge
- Position monitoring available as an accessory
- **NEW:** Stroke measuring system with an ultrasonic sensor
- Mounting position: any

Lever mechanism without side loads

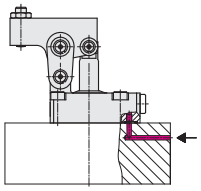


Installation and connecting options

Pipe thread

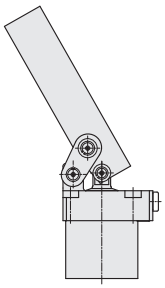


Drilled channels

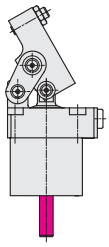


Versions

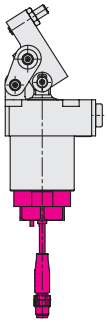
Without switch rod
(long clamping lever option)



With switch rod
(Accessories for position monitorings Pages 6 and 7)



With stroke measuring system (ultrasonic sensor)



Ultrasonic sensor

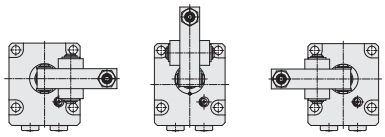
The ultrasonic sensor measures the piston position of the hinge clamps by measuring the duration of the ultrasonic signal in the hydraulic oil. The piston position determined in this way can be used to monitor the clamping process and can be transmitted via IO-Link, as an analogue signal or as a switching signal. → Page 5

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

Code for Part Numbers

1 8 2 6 X 12 X X X

Clamping direction
- **R** = clockwise
- **G** = straight
- **L** = counterclockwise



Operating pressure
- **12** = 120 bar

Size
- **1** = BG 1
- **2** = BG 2
- **3** = BG 3
- **4** = BG 4
- **5** = BG 5

Clamping lever
- **0** = without clamping lever
- **1** = clamping lever with contact bolt
- **2** = long clamping lever

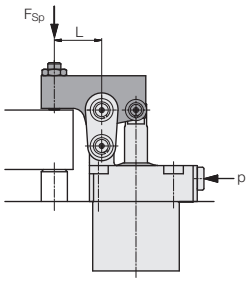
Versions
- **3** = without switch rod and sensor
- **4** = with switch rod and without sensor
- **5** = with ultrasonic sensor

Size			**1**	**2**	**3**	**4**	**5**
a		[mm]	55	60	66	82	96
a1		[mm]	35	40	46	56	68
a2		[mm]	5	5	5.5	7	9
a3		[mm]	22.5	25	28.5	35	43
Ø a4		[mm]	5.6	5.6	6.8	9	11
a5		[mm]	18	17	17	20	20
a6		[mm]	37.5	41	47	57	70.3
b		[mm]	45	50	57	70	86
b1		[mm]	35	40	46	56	68
b2 –0.05		[mm]	12	12	16	19	22
b3		[mm]	15.5	14	17	20	24
c		[mm]	22	20.8	22	26	32
c1		[mm]	63.5	68.5	77	93	110
c2		[mm]	79.8	85.5	97	116.5	138.9
c3		[mm]	129.1	152.8	157.6	204	226.8
d1		[mm]	16.5	18.5	21	24.5	30.5
d2		[mm]	20	23.5	29	32	39
d3		[mm]	88	110.5	108	148.5	159.5
d4		[mm]	20	23	29.5	31.5	37.5
d5		[mm]	82	104	100.5	138	147
d6		[mm]	14	17	21.5	21.5	26.5
d7		[mm]	4	4	4	6	6
d8 min.		[mm]	3	4	7	7	8
f1		[mm]	33.5	39.5	42.5	47	55
G			G1/8	G1/8	G1/8	G1/4	G1/4
Ø g1 max.		[mm]	40	48	54	64	79
Ø g2 ±0.1		[mm]	39	47	53	63	78
Ø g3		[mm]	34.5	34.5	43	48	60
h	Ideal clamping point	[mm]	48.5	51.5	56	67	79
ho	Upper end of the clamping range	[mm]	1	1.2	1.5	1.8	2
hu	Lower end of the clamping range	[mm]	1.1	1.3	1.5	1.7	2.1
h1	Stroke up to the ideal clamping point	[mm]	15.7	17.7	21	23	29
h2	Stroke up to the end of the clamping stroke	[mm]	3	3	3	3	3
h3		[°]	57.6	58.6	60.4	57.6	57.4
h4	Unclamping position	[mm]	60.2	68.2	72.6	78.1	93.6
h5		[mm]	17.9	17.1	15.9	14.9	11.4
h6		[mm]	8.4	8.6	8.4	8.4	5.9
j1		[mm]	12.5	12.8	14	14	14
j2		[mm]	20	22	23	30	38
j3	Fixing thread		M5	M5	M6	M8	M10
k1		[mm]	22	24	28	36	45
k2		[mm]	25	28	30.5	36	42
Ø l1 f12		[mm]	8	10	10	12	12
l2			M5 × 15 deep	M6 × 11.5 deep	M6 × 11.5 deep	M8 × 16 deep	M8 × 16 deep
q1		[mm]	26	26	29	39	48
q2		[mm]	14	16	20	25	30
q3		[mm]	21.5	26	30	36.5	45
q4			M6	M6	M8	M10	M12
r1		[mm]	0.4	0.4	0.4	0.4	0.4
r2		[mm]	7	9	9	11	12
s1		[mm]	5.5	6	6	7	10
Ø s2 H12		[mm]	6	8	8	10	14
Ø s3 H12		[mm]	6	6	7	8	12
t		[mm]	2.4	3.9	2.5	4	4.7
t2		[mm]	6.5	9	9	10.5	14
t3		[mm]	4	3	4.3	5.1	6.6
t4		[mm]	4	17	22	22	31
u1		[mm]	14.5	17.5	17.5	19	28
u2		[mm]	16	16.5	17	19	26
u3 +0.1		[mm]	6.1	6.1	8.1	10.1	11.1
×1		[mm]	4	4	4	5	5
SW		[mm]	32	32	36	46	46
Weight		[kg]	1	1.2	1.5	2.6	4.5

