Rotary linear clamp with pneum. control

hydraulically double-acting, pmax 250 bar, position control available in clamped and/or unclamped state

Description:

The rotary linear clamp with pneumatic position detection is particularly suitable for clamping devices that have limited space for the installation of clamping elements. The design and compact construction of the rotary linear clamps enable flexible solutions for a wide range of installation conditions.

The double-acting rotary linear clamps are pull cylinders and are used in clamping devices whose oil supply is provided via drilled channels.

The linear stroke is used proportionally to swing in the clamping lever, thereby securing the workpiece. This means that the linear stroke can also compensate workpiece tolerances. To release the clamp, the clamping lever swings back far enough to allow the workpiece to be removed without collision.

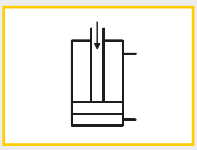
The clamping lever is coupled to the piston rod. In double-acting rotary linear clamps, the clamping lever is opened or closed by the pressure medium.

The version with cover is installed in open bores and ensures a minimum installation height. The version without cover requires a closed blind hole.

Pneumatic position control:

When querying the position, either the clamped position, the unclamped position or even both can be queried.

Webcode: 025040



Connections:

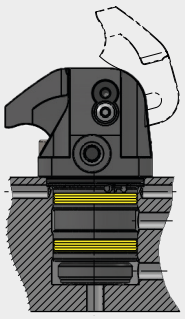
- Drilled channels

Advantages:

- Clamping without shear forces
- Pipeless oil supply
- Partial retractable housing
- Individual clamping levers mountable
- Control of the clamping lever position
- Any installation position
- Compact dimensions
- Metal wiper

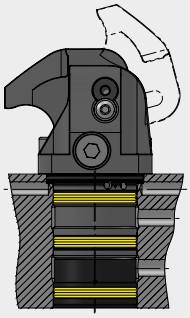
Installation options:

Standard clamping lever



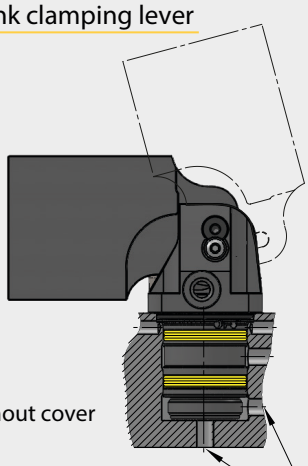
without cover

Standard clamping lever



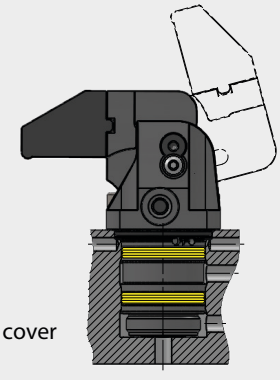
with cover

Blank clamping lever



without cover

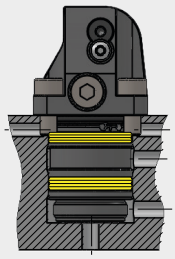
Adaptive clamping lever



without cover

Connection options unclamped

without clamping lever



without cover

Special clamping lever	
Quantity	**% at standard price**
3 - 5	+ 100%
6 - 15	+ 70%
from 16	+ 50%

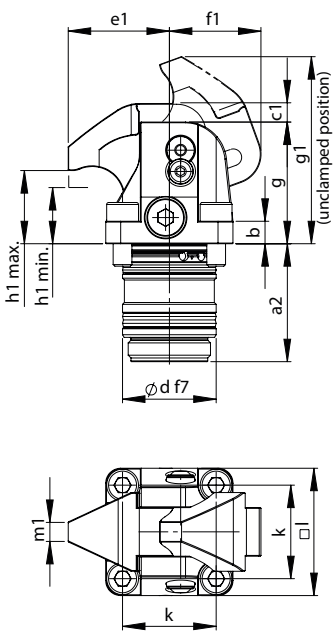
We also design and manufacture customized variants!

