Hinge Clamps
## with metallic wiper edge and optional position monitoring, double acting, max. operating pressure 250 bar

Metallic wiper edge

Advantages
- Compact design
- Body partially recessible
- Oil supply alternatively via pipe threads or drilled channels
- Unimpeded loading and unloading of the fixture
- Clamping lever can be swivelled into small recesses
- Clamping possible without side loads
- Long clamping lever adaptable to the work-piece
- Lever mechanism easy to clean
- Standard metallic wiper edge
- Standard FKM seals
- Inductive or pneumatic control of the clamping position and the clamping range optional
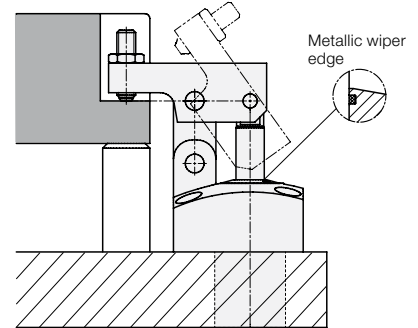
Application
The hinge clamp is a low-cost hydraulic clamp-ing element with many installation and con-necting possibilities.

If the clamping lever is completely retracted, unimpeded loading and unloading of the fix-ture can be effected. A clamping recess in the workpiece a little bit wider than the clamping lever is sufficient as clamping surface.

The special kinematics allow clamping nearly without side loads of workpieces which are very sensitive against deformation.

Description
When pressurising the element, the piston moves upwards and swivels the clamping le-ver over the hinges forwards and at the same time downwards onto the workpiece.

The piston force is deviated by 180° and is available as clamping force with virtually no loss of efficiency.

If the level of the clamping surface is exactly on height h (see page 2), no side loads are intro-duced into the workpiece.
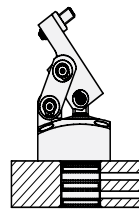
The bodies are recessible in the fixture up to the flange. Alternatively intermediate plates are available for height adjustment.

All versions are optionally available with ex-tended piston rod and with inductive or pneu-matic position monitoring.

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 compensate these forces. Considerable injuries can be caused to fingers during clamping and unclamping in the effective area of the clamping lever.

The manufacturer of the fixture or the machine is obliged to provide effective protective measures.

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.

Installation and connecting possibilities
Cartridge type
for horizontally-drilled channels

Pipe thread at the back / Plug-type connector

Fitting connection, at the back	for vertically-drilled channels

Pipe thread at 3 sides

Option
Extended piston rod
for all versions available

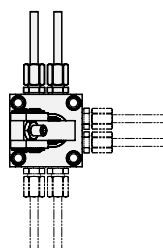| without position monitoring	with position monitoring
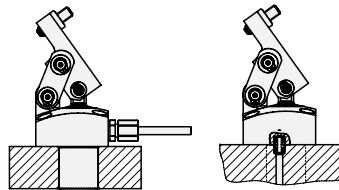
Accessories
Intermediate plates
for all versions with pipe thread

Intermediate plates

Option
Long clamping lever
for all versions available.
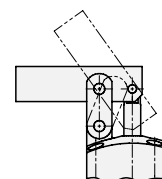
Alternatively all ver-sions are also available without clamping lever.

