

inosol

innovative solutions

KEN008

02-2017

Hydraulic Components and Parts

CATALOG



Fluid Connectors | Workholdings | Valves
Rotary Joints | Accessories | Pressure Generators

Who we are...

Dear customer, dear prospective customer

With this 8th edition of our product catalog we would like to show an overview about our current standard products.

The catalog contains both, products from the fields of fluid connecting and workholding technology, as well as the associated valves, pressure generators, rotary distributors and other accessories.

Our own high-quality elements from our core areas, we supplement with the products of well-known manufacturers with the goal, that you always get the best solution.

We develop special solutions from the already mentioned areas and especially in the areas of rotary distributors and pressure generators.

If you are looking for an individual solution, please do not hesitate to contact us.

Find out more at:

www.inosol.solutions

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→ Lever Clamp:

Tiny Link Clamp

Lever clamp with high power generation compared to the compact design. Even when using long clamping levers - absolute freedom of insertion.



- ✓ High Force Generation
- ✓ Pneumatic detection as option
- ✓ Absolute Freedom of insertion
- ✓ Lateral Force optimized

→ Sliding Joint Clamp:

Specially designed for heavy duty use in foundry and sand mold applications, takes this hydraulic clamping element, as a lever clamp, high vibrations.



- ✓ Solid Design
- ✓ As option with sensor-control
- ✓ Oil connection via thread- or manifold connection
- ✓ For high vibrations and abrasively media suitable

→ Bore Clamps:

Bore clamps can often replace conventional clamping elements, because they generate very high holding forces and do not affect the interference contour while machining the workpieces.



- ✓ Support and clamping element in one
- ✓ No interference contour during machining
- ✓ Incl. pneumatic controlling
- ✓ No high pressure required

→ Rotary Lever Clamps:

Rotary Lever Clamps are tension-optimized lever clamping cylinders. These are available in single- and double acting versions and have a pneumatic detection as option.



- ✓ Different types, single- and double acting
- ✓ Cost-efficient and compact Design
- ✓ No interference cont. while loading and unloading
- ✓ Length of clamping arm variable

→ Work Supports:

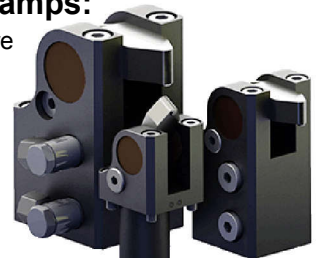
Work Support Elements are used as variable clamping points for supporting the work-piece during the preparation process. They compensate the transmitted forces from the tools and other vibrations.



- ✓ High support forces
- ✓ Metal wiper as option
- ✓ Perfect coolant protection
- ✓ Also as 70 bar-Elements available

→ Eccentric Lever Clamps:

Eccentric Lever Clamps are easy to mount with the possibility of manifold connection. Furthermore they have a compact design.



- ✓ Different types with bottom flange and top flange
- ✓ Cost-efficient and compact Design
- ✓ As standard with pneumatic detection
- ✓ Length of clamping arm variable

→ Pull-Down-Centering Clamps:

Unique clamping element with centering and pull down-function for use in big holes. As option the floating upper part can be used to adjust positional tolerances.



- ✓ High Clamping forces
- ✓ With blow air and pneumatic detection connection
- ✓ up to 200 bar

→ High force work support:

Very space saving solution with high support force. Low settlement with only one connection. Furthermore is a Rotation protection included.



- ✓ With protection against rotation
- ✓ High support force
- ✓ From 35 bar on

Lever Clamps



Rotary Lever Clamp
Page 4-8



Eccentric Lever Clamp
Page 9-11



Tiny Link Clamp
Page 12-16



Sliding Joint Clamp
Page 17-18

Swing Clamps



Hydraulic
up to 500 bar

Page 19-25



Pneumatic
up to 6 bar

Page 26-29

Centering Clamps



Expansion Clamp
up to 70 bar
Ø 5,5-16

Page 30-32



Pull down-
Centering clamp
up to 200 bar
Ø 35-81

Page 33-35

Work Supports



Work Support
35 - 250 bar
single acting

Page 36-37



Work supports
100 bis 350 bar
single- and
double acting

Page 38-40



Work support
70 bar
single-acting

Page 41

Other Clamping Elements



Threaded body cylinders
up to 350 bar
single acting

Page 42-43



Double acting

Single acting

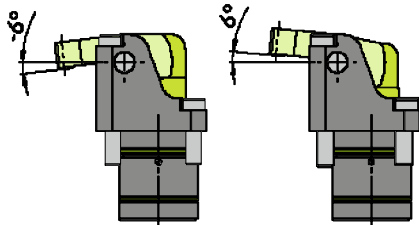
Description:

Because of their compact design, rotary lever clamps are particularly suitable for use in clamping devices with low installation spaces.

Due to the large opening angle of the clamping lever they allow easy loading and unloading of the fixture.

The lower housing part is recessed in the clamping fixture. Oil supply comes through drilled channels.

The clamping forces are depending on the length of release lever. Clamping forces and clamping lever lengths can be found on the following pages.



Clamping range from 6° to -6°

The rotary lever clamps are supplied with fixing screws.

The clamping levers are not included in the scope of supply. They must be ordered as an accessory.

The clamping forces are depending on the length of the lever. In a clamped position the lever should be at 90° angle to the housing.

Actual Clamping force F_S in response to the piston force F_k and Length of lever arm L

Example:

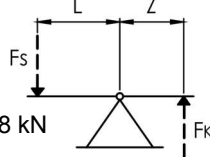
Rotary lever clamp size 20

working pressure 400 bar, piston force $F_k = 18 \text{ kN}$

Dim. Z (page 3) = 15,0 mm

Length of lever L

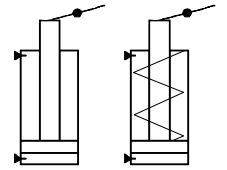
Actual Clamping force $F_S = 12,0 \text{ kN}$



$$\text{Clamping force } F_S = \frac{F_k \times Z}{L} = \frac{18 \text{ kN} \times 15,0 \text{ mm}}{22,5 \text{ mm}} = 12,0 \text{ kN}$$

Advantages:

- ✓ Clamping without shear force
- ✓ Compact design
- ✓ Very few parts
- ✓ Cost-efficient
- ✓ Length of clamping arm variable
- ✓ No interference contour while loading and unloading
- ✓ Mounting in feeder plate possible



Recommendations for use:

The clamping lever is actuated by the piston.

For single acting cylinders the clamping lever is opened via the spring return inside of the piston.

For double-acting cylinders this is done by the pressure media.

During the installation of the rotary lever clamp, the flange should be adjusted to the height of the workpiece.

For mounting on the device, housing blocks of aluminum and steel are available on request.

The cylinder is suitable for all mounting positions.

We recommend as a medium - hydraulic oils acc. DIN 51524 (HL, HLP).

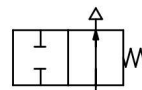
Rotary lever clamps can generate high forces. Workpieces and fixtures must be designed for such loads.

During operation consists crushing hazard. The accident prevention regulations are therefore mandatory.

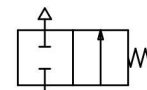
The rotary lever clamping cylinders should be checked regularly for pollution and they have to be cleaned if necessary.

Optional with included pneumatical query available (next page)!

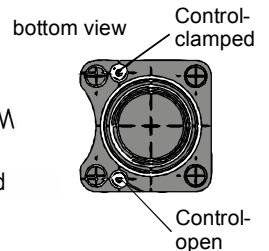
Clamping lever open



Control open



Control closed



Special solutions on request!

Contact

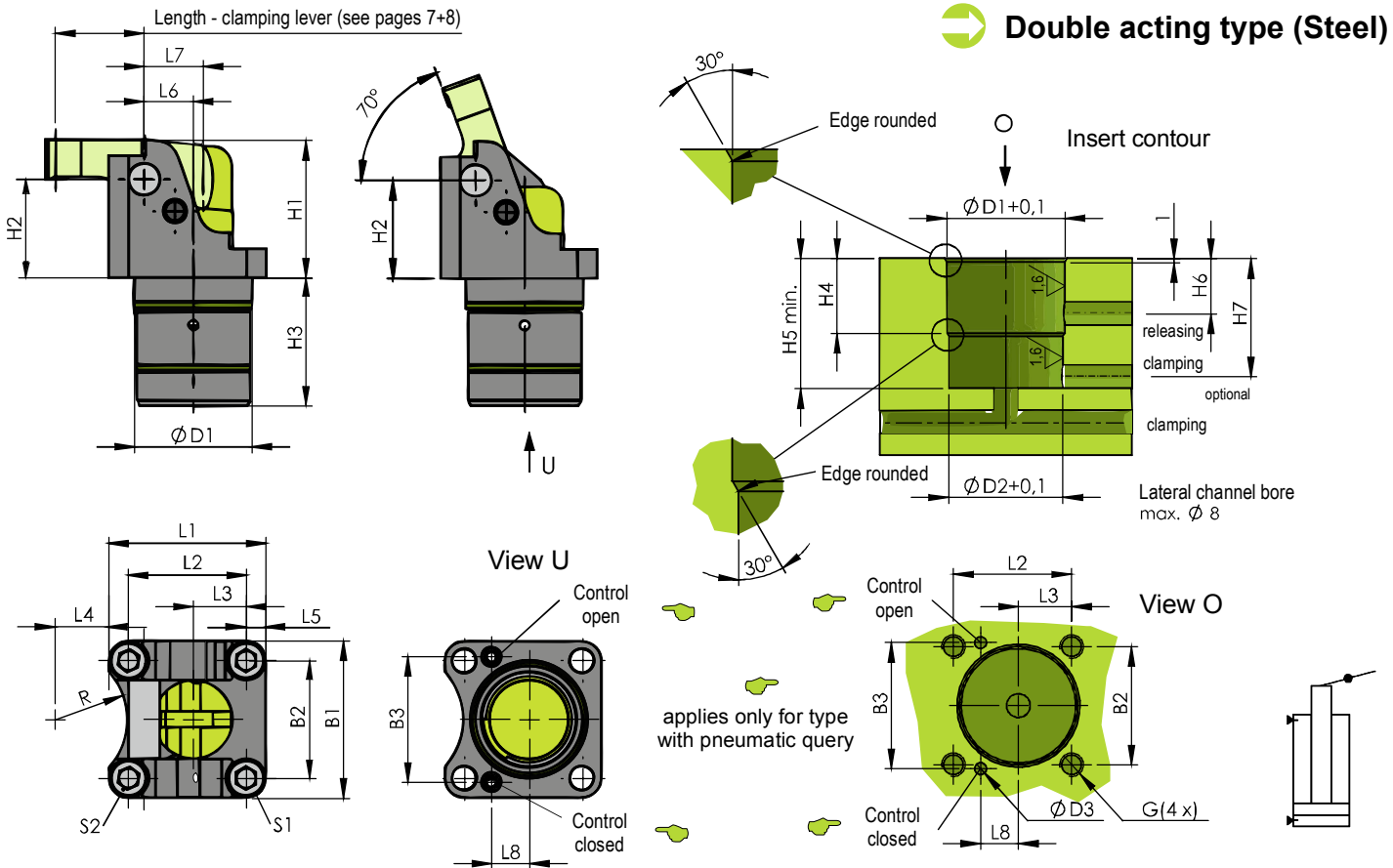
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Rotary lever clamp

hydraulic, up to 400 bar, single- and double acting

Double acting type (Steel)



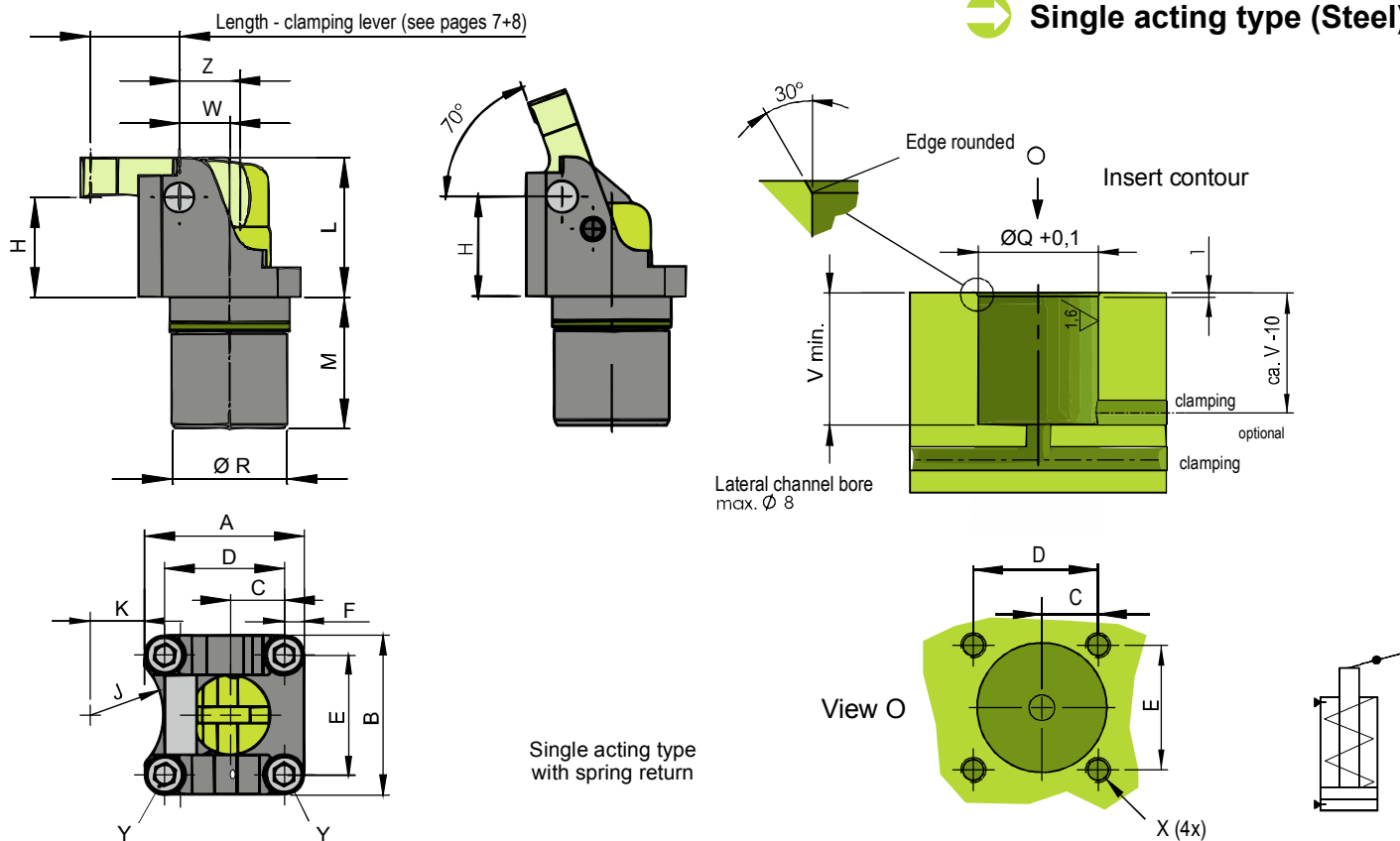
Screws included in scope!

Part numbers without clamping lever!

Technical Data

Size	12	16	20	25	32	40	50
B1	27,00	34,00	40,00	52,00	66,00	78,00	98,00
B2	19,50	25,00	30,00	38,50	49,00	59,00	74,00
B3	22,60	27,00	32,00	42,00	53,00	64,00	80,00
D1	20,00	24,00	30,00	36,00	45,00	55,00	66,00
D2	19,40	23,00	29,00	35,00	44,00	53,00	64,00
D3 max.	Ø 2	Ø 3	Ø 3	Ø 3	Ø 6	Ø 6	Ø 6
G	M4 x 8	M5 x 11	M6 x 10	M8 x 12	M10 x 16	M12 x 18	M16 x 23
H1	21,00	28,00	35,00	43,75	56,00	70,00	87,50
H2	15,00	20,00	25,00	31,25	40,00	50,00	62,50
H3	21,00	26,00	32,50	37,00	42,00	47,00	57,50
H4	14,00	17,00	19,00	20,00	23,00	25,00	30,00
H5	21,50	26,50	33,00	38,00	43,00	48,00	58,50
H6	11,00	13,00	14,00	15,00	17,00	19,00	24,00
H7	23,00	26,00	31,00	33,00	38,00	40,00	53,00
L1	26,00	32,00	40,00	49,00	62,00	74,00	92,00
L2	18,50	23,00	30,00	35,50	45,00	55,00	68,00
L3	8,75	9,50	13,50	14,75	18,50	21,50	25,75
L4	7,50	10,00	13,50	11,00	9,00	12,00	14,50
L5	3,75	4,50	5,00	6,75	8,50	9,50	12,00
L6	7,50	10,00	12,50	15,63	20,00	25,00	31,25
Z	9,00	12,00	15,00	18,75	24,00	30,00	37,50
L8	5,40	7,20	9,60	11,00	13,00	14,00	17,50
R Radius	10,60	14,20	18,20	18,70	19,70	24,70	31,00
S1*	M4 x 10	M5 x 16	M6 x 16	M8 x 20	M10 x 25	M12 x 30	M16 x 40
S2*	M4 x 25	M5 x 35	M6 x 40	M8 x 50	M10 x 65	M12 x 80	M16 x 100
Effective piston area (cm ²)	1,77	2,54	4,52	7,06	10,17	15,90	23,75
Piston force at 100 bar (kN)	1,7	2,5	4,5	7,0	10,1	15,9	23,7
Piston force at 400 bar (kN)	7,0	10,1	18,0	28,2	40,6	63,6	95,0
Volume (ccm)	1,06	2,03	4,52	8,82	16,27	31,80	58,20
Weight	115 g	265 g	550 g	855 g	1755 g	2625 g	5325 g
Part number without pneum. query	IRLC12-001	IRLC16-001	IRLC20-001	IRLC25-001	IRLC32-001	IRLC40-001	IRLC50-001
Part number with pneum. query	IRLC12-002	IRLC16-002	IRLC20-002	IRLC25-002	IRLC32-002	IRLC40-002	IRLC50-002

Single acting type (Steel)



Single acting type with spring return

Screws included in scope!

Part numbers without clamping lever!

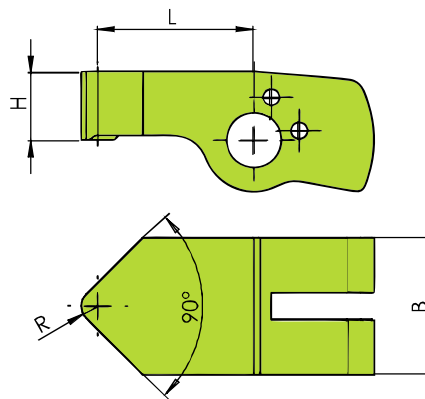
Technical Data

Size	12	16	20	25	32	40	50
A	26,00	32,00	40,00	49,00	62,00	74,00	92,00
B	27,00	34,00	40,00	52,00	66,00	78,00	98,00
C	8,75	9,50	13,50	14,75	18,50	21,50	25,75
D	18,50	23,00	30,00	35,50	45,00	55,00	68,00
E	19,50	25,00	30,00	38,50	49,0	59,0	74,0
F	3,75	4,50	5,00	6,75	8,50	9,50	12,00
H	15,00	20,00	25,00	31,25	40,00	50,00	62,50
J Radius	10,60	14,20	18,20	18,70	19,70	24,70	31,00
K	7,50	10,00	13,50	11,00	9,00	12,00	14,50
L	21,00	28,00	35,00	43,75	56,00	70,00	87,50
M	23,00	26,00	32,50	37,00	47,00	55,00	62,50
Q Ø	20,00	24,00	30,00	36,00	45,00	55,00	66,00
R Ø	20,00	24,00	30,00	36,00	45,00	55,00	66,00
V	23,50	26,50	33,00	38,00	48,00	56,00	63,50
W	7,50	10,00	12,50	15,63	20,00	25,00	31,25
X	M4x8	M5x11	M6x10	M8x12	M10x16	M12x18	M16x23
Y (acc. DIN 6912)*	M4x10/ M4x25	M5x16/ M5x35	M6x16/ M6x40	M8x20/ M8x50	M10x25/ M10x65	M12x30/ M12x80	M16x40/ M16x100
Z	9,00	12,00	15,00	18,75	24,00	30,00	37,50
Effective piston area (cm ²)	1,13	2,01	3,14	4,91	8,04	12,57	19,63
Piston force at 100 bar (kN)	1,1	1,9	3,0	4,7	7,8	12,3	19,3
Piston force at 400 bar (kN)	4,4	7,9	12,4	19,4	32,0	50,0	78,2
Volume (ccm)	0,68	1,61	3,14	6,14	12,90	25,20	49,10
Weight	110 g	200 g	405 g	700 g	1400 g	2460 g	5070 g
Part number	IRLC12-003	IRLC16-003	IRLC20-003	IRLC25-003	IRLC32-003	IRLC40-003	IRLC50-003

hydraulic, up to 400 bar, single- and double acting

➔ Clamping lever - Standard

Steel carbonized 1.7131 (16MnCr5)



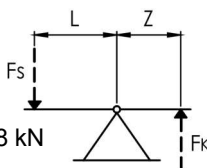
Part number	Size	Clamping force at 100 bar [kN]	L	B	H	R
10 1301	12	1,7	9,0	12	6,0	1,5
10 1302	12	1,1	13,5	12	6,0	1,5
10 1303	12	0,8	18,0	12	6,0	1,5
10 1304	12	0,7	22,5	12	6,0	1,5
10 1305	16	2,5	12,0	16	8,0	2,0
10 1306	16	1,7	18,0	16	8,0	2,0
10 1307	16	1,2	24,0	16	8,0	2,0
10 1308	16	1,0	30,0	16	8,0	2,0
10 1309	20	4,5	15,0	20	10,0	2,5
10 1310	20	3,0	22,5	20	10,0	2,5
10 1311	20	2,2	30,0	20	10,0	2,5
10 1312	20	1,8	37,5	20	10,0	2,5
10 1313	25	7,0	19,0	25	12,5	3,0
10 1314	25	4,7	28,5	25	12,5	3,0
10 1315	25	3,5	38,0	25	12,5	3,0
10 1316	25	2,8	47,5	25	12,5	3,0
10 1317	32	10,1	24,0	32	16,0	4,0
10 1318	32	6,7	36,0	32	16,0	4,0
10 1319	32	5,0	48,0	32	16,0	4,0
10 1320	32	4,0	60,0	32	16,0	4,0
10 1321	40	15,9	30,0	40	20,0	5,0
10 1322	40	10,6	45,0	40	20,0	5,0
10 1323	40	7,9	60,0	40	20,0	5,0
10 1324	40	6,3	75,0	40	20,0	5,0
10 1325	50	23,4	38,0	50	25,0	6,0
10 1326	50	15,9	56,0	50	25,0	6,0
10 1327	50	11,8	75,0	50	25,0	6,0
10 1328	50	9,5	94,0	50	25,0	6,0

Calculation

Actual Clamping force F_s in response to the piston force F_k and Length of lever arm L

Example:

Rotary lever clamp size 20
 working pressure 400 bar, piston force $F_k = 18 \text{ kN}$
 Dim. Z (page 3) = 15,0 mm
 Length of lever L



Actual Clamping force $F_s = 12,0 \text{ kN}$

$$\text{Clamping force } F_s = \frac{F_k \times Z}{L} = \frac{18 \text{ kN} \times 15,0 \text{ mm}}{22,5 \text{ mm}} = 12,0 \text{ kN}$$

Attention:

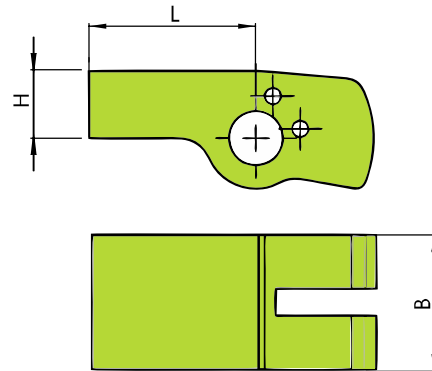
On request for size 16-50 there are clamping levers available with a modified operating point. For these ones the clamping length is the same, but the operating point corresponding to the piston is moved. Herewith the clamping force can be increased about the factor 1,2 to 1,5.

Steel (not carbonized) 1.7131 (16MnCr5)

Tool steel 1.2842 (90MnCrV8)



➔ Clamping lever - semifinished



Part number Steel	Part number Tool-steel	Size	L	B	H
10 1331	10 2328	12	15	12	6,0
10 1332	10 2329	12	24	12	6,0
10 1333	10 2330	16	20	16	8,0
10 1334	10 2331	16	32	16	8,0
10 1335	10 2332	20	25	20	10,0
10 1336	10 2333	20	40	20	10,0
10 1337	10 2334	25	31	25	12,5
10 1338	10 2335	25	50	25	12,5
10 1339	10 2336	32	40	32	16,0
10 1340	10 2337	32	64	32	16,0
10 1341	10 2338	40	50	40	20,0
10 1342	10 2339	40	80	40	20,0
10 1343	10 2340	50	62	50	25,0
10 1344	10 2341	50	100	50	25,0

Attention:

Clamping levers from 16MnCr5 must be hardened after mechanical processing!

Special levers on Request!

Calculation

Actual Clamping force F_S in response to the piston force F_K and Length of lever arm L

Example:

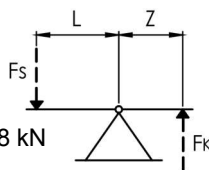
Rotary lever clamp size 20

working pressure 400 bar, piston force $F_K = 18 \text{ kN}$

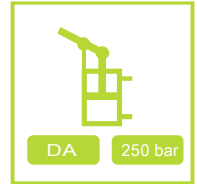
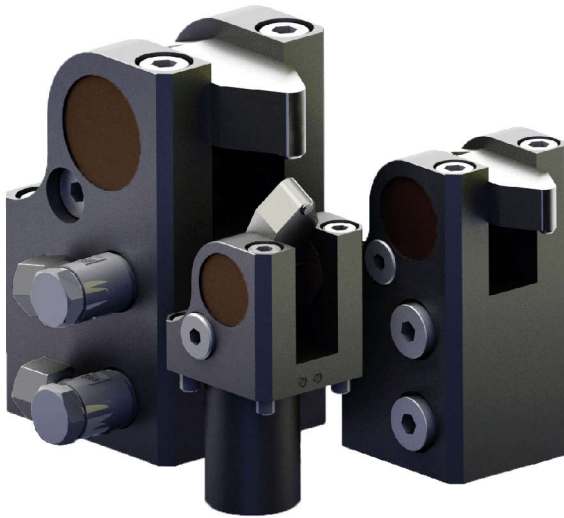
Dim. Z (page 3) = 15,0 mm

Length of lever L

Actual Clamping force $F_S = 12,0 \text{ kN}$



$$\text{Clamping force } F_S = \frac{F_K \times Z}{L} = \frac{18 \text{ kN} \times 15,0 \text{ mm}}{22,5 \text{ mm}} = 12,0 \text{ kN}$$



Advantages:

- ✓ Compact Design
- ✓ Including Pneumatic Control
- ✓ Top-Flange- / Bottom-Flange-Models
- ✓ Simple Counter Contour
- ✓ Thread and manifold connection
- ✓ Variable Mounting Position

Recommendations for use:

The eccentric lever clamp has a relatively high clamping force with a small base area. For this reason, this solution is suitable for machines with high power and challenging spaces.

Oil supply through drilled channels or via the unitary thread M10x1.

For the installation of the clamping cylinder, the flange surfaces should be adapted to the height of the workpiece.

These clamps are particularly suitable when no lateral swiveling of the clamping lever is possible.

The flow rate of about 1.8 l / min should not be exceeded.

When customer's tension levers are used, they should be equipped with a thrust bolt or hardened on the clamping / support surface.

As medium we recommend hydraulic oils according DIN 51524 (HL, HLP).

As already mentioned, the eccentric lever clamp generate high forces. Workpieces and fixtures have to be designed for such loads.

During operation consists a danger of crushing. The accident prevention regulations must be strictly adhered therefore.

The clamps should be regularly checked for contamination and cleaned if necessary.

The use side goose-necked clamping levers is not recommended.

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Description:

The eccentric lever clamp is a double-acting pressure cylinder, in which the clamping lever is moved over a eccentrically mounted rotary point to clamp the workpiece.

The type with bottom-side connection can be powered with pressure oil by drilled channels, as well as with the laterally integrated connecting threads.

All standard versions are equipped with the possibility to use a **pneumatic position detection** for clamping and unclamping. The actual movement process can only be carried out hydraulically.

It is not necessary to cure the clamping lever, but they are designed to allow a case hardening. The default levers are case-hardened.

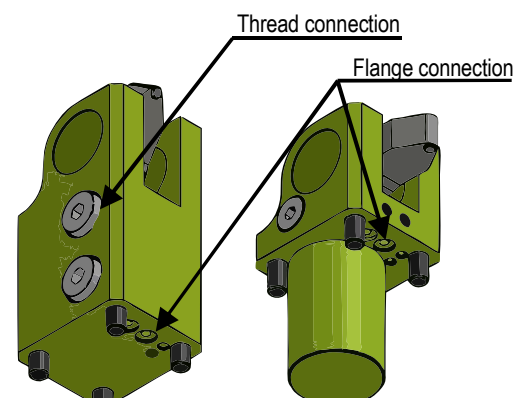
When the standard clamping lever is used, this one does not constitute an interference contour in relation to the base area.

For reliable position detection of the clamping lever, the position of the eccentric is queried.