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

Clamping Force Diagrams

Calculation of the clamping force



1. Length L of clamping lever is known

1.1 Admissible operating pressure

$$p = \frac{B}{(C/L) + 1} \leq 120 \text{ [bar]}$$

1.2 Effective clamping force

$(p_{adm.} > 120 \text{ bar}) \rightarrow F_{sp} = \frac{A}{L} * 120$ [kN]

$(p_{adm.} > 120 \text{ bar}) \rightarrow F_{sp} = \frac{A}{L} * p_{adm.}$ [kN]

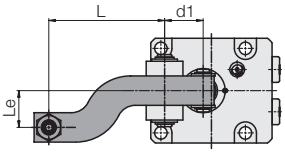
2. Min. length of clamping lever

$$L_{min.} = \frac{C}{(B/p) - 1} \text{ [mm]}$$

L, $L_{min.}$ = length of clamping lever [mm]
p, $p_{adm.}$ = operating pressure [bar]
A, B, C, = constants as per chart
A*, B* for version with switch rod

1826	121	122	123	124	125
A	0.73	1.18	1.82	3.35	6.76
A*	0.65	1.05	1.67	3.11	6.45
B	209.09	205.03	198.21	202.68	204.46
B*	232.95	230.40	215.83	218.97	214.29
C	14.85	16.65	18.90	22.05	27.45

Eccentric clamping lever



The diagrams show the admissible operating pressure for any combination of length L of clamping lever and the eccentricity Le.

Formula $p_{adm.} = \frac{X * L}{(Y * Le) + L + Z}$ [bar]

L = length of clamping lever,
Le = eccentricity [mm]
X, Y, Z = constant as per chart
X* for version with switch rod

1826	121	122	123	124	125
X	219.03	214.49	206.90	211.89	213.86
X*	244.01	241.30	225.31	228.84	224.13
Y	3.67	3.70	3.50	3.38	3.59
Z	16.50	18.50	21.00	24.50	30.50

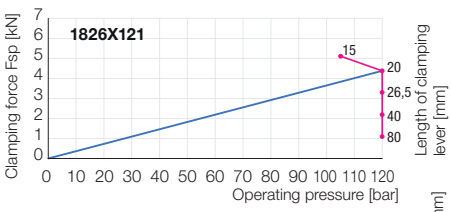
Example: Hinge clamp 1826G**122**
Special clamping lever L = 60 mm
Eccentricity Le = 48 mm
As per diagram: $p_{adm.}$ = approx. 50 bar
According to formula:

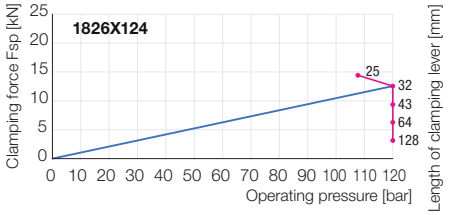
$$p_{adm.} = \frac{X * L}{(y * Le) + L + Z} = \frac{214.491 * 60}{(3.7 * 48) + 60 + 18.5}$$

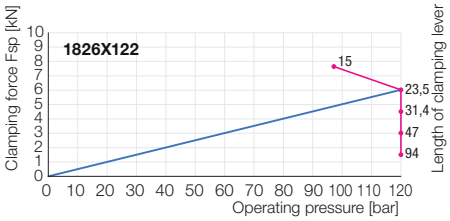
$p_{adm.}$ = 50.25 bar

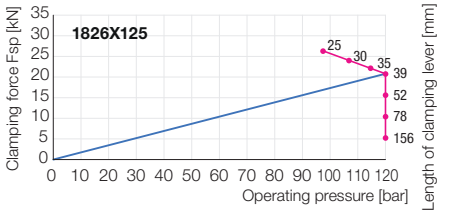
Effective clamping force (formula see above)

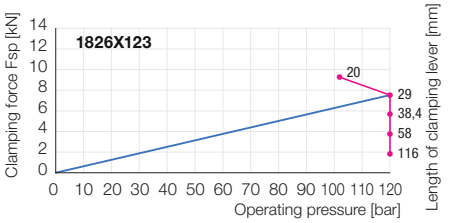
$$F_{Sp} = \frac{A}{L} * p_{adm.} = \frac{1.18}{60} * 50.25 = 1 \text{ kN}$$











Example 1: Hinge clamp 1826G**124**32
p = 50 bar; L = 32 mm

Effective clamping force

$$F_{Sp} = \frac{A}{L} * p = \frac{3.35}{32} * 50 = 5.2 \text{ kN}$$

Example 2: Hinge clamp 1826G**124**32
p = 50 bar

Min. length of clamping lever

$$L_{min.} = \frac{C}{(B/p) - 1} = \frac{22,05}{(202.68/50) - 1} = 7.2 \text{ mm}$$

Effective clamping force

$$F_{Sp} = \frac{A}{L} * p = \frac{3.35}{7.2} * 50 = 23.2 \text{ kN}$$

Example 3: Hinge clamp 1826G**125**32
Special clamping lever L = 20 mm

Admissible operating pressure

$$p_{adm.} = \frac{B}{(C/L) + 1} = \frac{204,46}{(27.45/20) + 1} = 86.2 \text{ bar}$$

Effective clamping force

$$F_{Sp} = \frac{A}{L} * p_{adm.} = \frac{6.76}{20} * 86.2 = 29.13 \text{ kN}$$

Example 4: Hinge clamp 1826G**125**32
Special clamping lever L = 78 mm

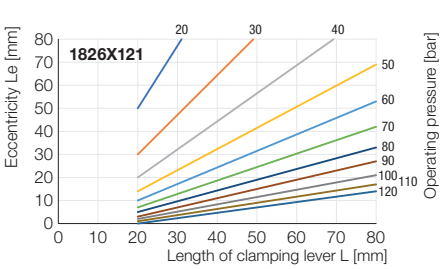
Admissible operating pressure

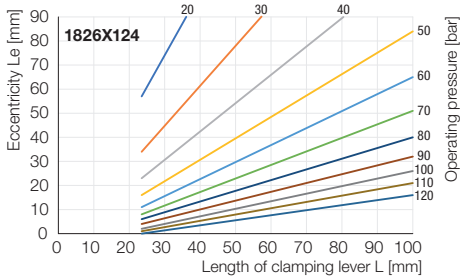
$$p_{adm.} = \frac{B}{(C/L) + 1} = \frac{204.46}{(27.45/78) + 1} = 151.2 \text{ bar}$$