Cartridge type
Clamping lever with
swivel contact bolt

without clamping lever
extended piston rod

Optionally
with pneumatic position
monitoring

Optionally
with inductive position monitoring/
long clamping lever

Location hole
for cartridge type

1825-X11 **1825-X20** **1825-X21P** **1825-X22E**

All edges in Øg1H7
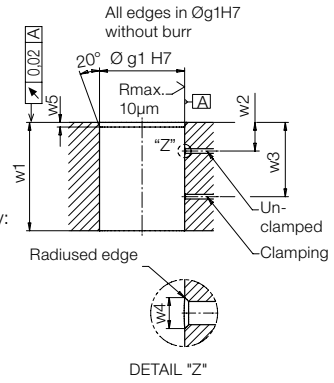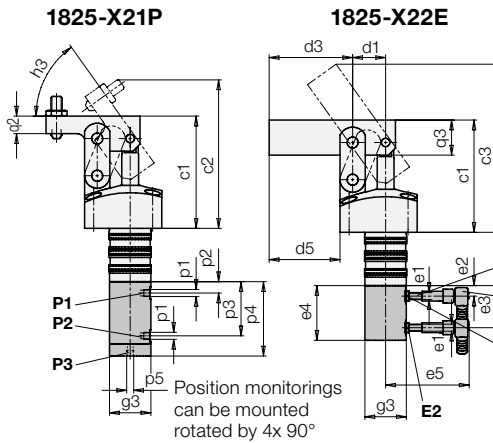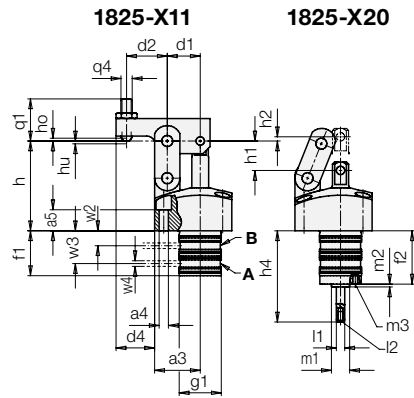without burr

Accessory:
Inductive
proximity
switch
Plug and
cable

E1

P1 = Clamping range, pneum.
P2 = Unclamped, pneum.
P3 = Outlet air, pneum. position monitoring

Position monitorings
can be mounted
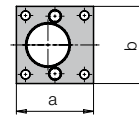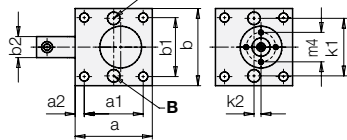rotated by 4x 90°

E2

DETAIL "Z"

Pipe thread at the back / plug-type connector

Clamping lever with
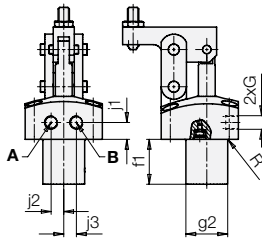swivel contact bolt

without clamping leverl
extended piston rod

A = Clamping
B = Unclamping
E1 = Clamping range, inductive
E2 = Unclamped, inductive
P1 = Clamping range, pneum.
P2 = Unclamped, pneum.
P3 = Outlet air, pneum. position monitoring

Accessory:
Intermediate plates for versions with
pipe threads
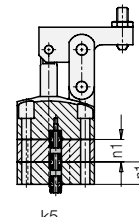
1825-X31 **1825-X40**

Material
Clamping lever: C45 + C (1.0503)
Body: steel
Sealings: FKM
Piston: high alloy steel

Accessory:
Plug-type
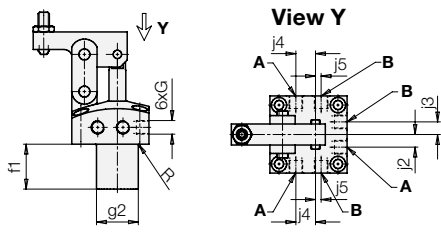connector

Socket head cap screw
with USIT ring

Fit depth K6

For oil supply through plug-type connectors, these
bore holes have to be provided in the base plate
Required accessory when using plug-type connectors:
2 x sealing plug
or 2 x screw plug (see page 4)

Pipe thread at 3 sides

1825-X51
Clamping lever with
swivel contact bolt

1825-X60
Without clamping lever
extended piston rod

View Y

4 x screw plug with sealing
edge included in the delivery
(dimension x1)