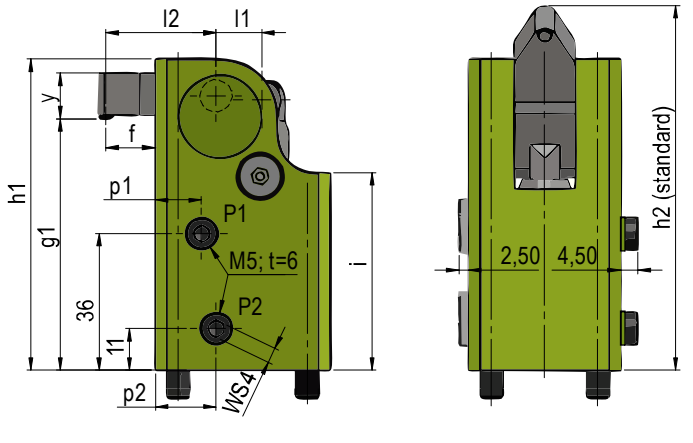
These workholding elements have no losable parts.

With this solution, no complicated mounting contours have to be produced.

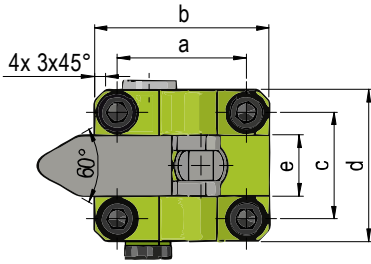
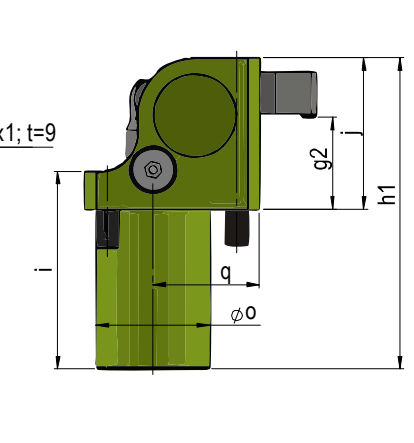
Seals, fastening and locking screws are included in the scope of supply!



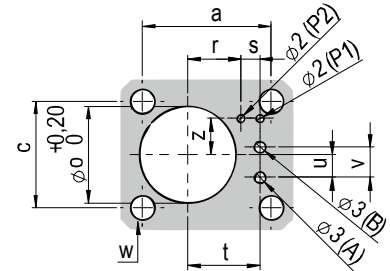
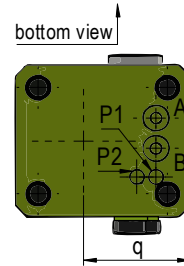
Bottom-Flange Type (IELCXX-001)



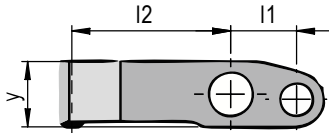
Top-Flange Type (IELCXX-002)



A = Clamping
B = Unclamping
P1 = Control clamping
P2 = Control open



Lever-standard



Lever-semifinished



Mounting contour

- If flange bottom type is used, „o“ is not required
- P1 and P2 only required when a pneumatic control is used
- If only thread connection is used, „w“ is not necessary

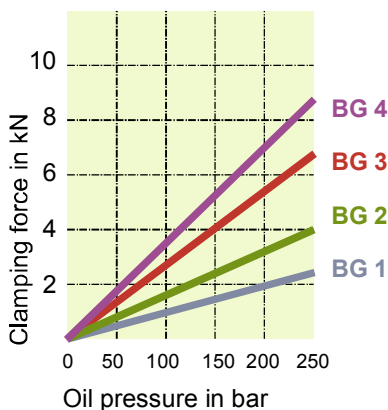
Notes

Clamping force

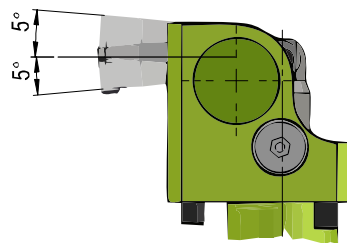
Calculation - Clamping force

$$\text{Clamping } F_s = \frac{F_k \times l1}{l2; l3}$$

Clamping force depending on the operating pressure when using the standard clamping lever



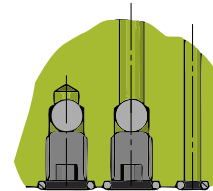
Clamping position



In order to create the maximum clamping force and minimum transverse force, a variation of the horizontal clamping position of the lever of a maximum of +/- 5° is recommended.

The pneumatic detection is only working in this area.

Sealing



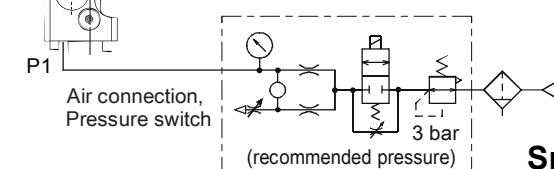
Only applies to flange-bottom type

If the manifold connection is chosen for supplying pressure oil, the set screws (M5) and the balls must be removed!

For size BG 1 this additional type of sealing is not integrated.

For mounting of these elements it is generally recommended to keep the seals at the bottom.

Example: clamping detection



Special solutions on request!

Eccentric-Lever-Clamp

Double acting, max. 250 bar working pressure

Dimensions and part numbers

Size	Unit	1	2	3	4
Piston force at 250 bar	[kN]	5,0	9,5	15,4	20,1
Piston force at 100 bar	[kN]	2,0	3,8	6,2	8,0
Clamping force at 250 bar with stand.-lever *	[kN]	2,3	3,9	6,7	8,5
Piston-Ø	[mm]	16	22	28	32
Min. air pressure for clamping control	[bar]	3	3	3	3
a	[mm]	29	34	40	46
b	[mm]	40	46	55	64
c	[mm]	25	28	35	40
d	[mm]	36	40	50	56
e	[mm]	14	16	20	24
f *	[mm]	13	13	16	16
g1 *	[mm]	62	66	76	80,5
g1 min. *	[mm]	59,5	63,5	72,5	77
g1 max. *	[mm]	64,5	68,5	79,5	84
g2 * (**)	[mm]	26	24	30	34,5
g2 min. *	[mm]	23,5	21,5	26,5	31
g2 max. *	[mm]	28,5	26,5	33,5	38
h1	[mm]	75	82	97	104
h2	[mm]	89,3	96	114	121,8
i	[mm]	19	52	57	57
j **	[mm]	39	40	51	58
k	[mm]	14	15	18	19
l1	[mm]	12	12	15	16
l2 *	[mm]	26	29	34,5	38
l3	[mm]	43	46	54,5	59
m	[mm]	14,5	13,5	14	14
n	[mm]	36	38	44,5	45
o **	[mm]	24	30	35	40
p1	[mm]	11	12,2	14,5	16,5
p2	[mm]	14	16	19,5	22
q	[mm]	25	30	33,5	38
r	[mm]	11	14	16	18
s	[mm]	4,5	4,5	5	6
t	[mm]	16	19	21	24
u	[mm]	6	6	9	8
v	[mm]	6	8	9	10
w	[mm]	M5; 10 depth	M6; 12 depth	M8; 16 depth	M8; 16 depth
y	[mm]	10	12	15	18
z	[mm]	8,5	9,5	11,5	14
Manifold Connection Bottom-Flange		IELC16-001	IELC22-001	IELC28-001	IELC32-001
O-Ring with Top-Flange connection		IELC16-002	IELC22-002	IELC28-002	IELC32-002
Lever standard		2014010	2016010	2020010	2024010
Lever semifinished		2014011	2016011	2020011	2024011

* Applies only for standard lever

** Applies only for Top-Flange type (...-002)



Advantages:

- ✓ High force generation
- ✓ Compact design
- ✓ Adjustable clamping point
- ✓ Lever Ratio 1:1 with Standard-Clamp arm
- ✓ No interference contour = completely free loading
- ✓ Insensitive to hot chips
- ✓ With optional pneumatic detection
- ✓ Lateral force optimized



Description

Recommendations for use:

The cylinder is suitable for any installation position and allows an absolute freedom to insert the workpiece.

Even with low operating pressures, this tiny clamp generates relatively high clamping forces. It is highly important to observe the accident prevention regulations.

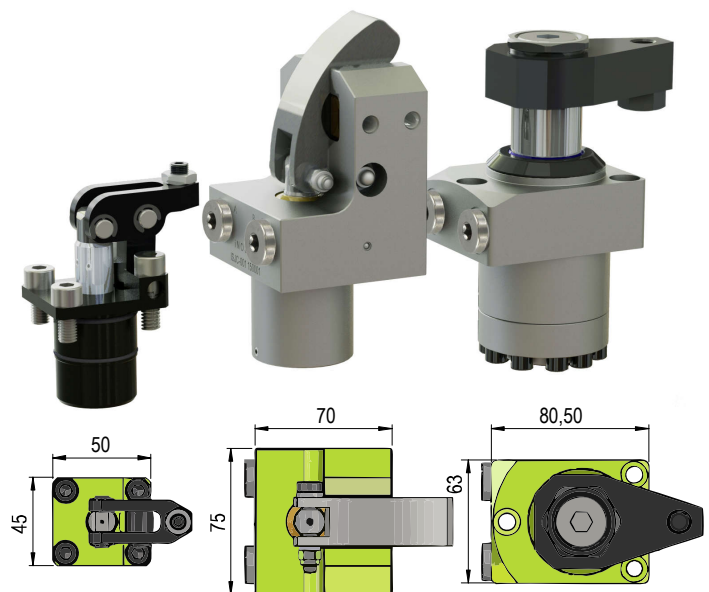
The specified operating pressure may not be exceeded - or only after consultation.

The adjusting screw makes it possible to adjust the clamping point in a way that the clamping lever lies in the optimum vertical position relative to the generated clamping force.

We recommend as medium- hydraulic oils according to DIN1524.

A pneumatic detection is available as option.

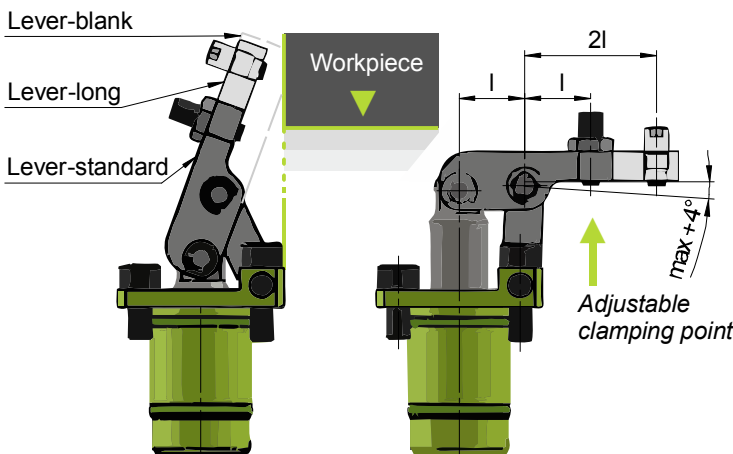
Size and Performance comparison with...



Tiny Link Clamp
ITLC28-001
Piston-Ø = 28 mm
at 200 bar = **12,3 kN**

Sliding Joint Clamp
ISJC-001
Piston-Ø = 25 mm
at 200 bar = **10,2 kN**

Swing Clamp
PLB16-U
Piston-Ø = 40 mm
at 200 bar = **7,8 kN**



Free loading with all lever arm sizes

Lever Ratio 1:1 as Standard or 1:2 as Long-Version

Description:

The small lever clamp is a double-acting push cylinder. To clamp the workpiece the clamp arm is moved along defined pivot points.

This clamp is characterized by a very good size-to-power ratio and has also an adjustable clamping point.

Likewise, this clamp allows the workpieces to be freely inserted, regardless of the clamping lever size (clamping levers made by the customer may vary from this).

Due to the metallic scraper edge and the defined guide, the clamp is largely insensitive to chips of any kind.

All clamping levers are made of heat-treated steel.

A pneumatic detection is offered as an option for reliable position detection of the clamping lever.

The securing rings of the clamping element are clearly more loss-proof than those of comparable products.

Seals and mounting screws are included in the scope of supply!

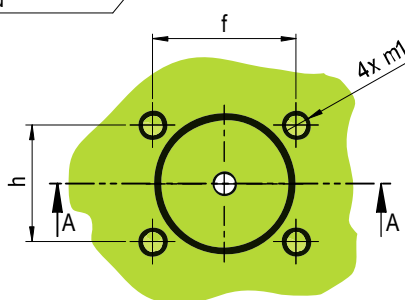
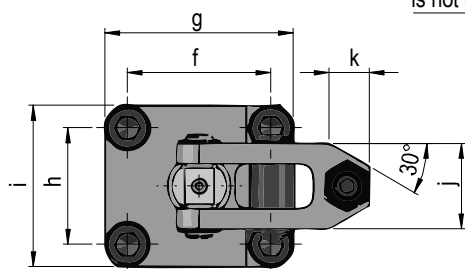
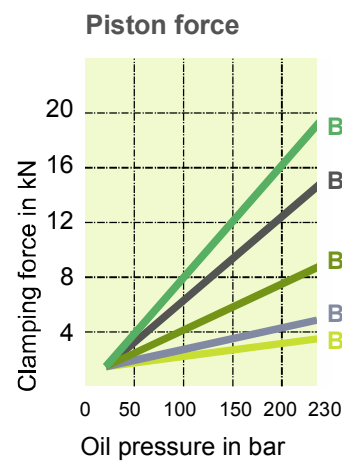
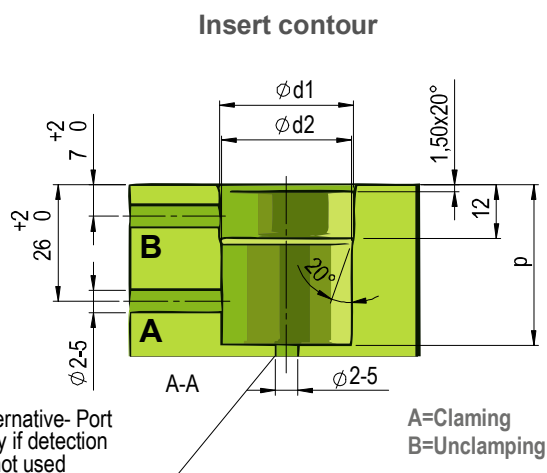
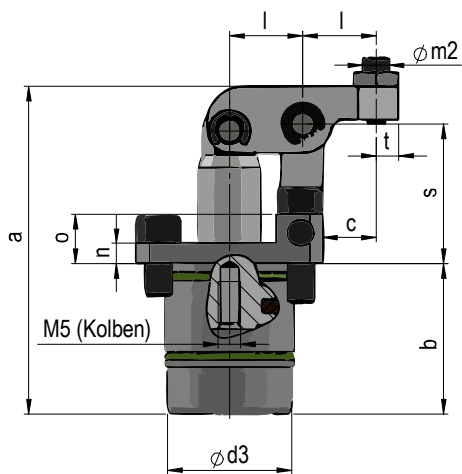
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Small Lever Clamp - Tiny Link Clamp

hydraulic up to 230 bar, double acting



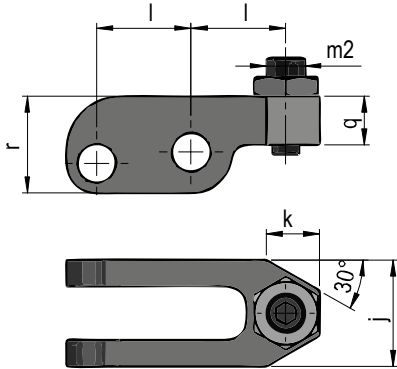
** By using the „M5“ thread in the piston, a shift rod or the - also available- pneumatic detection can be installed if required.

By making use of this possibility the effective piston area is reduced!

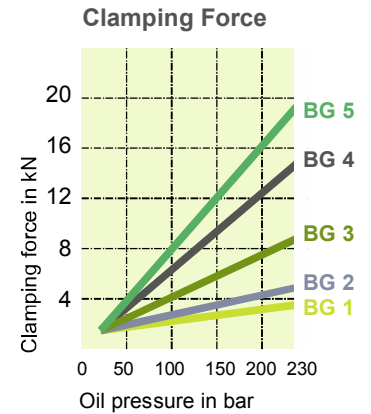
Technical Data

Size	Unit	1	2	3	4	5
Piston force at 200 bar	[kN]	3,08	4,02	7,60	12,31	16,08
Piston force at 100 bar	[kN]	1,54	2,01	3,80	6,15	8,04
Clamping force at 200 bar - Standard-Lever *	[kN]	3,08	4,02	7,60	12,31	16,08
Clamping force at 200 bar with Long-Lever *	[mm]	1,54	2,01	3,80	6,15	8,04
Piston-Ø **	[mm]	14	16	22	28	32
a	[mm]	54	62	74	89,5	95
b	[mm]	26,5	30	34	42	44
c	[mm]	8	10	12	14	17
d1 (+0,06)	[mm]	20	22	30	36	40
d2 (+0,06)	[mm]	19	21	29	35	39
d3	[mm]	18	20	28	34	38
e	[mm, ca.]	10	12	15	20	20
f	[mm]	23	25	32	37	42
g	[mm]	30	34	42	50	26
h	[mm]	17	18	26	32	36
i	[mm]	24	27	36	45	50
j	[mm]	12	14	19	22	25
k	[mm]	6	7,5	9	11	12
l *	[mm]	11,5	13,5	16,5	19,5	22,5
m1	[mm]	M4; 8 deep	M5; 10 deep	M6; 12 deep	M8; 16 deep	M8; 16 deep
m2	[mm]	M5	M5	M6	M8	M10
n	[mm]	3	3,5	4,5	5	5
o	[mm]	7	8	11	14	18
p min. (with pneum. Position det. see TP)	[mm]	27	30,5	34,5	42,5	44,5
s	[mm]	22	25	31,3	36	39,5
Part number		ITLC14-001	ITLC16-001	ITLC22-001	ITLC28-001	ITLC32-001

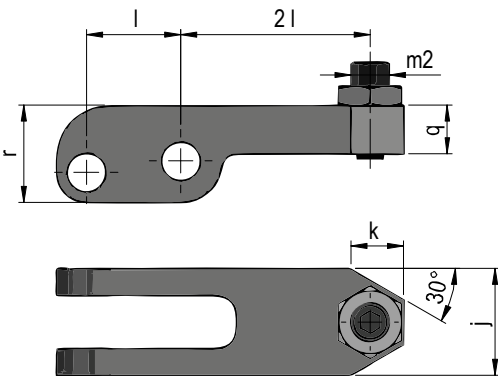
** = Observe the indications regarding the use of position detection!



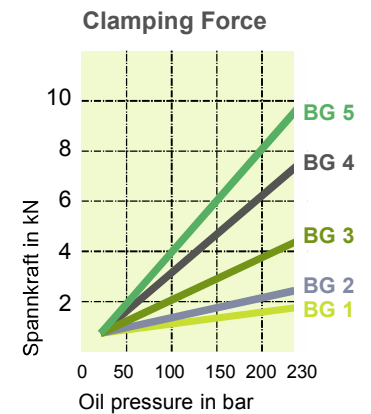
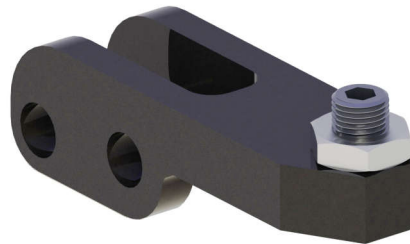
Clamping Lever - Standard



Size	Unit	1	2	3	4	5
For Part number		ITLC14-001	ITLC16-001	ITLC22-001	ITLC28-001	ITLC32-001
Clamping force at max. 230 bar	[kN]	3,54	4,62	8,74	14,16	18,49
l	[mm]	11,5	13,5	16,5	19,5	22,5
j	[mm]	12	14	19	22	25
r	[mm]	7	8	10	13	15
s	[mm]	7	8	9	12	13
u	[mm]	31	35,5	43	52,5	61,5
k	[mm]	6	7,5	9	11	12
m2	[mm]	M5	M5	M6	M8	M10
Part number		ITLC14L-001	ITLC16L-001	ITLC22L-001	ITLC28L-001	ITLC32L-001



Clamping Lever - Long



Size	Unit	1	2	3	4	5
For Part number		ITLC14-001	ITLC16-001	ITLC22-001	ITLC28-001	ITLC32-001
Clamping Force at max. 230 bar	[kN]	1,77	2,31	4,37	7,08	9,245
l	[mm]	11,5	13,5	16,5	19,5	22,5
j	[mm]	12	14	19	22	25
r	[mm]	7	8	10	13	15
s	[mm]	7	8	9	12	13
u	[mm]	31	35,5	43	52,5	61,5
k	[mm]	6	7,5	9	11	12
m2	[mm]	M5	M5	M6	M8	M10
Part number		ITLC14L-001	ITLC16L-001	ITLC22L-001	ITLC28L-001	ITLC32L-001

Contact

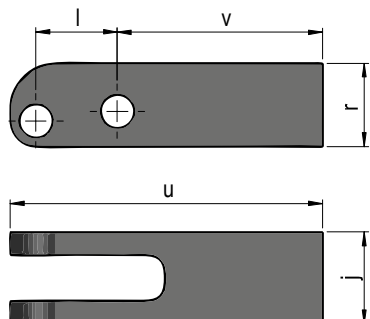
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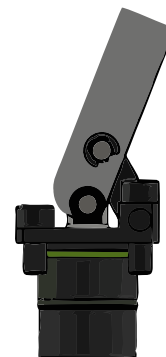
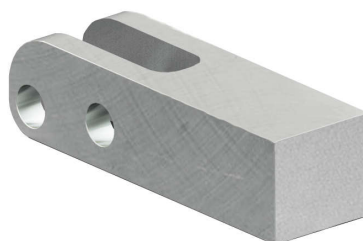
Small Lever Clamp - Tiny Link Clamp

hydraulic up to 230 bar, double acting

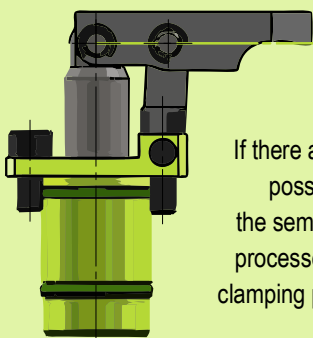
➔ **Lever arms**



Clamping lever - semifinished



Size	Unit	1	2	3	4	5
For Part number		ITLC14-001	ITLC16-001	ITLC22-001	ITLC28-001	ITLC32-001
l	[mm]	11,5	13,5	16,5	19,5	21,5
j	[mm]	12	14	19	22	25
r	[mm]	7	8	10	13	15
u	[mm]	45	50	61	75	84
v	[mm]	30	33	40	50	55
Part number		2012005	2014005	2019005	2022005	2025005

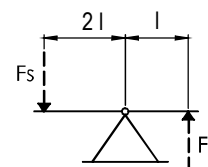


Hint

If there are any concerns regarding possibly occurring lateral forces, the semifinished clamp arm can be processed, so that the pivoting and clamping point are on the same level as shown here.

Calculation - Clamping Force

Clamping force depending on the operating pressure when using the long lever.

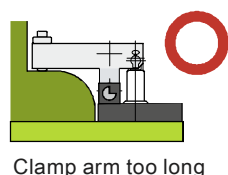


$$\text{Clamping Force } F_s = \frac{F_k \times l}{2l}$$

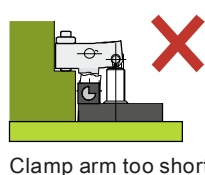
F_s = Clamping force
 F_k = Piston force
 l = Length between clamping point and pivoting point

➔ **General notes**

We do not recommend the operating situation shown below!



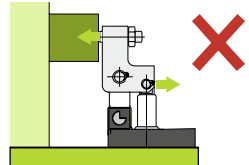
Clamp arm too long



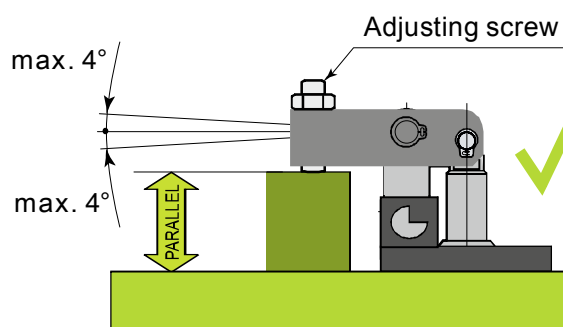
Clamp arm too short



Cranked clamp arm



Angled clamp arm



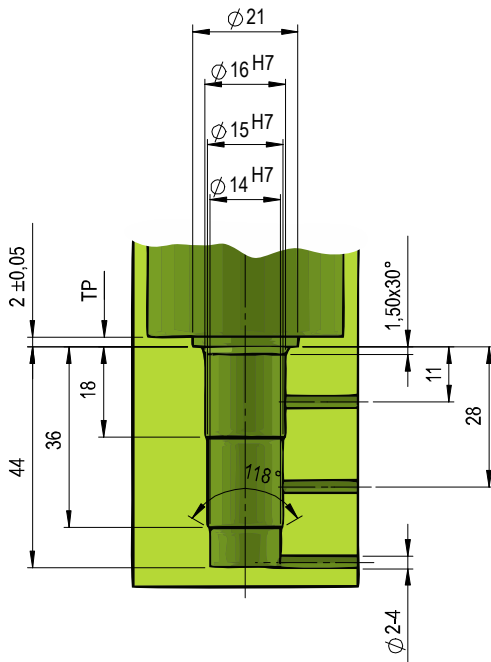
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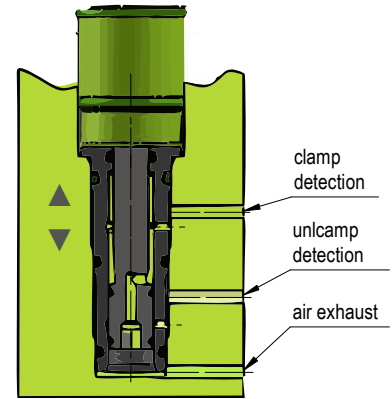
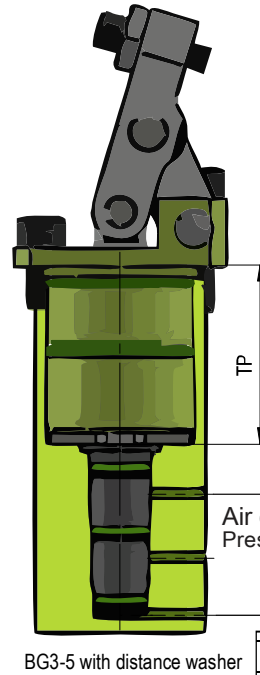
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 **Pneumatic detection**

Insert contour

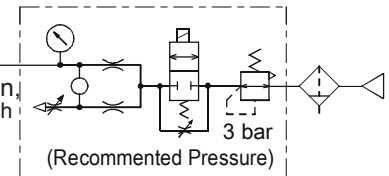


Function



BG 2 without distance washer

Sample: Clamping detection



Part number- pneumatic detection	For size...	TP (+/- 0,05)	Effective area (mm ²)	Piston Thread	Piston-Ø
ITLC16-P02	2	-	163	M5	16
ITLC22-P02	3	35,50	238	M5	22
ITLC28-P02	4	44,00	313	M5	28
ITLC32-P02	5	47,00	364	M5	32

Note:

No clamping errors are detected. By this method only the two end positions are determined.

No query option is available for size 1 (BG1).

 **Product-Examples**

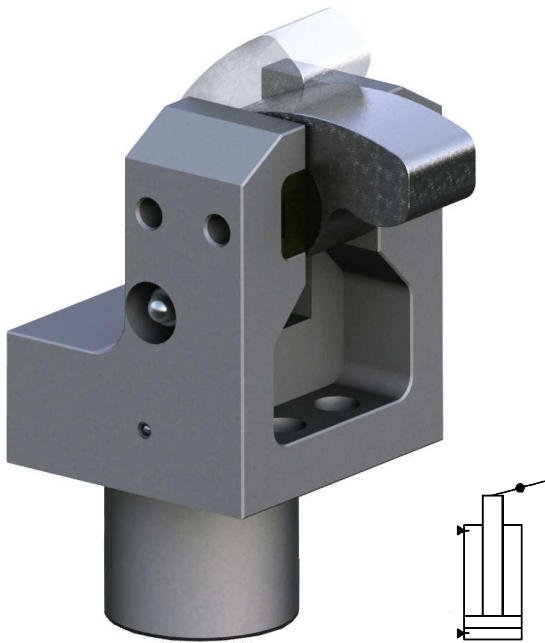


Examples for size and special clamping levers

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Advantages:

- ✓ High clamping force
- ✓ Solid design
- ✓ For high vibrations and abrasively media suitable
- ✓ No interference contour while loading the parts
- ✓ Oil connection via thread- or manifold connection
- ✓ Withstands large dirt

**FOR
HEAVY
DUTY
USE**

Description:

Due to the symmetrical lever construction, depending on the clamping position, the piston force is nearly 1:1 transferred. While declamping the clamping lever is as far back that a free insertion of the parts is possible.

In the relieved state the clamping lever is moved against a mechanical stop, so that even at high vibrations no loose parts of the assembly may damage the adjacent parts.

Means: With a mounted stop, the piston never moves into its basic position.

Likewise, all pivot points are designed in a way that there is no direct contact to the axially adjacent parts. This reduces the wear under vibration and abrasive media enormously.

Unlike to several competitors' products, the sliding surface is hardened and not the sliding components.