HYDROKOMP®
Hydraulische Komponenten GmbH

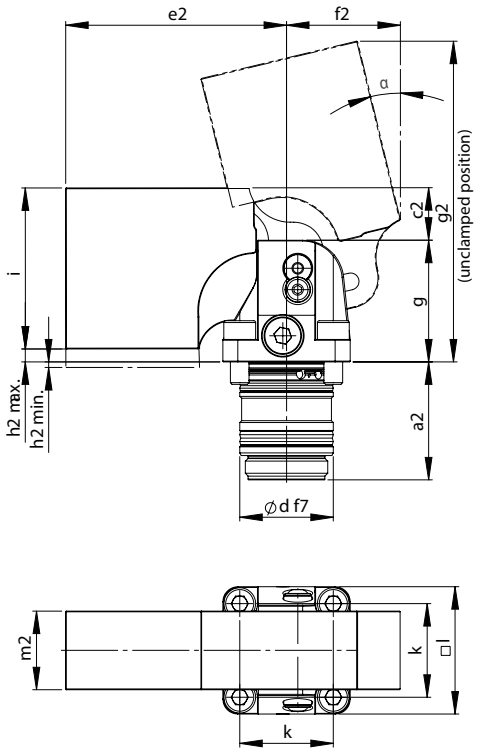
+49 6401 225999-0
sales@hydrokomp.de
Siemenstr. 16
35325 Mücke (Germany)
www.hydrokomp.de