Connecting dimensions for self-manufactured clamping levers

Size		1	2	3	4
d1	[mm]	23.5	33	37	43.5
q3	[mm]	25	40	50	55
s1	[mm]	7	10.5	13	16.5
s2	[mm]	Ø8 H7	Ø12 H7	Ø15 H7	Ø18 H7
s3	[mm]	Ø6 H7	Ø9 H7	Ø12 H7	Ø14 H7
t1	[mm]	15 – 0.1	20 – 0.1	25 – 0.1	30 – 0.1
t2	[mm]	9	16.5	20	20
t3	[mm]	5	8	12	12
t4	[mm]	5	8	32	32
u1	[mm]	18	27.5	35.5	40
u2	[mm]	18	24	31	40
u3	[mm]	8.1 + 0.1	10 + 0.1	13 + 0.1	18+0.2
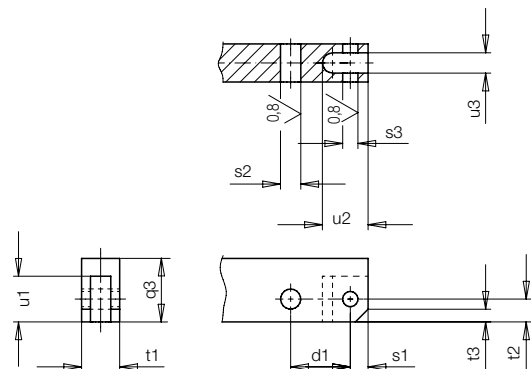
Size			1	2	3	4
Clamping force at a length of clamping lever	d2 and 250 bar	[kN]	3.8	9.7	14.4	21.5
Clamping force at a length of clamping lever with extended piston rod	d2 and 250 bar	[kN]	3.3	9.1	13.9	21
Oil volume clamping		[cm³]	4.8	16.9	31.1	61.6
Oil volume clamping with extended piston rod		[cm³]	4.1	16.0	30.0	60.2
Oil volume unclamping		[cm³]	2.1	10.0	19.0	37.5
Admissible flow rate		[cm³/s]	15.7	24.5	24.5	55
a		[mm]	55	70	85	100
a1		[mm]	42	56	69	81
a2		[mm]	6.5	7	8	9.5
a3		[mm]	32.5	46	52	60
a4		[mm]	4 x Ø 6.6	4 x Ø 9	4 x Ø 11	4 x Ø 13.5
a5		[mm]	15	18	21.5	30
b		[mm]	55	70	85	100
b1		[mm]	42	56	69	81
b2		[mm]	15	20	25	30
c1		[mm]	80	116	143	163
c2		[mm]	106	150	185	208
c3		[mm]	120	171	208	238.8
d1		[mm]	23.5	33	37	43.5
d2		[mm]	29	39.5	49	60.5
d3		[mm]	59.5	81.5	98	114
d4		[mm]	27.5	37.5	47.5	57.5
d5		[mm]	50.5	68.5	83	97.5
e1			M5 x 0.5	M5 x 0.5	M5 x 0.5	M5 x 0.5
e2		[mm]	7.5	9.7	11.6	14.5
e3		[mm]	30	41.9	46	58.3
e4		[mm]	39	49	55	68.5
e5		[mm]	approx. 60	approx. 60	approx. 60	approx. 60
f1		[mm]	32	43	44.5	52.5
f2		[mm]	38	49	50.5	58.5
G			G 1/8	G 1/8	G 1/4	G 1/4
Max. size of connecting fitting			6 L	8 S	10 L	10 L
g1		[mm]	Ø 30 f7	Ø 42 f7	Ø 52 f7	Ø 65 f7
g2		[mm]	Ø 29.8	Ø 41.8	Ø 51.8	Ø 64.8
g3		[mm]	Ø 29.5	Ø 39	Ø 39	Ø 39
h	ideal clamping point	[mm]	64	92.5	113	128
ho	upper end of the clamping range	[mm]	2	2.7	3.5	4.5
hu	lower end of the clamping range	[mm]	2	2.7	3.5	4.5
h1	piston stroke up to ideal clamping point	[mm]	21	30	33.5	41.5
h2	piston stroke up to the end of the clamping stroke	[mm]	3	4.5	5.2	7.5
h3		[°]	54.5	55.5	56	58.2
h4		[mm]	65	86.5	93	111
j1		[mm]	12	16	17	20
j2		[mm]	9	13.5	15.5	22
j3		[mm]	9	13.5	15.5	22
j4		[mm]	14	20	25	32
j5		[mm]	4	2	6	12
k1		[mm]	41 ± 0.02	55 ± 0.02	68 ± 0.02	80 ± 0.02
k2		[mm]	5 ± 0.05	0 ± 0.05	0 ± 0.05	0 ± 0.05
k3		[mm]	6.5	6.5	6.5	8
k4		[mm]	1.5	1.5	1.5	1.5
k5		[mm]	Ø 8 H7	Ø 8 H7	Ø 8 H7	Ø 10 H7
k6		[mm]	5.5	5.5	5.5	7
l1		[mm]	Ø 6 f7	Ø 6 f7	Ø 6 f7	Ø 6 f7
l2			M4 x 7.5 deep	M4 x 7.5 deep	M4 x 7.5 deep	M4 x 7.5 deep
m1		[mm]	Ø 13 f7	Ø 13 f7	Ø 13 f7	Ø 13 f7
m2		[mm]	2	2	2	2
m3			M4 x 6 deep	M4 x 6 deep	M4 x 6 deep	M4 x 6 deep
m4		[mm]	21	27	27	27
n1		[mm]	16	21.5	22.5	26.5
p1			M5	M5	M5	M5
p2		[mm]	8.5	10.6	12.3	15.2
p3		[mm]	38.6	50.9	55.1	66.5
p4		[mm]	53	73	77	84
p5			M5	G 1/4	G 1/4	G 1/4
q1		[mm]	30	40	50	50
q2		[mm]	12.5	20	25	28
q3		[mm]	25	40	50	55
q4			M8	M12	M16	M16
R		[mm]	0.8	0.8	1	0.8
w1		[mm]	min. 31.5	min. 41.5	min. 43.5	51.5
w2		[mm]	10.6	14.3	14.8	18
w3		[mm]	23.4	30.7	31.9	37.5
w4		[mm]	max. Ø 4	max. Ø 5.5	max. Ø 5.5	max. Ø 5.5
w5		[mm]	2.5 – 0.5	2.5 – 0.5	2.5 – 0.5	2.5 – 0.5
x1		[mm]	7	7	8	8
Weight approx.	**1825-XX0**	[kg]	1.0	2.3	3.8	6.1
	1825-XX1	[kg]	1.1	2.7	4.6	7.3
	1825-XX2	[kg]	1.2	3.0	5.1	8.1