The position of the clamping lever can be monitored by optional inductive sensors.

The clamping lever is hardened and convex at the clamping point. Here we waived conscious for a separate pressure piece (clamping security and no damages/losses).

The surface of the housing is nitrided.

The cylinder has to be fitted with the flange surface into the counter body and the pressure oil supply can be realized with the rear G1/4 threads or via the integrated drilled channels with manifold connection.

Likewise the sliding joint cylinder can be installed in a custom-built housing.

Recommendations for use:

The Slide Joint Clamp cylinder has, compared to other solutions, a high clamping force with a relatively low base. For this reason, this solution is suitable for machines with high power and close quarters.

In particular, the clamping cylinder can also be used in the field of mining- and casting operations. Because of the design of the guides, seals and wipers here is a significantly longer service life reachable, as with comparable other clamping solutions.

While installing the rotary lever clamping cylinder, the flange should be adapted to the height of the workpiece.

For mounting on the device, housing blocks of steel can be manufactured / offered.

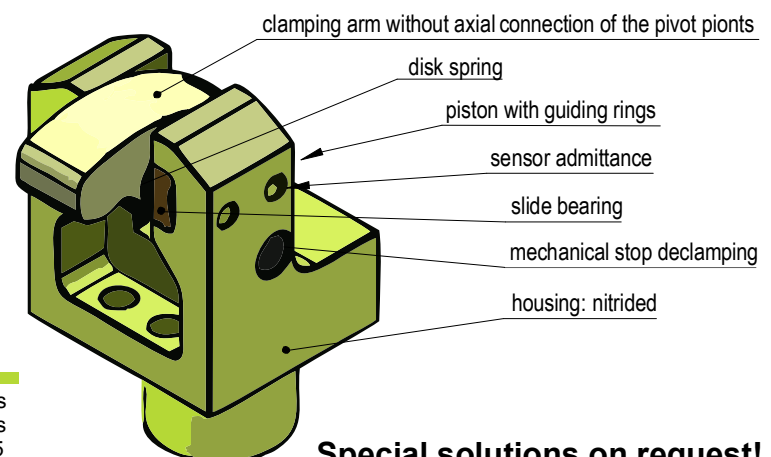
The cylinder is suitable for different installation positions.

We recommend as a pressure medium hydraulic oils acc. DIN 51524 (HL, HLP).

Slide joint and lever clamp cylinder can generate high forces. Workpieces and fixtures must be designed for such loads.

During operation consists a danger of crushing. Therefore the accident prevention regulations must be strictly adhered to.

The rotary lever clamping cylinder must be checked regularly for contamination and cleaned, if necessary.



Special solutions on request!

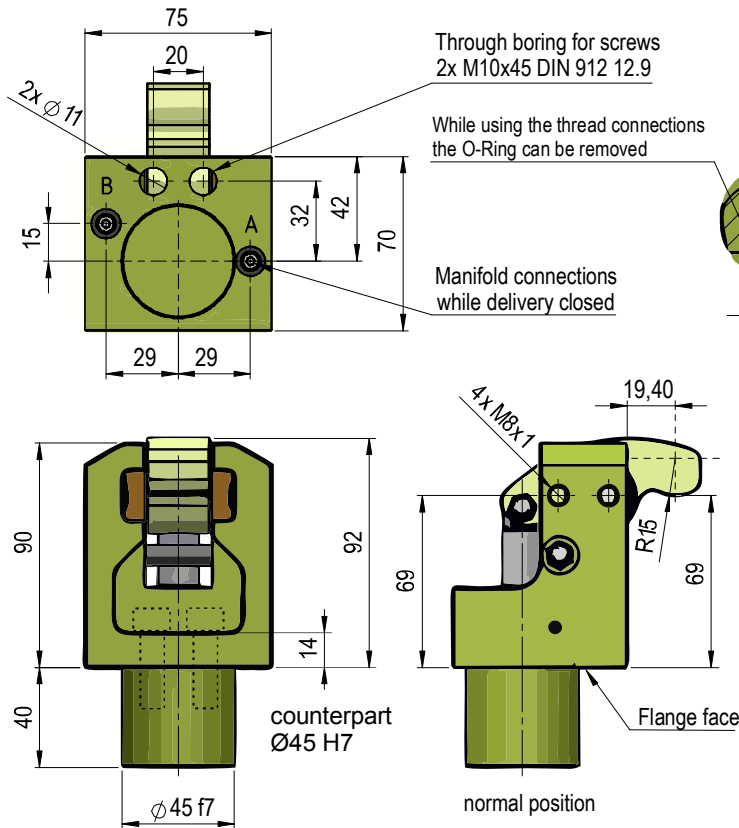
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Details

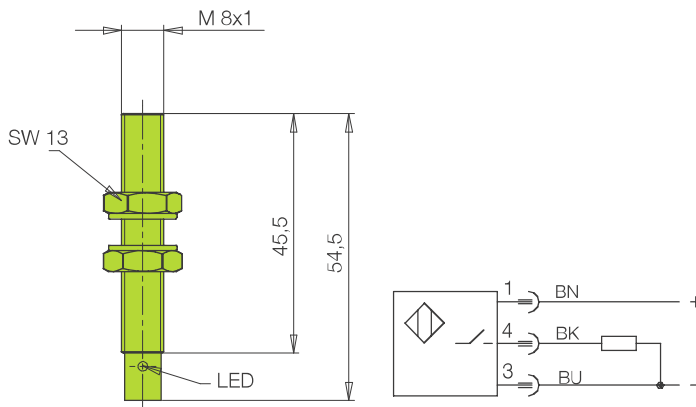
Technical Data



Working pressure p max	400 bar
Working temperature t max	-20° to 60°C
Weight m	2,6 kg
Clamping force at 400 bar F max	21,5 kN
Clamping force at 200 bar F	10,2 kN

A = Clamping
B = Declamping

Attachments



Inductive sensor

General characteristics

Type of installation	flush mounting
Rated operating distance Sn	[mm] 1.5
Secured operating distance Sa	[mm] 0...1.2
Repeatability	[%] ≤ 5
Hysteresis	[%] ≤ 15
Environmental temperature	[°C] -25...+70
Degree of contamination	3
Stand-by delay	[ms] ≤ 10

Mechanical characteristics

Shape in mm	[mm] M 8
Material of the body	stainless steel
Material of sensing face	PBTP
Code class	[IP] IP 67
Connection	plug S49

Electrical characteristics

Voltage	DC
Wiring	3 wires
Switching function	interlock
Output signal	pnp
Rated operating voltage	[V] 24 DC
Rated operating current	[mA] 200
Short circuit protection	yes
Protection against reverse battery	yes

Part-no 7300001

Accessories for inductive sensor

Connecting cable with right angle plug

Voltage	10 – 30 V DC
Protection as per DIN 40050	IP 67
Environmental temperature	-25°C up to +90°C
Plug connection	M8 plug
LED	Voltage (green) Function display (yellow)
Cable, length of cable	PIR, 5 m
Output, interlock	pnp
Part no	7300002



Advantages:

- ✓ Clamping without shearing force
- ✓ Compatible with competing products
- ✓ Fast movement possible
- ✓ Various designs of clamping arm
- ✓ No interference contour during loading and unloading
- ✓ Incl. Indexing of the clamping arm
- ✓ Solid design
- ✓ Incl. Metal wiper

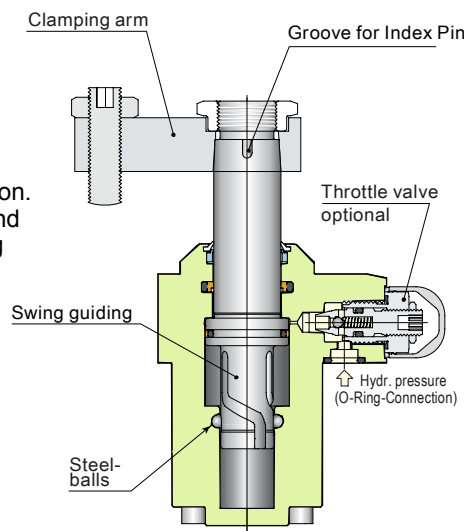


Generally

Recommendations for use

Hydraulic swing clamps are used for clamping of workpieces for which the clamping points must be free for loading and unloading the device. This series is very robust and is particularly suitable for continuous use in 3-shift operation. With the robust rotary motion mechanism and the possibility of optional throttling the swing clamps are particularly suitable for:

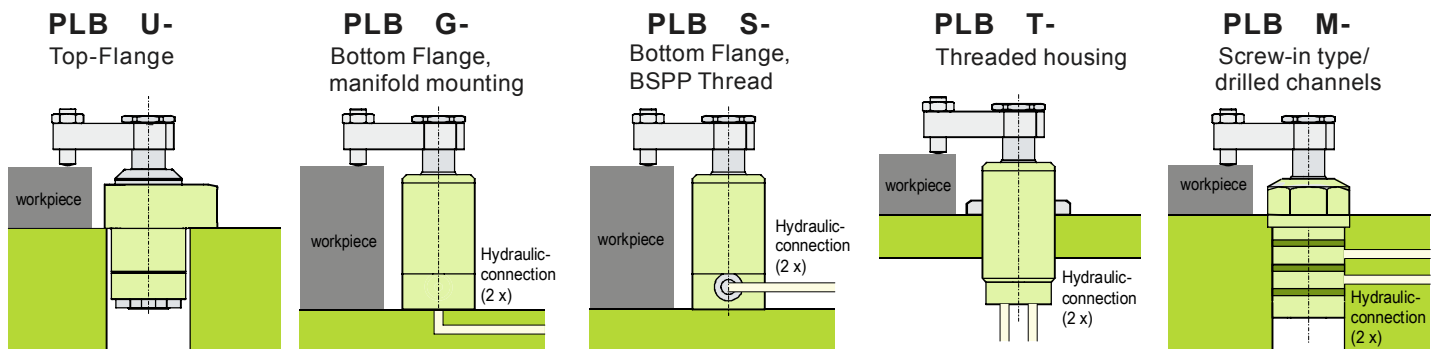
- Fully automated production systems with very short cycle times
- Fixtures with workpiece loading by handling systems or robots
- Test systems for engines, gears
- Assembly lines
- Special machines



Description

Swing Clamps are pull-type cylinders, for which a part of the total stroke is used to swing the piston. Due to the solid swing mechanism the angle position of the clamping arm remains even after a slight collision during loading and unloading of the workpiece or the clamping operation. The angular position of the clamping arm can be indexed with a straight pin. The metallic wiper protects the underlying FKM wiper against rough and hot chips. Likewise, optional flow control valves are available for throttling / synchronisation. The excellent finishes of the piston and housing make these clamps under harsh conditions very resistance capable.

Configuration



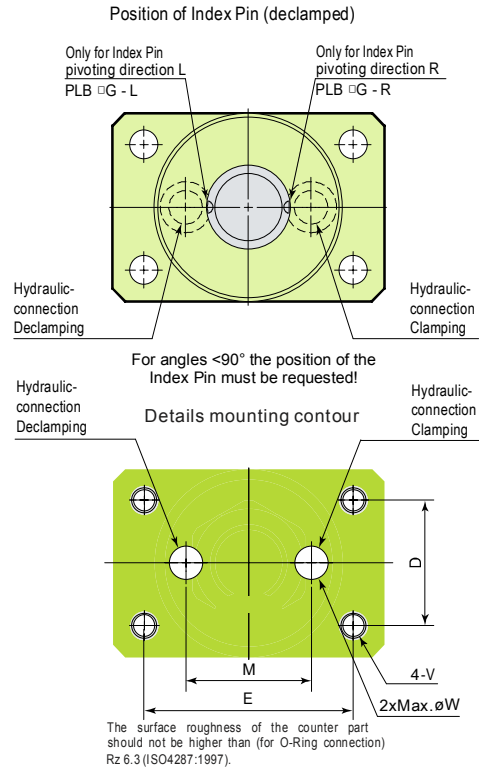
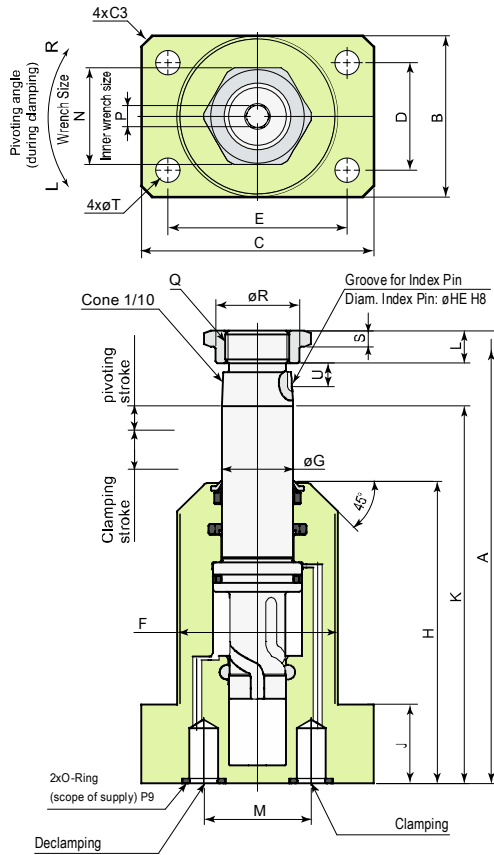
Type designation

Size code	Piston/rod diam.	Shape	Pivoting angle/ Direction	Example: 90° clockwise
PLB	06	(25/20)	U : Top Flange	
	16	(40/32)	G : Bottom Flansh, Manifold mounting	
	25	(50/40)	S : Bottom Flansh, BSPP Thread	
	40	(63/50)	M : Screw-in type (drilled cannels)	
			L : Anticlockwise, pivoting angle=90°	
			(L45) : Anticlockwise, pivoting angle=45°	
			(L60) : Anticlockwise, pivoting angle=60°	
			R : Clockwise, pivoting angle=90°	
			(R45) : Clockwise, pivoting angle=45°	
			(R60) : Clockwise, pivoting angle=90°	
			(C) : Pivoting angle=90°	

Example: PLB06U-R

Type „PLB“, Piston-/Rod diameter 25/20, Top-Flange, 90° clockwise

**PLB 06
16
25
40** G-
L
-
R
C



Note 1. This drawing refers to the declamped position.
2. Index Pins and Screws are not in scope of supply.

Type	PLB06G- L - R C	PLB16G- L - R C	PLB25G- L - R C	PLB40G- L - R C	
pivoting stroke	7	8	11	9	
clamping stroke	11	14	15	15	
A	126.5	147.5	172	182	
B	45	63	80	90	
C	65	85	100	115	
D	30	44	60	68	
E	50	65	80	90	
F	M45×1.5	M60×1.5	M80×2.0	M90×2.0	
G	20	32	40	50	
H	84.5	95.5	108	113	
J	22	22	22	22	
K	105.5	119.5	138	142	
L	9	10	11	12	
M	30	56	62	75	
N	27	36	55	65	
P	6	10	12	14	
Q	M18×1.5	M28×1.5	M35×1.5	M45×1.5	
R	23.5	33.5	45	55.5	
S	4.5	4.5	5.5	5.5	
T	6.8	9	14	15.5	
U	6.5	10.5	12.5	16.5	
V	M6	M8	M12	M14	
W	7	7	7	7	
HE	3 ^{+0.014} ₀	5 ^{+0.018} ₀	6 ^{+0.018} ₀	8 ^{+0.022} ₀	
Weight	1.2 kg	2.4 kg	4.5 kg	6.2 kg	
Contact	Recommended Torque for mounting screw	11 N•m	25 N•m	60 N•m	100 N•m

Contact

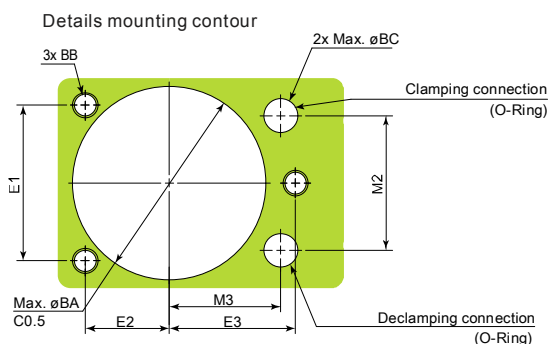
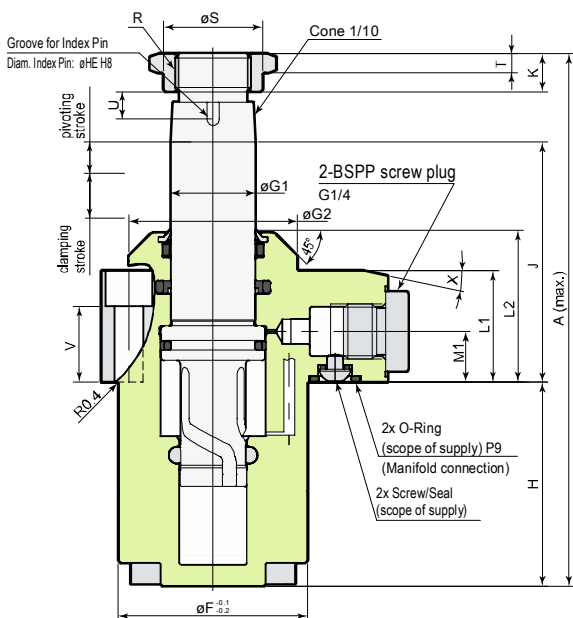
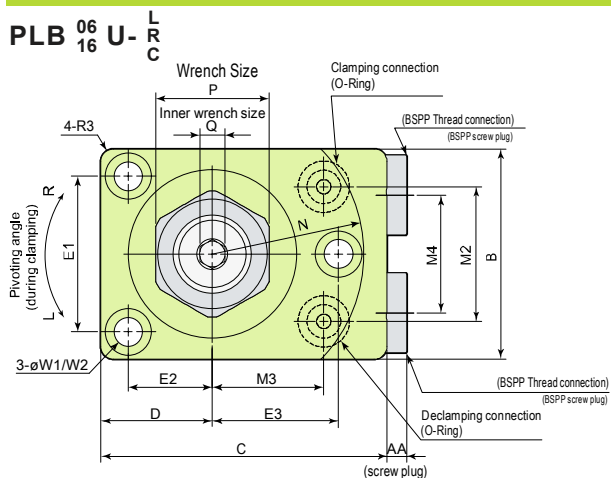
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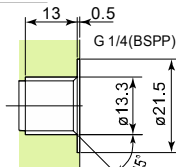
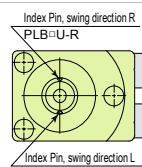
web: www.inosol.solutions
email: info@inosol.solutions
tel: (+49) 6633 / 368 95 25

➔ PLB U Installation dimensions



Position of Index Pin (declamped)

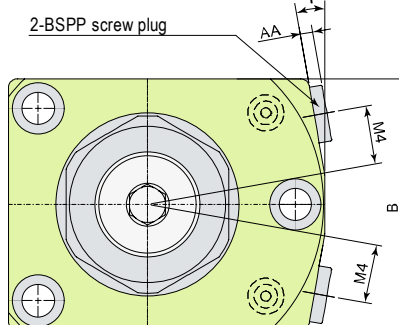
For angles <90° the position of the Index Pin must be requested!



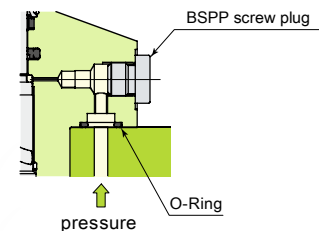
Detail - BSPP Thread

Note:
For manifold mounting (O-Rings) the flow valve (VCH) can be used.
The surface roughness of the counter part should not be higher than (for O-Ring connection) Rz 6.3 (ISO4287:1997).

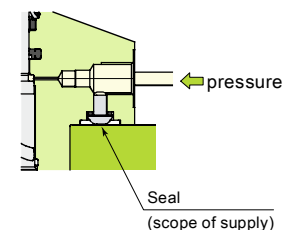
Detail only for **PLB 25 40**



O-Ring-Connection



BSPP Thread connection



Type	PLB06U-R _C	PLB16U-R _C	PLB25U-R _C	PLB40U-R _C
pivoting stroke	7	8	11	9
clamping stroke	11	14	15	15
A	126.5	147.5	172	182
B	50	63	85	95
C	68	80.5	107	122
D	26.5	34.5	47	55
E1	37	48	65	72
E2	20	27	37	42
E3	30	38	50	55
F	44.8	59.8	79.8	89.8
G1	20	32	40	50
G2	40	54	62	74
H	48.5	53.5	68	73
J	57	66	70	69
K	9	10	11	12
L1	26.4	31.4	29.4	29.4
L2	36	42	40	40
M1	14	14	12	12
M2	32	46	62	75
M3	26.5	31	40	45
M4	28	41	20.5	23.5
N	36	45.3	59.5	66
P	27	36	55	65
Q	6	10	12	14
R	M18×1.5	M28×1.5	M35×1.5	M45×1.5
S	23.5	33.5	45	55.5
T	4.5	4.5	5.5	5.5
U	6.5	10.5	12.5	16.5
V	18	19	15	14
W1	6.8	9	11	14
W2	11	14	17.5	20
X	12°	27°	26°	25°
AA	4.8	4.8	4.3	4.3
BA	46	61	81	91
BB	M6	M8	M10	M12
BC	7	7	7	7
HE	3 ^{+0.014} ₀	5 ^{+0.018} ₀	6 ^{+0.018} ₀	8 ^{+0.022} ₀
Weight	1.3 kg	2.4 kg	4.8 kg	6.5 kg
Recommended Torque for mounting screw	11 N·m	25 N·m	49 N·m	60 N·m

Contact

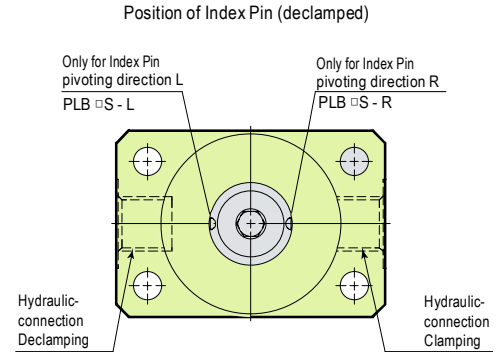
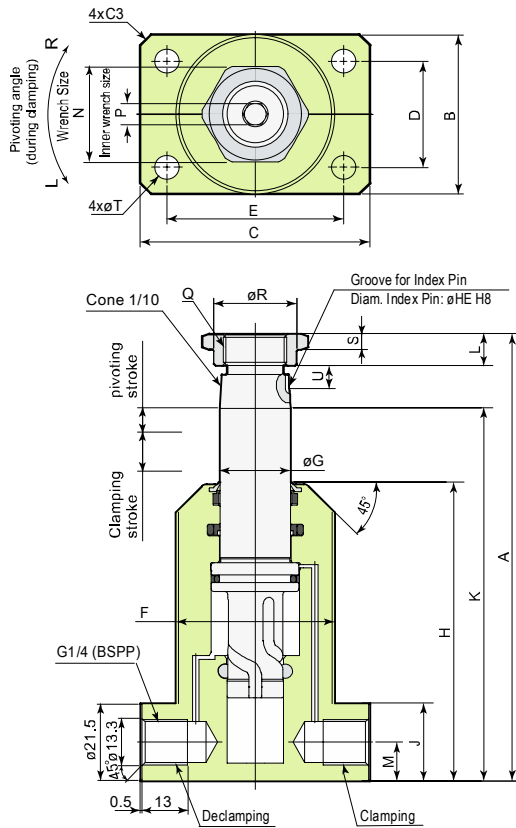
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35315 Homberg/Ohm (Germany)

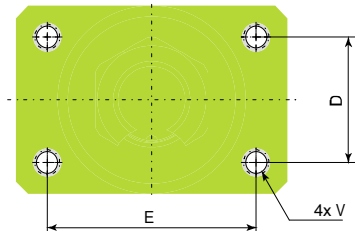
web: www.inosol.solutions
email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25

**PLB 06
16
25
40** S-
L
R
C



For angles <math><90^\circ</math> the position of the Index Pin must be requested!

Details mounting contour



Note 1. This drawing refers to the de-clamped position.
2. Index Pins and Screws are not in scope of supply.

Type	PLB06S- ^L / _C	PLB16S- ^L / _C	PLB25S- ^L / _C	PLB40S- ^L / _C
pivoting stroke	7	8	11	9
clamping stroke	11	14	15	15
A	126.5	147.5	172	182
B	45	63	80	90
C	65	85	100	115
D	30	44	60	68
E	50	65	80	90
F	M45×1.5	M60×1.5	M80×2.0	M90×2.0
G	20	32	40	50
H	84.5	95.5	108	113
J	22	22	22	22
K	105.5	119.5	138	142
L	9	10	11	12
M	11	11	11	11
N	27	36	55	65
P	6	10	12	14
Q	M18×1.5	M28×1.5	M35×1.5	M45×1.5
R	23.5	33.5	45	55.5
S	4.5	4.5	5.5	5.5
T	6.8	9	14	15.5
U	6.5	10.5	12.5	16.5
V	M6	M8	M12	M14
HE	3 ^{+0.014} ₀	5 ^{+0.018} ₀	6 ^{+0.018} ₀	8 ^{+0.022} ₀
Weight	1.2 kg	2.4 kg	4.5 kg	6.2 kg
Recommended Torque for mounting screw	11 N•m	25 N•m	60 N•m	100 N•m

Contact

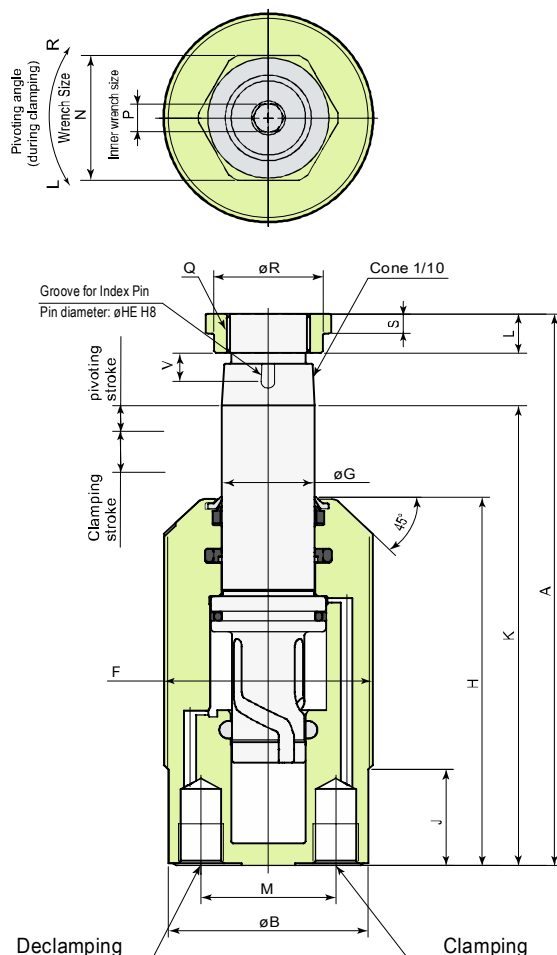
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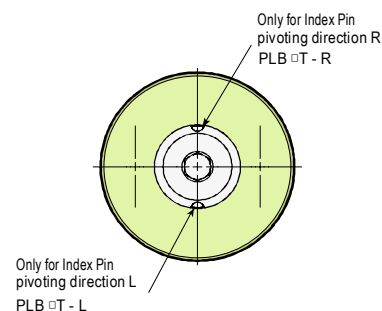
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PLB ⁰⁶₁₆ T-^L_R
25
40

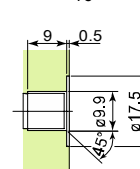


Position of Index Pin (declamped)



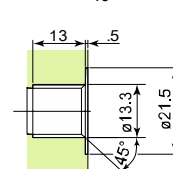
Details - BSPP Thread connection

PLB⁰⁶₁₆ T-



G 1/8 (BSPP)

PLB²⁵₄₀ T-



G 1/4 (BSPP)

- Note 1. This drawing refers to the declamped position.
- 2. Index Pins and Screws are not in scope of supply.
- 3. Recommended torques for mounting screws see following pages.