Technology that connects

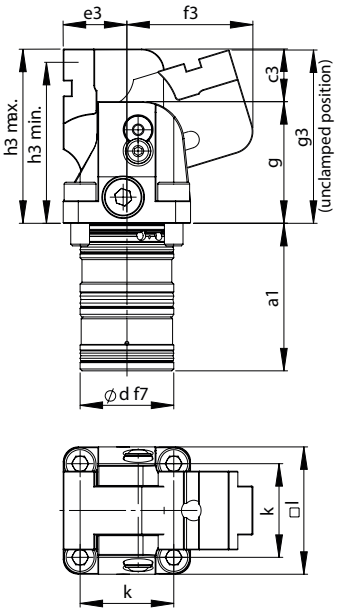
without cover
Standard clamping lever



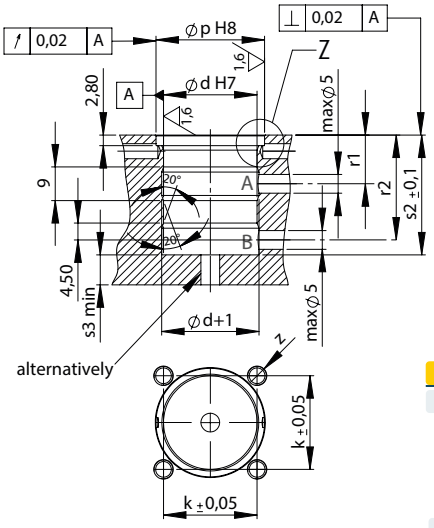
without cover
Blank clamping lever

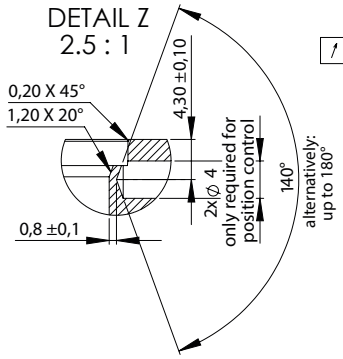


with cover
Adaptive clamping lever

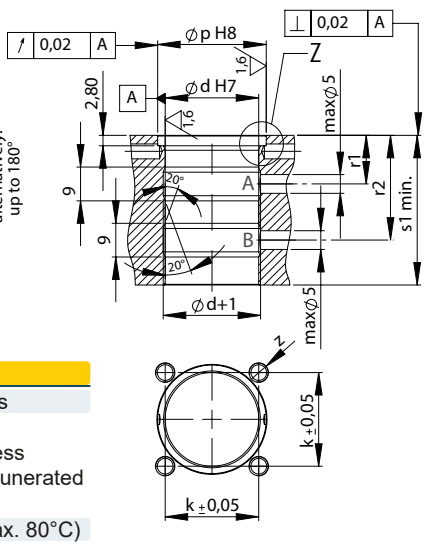


Installation contour without cover





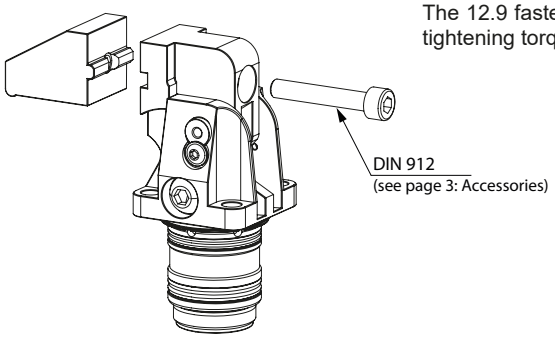
Installation contour with cover



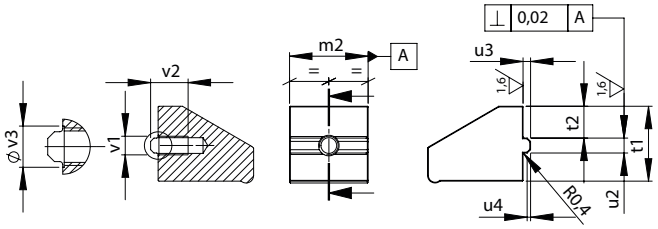
Materials	
housing	hardened, stainless
clamping lever:	
standard	HRC 48-55, stainless
blank	X37CrMoV5-1 remunerated HR 40, nitrided
seals	NBR and PUR (max. 80°C)

The rotary linear clamp with Adaptive clamping lever and integrated swivel mechanism allows the attachment of customer-specific clamping levers, which are relatively easy to manufacture. The 12.9 fastening screw is included in the scope of delivery. For tightening torque, see table on *page 3*.