Calculations

1. Length L of clamping lever is known

1.1 Admissible operating pressure

$$p_{adm} = \frac{B}{\frac{C}{L} + 1} \leq 250 \text{ bar} \qquad [\text{bar}]$$
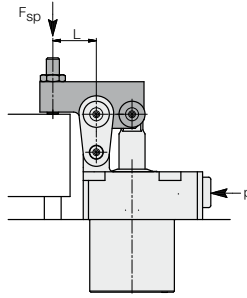
1.2 Effective clamping force

$$p_{adm} > 250 \text{ bar} \rightarrow F_{sp} = \frac{A}{L} * 250 \quad [\text{kN}]$$

$$p_{adm} < 250 \text{ bar} \rightarrow F_{sp} = \frac{A}{L} * p_{adm} \quad [\text{kN}]$$

2. Min. length of clamping lever

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

$L, L_{min.}$ = Length of clamping lever [mm]
$p, p_{adm.}$ = Operating pressure [bar]
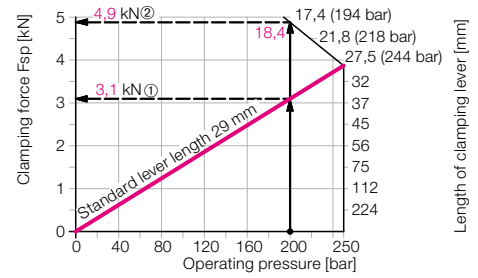A, B, C, = Constants as per chart

Constant

	1825-1	1825-2	1825-3	1825-4
A	0.449	1.54	2.827	5.193
A*	0.386	1.45	2.728	5.076
B	442.45	448.42	429.34	429.75
B*	514.86	475.83	444.98	420.08
C	22.325	31.35	35.15	43.5

A*, B* for version with switch rod
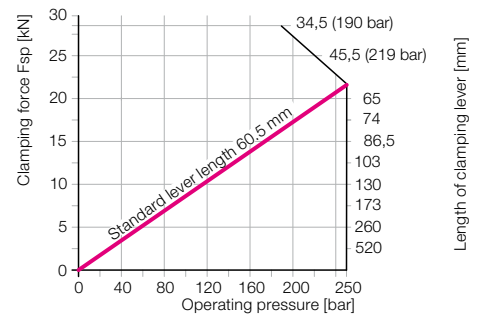
Example 1: Hinge clamp 1825-111
Operating pressure 200 bar
Standard clamping lever L = 29 mm