Type	PLB06T- ^L _R C	PLB16T- ^L _R C	PLB25T- ^L _R C	PLB40T- ^L _R C
pivoting stroke	7	8	11	9
clamping stroke	11	14	15	15
A	126.5	147.5	172	182
B	43	58	77	87
F	M45×1.5	M60×1.5	M80×2.0	M90×2.0
G	20	32	40	50
H	84.5	95.5	108	113
J	22	22	22	22
K	105.5	119.5	138	142
L	9	10	11	12
M	29	41	54	68
N	27	36	55	65
P	6	10	12	14
Q	M18×1.5	M28×1.5	M35×1.5	M45×1.5
R	23.5	33.5	45	55.5
S	4.5	4.5	5.5	5.5
U	6.5	10.5	12.5	16.5
HE	3 ^{+0.014} ₀	5 ^{+0.018} ₀	6 ^{+0.018} ₀	8 ^{+0.022} ₀
Contact Weight	1.0 kg	2.0 kg	4.0 kg	5.5 kg

Contact

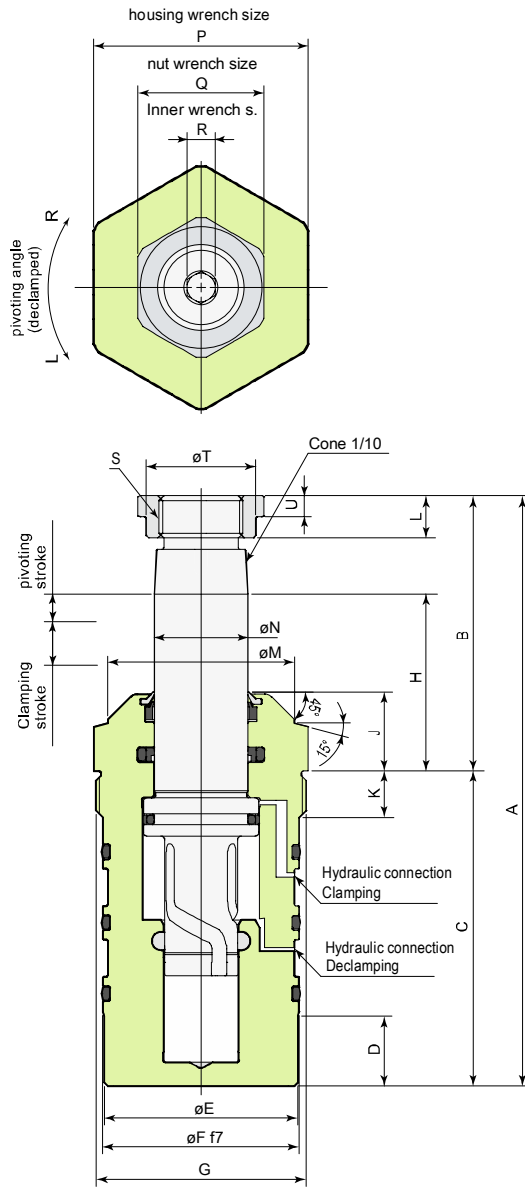
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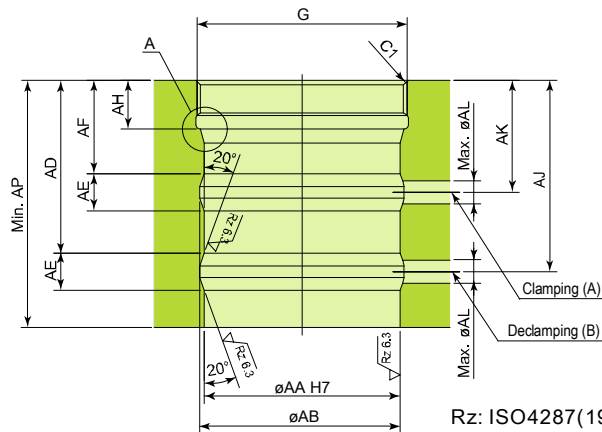
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PLB 06 M-L
16 C-R



Details mounting contour

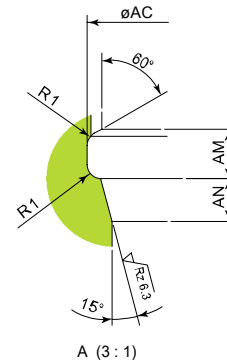


Rz: ISO4287(1997)

PLB M Installation dimensions

Type	PLB06M-L 16 C-R	PLB16M-L 16 C-R
pivoting stroke	7	8
clamping stroke	11	14
A	126.5	162
B	59	86
C	67.5	76
D	15	15
E	41.5	54.5
F	42 ^{+0.025} _{-0.050}	55 ^{+0.030} _{-0.060}
G	M45×1.5	M60×1.5
H	38	58
J	17	34
K	10	11
L	9	10
M	40	54
N	20	32
P	46	55
Q	27	36
R	6	10
S	M18×1.5	M28×1.5
T	23.5	33.5
U	4.5	4.5
AA	42 ^{+0.025} ₀	55 ^{+0.030} ₀
AB	44	57
AC	45.5	60.5
AD	37	41.5
AE	8	10
AF	20	24
AH	10.5	12.5
AJ	41	46.5
AK	24	29
AL	5	5
AM	3.5	3.5
AN	3	3
AP	52.5	61
Recommended torque for mounting screw	65 N·m	220 N·m
Weight	0.9 kg	2.1 kg

Note 1. This drawing refers to the declamped position.
2. Index Pins and Screws are not in scope of supply.



Contact

This offer is provided in cooperation with:

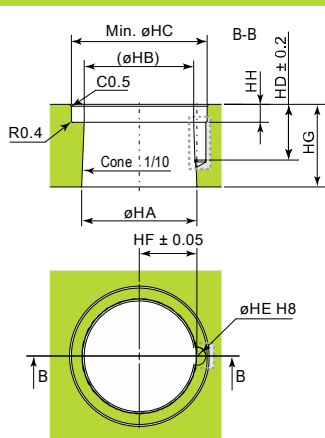
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hydraulic, double acting, up to 500 bar

Cone for clamping arms



Types	PLB06	PLB16	PLB25	PLB40
HA	20 ^{-0.020} _{-0.041}	32 ^{-0.025} _{-0.050}	40 ^{-0.025} _{-0.050}	50 ^{-0.025} _{-0.050}
HB	18.8	30.2	37.7	47.2
HC	24	38	47	59
HD	10.5	15.5	17.5	22.5
HE	3 ^{+0.014} ₀	5 ^{+0.018} ₀	6 ^{+0.018} ₀	8 ^{+0.022} ₀
HF	10.1	16.1	20.1	25.1
HG	16	23	28	34
HH	4	5	5	6
HJ	22 ^{+0.033} ₀	34.5 ^{+0.039} ₀	43 ^{+0.039} ₀	54 ^{+0.046} ₀
HK	19	30	38	47
HL	10	16	21	26
Index Pin	ø 3(h8)×6	ø 5(h8)×10	ø 6(h8)×12	ø 8(h8)×16
Taper sleeves	PLZ06-BS	PLZ16-BS	PLZ25-BS	PLZ40-BS

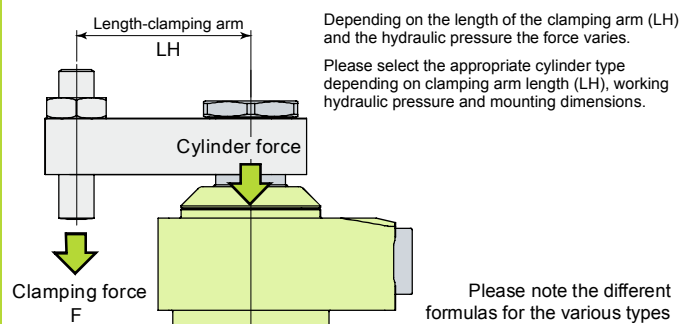
Index hole only when using the indexation!
Please request the dimensions!

Technical Data

Type		PLB06	PLB16	PLB25	PLB40
Force (for pressure of 500 bar)	(kN)	8.8	22.6	35.3	57.7
Piston diameter	(mm)	25	40	50	63
Rod diameter	(mm)	20	32	40	50
Usable annular surface	(cm ²)	1.8	4.5	7.1	11.5

Calculation of clamping force

Type	PLB06
Pressure (P)	150 bar
Length of clamping arm	40 mm
Cylinder force	2.7 kN
Clamping force (F)	2.3 kN
Formula Example	$F = \frac{0.1P}{5.66+0.0213 \times LH}$ $= \frac{0.1 \times 150}{5.66+0.0213 \times 40} = 2.3 \text{ kN}$



PLB25		Clamping force (kN)											Max. Clamp arm length Max. LH (mm)
Hydraulic-pressure (bar)	Cylinder-force (kN)	Length of clamping arm LH (mm)										Max. LH (mm)	
		40	50	60	70	80	90	100	120	140	160		
500	35.3	31.7											40
450	31.8	28.5											45
400	28.3	25.3	24.7										52
350	24.7	22.2	21.6	21.1									61
300	21.2	19.0	18.5	18.1	17.6								73
250	17.7	15.8	15.4	15.0	14.7	14.3	14.0						91
200	14.1	12.7	12.3	12.0	11.7	11.5	11.2	10.9	10.5				122
150	10.6	9.5	9.3	9.0	8.8	8.6	8.4	8.2	7.9	7.5	7.2		185
100	7.1	6.3	6.2	6.0	5.9	5.7	5.6	5.5	5.2	5.0	4.8		9
50	3.5	3.2	3.1	3.0	2.9	2.9	2.8	2.7	2.6	2.5	2.4		185

PLB40		Clamping force (kN)											Max. Clamp arm length Max. LH (mm)
Hydraulic-pressure (bar)	Cylinder-force (kN)	Length of clamping arm LH (mm)										Max. LH (mm)	
		45	50	60	70	80	90	100	120	140	160		
500	57.7	51.1											48
450	51.9	46.0	45.4										860
400	46.1	40.9	40.4	39.4									62
350	40.4	35.8	35.3	34.5	33.7								750
300	34.6	30.7	30.3	29.6	28.9	28.2							89
250	28.8	25.6	25.2	24.6	24.1	23.5	23.0	22.5					1250
200	23.1	20.5	20.2	19.7	19.2	18.8	18.4	18.0	17.2	16.5			152
150	17.3	15.3	15.1	14.8	14.4	14.1	13.8	13.5	12.9	12.4	11.9		2070
100	11.5	10.2	10.1	9.9	9.6	9.4	9.2	9.0	8.6	8.2	7.9		9
50	5.8	5.1	5.0	4.9	4.8	4.7	4.6	4.5	4.3	4.1	4.0		237 50

PLB06		Clamping force (kN)											Max. Clamp arm length Max. LH (mm)	
Hydraulic-pressure (bar)	Cylinder-force (kN)	Length of clamping arm LH (mm)										Max. LH (mm)		
		25	30	40	50	60	70	80	90	100	120			
500	8.8	8.1												27
450	8.0	7.3	7.1											30
400	7.1	6.5	6.4											35
350	6.2	5.7	5.6	5.4										41
300	5.3	4.8	4.8	4.6	4.5									50
250	4.4	4.0	4.0	3.8	3.7	3.6								63
200	3.5	3.2	3.2	3.1	3.0	2.9	2.8	2.7						85
150	2.7	2.4	2.4	2.3	2.2	2.2	2.1	2.0	2.0	1.9	1.8			128
100	1.8	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.2			9
50	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.6	0.6			128

PLB16		Clamping force (kN)											Max. Clamp arm length Max. LH (mm)	
Hydraulic-pressure (bar)	Cylinder-force (kN)	Length of clamping arm LH (mm)										Max. LH (mm)		
		35	40	50	60	70	80	90	100	120	140			
500	22.6	20.2												39
450	20.4	18.2	17.9											44
400	18.1	16.2	15.9	15.5										50
350	15.8	14.2	14.0	13.5										59
300	13.6	12.1	12.0	11.6	11.3	11.0								71
250	11.3	10.1	10.0	9.7	9.4	9.2	8.9							89
200	9.0	8.1	8.0	7.7	7.5	7.3	7.1	6.9	6.8	6.4				121
150	6.8	6.1	6.0	5.8	5.6	5.5	5.3	5.2	5.1	4.8	4.6			186
100	4.5	4.0	4.0	3.9	3.8	3.7	3.6	3.5	3.4	3.2	3.1			9
50	2.3	2.0	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.5			186



Advantages:

- ✓ Clamping without lateral force
- ✓ High clamping force
- ✓ Optional flow control available
- ✓ Various design options for clamp arms
- ✓ No interfering contours while loading/unloading
- ✓ Incl. positioning pin for clamp arms
- ✓ Compact Design



General

Recommendations for use

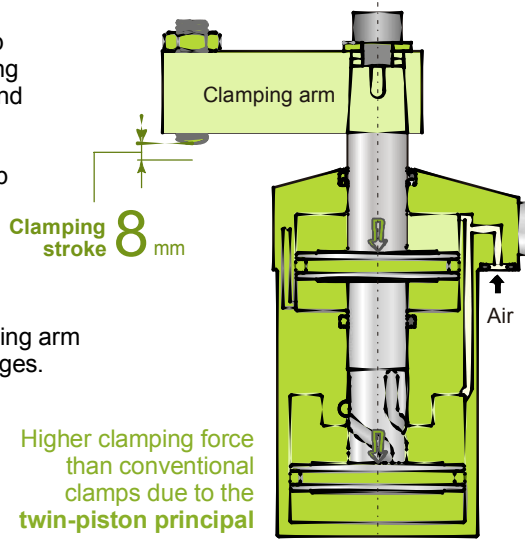
Swing Clamps are used to clamp workpieces for which the clamping points must be free for loading and unloading of the fixture.

The angular position of the clamp arm can be fixed with a pin.

Manifold mounting via flange or BSPP thread connection.

The maximal length of the clamping arm can be found on the following pages.

These clamps may only be operated with compressed air.



Higher clamping force than conventional clamps due to the twin-piston principal

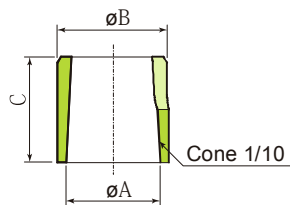
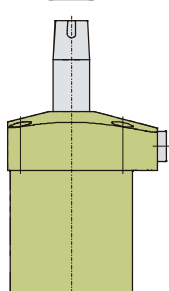
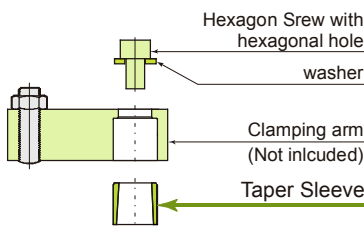
Description

Due to the twin-piston principal a much higher clamping force can be achieved in comparison to comparable systems. This is resulting in a much smaller body size, by keeping the same clamping force as a similar standard clamp which is 2 sizes bigger. Especially in pneumatic applications this is a great advantage.

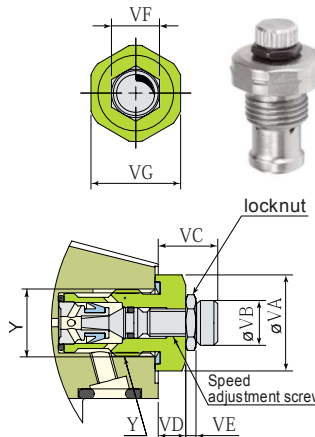
Swing clamps are pull-type cylinders, where a part of the total is used to swing the piston.

The swing clamp shows a robust panning mechanism with the optional possibility to throttle the moving speed.

Accessories

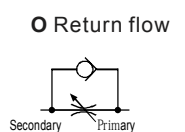
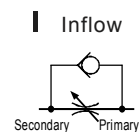


Taper Sleeve

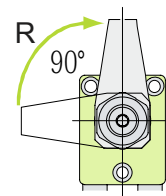
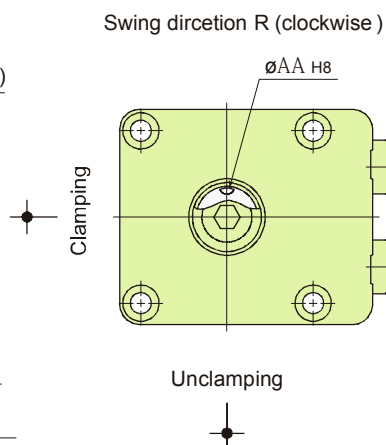
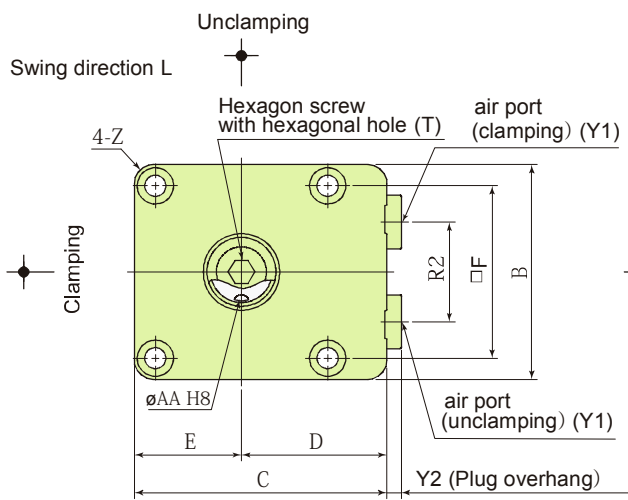


Throttle valve

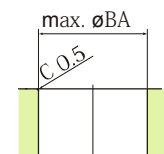
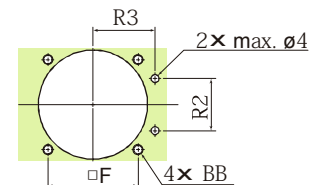
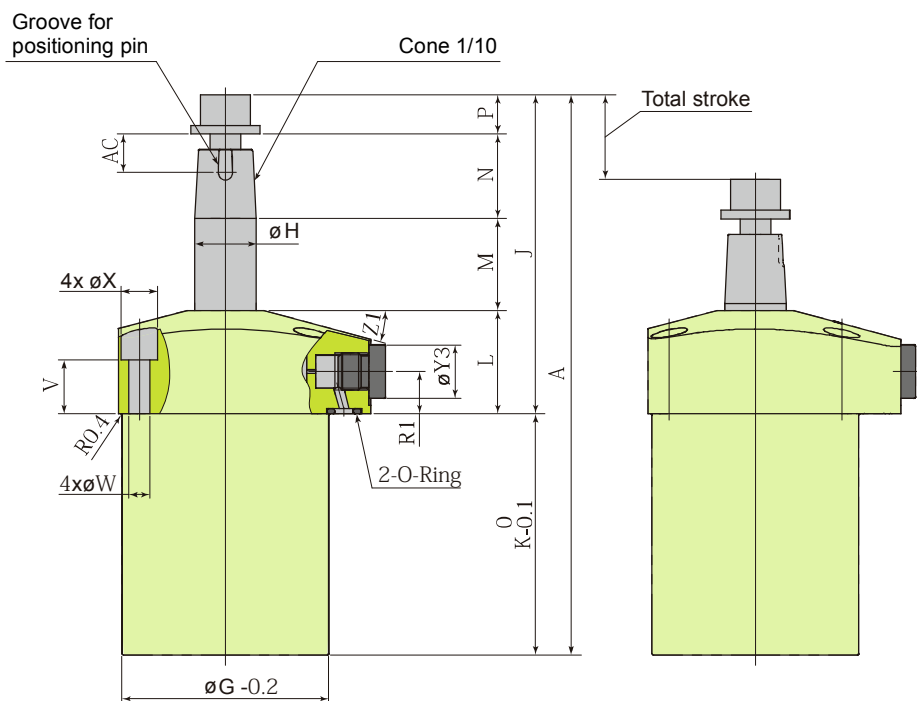
Typ	VCL01-I	VCL01-O	VCL02-I	VCL02-O
Y	G1/8		G1/4	
VA	14		19	
VB	6.5			
VC	Min. 8.6 ~ Max. 12.6			
Number of rotations for setting	8 Rotations			
VD	4			
VE	1.5			
VF	7			
VG	13		17	



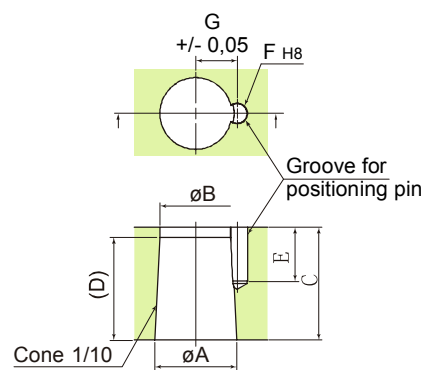
Taper Sleeve	CTH32-XS	CTH40-XS	CTH50-	CTH63-XS
Matching Swing Clamps	CTY32-□	CTY40-□	CTY50-□	CTY63-□
∅ A	14	16	20	25
∅ B	17	19	24	29
C	14	18	22	26



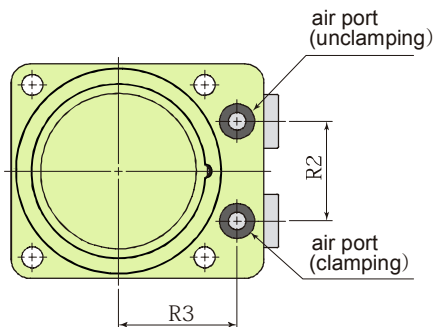
Example Swing direction



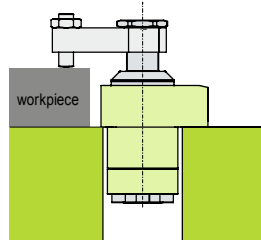
Mounting Contour



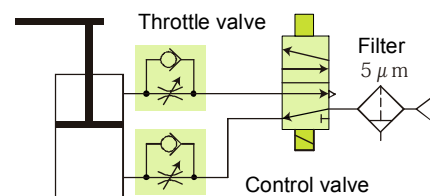
Details clamping arm contour



CTY... - R/L Upper flange



Air circuit diagram



Type (-R; L)		CTY32-	CTY40-	CTY50-	CTY63-
Cylinder force at 5 bar	[N]	950	1430	2110	3090
Effective area clamping	[mm ²]	1905	2853	4214	6179
Total stroke	[mm]	17	18	21	24,5
Clamp stroke	[mm]	8	8	8	8
Swing angle	[°]	90	90	90	90
Weight	[kg]	0,49	0,67	1,1	1,7
Air volume - Clamping	[cm ³]	32,4	51,4	88,5	151,4
Air volume - Unclamping	[cm ³]	35	55	95,1	163,4
A	[mm]	141,3	148,3	171,7	195,7
B	[mm]	50	56	66	78
C	[mm]	60	66	80	91
D	[mm]	35	38	47	52
E	[mm]	25	28	33	39
F	[mm]	39	45	53	65
ØG	[mm]	46	54	64	77
ØH	[mm]	14	16	20	25
J	[mm]	75,3	79,3	95,2	105,7
K	[mm]	66	69	76,5	90
L	[mm]	27	27	32	32
M	[mm]	19	20	23	26,5
N	[mm]	19	22	27	32
P	[mm]	10,3	10,3	13,2	15,2
R1	[mm]	11	11	12,5	12,5
R2	[mm]	20	26	30	40
R3	[mm]	28	31	36	41
T	[]	M8 / 16 deep	M8 / 16 deep	M10 / 20 deep	M10 / 20 deep
V	[mm]	14	14	17	16
ØW	[mm]	5,5	5,5	6,8	6,8
ØX	[mm]	9,5	9,5	11	11
Y1	[Zoll]	G1/8	G1/8	G1/4	G1/4
Y2	[mm]	3,8	3,8	4,8	4,8
ØY3	[mm]	14	14	19	19
Z	[mm]	R5	R5	R6	R6
Z1	[°]	15	15	14	13
ØAA	[mm]	11	14	16	18
AC	[mm]	10,5	10,5	12,5	12,5
Pin size	[mm]	Ø4 h8 x 10	Ø4 h8 x 10	Ø5 h8 x 12	Ø5 h8 x 12
Taper sleeve	[P/N]	CTH32-XS	CTH40-XS	CTH50-XS	CTH63-XS

Contact

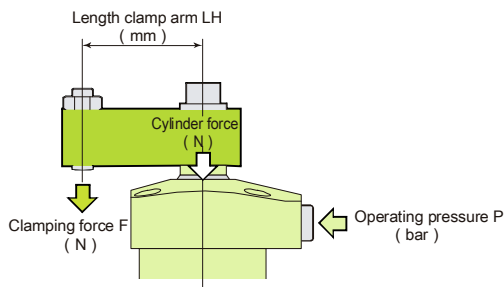
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Details-Clamping arm



The force varies depending on the length of the clamp arm (LH) and operating pressure (P)

Formula Example Clamping force

$$F = P \times 100 / (\text{Coefficient } 1 + \text{Coefficient } 2 \times LH)$$

F: Clamping force P: Operating air pressure LH: Length of clamp arm

CTY50 with length of clamp arm(LH)=60 mm at working pressure of 5 bar, the clamping force F is calculated by

$$5 \times 100 / (0.237 + 0.00105 \times 60) = 1670N$$

The clamp is only to be used in the allowed area. Otherwise cylinder and rod can be seriously damaged.

Typ CTY32		Clamping force $F = P \times 100 / (0.350 + 0.00180 \times LH)$						
Air pressure bar	Cylinder force N	Clamping force N						Max. length of clamp arm Max. LH mm
		bar						
		35	50	70	90	100	120	
0.5	950	800	750	690	Non-usable area		77	
0.4	760	640	600	550	510	500	109	
0.3	570	480	450	410	380	370	182	
0.2	380	320	300	280	260	250	190	
0.1	190	160	150	140	130	120	190	

Typ CTY40		Clamping force $F = P \times 1000 / (0.350 + 0.00180 \times LH)$						
Air pressure bar	Cylinder force N	Clamping force N						Max. length of clamp arm Max. LH mm
		Length clamp arm mm						
		50	70	90	110	130	150	
0.5	1430	1140	1050	Non-usable area				75
0.4	1140	910	840	780	Non-usable area			105
0.3	860	680	630	590	550	510	480	174
0.2	570	450	420	390	360	340	320	196
0.1	290	230	210	200	180	170	160	196

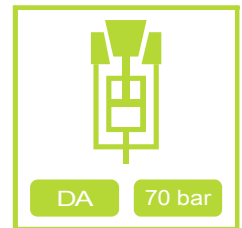
Typ CTY50		Clamping force $F = P \times 1000 / (0.237 + 0.00105 \times LH)$						
Air pressure bar	Cylinder force N	Clamping force N						Max. length of clamp arm Max. LH mm
		Length clamp arm mm						
		60	80	100	120	140	160	
0.5	2110	1670	1560	1460	Non-usable area		105	
0.4	1690	1330	1250	1170	1100	1040	151	
0.3	1270	1000	930	880	830	780	740	260
0.2	840	670	620	580	550	520	490	↑
0.1	420	330	310	290	280	260	250	260

Typ CTY63		Clamping force $F = P \times 1000 / (0.381 + 0.00090 \times LH)$						
Air pressure bar	Cylinder force N	Clamping force N						Max. length of clamp arm Max. LH mm
		Length clamp arm mm						
		75	90	110	130	150	170	
0.5	3090	2400	2300	2170	2060	1960	152	
0.4	2470	1920	1840	1740	1650	1570	1500	224
0.3	1850	1440	1380	1300	1240	1180	1120	330
0.2	1230	960	920	870	820	780	750	↑
0.1	620	480	460	430	410	390	370	330



Advantages:

- ✓ Compact Design
- ✓ High positioning accuracy
- ✓ Incl. pneumatic controlling
- ✓ Support and clamping element in one
- ✓ No interference contour during machining
- ✓ No deformation of work pieces
- ✓ No high pressure required
- ✓ Hardened workpiece support



Generally

Description:

The clamping force of the Bore Clamp (Expansion Clamp) is transmitted by a cone to the gripper. This generates the required clamping force.

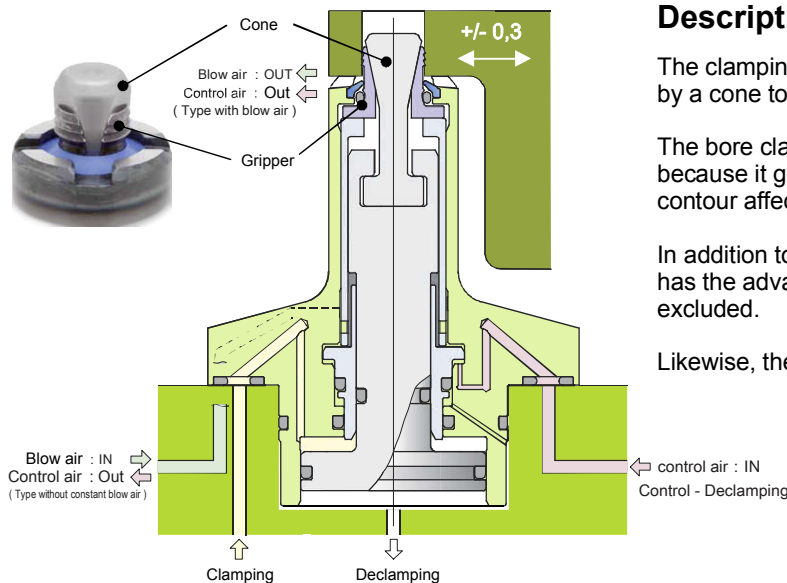
The bore clamp can often replace conventional clamping elements, because it generates very high clamping forces and no interference contour affects the machining of the workpiece.

In addition to the optimal accessibility of the workpiece the bore clamp has the advantage that a deformation of the workpiece can be largely excluded.

Likewise, the "clamping time" can be reduced to a minimum.

The integrated clamping and unclamping control with compressed air provides additional process reliability because an optical or electrical control is not possible.

If needed, the hardened work piece support surfaces can be reworked about 0,1mm.



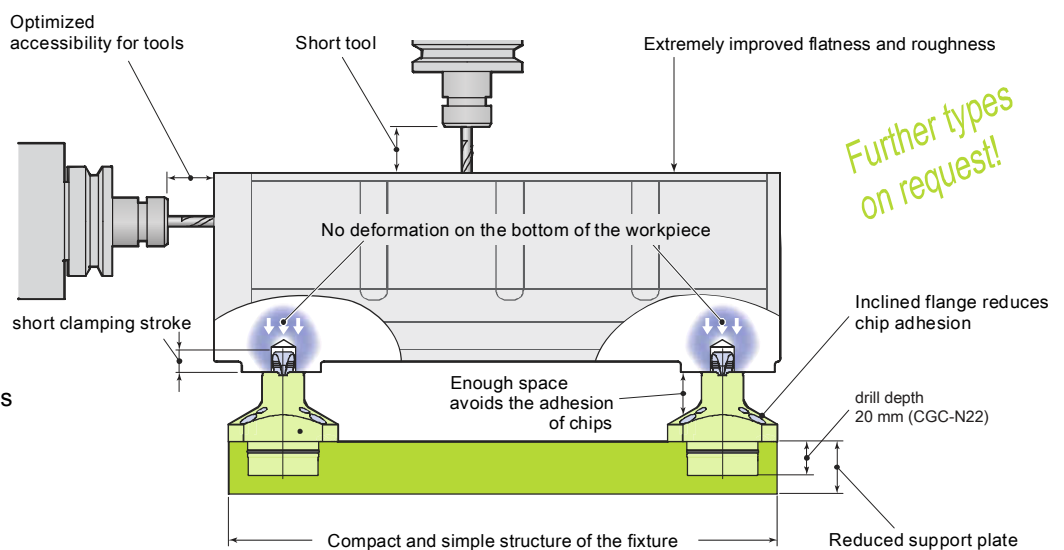
Application

Example:

The figure shows a possible application of the bore clamp.