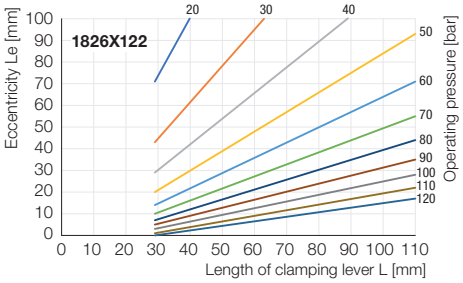
Effective clamping force
The max. operating pressure is 120 bar, thus

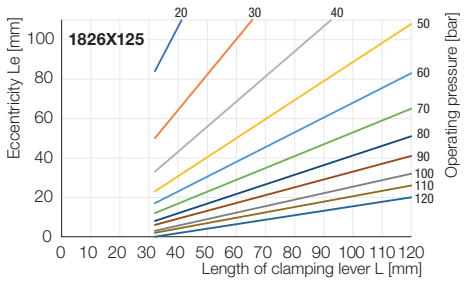
$$F_{Sp} = \frac{A}{L} * 70 = \frac{6.76}{78} * 120 = 10.4 \text{ kN}$$

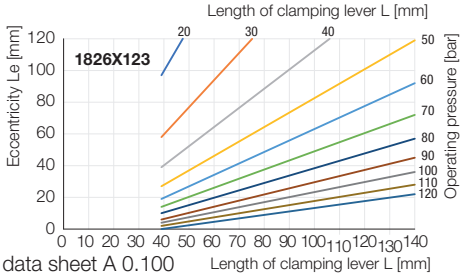
Admissible operating pressure p_{adm} at eccentric location of the clamping point











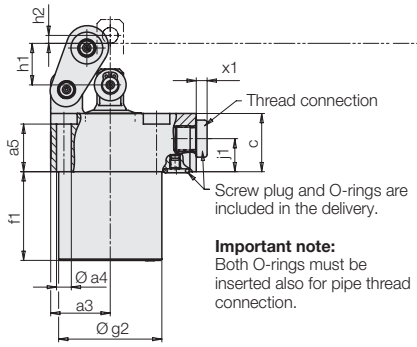
Important note

Depending on the eccentric load, there will be a one-sided wear of the bolts and an increasing torsion of the clamping lever around the longitudinal axis.
Recommendation: Regular visual inspection

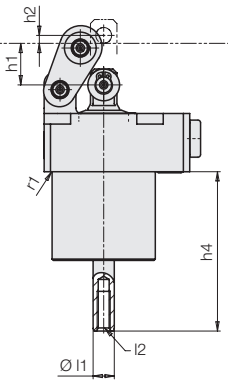
Operating conditions, tolerances and other data, see data sheet A 0.100

Versions

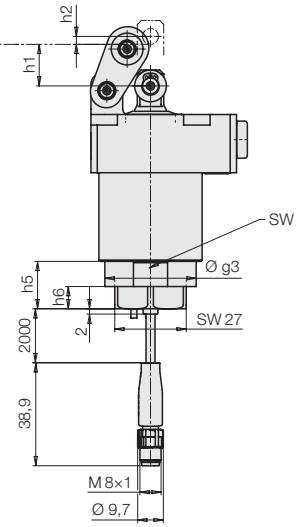
without switch rod 3
(Without clamping lever)

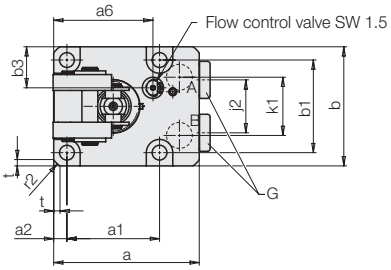


With switch rod 4
(Without clamping lever)



With stroke measuring system 5
(Ultrasonic sensor, without clamping lever)