Adaptive clamping lever



Flange dimensions for adaptive clamping lever



Size / Piston Ø:		18	22	28	33
Clamping force at 250 bar (standard clamping lever)	[kN]	3,2	4,5	7,5	11,5
Max. stroke	[mm]	5	5	7	8,5
Usable clamping stroke	[mm]	4,5	4,5	6,5	8
Rod diameter	[mm]	11	14	17	19
Oil requirements clamping / unclamping	[cm3]	2,3 / 3,6	3,2 / 5,4	6,4 / 10,2	10,5 / 15,7
Permissible volume flow	[cm3/s]	8	11	22	35
Minimum pressure without clamping control	[bar]	20	20	20	20
with clamping control	[bar]	70	70	70	70
with unclamping control	[bar]	20	20	20	20
Minimum air pressure	[bar]	0,5	0,5	0,5	0,5
α ± w1	[°]	13,5	10,5	14	16
a1	[mm]	39,4	43	48,5	50,5
a2	[mm]	32	34	40,6	40,8
b	[mm]	6	7	10	10
c1	[mm]	5	5	7	8,5
c2	[mm]	14	12	7	8,5
c3	[mm]	14	16	16	22,5
Ød H7 / f7	[mm]	25	32	40	45
e1	[mm]	27	28	36,5	36,5
e2	[mm]	59	60	67,5	67,5
e3	[mm]	17	20	22	22
f1	[mm]	24,7	25,9	31,3	33,8
f2	[mm]	30,7	30,5	31,3	33,8
f3	[mm]	34,3	37	40,4	48,1
g	[mm]	32,5	36,5	43	46
g1 max.*	[mm]	49,3	51	63	64,8
g2 min. / max.*	[mm]	85 / 87,5	86 / 89,5	97,7 / 99,7	100,9 / 103
g3	[mm]	44	47,2	55,4	60,6
h1 min. / h1 max.	[mm]	15,5 / 20	15,5 / 20	15,5 / 22	15,5 / 23,5
h2 min. / h2 max.	[mm]	1 / 3,5	2 / 2,5	1 / 5,5	1 / 7
h3 min. / h3 max.	[mm]	42 / 46,5	48 / 52,5	52,5 / 59	60,5 / 68,5
i	[mm]	43	46	44,5	47,5
k	[mm]	25	31	36,5	41
l	[mm]	34	42	48	55
m1	[mm]	5	6	8	8
m2	[mm]	21	26	32	35
n	[°]	50,4	55,8	56,1	62
Ø p H8	[mm]	29	36	44	49
r1	[mm]	13	13	14	14
r2	[mm]	28	28	31	31
s1 min.	[mm]	40	43,5	49	51
s2 ± 0,1	[mm]	32	34	40,6	40,8
s3 min.	[mm]	6	7	9	10
t1	[mm]	20	23	23	29
t2	[mm]	8,5	12	10	17
u2 - 0,05	[mm]	4	5	6	6
u3	[mm]	2	3	4	4
u4	[mm]	0,9x45°	1x45°	1,3x45°	1,3x45°
v1 x v2	[mm]	M5 x 10	M5 x 10	M8 x 17	M8 x 17
Ø v3	[mm]	5,5	5,5	8,5	8,5
z	[mm]	M5	M6	M6	M8
Variant without cover: A					
Order no. - without clamping lever		**DLSP-A1805-00X**	**DLSP-A2205-00X**	**DLSP-A2807-00X**	**DLSP-A3308-00X**
Weight approx.	[kg]	0,19	0,33	0,55	0,70
Order no. - standard clamping lever		**DLSP-A1805-01X**	**DLSP-A2205-01X**	**DLSP-A2807-01X**	**DLSP-A3308-01X**
Weight approx.	[kg]	0,27	0,46	0,82	1,03
Order no. - blank clamping lever		**DLSP-A1805-02X**	**DLSP-A2205-02X**	**DLSP-A2807-02X**	**DLSP-A3308-02X**
Weight approx.	[kg]	0,54	0,82	1,3	1,56
Order no. - adaptive clamping lever		**DLSP-A1805-03X**	**DLSP-A2205-03X**	**DLSP-A2807-03X**	**DLSP-A3308-03X**
Weight approx.	[kg]	0,29	0,51	0,83	0,92
Variant with cover: B					
Order no. - without clamping lever		**DLSP-B1805-00X**	**DLSP-B2205-00X**	**DLSP-B2807-00X**	**DLSP-B3308-00X**
Weight approx.	[kg]	0,21	0,4	0,65	0,84
Order no. - standard clamping lever		**DLSP-B1805-01X**	**DLSP-B2205-01X**	**DLSP-B2807-01X**	**DLSP-B3308-01X**
Weight approx.	[kg]	0,3	0,53	0,92	1,17
Order no. - blank clamping lever		**DLSP-B1805-02X**	**DLSP-B2205-02X**	**DLSP-B2807-02X**	**DLSP-B3308-02X**
Weight approx.	[kg]	0,57	0,88	1,4	1,7
Order no. - adaptive clamping lever		**DLSP-B1805-03X**	**DLSP-B2205-03X**	**DLSP-B2807-03X**	**DLSP-B3308-03X**
Weight approx.	[kg]	0,32	0,57	0,93	1,06

Pneumatic position control:
When placing your order, please replace the variable **X** in the order number with the corresponding number to obtain the desired position query..

- **0** without position control
- **1** clamped position control
- **2** unclamped position control
- **3** clamped and unclamped position control

Accessories					
Order no. - standard clamping lever		SHS-18-001	SHS-22-001	SHS-28-001	SHS-33-001
Order no. - blank clamping lever		SHR-18-001	SHR-22-001	SHR-28-001	SHR-33-001
Order no. - adaptive clamping lever		SHA-18-001	SHA-22-001	SHA-28-001	SHA-33-001
Screw for adaptive clamping lever	[mm]	M5 x 30 –12.9	M5 x 30 –12.9	M8 x 35 –12.9	M8 x 35 –12.9
Tightening torque	[Nm]	10	10	42	42
Order no.		7005-101	7005-101	7008-039	7008-039

Order number key:

Example: **DLSP** - **A** **1805** - **0** **1** **0**

Design:
without cover = **A**
with cover = **B**

Piston Ø: **Linear stroke:**
18 → **05**
22 → **05**
28 → **07**
33 → **08**

Clamping lever:
without clamping lever = **0**
standard = **1**
blank = **2**
adaptive = **3**

Position control:
without position control = **0**
clamped position control = **1**
unclamped position control = **2**
clamped and unclamped position control = **3**

Position control:

1. Pneumatic clamping control

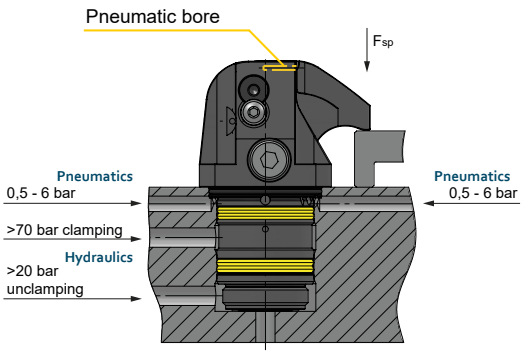
In the clamping range, the clamping lever moves downwards along two hardened surfaces on the housing. One of these surfaces has a hole for the pneumatic clamped control.

When moving over this hole, the clamping lever does not initially close it completely. Only when a workpiece is actually clamped in place does the lever rest against the sliding surface and the hole is securely closed.

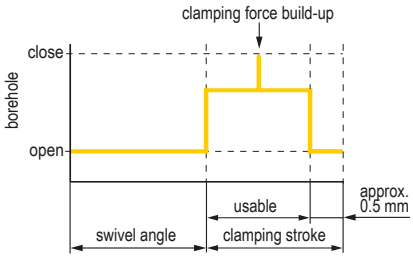
The clamping control emits a signal when the clamping lever is within the functional clamping range and a workpiece is correctly clamped.

Important:
Minimum pressures required for clamping control: Pneumatics 0.5 bar
Hydraulics 70bar

Example: clamped position



Function diagram:

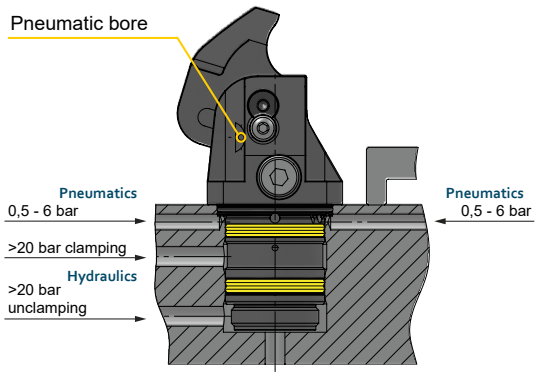


2. Pneumatic unclamping control

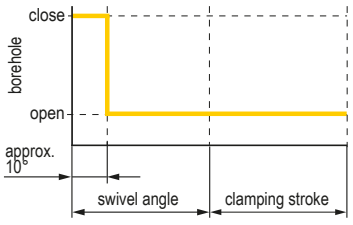
In the unclamping position, the clamping lever covers and closes a pneumatic bore.

Note:
The rotary linear clamp can be equipped with either a clamping or unclamping control, whereby it is also possible to monitor both positions in a rotary linear clamp.

Example: unclamped position



Function diagram:

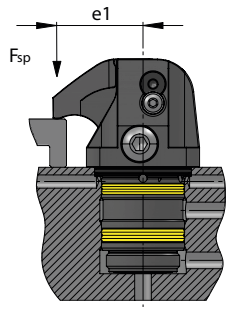


Control via pneumatic pressure switch

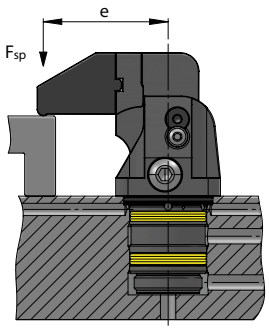
Standard pressure switches for pneumatics can be used to detect the pressure increase in the pneumatic line.