How you recognize already, here is a considerably more compact design of the fixture possible.

Furthermore, it is a fact that the workpiece support is already integrated and a risk of deformation of the workpieces can be largely excluded.



Further types on request!

Contact

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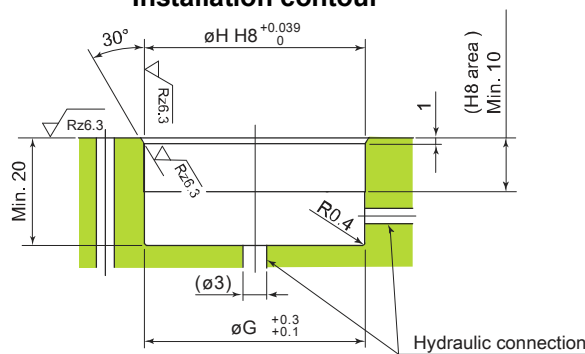
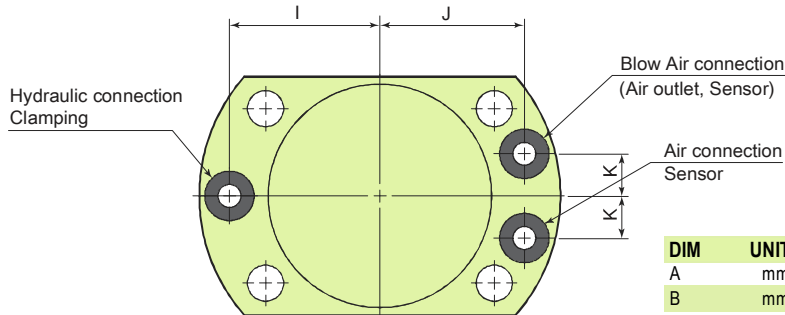
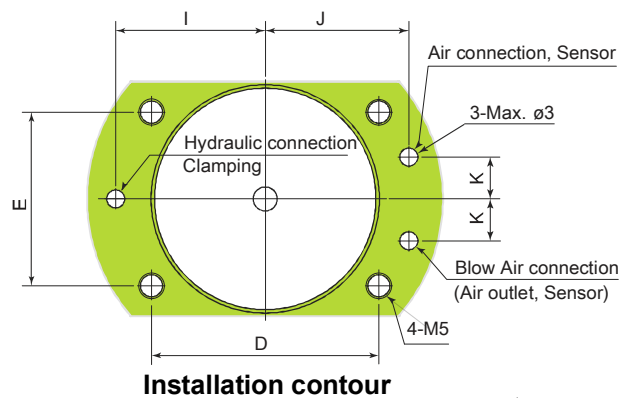
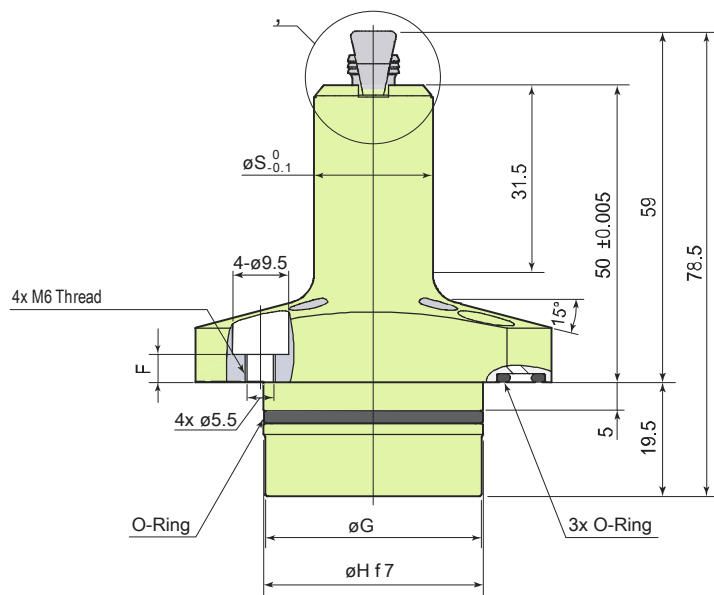
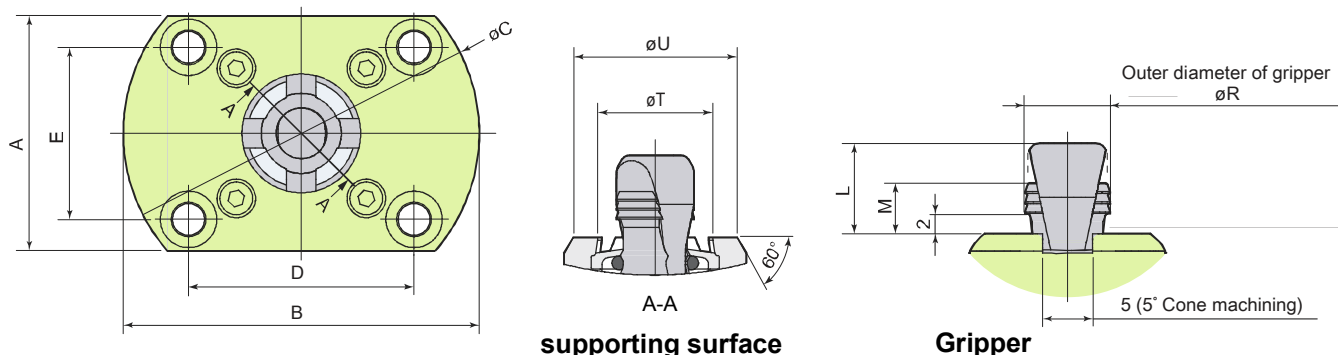
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hydraulic, double acting, 70 bar working pressure

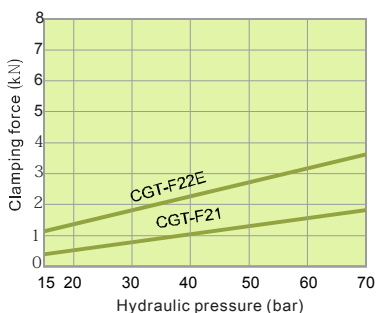
Technical Data



CGT-F22E without constant blow air!

DIM	UNIT	CGT-F21-				CGT-F22E-				
		055	067	070	080	090	010	011	012	013
A	mm	32,6	32,6	32,6	32,6	39,6	39,6	39,6	39,6	39,6
B	mm	51	51	51	51	60	60	60	60	60
C	mm	51	51	51	51	60	60	60	60	60
D	mm	31	31	31	31	38	38	38	38	38
E	mm	23	23	23	23	29	29	29	29	29
F	mm	5,5	5,5	5,5	5,5	4	4	4	4	4
G	mm	29,5	29,5	29,5	29,5	36,5	36,5	36,5	36,5	36,5
H	mm	30	30	30	30	37	37	37	37	37
I	mm	21	21	21	21	25	25	25	25	25
J	mm	20,5	20,5	20,5	20,5	24	24	24	24	24
K	mm	5,5	5,5	5,5	5,5	7	7	7	7	7
L	mm	7,5	7,5	8	8	9	9	10	10	10
M	mm	4	4	4	4	5	5	5,6	5,6	5,6
U	mm	11	13	16	17	18	19	20	21	22
T	mm	7,8	9	10,6	11,6	12,6	13,6	14,6	15,6	16,6
S	mm	15	15	18	19	20	21	22	23	24
R	mm	5	6,2	6,5	7,5	8,5	9,5	10,5	11,5	12,5

Pressure/ Clamping force



Order designation:
CGT-F21-070
(Ø-Receiving hole)

Contact

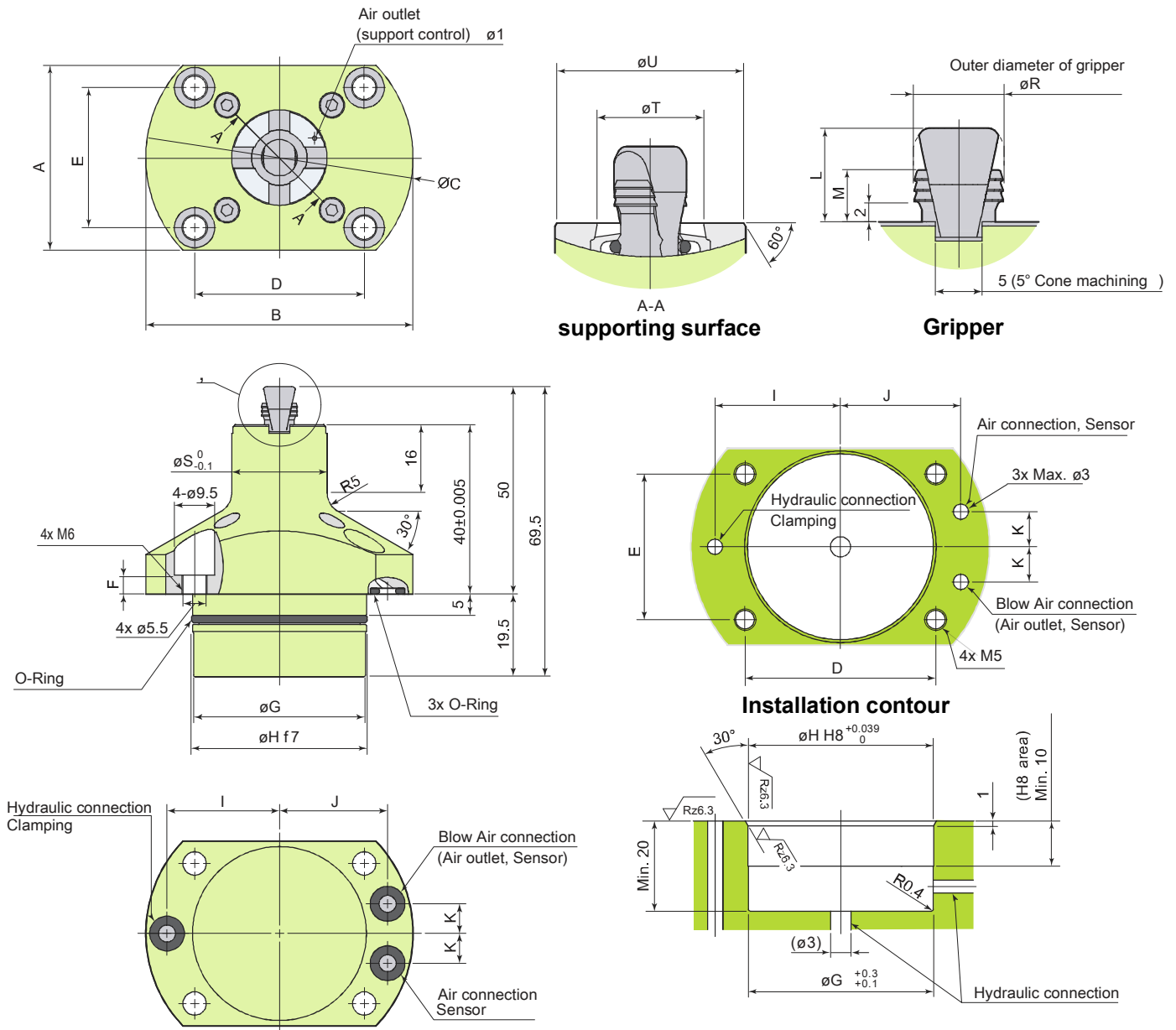
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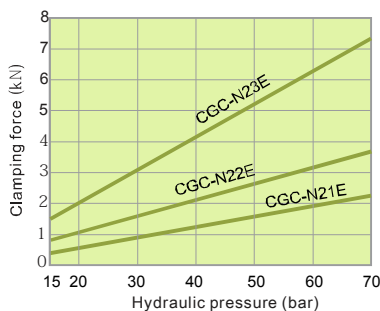
Technical Data



Order designation:

CGC-N21-070 (ϕ -Aufnahmebohrung)

Pressure/Clamping force



DIM	UNIT	CGC-N21E-		CGC-N22E-					CGC-N23E-			
		070	076	085	009	010	011	012	013	014	015	016
A	mm	36,6	36,6	43,6	43,6	43,6	43,6	43,6	43,6	55,6	55,6	55,6
B	mm	54	54	63	63	63	63	63	63	74	74	74
C	mm	54	54	63	63	63	63	63	63	77	77	77
D	mm	34	34	40	40	40	40	40	40	48	48	48
E	mm	27	27	33	33	33	33	33	33	43	43	43
F	mm	5,5	5,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
G	mm	33,5	33,5	40,5	40,5	40,5	40,5	40,5	40,5	52,5	52,5	52,5
H	mm	34	34	41	41	41	41	41	41	53	53	53
I	mm	22,5	22,5	26,5	26,5	26,5	26,5	26,5	26,5	32	32	32
J	mm	22	22	25,5	25,5	25,5	25,5	25,5	25,5	32	32	32
K	mm	5,5	5,5	7	7	7	7	7	7	9	9	9
L	mm	8	8	9	9	9	10	10	10	10	10	10
M	mm	4	4	5	5	5	5,6	5,6	5,6	5,6	5,6	5,6
U	mm	20	20,1	22	22	22	24	24	26	27,5	28	29
T	mm	10,6	10,9	12,1	12,6	12,6	14,6	15,6	16,6	17,6	18,6	19,6
S	mm	20,5	20,5	22,5	22,5	23,5	24,5	25,5	26,5	28	28,5	29,5
R	mm	6,5	6,8	8	8,5	9,5	10,5	11,5	12,5	13,5	14,5	15,5

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Advantages:

- ✓ Positioning and clamping possible
- ✓ Solid design
- ✓ Low position tolerance
- ✓ For diameters from 35 mm
- ✓ Also usable in filigree grooves
- ✓ Sealing air-, detection- and blow air connection possible



Description

These *positioning-, clamping- and pull-down-elements* are particularly suitable to accommodate machined or cast components, to clamp them centric for machining or to create a pull down force in a bore.

The elements are available for different diameter ranges and can be used as a center element and also as a pull down element and a mixture of these applications. Likewise, it is possible to generate a force in the vertical and axial directions with the grippers integrated in a ring groove.

The repeatability of the elements is $\pm 0.028 \text{ mm}$.
The minimum operating pressure is 30 bar.

Generally there are two variants available.
As pure centering element and with "floating" housing top.
These solutions compensate radial tolerances of $\pm 0.46 \text{ mm}$.

The allocation of vertical and horizontal clamping forces depends significantly from the respective bore diameter and the gripper position (further details on the following pages).

These workholdings are only available as *3-point clamping systems*.
Because of the fact, that in most cases special solutions are required, of course it is also possible to build them as a *2-point element* according to the customer specifications.

All components are hardened and have a very wear-resistant surface.

The elements are supplied including all seals for flange connection. This includes the seals for pressure oil supply (A + B) and these for both compressed air connections.

The compressed air connection "P1" is a pure blow air port that should be operated constantly, during the processing, if the elements are exposed to direct contamination.

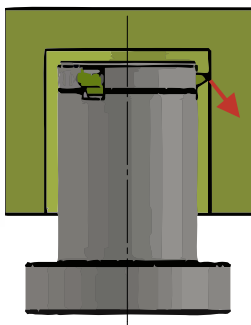
The port "P2" is only released when the actuator piston is in its home position. That means: Here, firstly a *pressure monitoring* can be integrated with a pressure sensor, which then also acts as a *barrier air connection*. After release, this connection may also be used as an additional *blow-air ventilation*, to ensure a better cleaning of the inner mechanism after the expansion. The use of both ports is highly recommended.

On the following pages we give some approximation values of the axial and radial forces, at different positions of the gripper arms and under different operating pressures. In case of doubts, it is recommended that these values are requested from us.

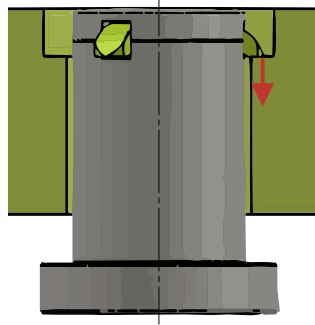
If multiple clamps from this kind are used for machining of one component, it is generally advisable to use a combination of fixed and floating elements to avoid over-determination.

These pull-down-centering elements work as double-acting pressure cylinders!

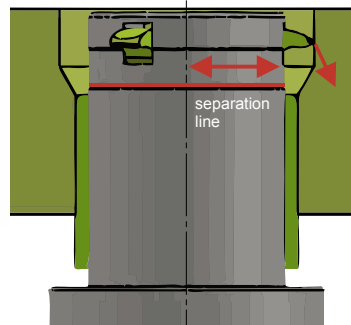
Examples of use



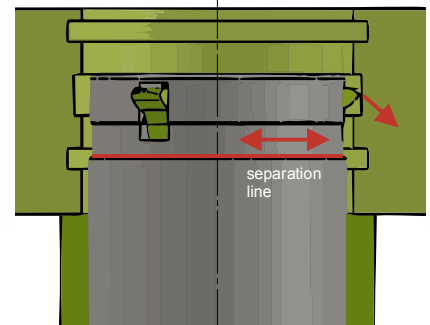
IPDCC22-001
as centering element
with proportionally
pull-down-force



IPDCC30-001
as pull-down-element

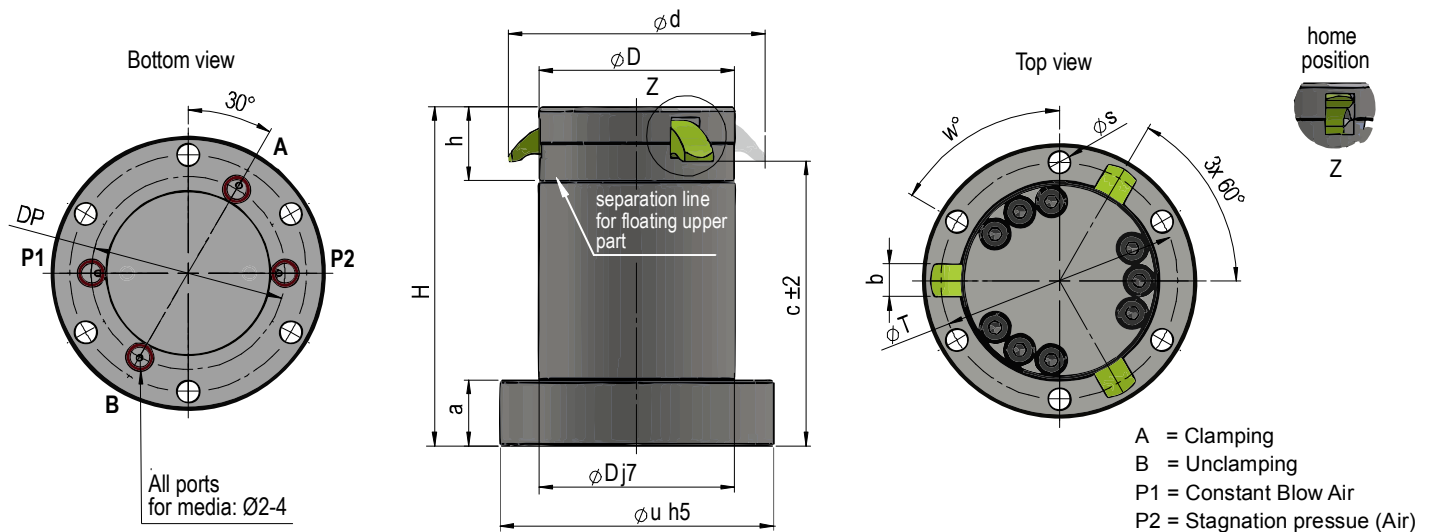


IPDCC36-002
as pull-down-element
with external centering
(bush) and floating
housing at the upper part



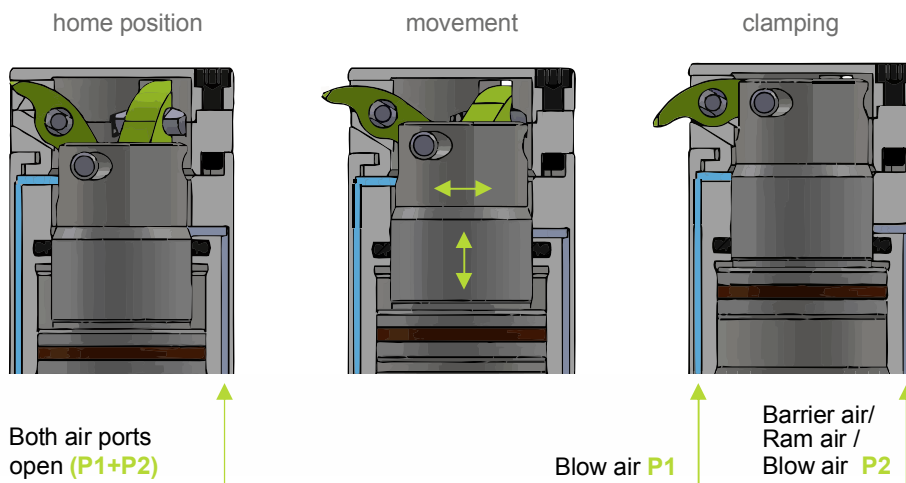
IPDCC40-002
as pull-down-element in a
ring groove with
floating upper housing
and external support

Technical Data



		IPDCC22-001	IPDCC30-001	IPDCC36-001	IPDCC40-001	IPDCC46-001
Radial position fix						
Radial position floating		-	IPDCC30-002	IPDCC36-002	IPDCC40-002	IPDCC46-002
Dimensions table	Unit					
Diameter range	mm	35-43	43-50	49-62	60-72	65-81
piston diameter	mm	22	30	36	40	46
d Gripper max. Ø	mm	44,4	51	63	73	83
D housing Ø	mm	34	42	48	58	63
a	mm	12	12	16	16	16
b	mm	6	8	8	8	8
c	mm	51,5	62,2	69,7	74,7	82,5
H	mm	61	74	83	88	98
h	mm	-	16	18	18	20
DP (+/- 0,15)	mm	34,4	42,4	47,4	53	60
s	mm	4,4	4,4	5,5	5,5	5,5
T	mm	42	50	58	67	73
w (Angle)	°	60	60	60	40	40
u	mm	50	58	67	76	82
Pull-down force without cent. at 100 bar	kN	3,7	6,9	9,8	12,1	16,1
Pull-down force without cent. at 200 bar	kN	7,4	13,8	19,6	24,2	32,2

Function



Both air ports open (P1+P2)

Blow air P1

Barrier air / Ram air / Blow air P2

Working data:

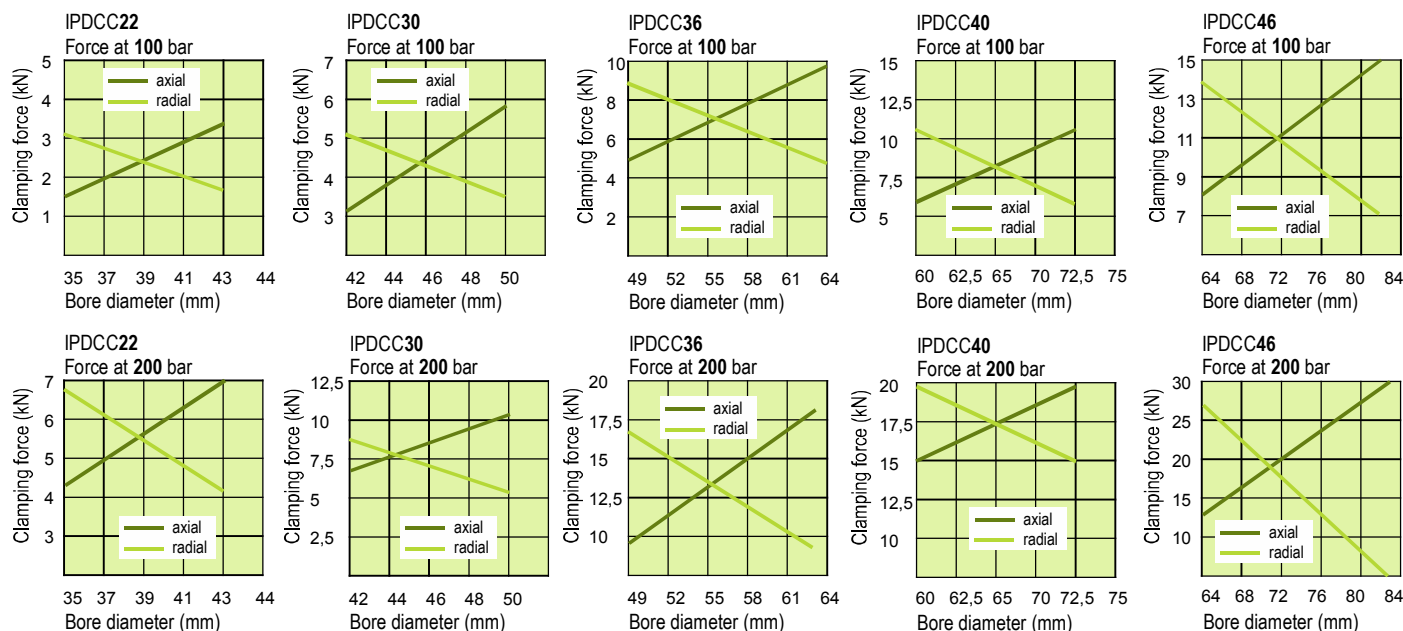
- Max. working pressure: 200 bar
- Min. working pressure: 30 bar
- Rec. blow air pressure: 4 bar
- Medium: Hydraulic oil
- Max. Temperature: 80°C
- Surface: hardened
- Type: Flanged connection
- Positioning tolerance: +/- 0,028 mm
- Radial compensation*: +/- 0,46 mm
- * Only for floating type

Due to the protected principle of the pivoting grippers, it is possible to produce a axial and radial clamping force.

Pull-Down-Centering-Clamp

Double acting, max. 200 bar working pressure

Clamping forces



These values are valid only for the standard types. Please inquire special gripper / diameter combinations!
 These tables are a guidance only. Intermediate sizes need to be interpolated.
 Surface condition, shape of the grippers and general friction affect these values.

Recommendations for use

These pull-down-centering clamps must not be used as a pull cylinder. The "B" port is used only for resetting the clamping unit.

The air port "P2" can be used as both, as an additional blow air ventilation, which blows only in relaxed state, as well as the backpressure query - for clamping and as sealing air connection.

The use of air connections is depending on the kind of use. In a - protected from contamination area - the use of blow air can possibly be dispensed.

We recommend as medium hydraulic oils according to DIN 51524 (HL, HLP).

To meet the respective specific clamping requirements, in many cases it is recommended to request us directly, so that we can determine the forces and performance details.

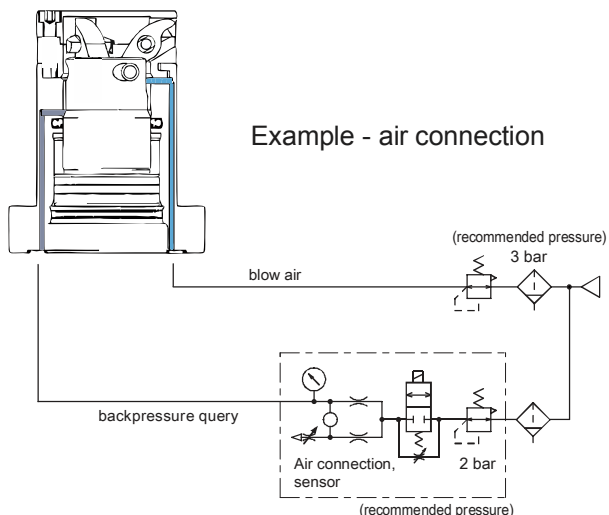
The workpieces must be carried out constructively so, that they withstand the forces during clamping.

During operation there is a risk of crushing. The accident-prevention-regulation are therefore mandatory.

It has to be made sure, that no chips and dirt domestic are located between the clamping surfaces.

Because these elements operate as push cylinders and very high forces can be achieved!

Notes



Also available as Screw-in type for drilled channels with coupling nut. In this case the middle channel is used for air ventilation.

Special solutions on request!

Contact

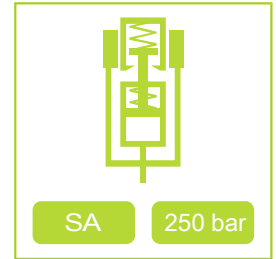
iNOSOL GmbH
 Frankfurter Str. 18
 35315 Homberg/Ohm (Germany)

web: www.inosol.solutions
 email: info@inosol.solutions
 tel.: (+49) 6633 / 368 95 25



Advantages:

- ✓ High support forces
- ✓ Operating pressure from 35 bar on
- ✓ Lock against rotation included
- ✓ Low settlement
- ✓ Non-sensitive for lateral forces
- ✓ No ventilation for housing required
- ✓ Compact design



Function

Recommendations for use:

Work support elements are used as variable support points to prevent the vibration and deflection during the machining of workpieces.