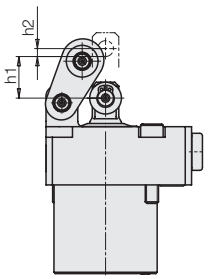


A = clamping
B = unclamping

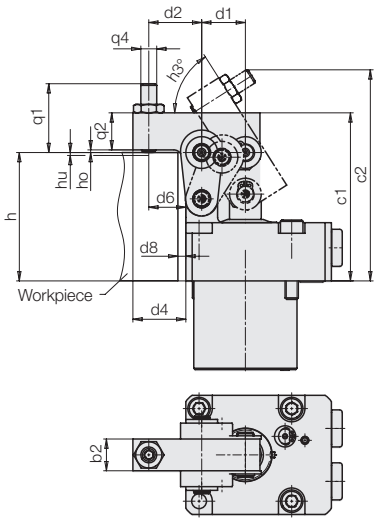
Clamping lever

Without clamping lever 0

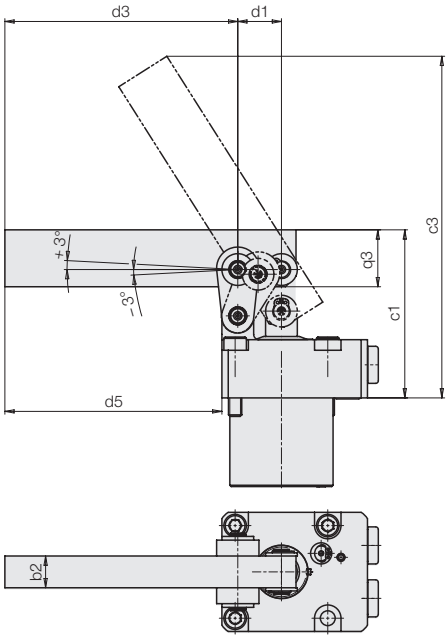
Connecting dimensions for self-manufactured clamping levers



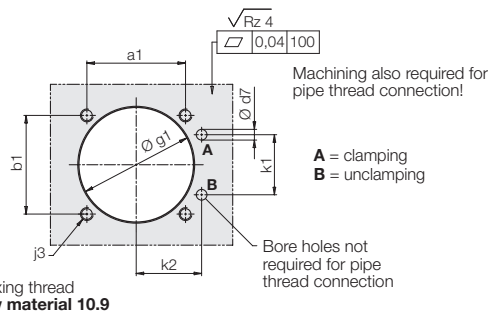
Clamping lever with contact bolt 1



Long clamping lever 2

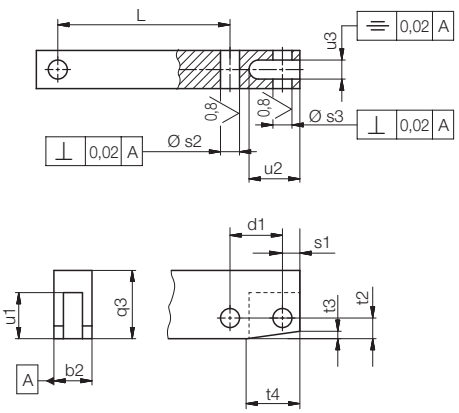


Connecting scheme



Use fixing thread
screw material 10.9

Connecting dimensions for self-manufactured clamping levers



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

Size			1		2		3		4		5	
Operating pressure		[bar]	120	70	120	70	120	70	120	70	120	70
Max. clamping force at	length of clamping lever d2											
	without switch rod	[kN]	4.5	2.6	6.0	3.5	7.6	4.4	12.6	7.3	20.8	12.1
	with switch rod	[kN]	4.0	2.3	5.3	3.1	7.0	4.0	11.6	6.8	19.8	11.5
Piston force	without switch rod	[kN]	5.9	3.4	8.5	4.9	11.5	6.7	18.2	10.6	29.6	17.2
	with switch rod	[kN]	5.3	3.0	7.5	4.3	10.6	6.1	16.9	9.8	28.2	16.4
Piston Ø		[mm]	25		30		35		44		56	
Piston rod Ø		[mm]	12		14		14		16		22	
Piston stroke		[mm]	18.7		20.7		24		26		32	
Piston area	Clamping without switch rod	[cm^2]	4.9		7.06		9.62		15.2		24.6	
	Clamping with switch rod	[cm^2]	4.4		6.28		8.83		14		23.4	
	Unclamping	[cm^2]	3.77		5.52		8.08		13.1		20.8	
Oil volume	Clamping without switch rod	[cm^3]	9.2		14.7		23.1		39.6		78.8	
	Clamping with switch rod	[cm^3]	8.3		13		21.2		36.6		75.2	
	Unclamping	[cm^3]	7.1		11.45		19.4		34.3		66.7	
Max. flow rate		[cm^3/s]	16		25		40		75		150	
Weight		[kg]	1		1.2		1.5		2.6		4.5	
Part no. without switch rod												
Without clamping lever			**1826X12130**		**1826X12230**		**1826X12330**		**1826X12430**		**1826X12530**	
Clamping lever with contact bolt			**1826X12131**		**1826X12231**		**1826X12331**		**1826X12431**		**1826X12531**	
Clamping lever, long			**1826X12132**		**1826X12232**		**1826X12332**		**1826X12432**		**1826X12532**	
Part no. with switch rod												
Without clamping lever			**1826X12140**		**1826X12240**		**1826X12340**		**1826X12440**		**1826X12540**	
Clamping lever with contact bolt			**1826X12141**		**1826X12241**		**1826X12341**		**1826X12441**		**1826X12541**	
Clamping lever, long			**1826X12142**		**1826X12242**		**1826X12342**		**1826X12442**		**1826X12542**	
Part no. with stroke measuring system ultrasonic sensor												
Without clamping lever			**1826X12150**		**1826X12250**		**1826X12350**		**1826X12450**		**1826X12550**	
Clamping lever with contact bolt			**1826X12151**		**1826X12251**		**1826X12351**		**1826X12451**		**1826X12551**	
Clamping lever, long			**1826X12152**		**1826X12252**		**1826X12352**		**1826X12452**		**1826X12552**	
Spare O-ring		[mm]	7 × 1.5		7 × 1.5		7 × 1.5		8 × 1.5		8 × 1.5	
Part no.			**3000342**		**3000342**		**3000342**		**3000343**		**3000343**	