Clamping forces:

Standard clamping lever



Adaptive clamping lever



Clamping force calculations:

1. Clamping lever length **e** is known

1.1 Permissible clamping force as a function of clamping lever length **e**

$$F_{zul} = \frac{A}{e - B} \quad [kN]$$

1.2 Permissible operating pressure

$$p_{zul} = \frac{F_{zul} * 100}{C} * \left(\frac{e - B}{D} + 1\right) \quad [bar]$$

1.3 Effective clamping force at other pressure **p**

1.3.1 **Fzul** and **pzul** are known

$$F_{sp} = F_{zul} \frac{p}{p_{zul}} \leq F_{zul} \quad [kN]$$

1.3.2 In general, the following applies:

$$F_{sp} = \frac{C}{\left(\frac{e-B}{D} + 1\right) * 100} * p \leq F_{zul} \quad [kN]$$

2. Maximum clamping lever length depending on the available operating pressure

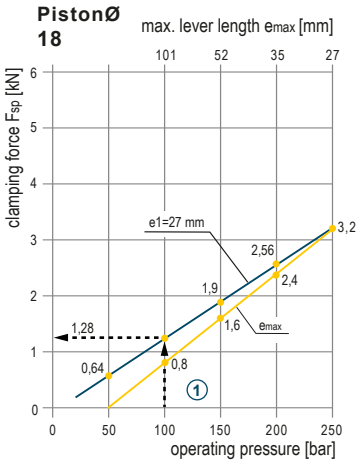
$$e_{max} = \frac{A}{(C * 0{,}01 * p) - E} + B \quad [mm]$$

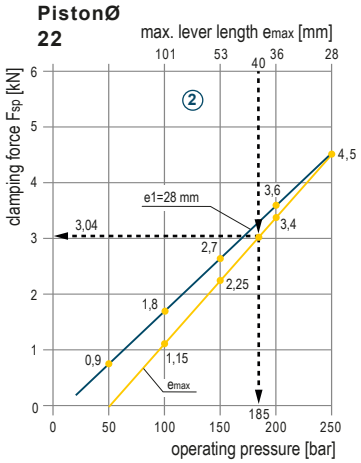
F_{sp}, F_{zul} = clamping force [kN]
e, e_1, e_{max} = clamping lever length [mm]
p, p_{zul} = operating pressure [bar]
A...E = constants according to table

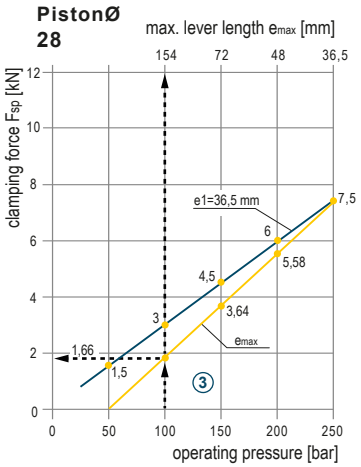
Enter the variables in the above units into the formulas.

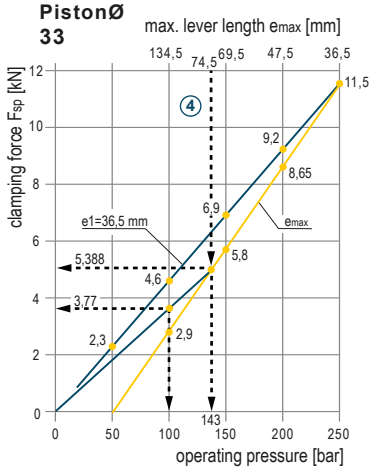
Constants

PistonØ	18	22	28	33
A	80	112,5	251,3	385,3
B	2	3	3	3
C	1,594	2,262	3,888	5,718
D	101,7	97,62	113	138,1
E	0,787	1,152	2,224	2,789









Example 1: Rotary linear clamp Ø18

Standard clamping lever **e1** = 27 mm; **Fzul** = 3,2 kN at **pzul** = 250 bar; operating pressure **p** = 100 bar