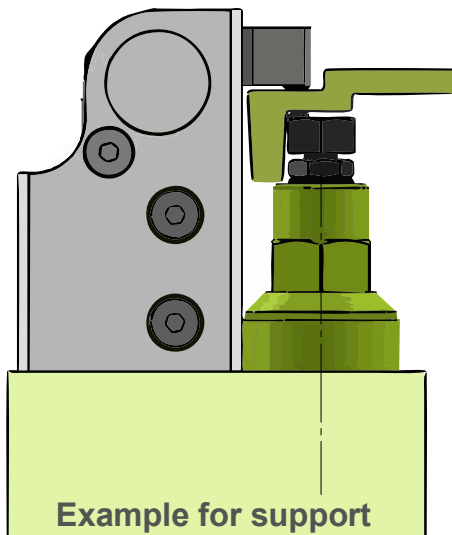
The threaded-body design allows space saving and direct installation into the fixture body. Oil supply is made through drilled channels.

The support elements must always be selected so that occurring load and clamping forces are recorded with sufficient reserve.

The support elements are protected against the ingress of fluids and moisture. An additional ventilation or air purge connection is not necessary.

By observing the indicated contact spring-force, own thrust bolts can be used.

We recommend as medium hydraulic oils acc. to DIN 51524 (HL, HLP).



Description:

Function: Single acting
Connection: 1x supply hydraulic oil
Operation: Hydraulic against spring force

These elements don't work with conventional generated supporting force by a clamping bush. For this reason, possibly penetrating moisture decreases the support force only slightly.

The support plunger is secured against rotation. This means: When replacing the standard thrust bolt the support plunger must not be held against.

Because these elements are secured against rotation and also very transverse-load insensitive, asymmetrical thrust bolts / screws can be used.

These features, in conjunction with the slim upper part of the elements also allows the use for machining of very filigree components.

Compared to the size, these elements generate very high support forces.

This elements have a negligible low settlement- and elongation behavior.

Specifications on the next page!

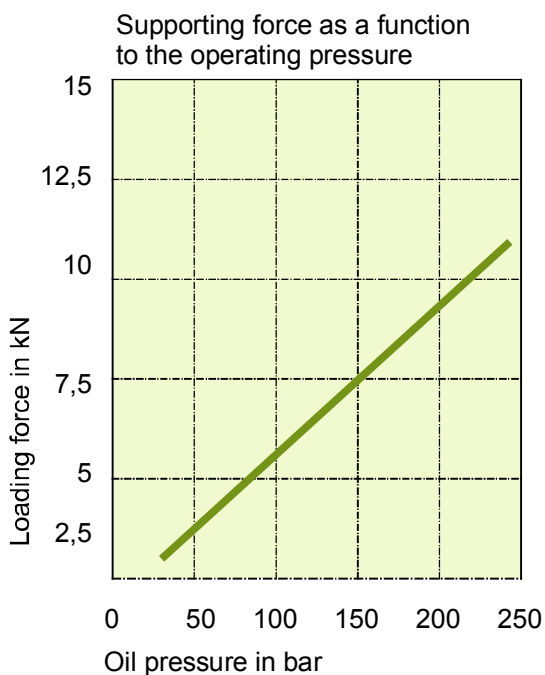
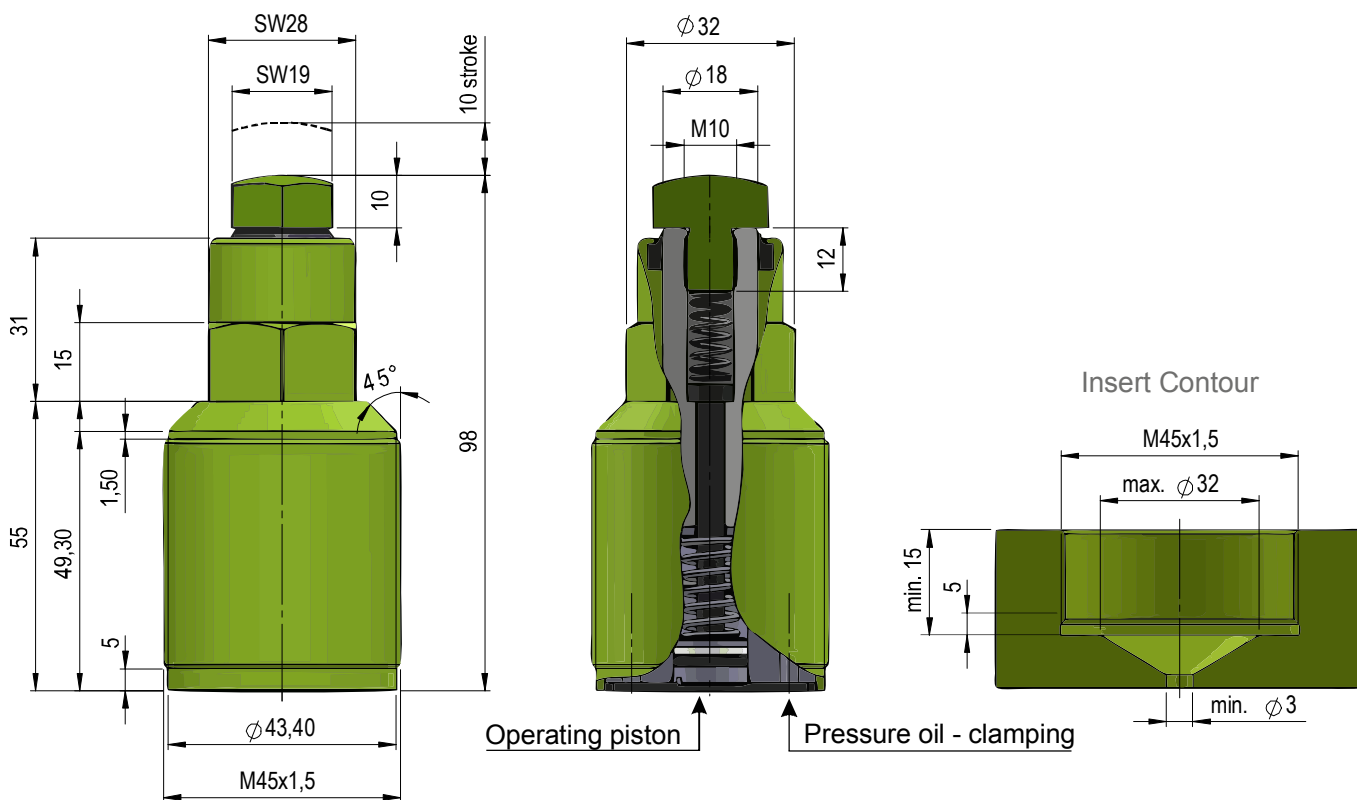
Contact

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 tel.: (+49) 6633 / 368 95 25

Work support element

Single acting, max. 250 bar working pressure



Technical Data	Unit	Value
diameter of support piston	mm	18
Stroke	mm	10
Recommended Volume flow	l/min	1-2
Spring force	N	10-27
Min. working pressure	bar	35
Max. working pressure	bar	250
Setting behavior under load max.	mm	0,025
Elastic elongation max.	mm	0,025
Recommended torque	Nm	60
Max. working temperatur	°C	80
Part number		IWS18-001



Eccentrically support possible

Contact

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email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25

Special solutions on request!

Advantages:

- ✓ High support forces
- ✓ Inner parts of stainless steel
- ✓ Metal wiper as option
- ✓ Perfect coolant protection
- ✓ Expandable with accessories
- ✓ Partially compatible to competitive products

Recommendations for use

Support elements act as a variable clamping points for supporting workpieces during machining and avoid/reduce the vibrations and deflections.

For space-saving the threaded-body design allows the direct installation into the fixture body. The hydraulic oil supply and the ventilation effected through drilled channels.

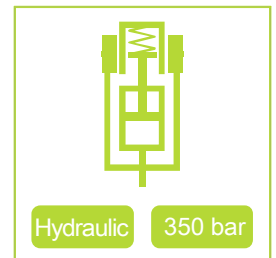
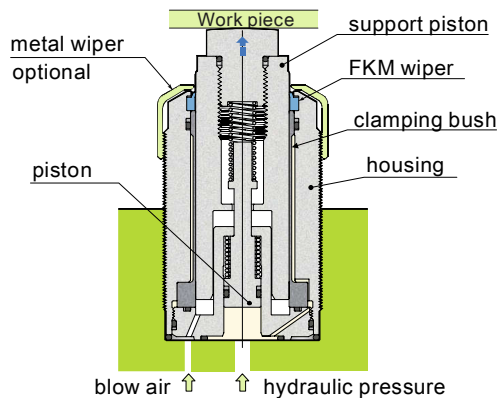
Description

The - integrated in the housing - clamping bush, clamps the movable plunger when it is pressurized. But in advance, this plunger is moved by the pressure connection, against the workpiece.

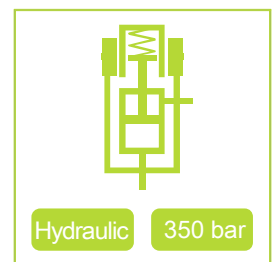
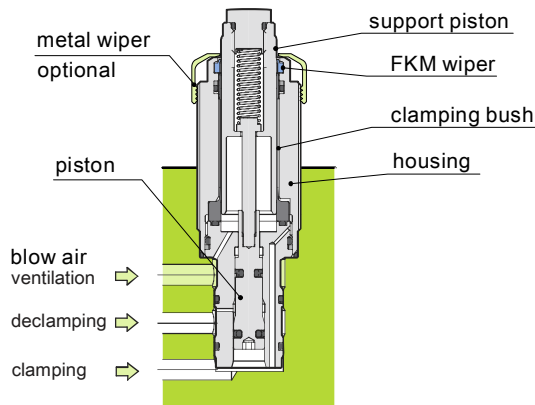
The penetration of liquids is prevented by a FKM wiper.

An optional metallic wiper provides another reliable protection against the penetration of hot chips. If required, the ventilation connecting can be pressurized with blow air.

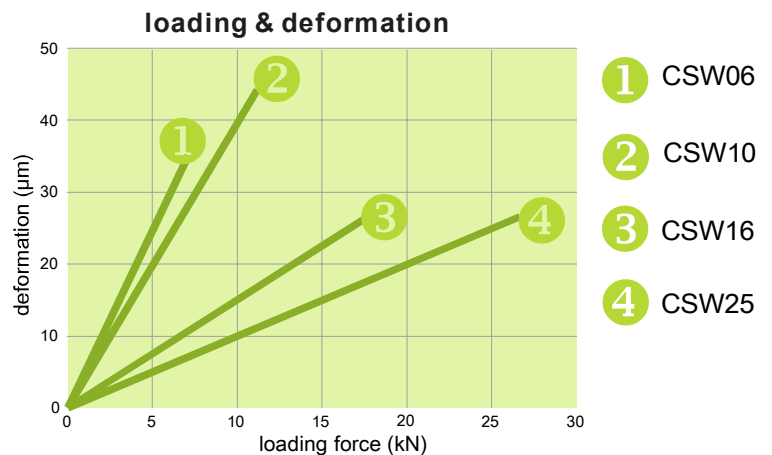
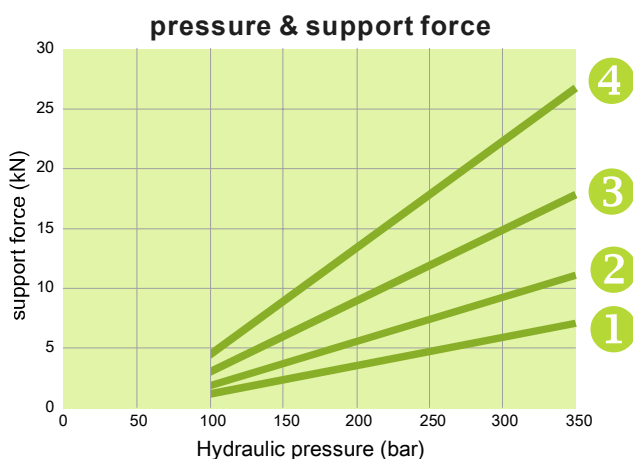
CSW single acting



CSW-D double acting

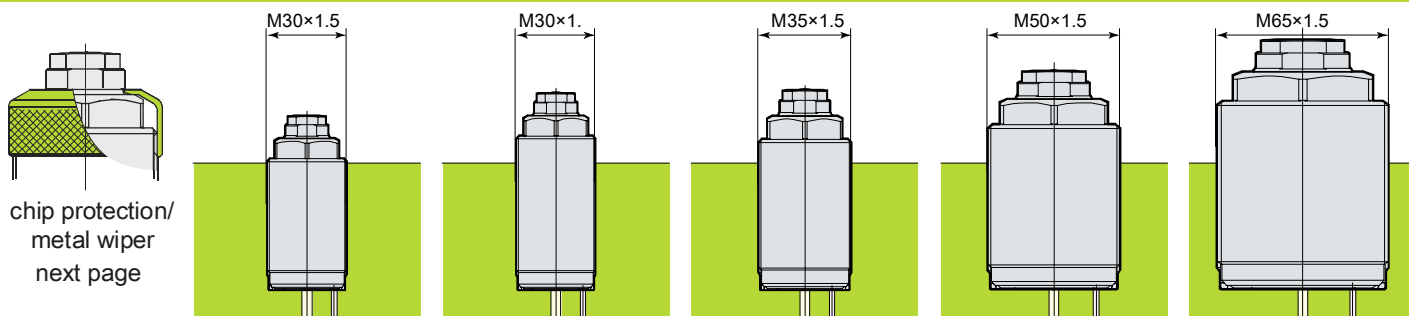


Pressure/force ratio

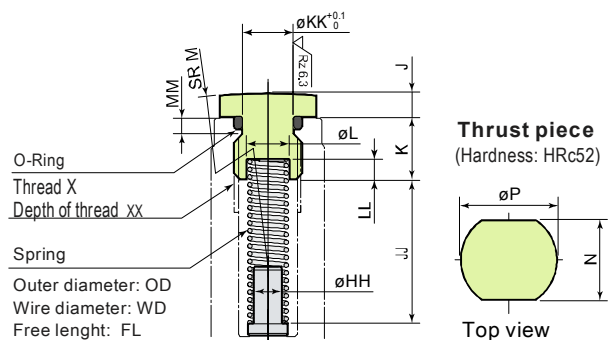
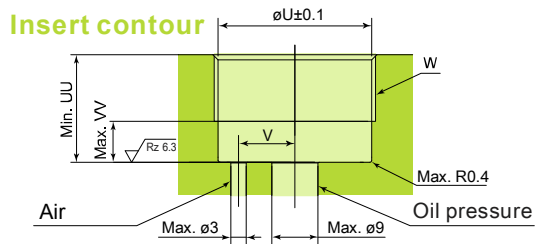
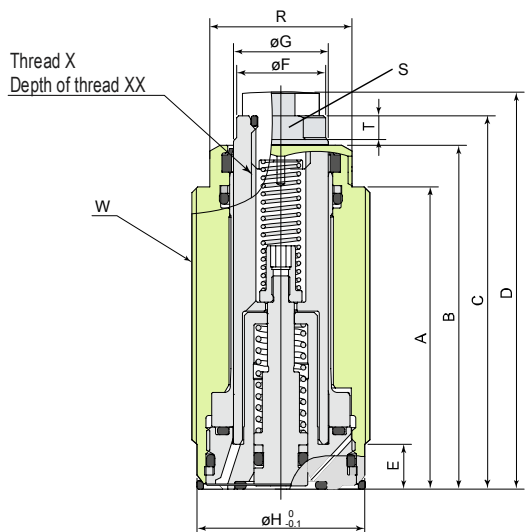


- 1 CSW06
- 2 CSW10
- 3 CSW16
- 4 CSW25

hydraulic, single- and double acting, up to 350 bar



Type	CSW06M-L	CSW06M-D	CSW10M-L	CSW16M-L	CSW25M-L
stroke	8 mm	15 mm	10 mm	10 mm	13 mm
feeding force-spring	6-11 N	4-11 N	10-16 N	16-29 N	25-45 N



Type	CSW06M-L	CSW06M-D	CSW10M-L	CSW16M-L	CSW25M-L
A	51	58	58	59.5	68.5
B	58	65	67	71.8	82
C	63	70	73	78	89
D	67	74	77	84	96
E	7.5	7.5	7.5	7.5	8
F	15	15	19	29	39
G	16	16	20	30	40
H	28.3	28.3	33.2	48.2	63.2
HH	5	5	5	6	7.5
J	4	4	4	6	7
JJ	20.5	21.3	25.5	25	32.5
K	9	9	11	12	11
KK	7.8	7.8	8.9	13.3	13.3
L	7.4	7.4	7.6	9.2	11.2
LL	1.5	1.5	3.5	1.5	1.5
M	70	70	90	110	140
MM	1.9	1.9	3	2.4	2.4
N	12	12	14	19	24
P	12.9	12.9	16.9	23	30
R	24	24	30	41	55
S	13	13	17	24	32
T	4	4	5	5	5.7
U	28.5	28.5	33.5	48.5	63.5
UU	15.5	15.5	15.5	15.5	20
V	11	11	12	18	23.5
VV	6.5	6.5	6.5	6.5	7
W	M30x1.5	M30x1.5	M35x1.5	M50x1.5	M65x1.5
X	M10x1.5	M10x1.5	M12x1.75	M16x2	M16x2
XX	13	13	16	20	20
Housing, Torque	35 N•m	35 N•m	60 N•m	130 N•m	250 N•m
Thrust pcs Torque	30 N•m	30 N•m	50 N•m	100 N•m	100 N•m

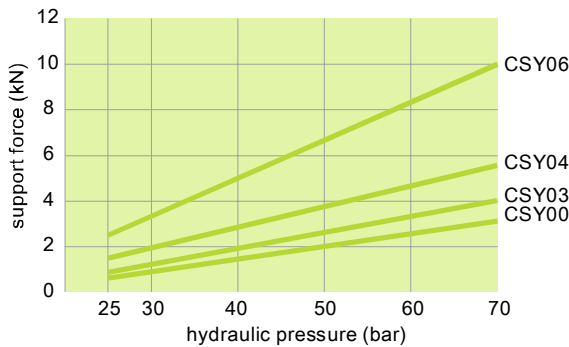
Contact

This offer is provided in cooperation with:



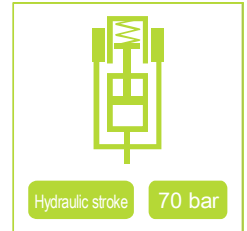
iNOSOL GmbH
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35315 Homberg/Ohm (Germany)

web: www.inosol.solutions
email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25



Advantages:

- ✓ High support forces
- ✓ Low working pressure
- ✓ Metal wiper as option
- ✓ Perfect Coolant protection
- ✓ Expandable with accessories



Function

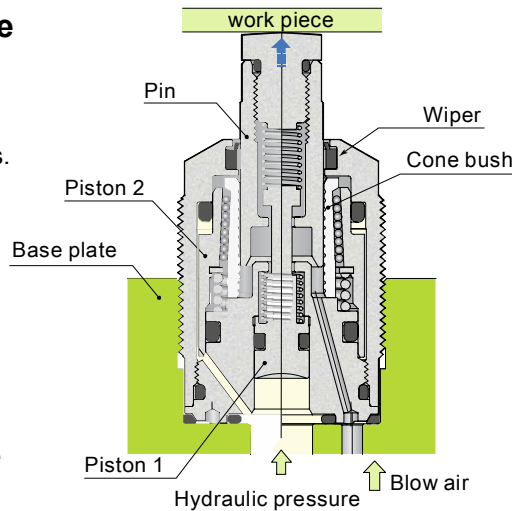
Recommendations for use

Support elements act as variable clamping points for supporting work-pieces during machining and avoid/reduce the vibrations and deflections.

For space-saving the threaded-body design allows the direct installation into the fixture body.

The hydraulic oil supply and the ventilation effected through drilled channels.

The operation is carried out hydraulically against spring force.



Description

The - in the housing integrated - cone bush, clamps the movable plunger when it is pressurized. But in advance, this plunger is moved by the pressure connection, against the workpiece.

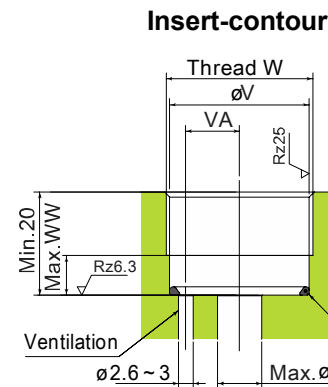
The penetration of liquids is prevented by a FKM wiper.

An optional metallic wiper provides another reliable protection against the penetration of hot chips.

If required, the ventilation connecting can be pressurized with blow air.

Technical Data

Typ	CSY00-H	CSY03-H	CSY04-H	CSY06-H
A	49	54	48	60
B	57	62	58	71
C	63	69	65	78
D	66	73	69	82
E	10	12	15	16
F	24.3	28.2	34.2	43.2
G	8.4	9.4	9.4	9.4
H	4.5	5.5	7.2	7.2
HH	5.1	6.8	8.5	8.5
JJ	20.6	23.2	24.1	32.5
K	1	1	1	1
L	3.5	4.3	5	5
M	9.5	11.5	12.5	12.5
N	4.5	6	7.8	7.8
P	7.5	9	9	9
Q	3	4	4	4
R	1.5	1.9	1.9	1.9
S	22	24	30	36
T	8	10	11	11
TT	8	10	13	13
U	5	6	6	6
V	24.5	28.5	34.5	43.5
VA	9	11	13	16
W	M26×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	9	9	9
X	M6×1	M8×1.25	M10×1.5	M10×1.5
Depth	Tiefe 9	Tiefe 12	Tiefe 11	Tiefe 11

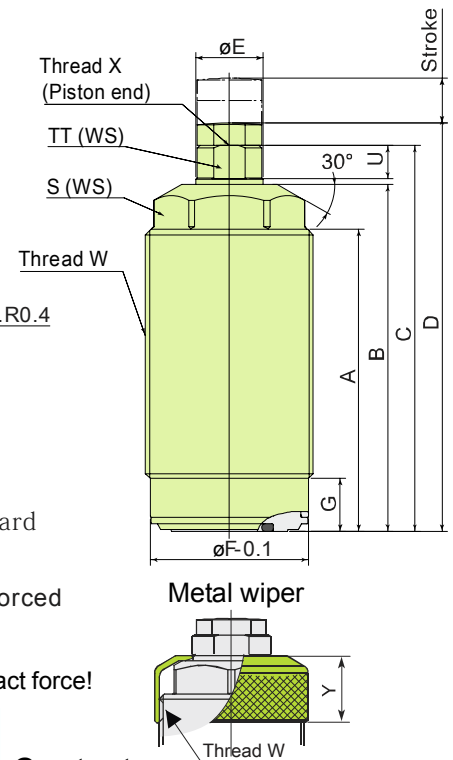


Metal wiper and other extensions you can find in data sheet CLS003

CSY

00 L Standard type
 03 - type
 04 H Reinforced type
 06 type

Reinforced type with a higher contact force!



Contact

INOSOL GmbH tel.: (+49) 6633 / 368 95 25
 Frankfurter Str. 18
 35315 Homberg/Ohm (Germany)

This offer is provided in cooperation with:





Advantages:

- ✓ Compact Design
- ✓ Cost-efficient
- ✓ Multifarious use
- ✓ Only one pressure line necessary



Generally

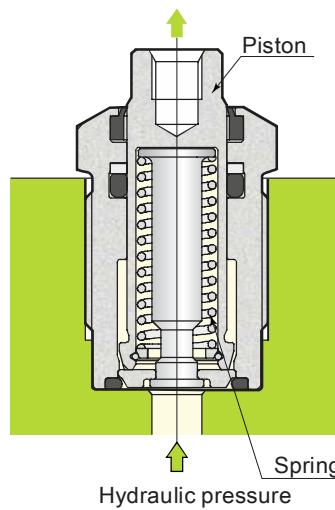
Description:

These threaded body cylinders can be mounted into the counter-contour until the hexagon. In the arrangement in chip rows, closest distances are possible, since the hydraulic oil is supplied through drilled channels and only one port is necessary.

Sealing is done by the supplied sealing ring at the base of the mounting cavity. The plunger design prevents the penetration of liquids into the spring chamber.

On the rake face the round bottom design (convex) has a hardness of 54 HRC.

The cylinders work single-acting, with spring return. The cylinders are available in both types, with convex piston end and also as piston end with inner thread, for mounting a thrust piece.



Recommendations for use:

To operate the threaded body cylinders we recommend standard hydraulic oils acc. to ISO-VG32 / DIN 51524

The cylinders are particularly suitable for assembly in series jigs or even for actuating lever mechanisms.

Furthermore, the cylinder can be mounted in a self built housing.

The Threaded body cylinders are not sustainable in the unpressurized state.

In order to guarantee a reliable seal, the surface information on the next page must be respected.

Technical Data

Type	CMC01			CMC03			CMC04				CMC06				CMC10				CMC20				CMC25			CMC40			CMC50											
Stroke (mm)	5	10	15	5	10	15	5	10	15	20	5	10	15	20	5	10	15	25	10	15	20	32	12	20	32	16	25	40	16	25	40									
Cylinder force (kN)	Pressure 35 bar	0.16			0.4			0.5				0.8				1.3				2.6				3.1			5.1			7.5										
	Pressure 70 bar	0.34			0.8			1.0				1.7				2.6				5.4				6.6			10.6			15.8										
	Pressure 250 bar	1.24			2.8			3.8				6.3				9.7				19.9				24.4			39.3			58.6										
	Pressure 350 bar	1.74			3.9			5.3				8.8				13.7				27.9				34.3			55.2			82.4										
Piston-diameter (mm)	8			12			14				18				22.4				32				35.5			45			55											
Oil volume (cm ³)	0.3	0.5	0.8	0.6	1.1	1.7	0.8	1.5	2.3	3.1	1.3	2.5	3.8	5.1	2.0	3.9	5.9	9.9	8.0	12.0	16.0	20.1	11.9	19.8	31.7	25.4	39.8	63.6	38.0	59.4	95.0									
Return spring force (N)	13~19			28~42			38~59				62~100				97~160				200~310				240~405			370~600			570~1010											
Weight (kg)	0.05	0.06	0.08	0.07	0.10	0.13	0.09	0.12	0.15	0.20	0.16	0.21	0.26	0.32	0.24	0.30	0.35	0.60	0.63	0.78	0.91	1.38	0.81	1.02	1.36	1.45	1.8	2.46	2.59	3.23	4.3									
Working pressure (bar)											10~350																				10~350									
Testing pressure (bar)											525																				525									
Working temperature (°C)											0~70																				0~70									

Order designations

Version with threaded rod end = Standard

Version with convex rod end = „R“

Example: **CMC06-5RV** = Type CMC; size 06; stroke = 5 mm; with convex rod end and FKM-seals

Sealing version „NBR“ = Standard

Sealing version „FKM“ = „V“

Standard version = no details

Contact

This offer is provided in cooperation with:

Pascal
GmbH

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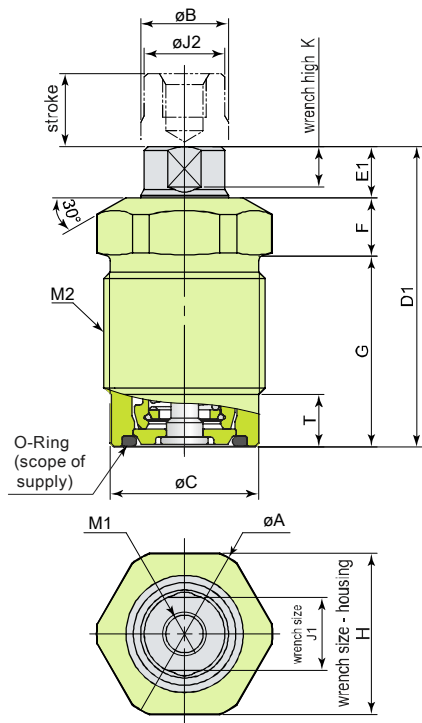
Special solutions on request!