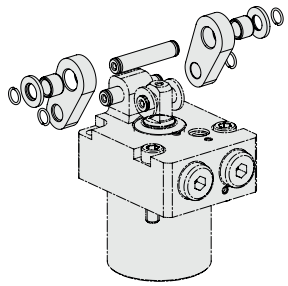
Product available on request

X = Code letter → Page 2

Conversion kit with clamping lever mechanism for operating pressure 120 bar

Existing hinge clamps rated up to 70 bar can be operated at a pressure of 120 bar by replacing the clamping lever mechanism.

Size	Part no.
BG 1	**0182611**
BG 2	**0182612**
BG 3	**0182613**
BG 4	**0182614**
BG 5	**0182615**



Stroke measuring system ultrasonic sensor

The ultrasonic sensor measures the piston position of the hinge clamp in absolute terms. This makes it possible to detect the clamped and unclamped positions of the clamping device or to identify when the clamping device is clamped without a workpiece in place.
The sensor is screwed into the base of the clamping device and tightened to a specified torque. If the piston moves during operation, the distance between the bottom of the piston and the sensor changes, resulting in a change in the duration of the ultrasonic signal.

Important notes

To ensure trouble-free operation, the clamping element must be carefully bled. A mounting position in which air can accumulate in the sensor's installation space (e.g. overhead) is not recommended.

Operating modes

The sensor can be connected and read in two different ways.

1. IO Link

The sensor is IO-Link compatible. If this transmission method is used, it is possible to analyse further data from the sensor or pre-process data, such as: reading the signal quality, setting switching points (e.g. clamped or unclamped position), and setting a switch counter.

2. SIO mode

In SIO (standard input/output) mode, the device can be used without an IO-Link connection. The behaviour in SIO mode is configured once via IO-Link.
The sensor can be configured so that one signal is transmitted via pin 2 (analogue or digital output) and another via pin 4 (digital output).
A complete overview of the sensor's range of functions can be found in the sensor's operating instructions.

Technical characteristics

Operating voltage	[V]	24
Max. current consumption	[mA]	130
Operating modes		IO-Link mode/ SIO mode
Repetitive accuracy	[µm]	± 50
Tightening torque	[Nm]	58–62
Max. compressive strength	[bar]	350
Ambient temperature	[°C]	0–85
Part no.		**3829519**

Connection

Pin	Signal
1	L+ (operating voltage +, SIO 10–30 V, IO-Link 18–30 V)
2	I/Q (digital input / digital output / analogue output)
3	L– (operating voltage –)
4	C/Q (IO-Link communication / digital output in SIO mode)

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

Application

The pneumatic position monitoring signals the following conditions by closing two bore holes:

1. Piston retracted and clamping lever in off-position
2. Piston in clamping area and clamping lever in clamping position

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

Description

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 connection

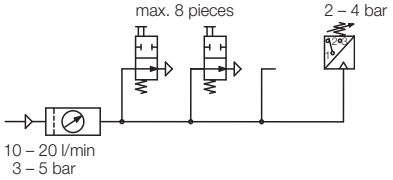
Cartridge type

The hinge 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 M5 pneumatic ports can be rotated by 360°.