Effective clamping force

$$F_{sp} = F_{zul} \frac{P}{p_{zul}} = 3{,}2 \frac{100}{250} = \underline{1{,}28\ kN}$$

alternative

$$F_{sp} = \frac{C}{\left(\frac{e - B}{D} + 1\right) * 100} * p$$

$$F_{sp} = \frac{1{,}594}{\left(\frac{27 - 2}{101{,}7} + 1\right) * 100} * 100$$

$F_{sp} = \underline{1{,}28\ kN}$

Example 2: Rotary linear clamp Ø22

Standard clamping lever **e** = 40 mm

Effective clamping force

$$F_{zul} = \frac{A}{e - B} = \frac{112{,}5}{0 - 3} = \underline{3{,}04\ kN}$$

Permissible operating pressure

$$p_{zul} = \frac{F_{zul} * 100}{C} * \left(\frac{e - B}{D} + 1\right)$$

$$p_{zul} = \frac{3{,}04 * 100}{2{,}262} * \left(\frac{40 - 3}{97{,}62} + 1\right)$$

$p_{zul} = \underline{185\ bar}$

Example 3: Rotary linear clamp Ø28

operating pressure **p** = 100 bar; Adaptive clamping lever

Maximum clamping lever length

$$e_{max} = \frac{A}{(C * 0{,}01 * p) - E} + B$$

$$e_{max} = \frac{251{,}3}{(3{,}888 * 0{,}01 * 100) - 2{,}224} + 3$$

e_{max} = 154,02 mm $\triangleq \underline{154\ mm}$

Maximum clamping force

$$F_{sp} = \frac{C}{\left(\frac{e - B}{D} + 1\right) * 100} * p$$

$$F_{sp} = \frac{3{,}888}{\left(\frac{154 - 3}{113} + 1\right) * 100} * 100$$

$F_{sp} = \underline{1{,}66\ kN}$

Example 4: Rotary linear clamp Ø33

Adaptive clamping lever **e** = 74,5 mm

Permissible clamping force

$$F_{zul} = \frac{A}{e - B} = \frac{385{,}3}{74{,}5 - 3} = \underline{5{,}388\ kN}$$

Permissible operating pressure

$$p_{zul} = \frac{F_{zul} * 100}{C} * \left(\frac{e - B}{D} + 1\right)$$

$$p_{zul} = \frac{4{,}077 * 100}{5{,}718} * \left(\frac{74{,}5 - 3}{138{,}1} + 1\right)$$

$p_{zul} = \underline{143\ bar}$

Effective clamping force at 100 bar

$$F_{sp} = \frac{C}{\left(\frac{e - B}{D} + 1\right) * 100} * p$$

$$F_{sp} = \frac{5{,}718}{\left(\frac{74{,}5 - 3}{138{,}1} + 1\right) * 100} * 100$$

$F_{sp} = \underline{3{,}77\ kN}$

Permissible volume flow:

The permissible volume flow specified in the table on page 3 refers to short-type clamping levers. In this case, the clamping time is approximately 0.6 seconds and the unclamping time is approximately 1 second.

When using longer clamping levers with a higher moment of inertia, the swivel mechanism is subjected to greater stress, which can lead to increased wear. The end stop is particularly critical when unclamping. Therefore, the volume flow should be reduced for longer clamping levers according to the following formula:

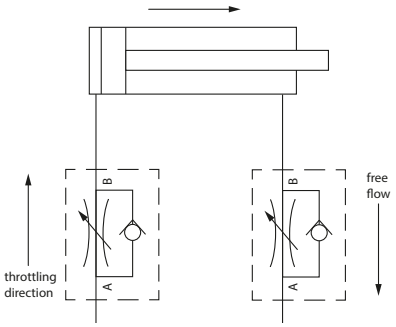
$$Q_L = Q_K * \sqrt{\frac{J_K}{J_L}} \ cm^3/s$$

Q_L = Permissible volume flow with longer special clamping lever
Q_K = Permissible volume flow with 'short' clamping lever according to table on page 3
J_K = Moment of inertia of the 'short' special clamping lever (see table)
J_L = Moment of inertia of the longer special clamping lever

$$\text{clamping time } t_{Sp} = \frac{\text{oil consumption range [cm}^3\text{]}}{\text{permissible volume flow } [\frac{cm^3}{S}]} \ [S]$$