Threaded Body Cylinders CMC

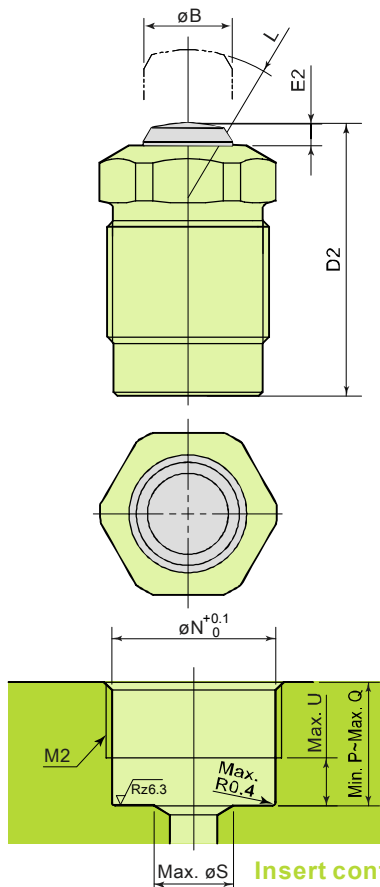
hydraulic, single acting, up to 350bar

Technical Details

Version with threaded end



Version with convex end



Insert contour

Type	CMC01			CMC03			CMC04				CMC06			
Stroke	5	10	15	5	10	15	5	10	15	20	5	10	15	20
A	15.5			24			26				33			
B	8			12			14				18			
C	14.3			20.3			23.3				28.3			
D1	31	41	50	31	41	51.5	36	47	58	68	40.5	51.5	62.5	72.5
D2	27	37	46	27	37	47.5	31	42	53	63	34	45	56	66
E1	5.5			7			8.5				10			
E2	1.5			3			3.5				3.5			
F	6			8			9				10.5			
G	19.5	29.5	38.5	16	26	36.5	18.5	29.5	40.5	50.5	20	31	42	52
H	14			22			24				30			
J1	7			10			12				14			
J2	7.5			11			13				17			
K	4.5			5.5			6.5				7.5			
L	16			20			25				32			
M1	M5×0.8 Tiefe 8			M6×1 Tiefe 6			M6×1 Tiefe 11				M8×1.25 Tiefe 13			
M2	M16×1.5			M22×1.5			M25×1.5				M30×1.5			
N	14.5			20.5			23.5				28.5			
P	12			13			14				15			
Q	19	29	38	15.5	25.5	36	18	29	40	50	19.5	30.5	41.5	51.5
S	5			8			10				14			
T	7			7			7				7			
U	6			6			6				6			
O-Ring	AS568-012(90)			AS568-015(90)			AS568-016(90)				AS568-019(90)			
Torque	10 N·m			30 N·m			40 N·m				60 N·m			

Continuation

Type	CMC10				CMC20				CMC25			CMC40			CMC60		
Stroke	5	10	15	25	10	15	20	32	12	20	32	16	25	40	16	25	40
A	40				50				55			66			80		
B	22.4				32				35.5			45			55		
C	34.3				46				52.6			62.6			77.6		
D1	44.5	54.5	66.5	87.5	67.5	80.5	92	118.5	67	81.5	104.5	79	94	122	89	107	138
D2	36.5	46.5	58.5	79.5	57	70	81.5	108	56	70.5	93.5	65	80	108	76	94	125
E1	12				16				17.5			21.5			20		
E2	4				5.5				6.5			7.5			7		
F	12.5				14				15			17			15		
G	20	30	42	63	37.5	50.5	62	88.5	34.5	49	72	40.5	55.5	83.5	54	72	101
H	36				46				50			60			75		
J1	19				27				30			36			41		
J2	21.4				30				32.5			43			52		
K	9.5				12.5				13.5			15.5			17		
L	40				50				60			70			80		
M1	M8×1.25 Tiefe 13				M12×1.75 Tiefe 18				M12×1.75 Tiefe 18			M16×2.0 Tiefe 18			M20×2.5 Tiefe 22		
M2	M36×1.5				M48×1.5				M55×2.0			M65×2.0			M80×2.0		
N	34.5				46.5				53			63			78		
P	17				20				24			27			29		
Q	19.5	29.5	41.5	62.5	37	50	61.5	88	33.5	48	71	40	55	83	53.5	71.5	100.5
S	19				26				34			44			56		
T	7				7				10			10			10		
U	6				6				9			9			9		
O-Ring	AS568-022(90)				AS568-126(90)				AS568-129(90)			AS568-135(90)			AS568-143(90)		
Torque	110 N·m				270 N·m				360 N·m			620 N·m			1.160 N·m		

Contact

This offer is provided in cooperation with:

Pascal
GmbH

iNOSOL GmbH
Frankfurter Str. 18
35315 Homberg/Ohm (Germany)

web: www.inosol.solutions
email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25

Fluid Connector 350 bar

Screw-in- and
insert- elements
Nominal diameter 3-8

Page 45-47



Fluid Connector 200 bar

Srew-in elements
Nominal diameter 6 + 10

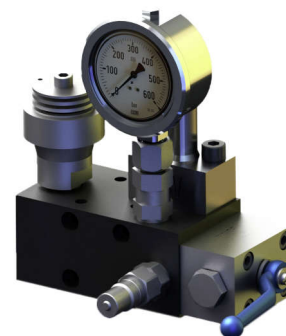
Page 48-49



Coupling unit SA

Manual coupling unit, 400 bar
Nominal diameter 5, single acting

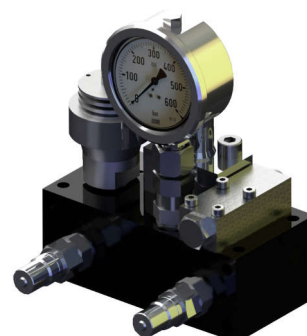
Page 50-51



Coupling unit DA

Manual coupling unit, 400 bar
Nomimal diameter 5, double acting

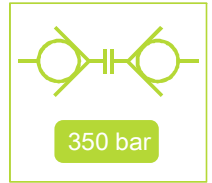
Page 52-53





Advantages:

- ✓ Very low leakage and air intake
- ✓ Suitable for fluids and gases
- ✓ Functional parts made of high density stainless steel
- ✓ Simple mounting (without special tools)
- ✓ Pressurized and depressurized connectable
- ✓ Mounting into individual contour
- ✓ Low pollution possibility



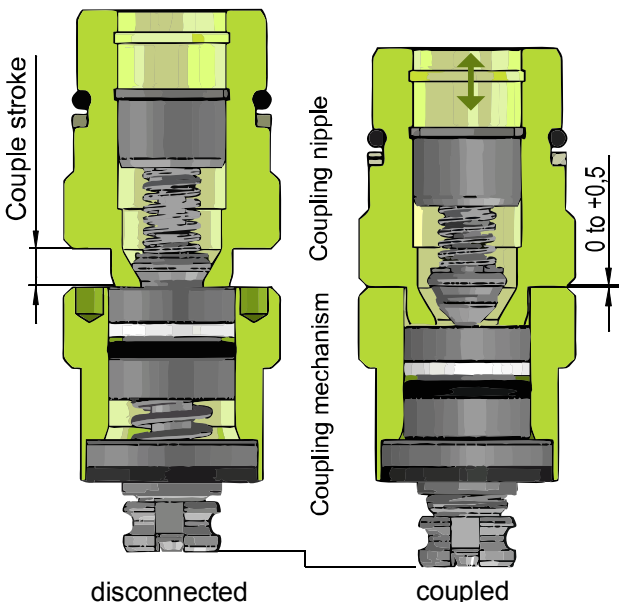
Recommendations for use:

The **insert elements** are particularly suitable for installation into **plates of multiple coupling systems**.
The **screw-in elements** can be **directly screwed into the fixture body**, for example of a tool change system.

The mechanism and the nipple must be coaxial and opposite to each other before the coupling process.
The inclusion bodies of both coupling elements must be guided approximately 2 mm before the contact of the flat face sealing, without passing the radial position tolerance.

When coupling nipple and coupling mechanism are locked and under pressure, there is a coupling force acting between them.
The coupling force must be absorbed by a form-locking or nonpositive design.
(see technical data - coupling force).

The coupling surfaces must be free of dirt before coupling.



Description:

These coupling elements are only for **mechanically connecting** and are used for the transfer of liquids and gases.

They have to be integrated directly into a countercontour.
Because of the use of an axial seal between coupling mechanism and coupling nipple, radial and axial positioning tolerances can be compensated in a limited scope.

The coupling elements are **depressurized and pressurized** connectable.

All system sealing surfaces are metal- and soft sealed. Because of that, and due to the use of new materials, there is no distinction between the type of coupling / application.

All mechanical parts are made of stainless steel (partly high density).
Regarding the sealing materials we dispensed consciously on FKM.
NBR seals have more media resistance and the system seals usually are not made from FKM, anyway.

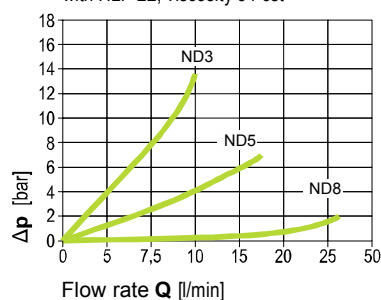
The coupling elements are **completely dis-assemblable**.
That's why all internal seals can be replaced when worn.

Technical data:

Nominal diameter:	[mm]	3	5	8
max. working pressure	[bar]	350	350	350
max. flow rate / min.	[l]	8	12	25
coupling stroke	[mm]	4,5	4,5	7,0
coupling force min. at 0 bar	[N]	94	98	98
axial coupling force under pressure per coupling point		F[N]=9,4xp[bar]	F[N]=15,4xp[bar]	F[N]=31,4xp[bar]
axial positioning tolerance	[mm]	+ 0,5	+ 0,5	+ 0,5
radial positioning tolerance	[mm]	± 0,1	± 0,25	± 0,3
permitted angle tolerance		± 1°	± 1°	± 1°

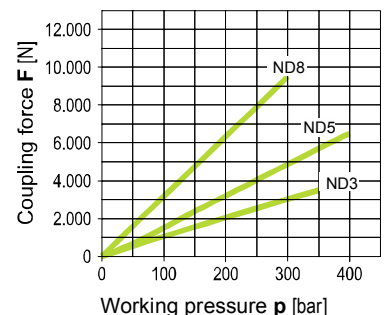
Flow resistance:

Δp characteristic with HLP 22, viscosity 34 cst



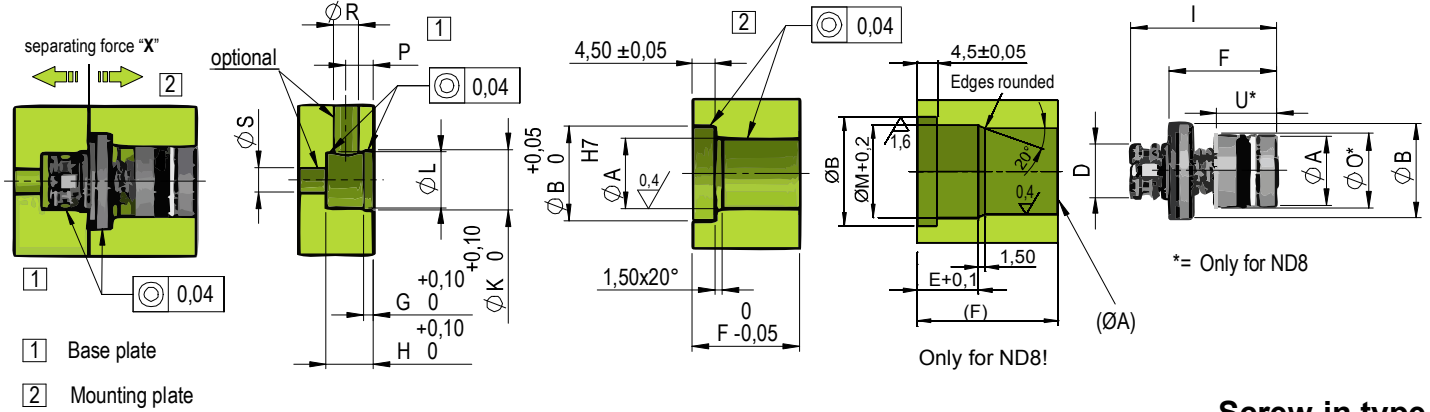
Coupling force:

Under pressure

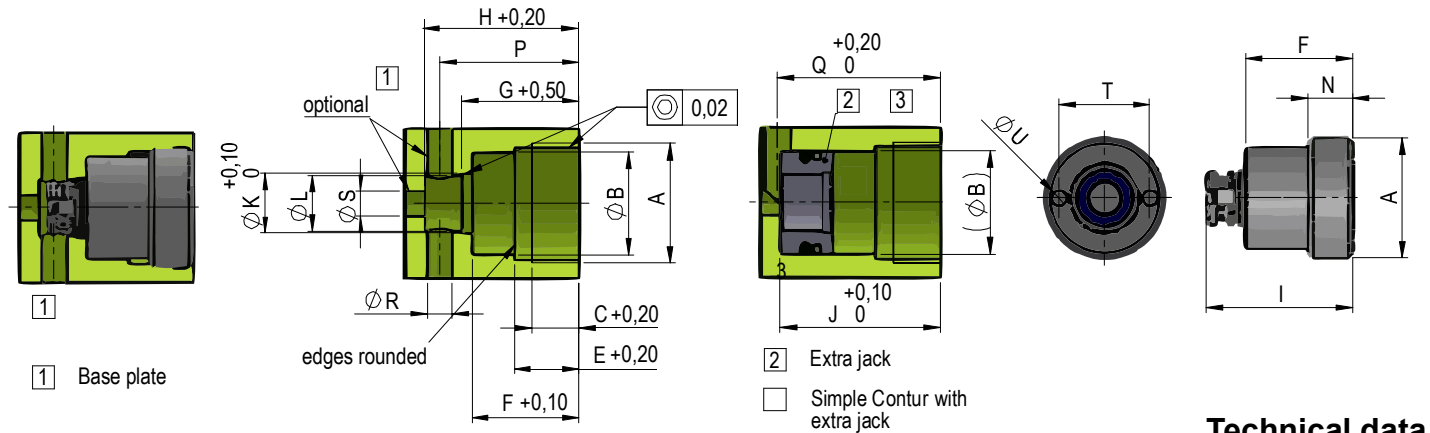


Coupling mechanics

Insert type



Screw-in type



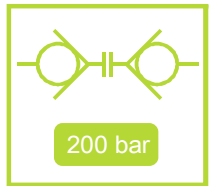
Technical data

Nominal Diameter	Type	Unit	3				5				8			
			Insert	Screw-In	Insert	Insert ***	Screw-In	Screw-In	Insert	Insert	Screw-In	Screw-In		
A	mm	10	M20x1,5	14	14	M24x1,5	M24x1,5	19	20	M36x1,5	M32x1,5			
B	mm	15	18 H7	19	19	22 H7	20,5 H7	24	24	30 +0,05	27 H7			
C	mm	-	9,5	-	-	10 **	9,5	-	-	13 **	13 +1			
D	mm	10,8	-	10,8	10,8	-	-	18	18	-	-			
E	mm	-	13	-	-	10 **	13	14	13,5	13 **	16			
F	mm	21,5	21,5	21,5	21,5	21,5	21,5	31	31	31	31			
G	mm	2 *	23,5 *	2 *	2 *	23,5 *	23,5 *	-	-	-	-			
H	mm	9,5	31	9,5	9,5	9,5	31	15,5	15,5	46,5	46,5			
I	mm	29,2	29,2	29,2	29,2	29,2	29,2	44	44	44	44			
J	mm	-	32	-	-	32	32	-	-	49	49			
K	mm	12 *	12 *	12 *	12 *	12 *	12 *	-	-	-	-			
L	mm	11,2	11,2	11,2	11,2	11,2	11,2	18	18	18	18 H7			
M	mm	-	-	-	-	-	-	21,6	20,5	-	-			
N	mm	-	8,5	-	-	9	8,5	-	-	12	12			
O	mm	-	-	-	-	-	-	20,2	20,2	-	-			
P	mm	6,5	28	6,5	6,5	28	28	7,5	9	40	38,5			
Q	mm	-	31,8	-	-	-	31,8	-	-	-	48,8			
R	mm	5	5	5	5	5	5	8	12	8	8			
S	mm	7	6	7	7	7	7	10	10	10	10			
T	mm	-	15	-	-	18,5	18,25	-	-	28	25			
U	mm	-	3	-	-	2,6	3	18,5	-	4x Ø4,5	4,1			
X	N	17,7 x p (bar)	-	26,4 x p (bar)	26,4 x p (bar)	-	-	45,2 x p (bar)	45,2 x p (bar)	-	-			
Torque	Nm	-	18	-	-	20	20	-	-	32	32			
Part Number		ICME03-001	ICME03-002	ICME05-001	ICME05-004	ICME05-005	ICME05-002	ICME08-001	ICME08-004	ICME08-002	ICME08-002			
Extra Jack			ICME03-010				ICME05-010	-	-	-	ICME08-010			
Mounting Tool			ITC03-002			ITC05-002	ITC05-002			ITC08-003	ITC08-002			

* = Not necessary (only because of compatibility)

** = With Thread undercut

*** = to act with competitors-nipple



Advantages:

- ✓ Very low leakage and air intake
- ✓ 85% rough vacuum endurance
- ✓ Pressurized and depressurized connectable
- ✓ Suitable for fluids and gases
- ✓ Mounting into individual contour
- ✓ Low pollution possibility
- ✓ Mounting compatible to nominal diameter 3 and 8
- ✓ Stainless steel parts

Description

Technical Data:

Nominal Diameter [ND]:	6	10
max. working pressure [bar]	200	200
max. flow rate oil hydraulics [l/min]	15	35
max. flow rate air/vacuum [l/min]	800	1800
max. flow rate water [l/min]	18	52
Coupling stroke [mm]	4,5	7
Coupling force min. at 0 bar [N]	70	92
Axial positioning tolerance	+ 0,3	+ 0,3
Radial positioning tolerance	± 0,2	± 0,3
Permitted angle tolerance [mm]	± 0,6°	± 0,6°
Coupling force under pressure* [mm]	F[N]=16 x p[bar]	F[N]=38 x p[bar]

*= see following page as well.

Explanation:

These coupling elements are only for and are used mechanically connecting for the transfer of liquids and gases.

The elements have to be integrated directly into a counter contour. Because of the use of an axial seal between coupling mechanism and coupling nipple, radial and axial positioning tolerances can be compensated in a limited scope.

All mechanical parts are made of stainless steel (partly high density). The coupling elements are **pressurized and depressurized** connectable.

The screw-in elements are mounting compatible to standard elements with **nominal diameter 3 and 8**.

Recommendations for use:

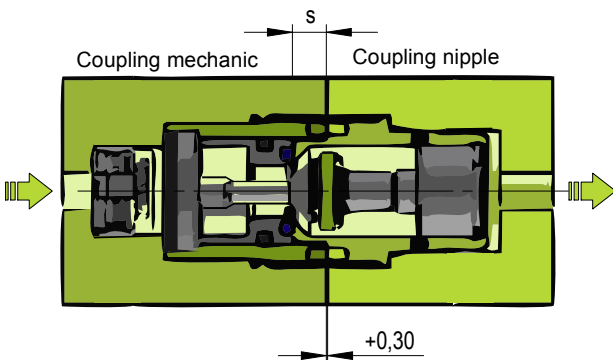
The mechanism and the nipple must be coaxial and opposite to each other before the coupling process.

The inclusion bodies of both coupling elements must be guided approximately 2 mm before the contact of the flat face sealing, without passing the radial position tolerance.

When coupling nipple and coupling mechanism are locked and under pressure, there's a coupling force acting between them.

The coupling force must be absorbed by a form-locking or nonpositive design. (see technical data -. coupling force).

The connecting- surfaces must be free of dirt before connecting.



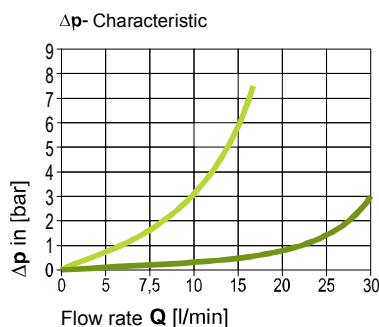
Parameters

The pressure losses are depending on temperature and used medium. The graph is based on following values:

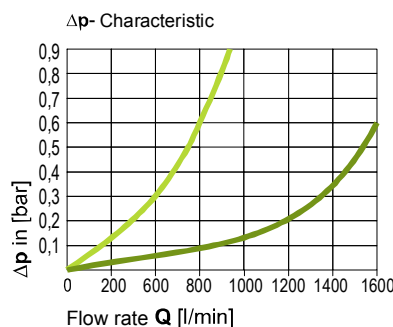
Hydraulic oil: 200 bar
Air: 6 bar
Water: 35 bar

— ND 6
— ND 10

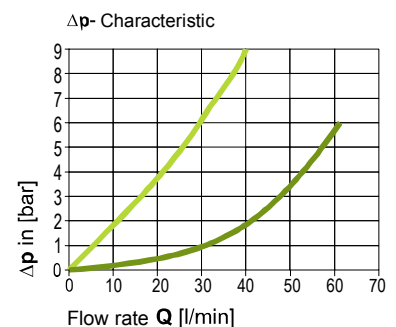
Pressure drop - hydraulic oil



Pressure drop - air

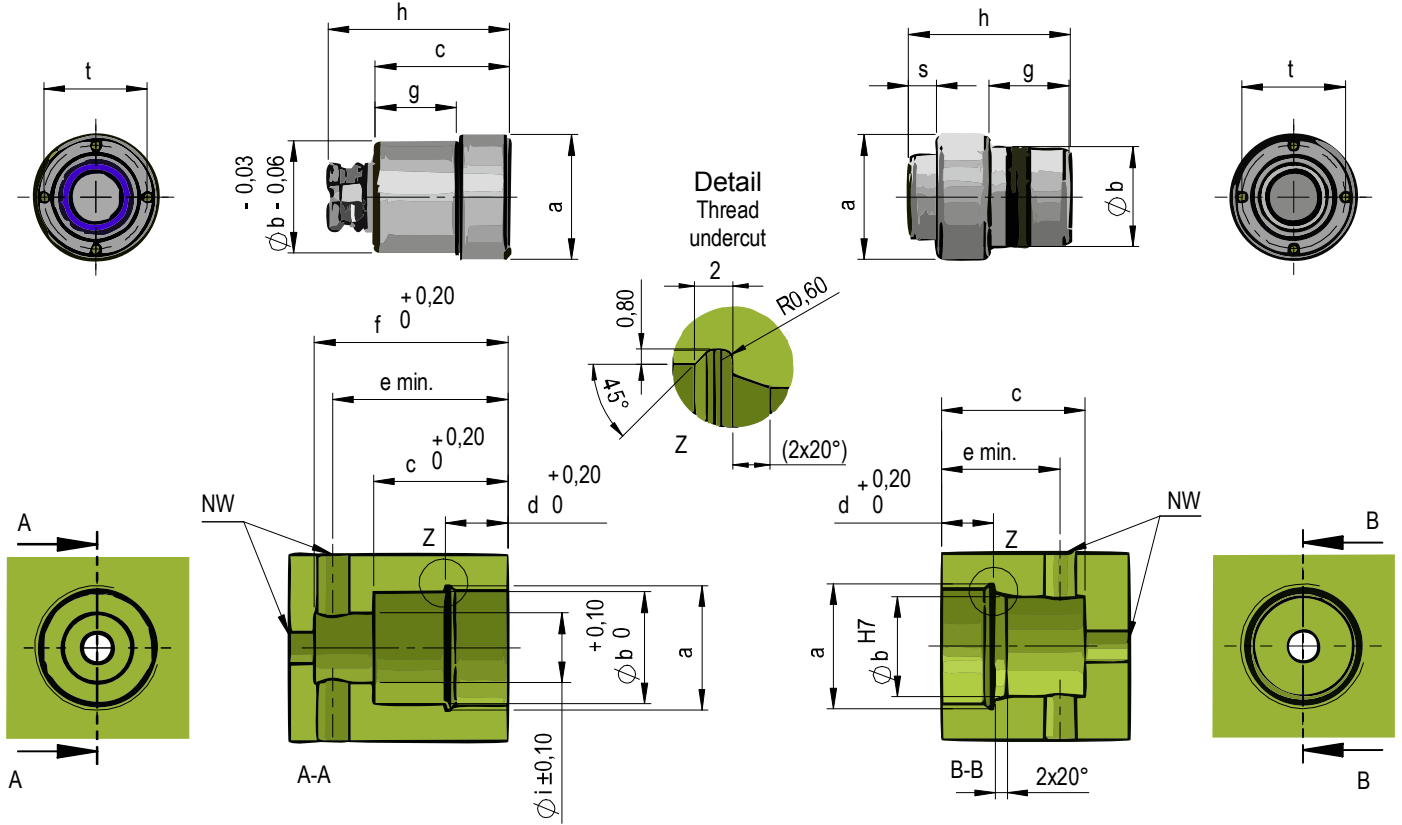


Pressure drop - water



Coupling mechanics

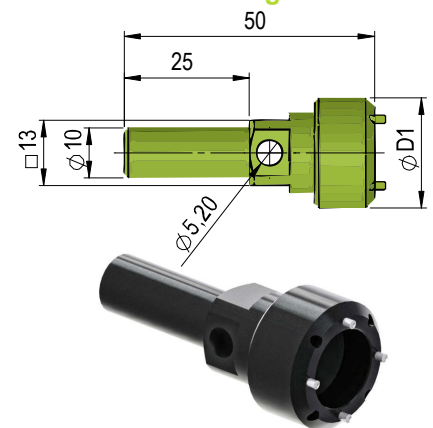
Coupling nipples



Details

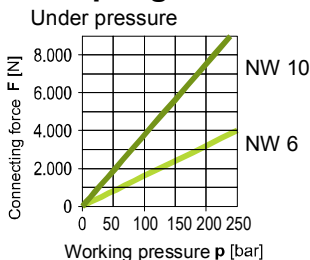
Nominal diameter		6		10	
Model	Unit	Mechanic	Nipple	Mechanic	Nipple
a	mm	M20x1,5	M20x1,5	M36x1,5	M30x1,5
b	mm	18	16	30	25
c	mm	21,5	23	31	26
d	mm	10	8,5	13	8,5
e	mm	28	19	40	22,5
f	mm	31	-	46,5	-
g	mm	13	13	19,5	14
h	mm	29,2	25,9	44	30
i	mm	11,2	-	18	-
s	mm	-	4,5	-	7,5
t	mm	16,6	16,6	25,4	25,4
D1	mm	22	22	30	30
Torque	Nm	14	14	20	20
Part number		ICME06-003	ICNI06-003	ICME10-003	ICNI10-003
Mounting tool		ITC06-002	ITC06-002	ITC10-002	ITC10-002

Mounting tool



Additional Information

Coupling force



Compatibility:

With regard to the mounting contour, the inosol elements are interchangeable with some competitive products, but our elements offer a much larger free cross-section (nominal width).

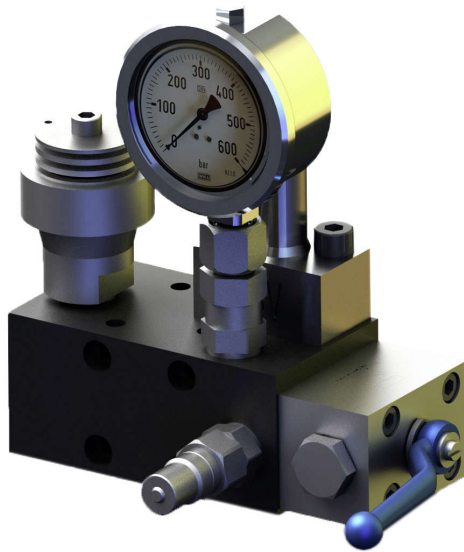
Multi Coupling Systems:

Since multi coupling systems always manufactured according to individual customer specifications, there is no separate data sheet available. We will gladly make an offer according to your specific requirements.

Contact

iNOSOL GmbH
Frankfurter Str. 18
35315 Homberg/Ohm (Germany)

web: www.inosol.solutions
email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25



Advantages:

- ✓ Integrated safety elements
- ✓ Manifold mounting
- ✓ O-Ring and thread connection
- ✓ Disconnection while keeping the system pressure
- ✓ Easy coupling



Function

Recommendations for use:

The coupling unit is equipped with various connectivity options. It can be attached via O-ring connector on the bottom or at the back with G1 / 4 or O-ring. All sealing and closure elements are included.

As pressure medium we recommend hydraulic oil acc. DIN 51524 (HL, HLP).

Workflow for tensioning of a device:

- Coupling-manually
- Opening of the ball valve
- Pressure generation until all clamping elements are excited and the required system pressure is reached.
- Closure of the ball valve
- Stop pressurizing
- Uncouple manually
- Releasing device for processing

If the ball valve is opened while pressurizing in uncoupled state, nothing happens, but then the pressure has to be broken down between the ball valve and quick coupling before the next coupling. This is done by loosening the quick coupling.

Description:

The coupling unit is used when the fixture is manually separated from the pressure generator, for example in flexible manufacturing systems or by using only one pressure generator for a plurality of clamping devices.

This unit has to be operated exclusively single-acting.

The necessary security elements are already built in. This means: You must not provide accumulators, safety valves, pressure gauges coupling elements or more in your fixtures.

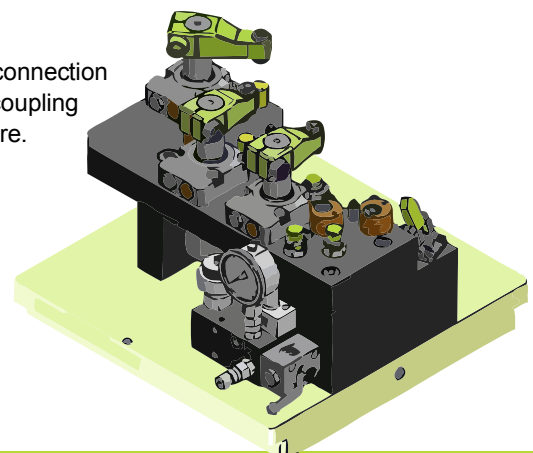
Technical Data	Unit	Value
Nominal Diameter	mm	5
Pretension of accumulator	bar	100
Pressure area	bar	100-400
Safety valve setting	bar	425
Coupling connection	Ermeto	G1/4
Weight	kg	3,8
Buffer oil volume	ccm	9,75
Max. working temperature	°C	80
Part number		IMCU-001

Contact

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Frankfurter Str. 18
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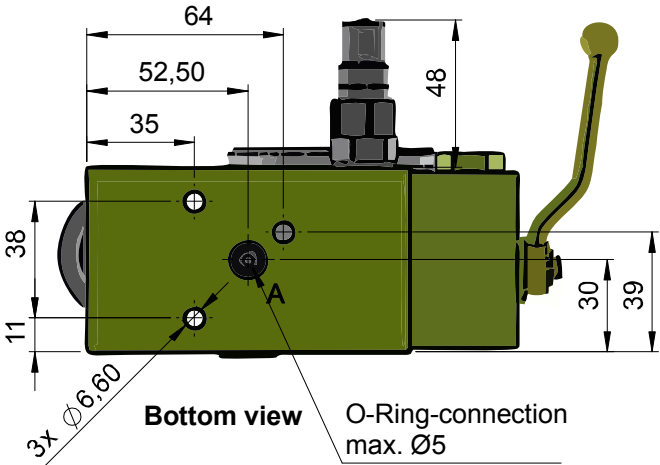
web: www.inosol.solutions
email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25

Example for connection of a manual coupling unit on a fixture.