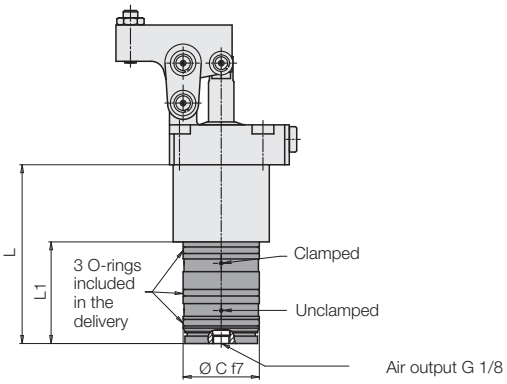
Monitoring by pneumatic pressure switch



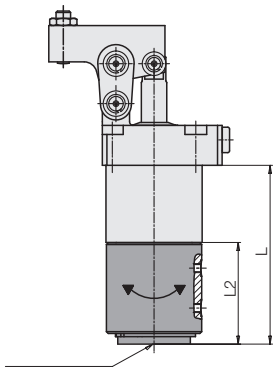
For the evaluation of the pneumatic pressure increase, standard pneumatic pressure switches can be used. Up to 8 position monitorings can be controlled with one pressure switch (see circuit diagram).

Note that reliable functioning of pneumatic monitoring is only guaranteed if the throttled air pressure and air flow rate are throttled.

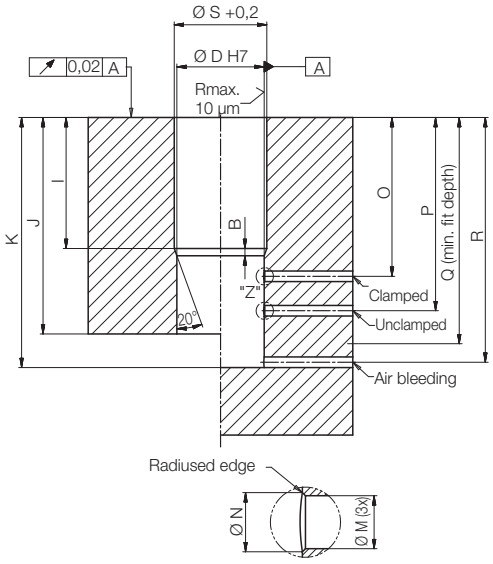
Cartridge type



Pipe thread connection

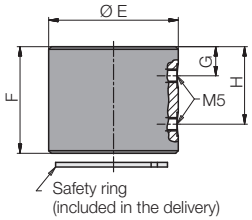


Location hole



Detail "Z"

Mounting body



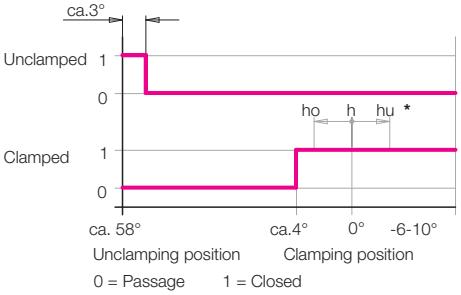
Technical characteristics

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.

**) Appropriate devices are available to measure the flow rate.

Function chart



***** Dimensions → Pages 2

Size		1	2	3	4	5
Ø A ± 0.1	[mm]	39	47	53	63	78
B	[mm]	1.3	2	2	2	2
Ø C f7	[mm]	38	42	42	45	45
Ø D H7	[mm]	38	42	42	45	45
Ø E	[mm]	49	53	52.5	62.5	62.5
F	[mm]	40.3	46	50	54	60
G	[mm]	11	13	14	14	15
H	[mm]	29.3	33	36	40	45
I +0.2	[mm]	34	40	43	47.5	55.5
J min.	[mm]	78	87	91	100	114
K min.	[mm]	84	95	100	109	123
L	[mm]	82.5	93.5	98.5	107	121.5
L1	[mm]	49	54	56	60	66.5
L2	[mm]	46.15	53.85	55.8	59.8	65.8
Ø M	[mm]	4	4	4	4	4
Ø N	[mm]	5	5	5	5	5
O	[mm]	46	52	55.5	60	70.6
P	[mm]	65	74	80	86	100.5
Q min.	[mm]	77	85	90	98.5	113
R	[mm]	79.5	90.5	95.5	104	118.5
Ø S max.	[mm]	40	48	54	64	79
Part no.						
Cartridge type with 4 screws		**0353341**	**0353342**	**0353343**	**0353344**	**0353345**
Mounting body For retrofitting of the cartridge type		**0353341A**	**0353342A**	**0353343A**	**0353344A**	**0353345A**