Throttling of the volume flow:

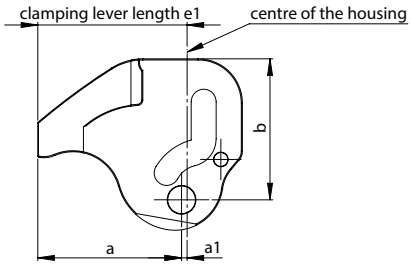
The volume flow must be throttled in the inlet, i.e. in the direction of the rotary linear clamp. This is the only way to avoid pressure transmission and thus pressures above 250 bar.



Important:
The clamping lever length **e** is always measured from the centre of the housing. As shown in the examples, the actual pivot axis for calculating the moment of inertia is offset by 1 to 2 mm. The exact position of the pivot axis can be determined precisely using coordinates a and b.

Standard clamping lever:

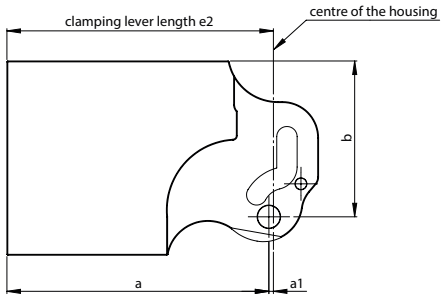
The moment of inertia specified in the table forms the basis for the maximum achievable volume flow and the minimum possible clamping time.



PistonØ		18	22	28	33
e1	[mm]	27	28	36,5	36,5
a	[mm]	26	26	34,5	34,5
a1	[mm]	1	2	2	2
b	[mm]	25,5	27,5	33	36
moment of inertia J_K	[kgmm²]	22	34	98	125

Blank clamping lever:

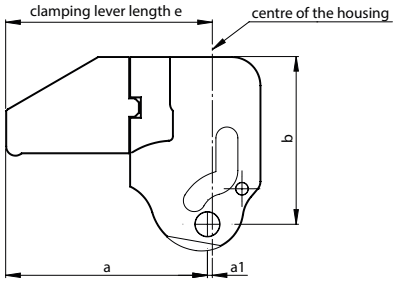
The blank does not represent a ready-to-use clamping lever. The table value indicates the maximum achievable moment of inertia.



PistonØ		18	22	28	33
e2	[mm]	59	60	67,5	67,5
a	[mm]	58	58	65,5	65,5
a1	[mm]	1	2	2	2
b	[mm]	34,5	34,5	33	36
moment of inertia J_L	[kgmm²]	576	756	1234	1477

Adaptive clamping lever:

The Adaptiv clamping lever is supplemented by a customer-supplied clamping iron and a fastening screw. To determine the moment of inertia, a CAD model should be created in the assembled state.



PistonØ		18	22	28	33
e	[mm]	*customer requirement*			
a	[mm]	16	18	20	20
a1	[mm]	1	2	2	2
b	[mm]	34,5	38,5	42	50
moment of inertia J_{L1}	[kgmm²]	49	97	170	294
+ extension J_{L2}	[kgmm²]	*determine using CAD model*			

Safety information:

Rotary linear clamps are designed for industrial use for clamping workpieces.
Da hydraulische Spannelemente sehr hohe Hydraulic clamping elements can generate very high forces, the workpiece, fixture and machine must be designed to be sufficiently stable. There is a risk of crushing in the area of the clamping lever, which is why the manufacturer of the device is obliged to take appropriate protective measures. During loading and unloading, avoid colliding with the clamping lever. The flange height of the rotary linear clamp and the clamping surface of the workpiece should be adjusted so that the clamping height is in the middle of the usable clamping stroke.

Regular inspection and cleaning of the clamping system is necessary, especially when chips are produced.
In the case of dry machining, minimum quantity lubrication or fine particles, regular disassembly, cleaning and lubrication of the lever mechanism is also necessary.