Effective clamping force

$$F_{Sp} = \frac{A}{L} * p = \frac{0.449}{29} * 200 = 3.1 \text{ kN}$$

Example 2: Hinge clamp 1825-110
Operating pressure 200 bar

Min. length of clamping lever

$$L_{min} = \frac{C}{\frac{B}{p} - 1} = \frac{22.325}{\frac{442.45}{200} - 1} = 18.4 \text{ mm}$$

Effective clamping force

$$F_{Sp} = \frac{A}{L} * p = \frac{0.449}{18.4} * 200 = 4.9 \text{ kN}$$

Example 3: Hinge clamp 1825-210
Special clamping lever L = 30 mm

Admissible operating pressure

$$p_{adm} = \frac{B}{\frac{C}{L} + 1} = \frac{448.42}{\frac{31.35}{30} + 1} = 219 \text{ bar}$$

Effective clamping force

$$F_{Sp} = \frac{A}{L} * p_{adm} = \frac{1.54}{30} * 219 = 11.25 \text{ kN}$$

Example 4: Hinge clamp 1825-310
Special clamping lever L = 118 mm

Admissible operating pressure

$$p_{adm} = \frac{B}{\frac{C}{L} + 1} = \frac{429.34}{\frac{35.15}{118} + 1} = 330.8 > 250 \text{ bar}$$

Effective clamping force
The max. operating pressure is 250 bar, thus

$$F_{Sp} = \frac{A}{L} * 250 = \frac{2.827}{118} * 250 = 6 \text{ kN}$$

Clamping force diagrams

Size 1

Size 2

Size 3

Size 4

see data sheet
C 2.940
C 2.9501

Free flow

Direction of flow control

Important note
Longer special clamping levers have a higher weight. Therefore the flow rate has to be considerably reduced to avoid damage of the mechanics in the stroke end positions.
A flow rate throttling always has to be effected in the supply line to the hinge clamp.

Code for part numbers

1 = Size 1
2 = Size 2
3 = Size 3
4 = Size 4
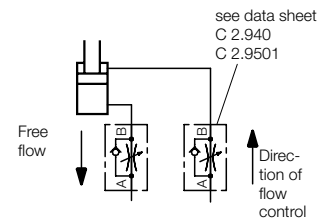
Basic type → **1825 - X X X X**

1 = cartridge-type
2 = cartridge-type with extended piston rod *)
3 = pipe thread at the back / plug-type connector
4 = pipe thread at the back / plug-type connector with extended piston rod *)
5 = pipe threads at three sides
6 = pipe threads at three sides with extended piston rod *)

*) A prerequisite for mounted position monitoring (addition: E or P)

E = mounted position monitoring, inductive (without proximity switch)
P = mounted position monitoring, pneumatic

0 = without clamping lever
1 = clamping levers with swivel contact bolt
2 = long clamping lever, unmachined Material: C45 + C (1.0503)

Technical characteristics for inductive proximity switches 3829-198

Operating voltage UB	10 ... 30 V DC
Switching function	Interlock
Output	PNP
Body material	Steel, corrosion resistant
Protection as per DIN 40050	IP 67
Environmental temperature	−25 ... +70 °C
Connection type	Plug
LED Function display	Yes
Constant current max.	150 mA
Rated operating distance	0.8 mm
Protected against short circuits	yes

Accessories Size	1	2	3	4
Intermediate plate (not for cartridge-type version)	3456-449	3456-468	3456-489	3456-534
Plug-type connector	9210-145	9210-145	9210-145	9210-132
Plug, flush screwable with hexagon socket	0361-986	0361-986	0361-987	0361-987
Screw plug with hexagon head	3610-008	3610-008	3610-006	3610-006
Pneumatic position monitoring, complete **)	0353-845	0353-853	0353-855	0353-962
Weight [kg]	0.18	0.42	0.46	0.74
Inductive position monitoring, without ind. proximity switch) **)	0353-846	0353-854	0353-856	0353-963
Weight [kg]	0.26	0.62	0.65	0.58
Inductive proximity switch	3829-198	3829-198	3829-198	3829-198
Plug and cable for inductive proximity switch	3829-099	3829-099	3829-099	3829-099

**) Only mountable at 1825-X2X, -X4X, -X6X.