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

Application

The electrical position monitoring signals the following conditions due to damping of two inductive proximity switches:

1. Piston retracted and clamping lever in off-position.
2. Piston extended and clamping lever in off-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 hinge clamps with switch rod (1826**X**12X**4**X) .

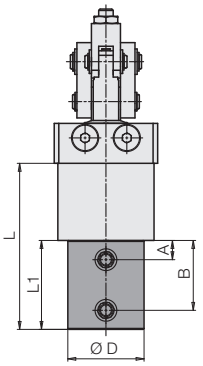
Included in our delivery are:

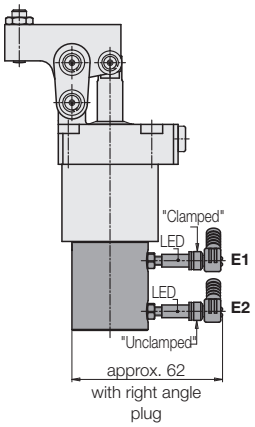
1 Signal sleeve with screw
1 Adapter with 4 countersunk screws
1 Control housing with 3 set screws
2 Inductive proximity switches with right angle plug (if ordered)

The signal sleeve is screwed onto the switch rod. The adapter is mounted with 4 countersunk screws on 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

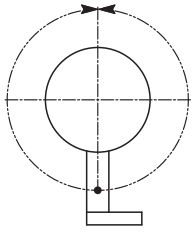
Inductive position monitorings are not suitable for the use in coolant and swarf areas. According to the corresponding application conditions, safety measures have to be planned and checked later on.





Four fixing screws included in our delivery

360° adjustable



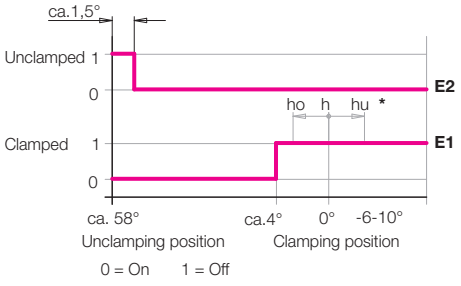
Possible position of the proximity switches

Technical characteristics

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 × 0.5
Code class	IP 67
Ambient temperature	–25 to +70 °C
LED function display	Yes
Protected against short circuits	Yes
Type of connection	Connector
Length of cable	5 m

Size		**1**	**2**	**3**	**4**	**5**
A	[mm]	12.5	12.5	10.5	10	12
B	[mm]	35	37	38.5	42.5	50
Ø D	[mm]	33	42	42	45	45
L	[mm]	75.5	84.5	91.5	103.5	117
L1	[mm]	42	45	49	56.5	62
Part no.						
without switches		**0353351**	**0353352**	**0353353**	**0353354**	**0353355**
with switch and plug		**0353351S**	**0353352S**	**0353353S**	**0353354S**	**0353355S**
Spare parts						
Inductive proximity switch		**3829198**	**3829198**	**3829198**	**3829198**	**3829198**
Right angle plug with cable 5 m		**3829099**	**3829099**	**3829099**	**3829099**	**3829099**

Function chart



***** Dimensions → Pages 2

Important notes

Hinge clamps must only be used for clamping of workpieces in industrial applications and may only be operated with hydraulic oil.
Hinge clamps can generate very high forces. The workpiece, the fixture or the machine must be in the position to absorb these forces. Considerable injuries to fingers during clamping and unclamping in the effective area of the clamping lever can occur.
The manufacturer of the fixture or the machine is obliged to provide effective protection devices.
Hinge clamps have to be checked regularly on contamination by swarf and have to be cleaned.

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