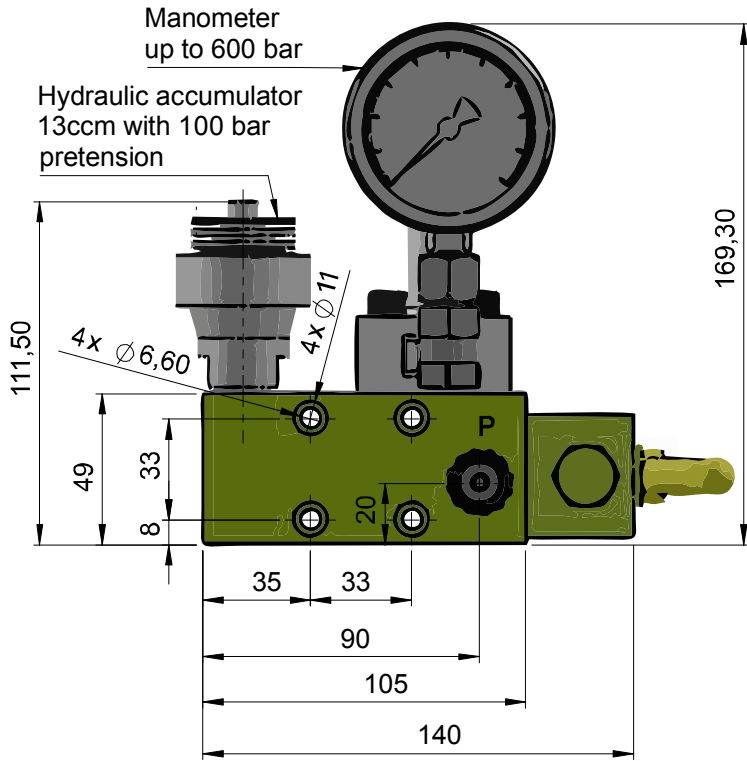
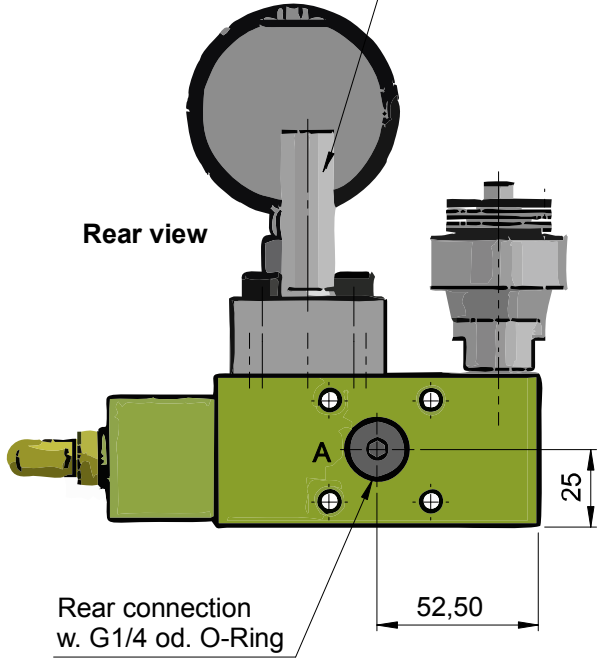
Manual Coupling Unit

Single acting, max. 400 bar working pressure

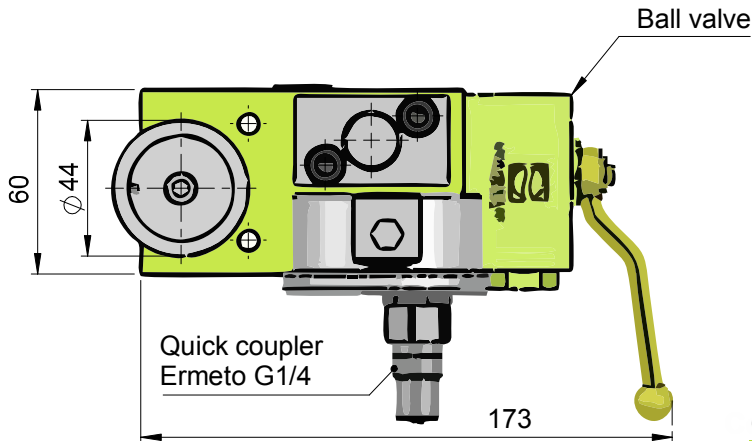


Pressure relief valve as safety device

Rear view



Ball valve

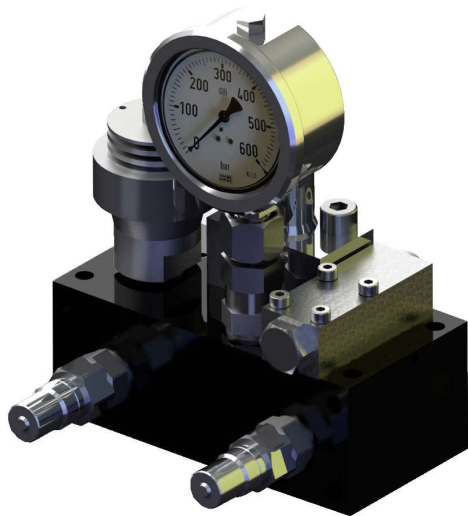


Special solutions on request!

Contact

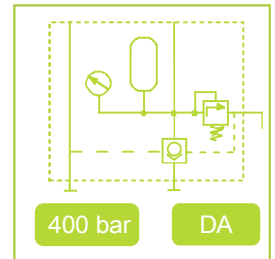
iNOSOL GmbH
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➔ Advantages:

- ✓ Integrated safety elements
- ✓ Manifold mounting
- ✓ O-Ring and thread connection
- ✓ Disconnection while keeping the system pressure
- ✓ Easy coupling



Function

Recommendations for use:

The coupling unit is equipped with various connectivity options. It can be attached via O-ring connector on the bottom or at the back with G1 / 4 or O-ring. All sealing and closure elements are included.

As pressure medium we recommend hydraulic oil acc. DIN 51524 (HL, HLP).

Workflow for tensioning of a device:

- Coupling-manually at port „A+B“
- Pressure generation at „A“ until all clamping elements are excited and the required system pressure is reached.
- Stop pressurizing
- Uncouple manually

Unclamping

- Coupling-manually at port „A+B“
- Pressure generation at „B“ until all clamping elements are retracted.
- With pressurizing at „B“ the double check valve is released and the reflow in „A“-port is effected.
- Stop pressurizing.

Description:

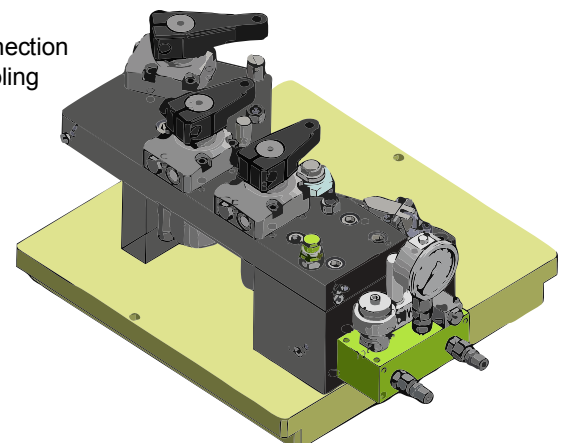
The coupling unit is used when the fixture is manually separated from the pressure generator, for example in flexible manufacturing systems or by using only one pressure generator for a plurality of clamping devices.

This unit has to be operated exclusively double-acting.

The necessary security elements are already built in. This means: You must not provide accumulators, safety valves, pressure gauges coupling elements or more in your fixtures.

Technical Data	Unit	Value
Nominal Diameter	mm	5
Pretension of accumulator	bar	100
Pressure area	bar	100-400
Safety valve setting	bar	425
Coupling connection	Ermeto	G1/4
Weight	kg	3,8
Buffer oil volume	ccm	9,75
Max. working temperature	°C	80
Part number		IMCU-002

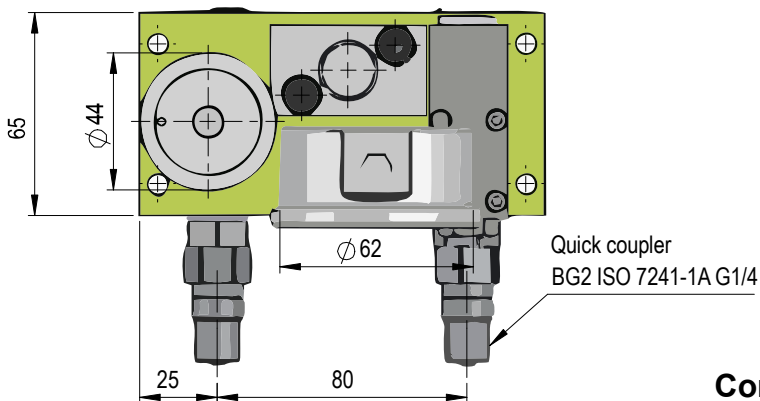
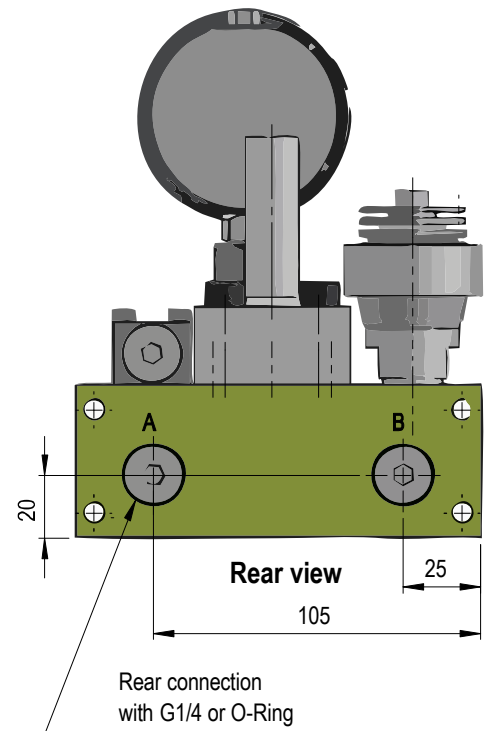
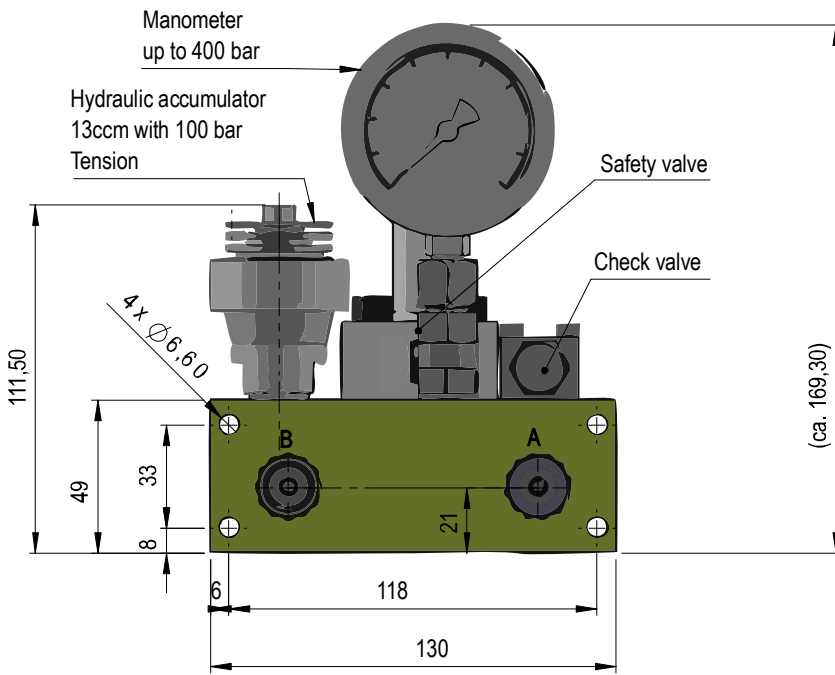
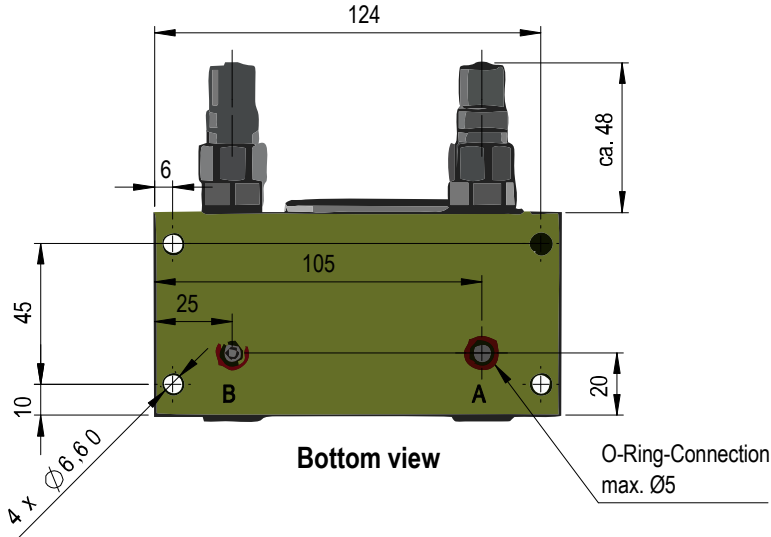
Example for connection of a manual coupling unit on a fixture.



Contact

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Threaded Valves 400 bar

Throttle check-, sequence-,
pressure differential valves

Page 55-56



Insert valves 300 bar

Insert valves
Nominal diameter 2

Page 57



Vent Screw

With hose nozzle
or internal venting screw

Page 58



Sequence Valve as timer

Time- dependent sequence valve, 250 bar
Nominal diameter 5

Page 59

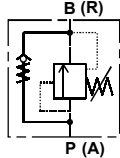
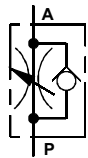
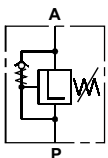




Sequence valve

Throttle check valve

Pressure differential valve



Advantages:

- ✓ Compact design
- ✓ Simple mounting hole
- ✓ Valve combinations possible
- ✓ Unified insert contour
- ✓ Operation with one line possible
- ✓ Working pressure up to 400 bar
- ✓ Different settings
- ✓ All valves with integrated non-return valve

pressure media:

Hydraulic oil according DIN 51524 TL.1 to 3; ISO VG 10 to 68 acc. DIN 51519

Example

When pressure is applied from the hydraulic unit, cylinders **1+2** are moving out. Cylinder **2** moves out with a throttled speed, to compensate any volume differences.

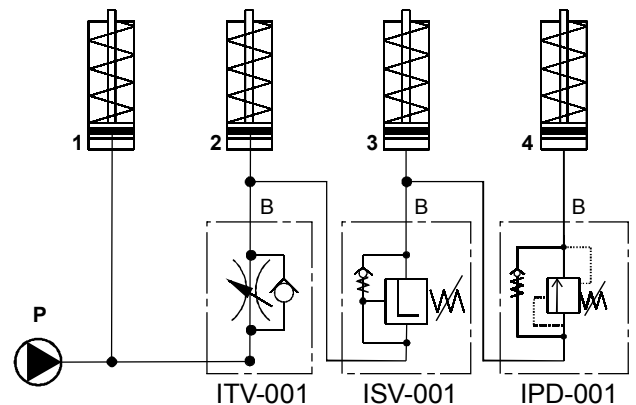
If the cylinders **1+2** reach their end position, the pressure in the main line **A (P)** is increasing.

If the pressure exceeds the set value of the sequence valve, cylinders **3+4** are coming out.

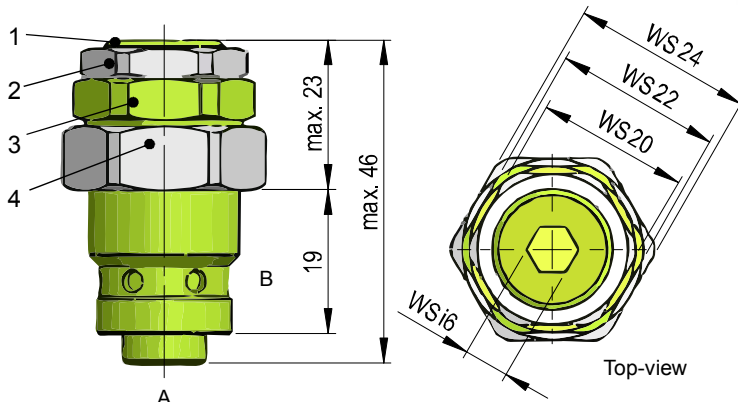
To cylinder **4** the inlet pressure minus the setted pressure difference is transmitted via the differential pressure valve.

Cylinder **4** generates less force because of the pressure difference.

If the pressure on the inlet side **A (P)** drops down, the check-valves allow free flow from **B (R)** to **A (P)** and the cylinders **1 to 4** return to their normal position.

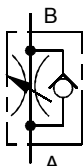


Throttle check valve



Part number: **ITV-001**

- 1 = adjustment
- 2 = locknut
- 3 = valve body
- 4 = sealing nut



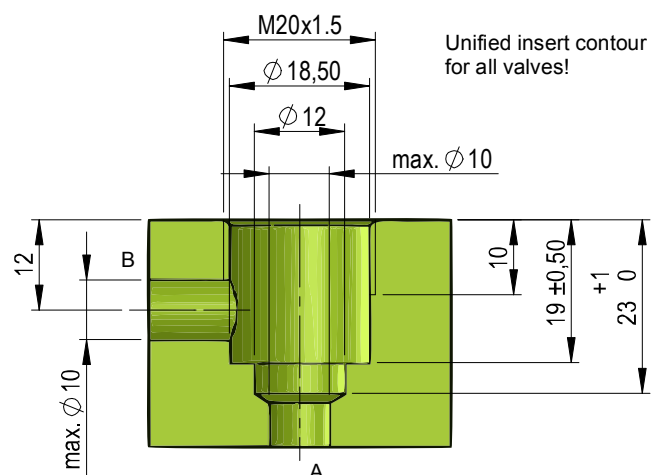
function:

Throttle check valves reduce the flow from **A** to **B**. The volume flow from **B** to **A** remains unchanged.

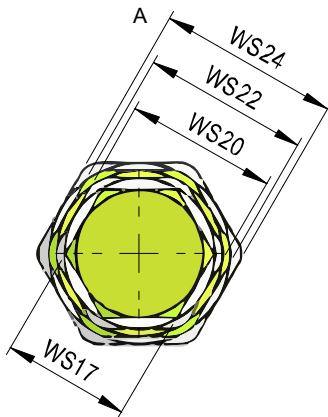
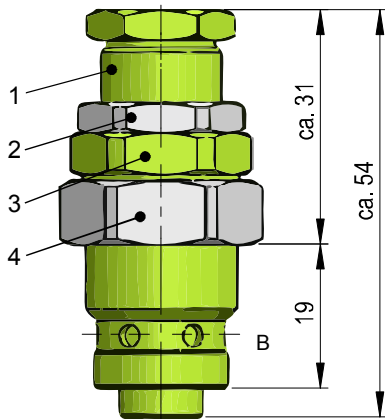
Note:

This valve is only available in this version.

Insert-contour



Sequence valve with integrated check valve



Sequence valve Partnumber	Setting range (bar)	Pressure change per rotation Δp (bar)	Weight (g)	Thread
ISV-001	0-80	10	90	M20x1,5
ISV-002	0-160	16	95	M20x1,5
ISV-003	0-300	36	100	M20x1,5
ISV-004	0-400	46	105	M20x1,5

Function:

Sequence valve with integrated check valve as directly operated poppet valve to 400 bar.

After reaching and exceeding the setted pressure value at the inlet side A (P), the sequence valve switches to full pressure on the load line B (R) (leak-free). If the pressure on the inlet side A (P) drops down under the pressure of the load line B (R), the integrated non-return valve allows a free flow of B (R) to A (P).

The sequence valve may be used as a **pressure relief valve**.

If the pressure in hydraulic systems is reaching the setted pressure value on the inlet side A (P), the valve opens for the return flow line B (R) until the pressure in the hydraulic system drops below to the set pressure value.

Note:

Inlet and outlet pressure are always identical in the sequence valves.

As a result, this type of valve is ideal for use in sequential circuits.

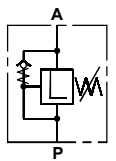
Row combinations of sequence valves are possible.

1 = adjustment

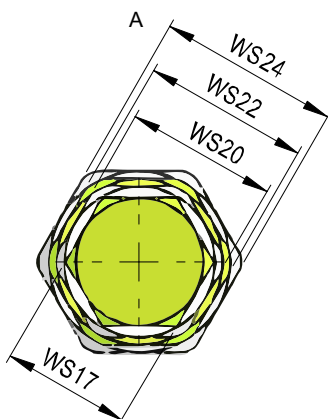
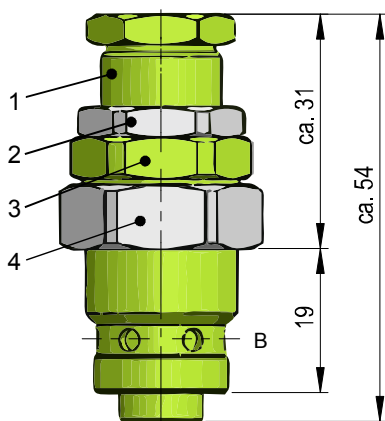
2 = locknut

3 = valve body

4 = sealing nut



Pressure differential valve with integrated check valve



Pressure differential valve Part number	Setting range (bar)	Weight (g)	Thread
IPD-001	0-80	90	M20x1,5
IPD-002	0-160	94	M20x1,5
IPD-003	0-300	98	M20x1,5

Function:

Differential valve with integrated check valve as directly operated poppet valve to 400 bar.

After reaching and exceeding the setted pressure value difference at the inlet side A (P) and the load line B (R), the pressure difference valve connects to the load line B (R). When the pressure in the load line plus the setted pressure difference the total pressure at the inlet side, the flow is blocked again. There is a constant pressure difference (gap) between the inlet side A (P) and the load line B (R) generated.

If the pressure on the inlet side A (P) drops under the pressure of the load line B (R), enables the integrated check valve the free flow of B (R) to A (P).

Note:

Differential pressure valves belong to the group of flow control valves.

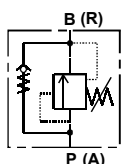
In order to avoid flow and pressure peaks, it is recommended to operate these valves in conjunction with a throttle valve.

1 = adjustment

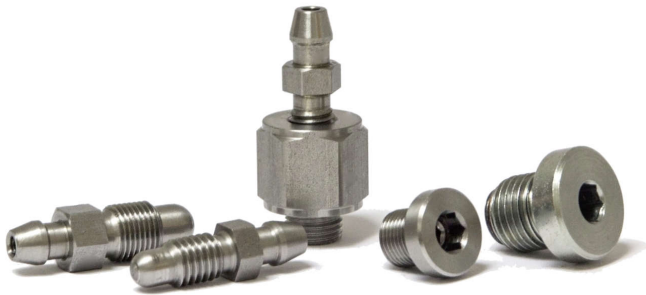
2 = locknut

3 = valve body

4 = sealing nut



Special solutions on request!



Advantages:

- ✓ Suitable for high pressure
- ✓ No lock nut is required
- ✓ Suitable for high temperatures
- ✓ Working pressure up to 400 bar
- ✓ Applicable for different media



Details

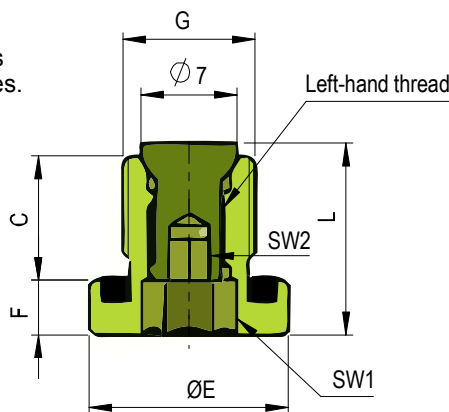
Principle 1:

Due to the simple design, the vent plugs are very insensitive to external influences.

For venting only one Allen key WS3 is required.

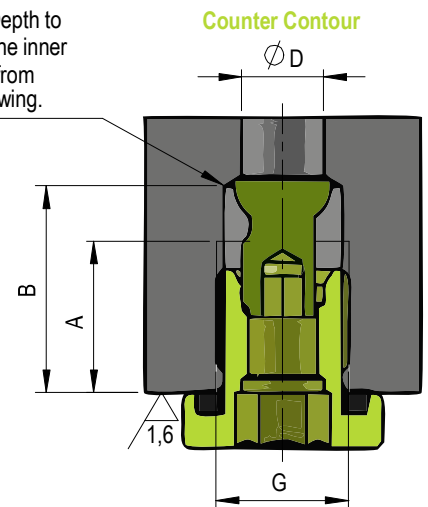
The inner vent screw is to open in counterclockwise sense. Because of that, there is no risk of loosening of the outer screw while closing.

It is sufficient to open the inner screw only a half turn for venting.



Turn the inner screw to the left for venting!

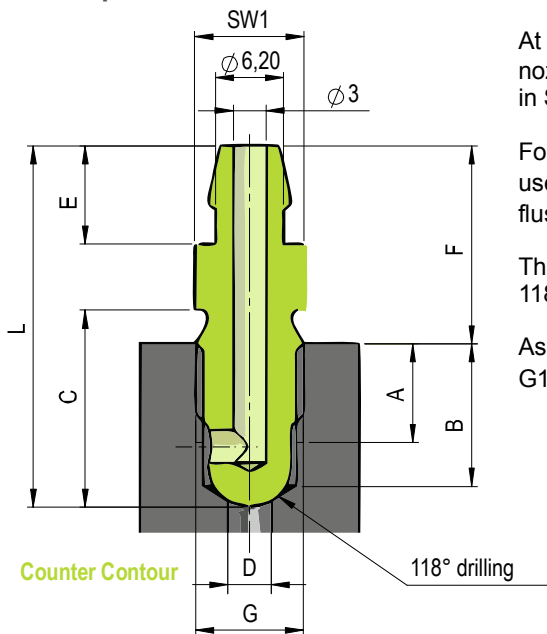
Max. Depth to avoid the inner screw from unscrewing.



Counter Contour

Part-no.	Principle	G	L	A	B	C	D	E	F	SW1	SW2
IVS-001	2	M8	31,5	8,00	10,5-13,5	ca. 17,5	2-3,5	9,5	ca. 18	9	
IVS-002	1	1/4	19,5	13,00	14-17	12	1-6	20	5	6	3
IVS-006	2	1/8	33	9,00	11,5-13,5	ca. 18	3,5-6,5	9,5	ca. 17,5	10	
ISV-007	1	1/8	14	11,00	12-15	9	1-6	14,5	4	6	3

Principle 2



Principle 2:

At the end of the screw there is a hose nozzle integrated to connect a PVC-Tube in Size 8.

For venting an open-end wrench can be used. The hose nozzle can be used to flush the piping system.

The screw is designed to seal against a 118° drilling.

As standard we offer screws with M8 and G1/8 thread. Other sizes on request.

Notes:

All indications relate exclusively to the use of iron and steel materials. The components are only to be used in accordance to their intended use.

The recommended tightening torques for other counter materials can be requested from us.

General Data:

Max. Working pressure: 400 bar

Max. Temperature: 150°C

Material: Stainl. Steel

Sealing material: Viton

Contact

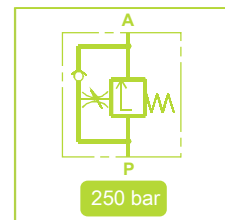
iNOSOL GmbH
Frankfurter Str. 18
35315 Homberg/Ohm (Germany)

web: www.inosol.solutions
email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25



Advantages:

- ✓ Absorption of pressure peaks
- ✓ Delay time adjustable
- ✓ Large adjustment range
- ✓ Pressure-independent switching sequences possible
- ✓ Only one adjustment screw
- ✓ Valve combinations possible



Details

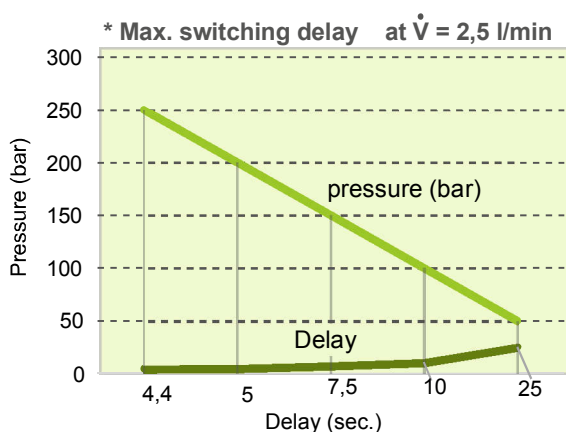
Recommendations for use:

The **sequence valve with relay switching sequence** is used in clamping devices, in which a **pressure-independent switching sequence** is to be achieved within a circuit.

A plurality of valves can be connected in parallel or in series.

We recommend as a pressure medium hydraulic oils according to DIN 51524 (HL).

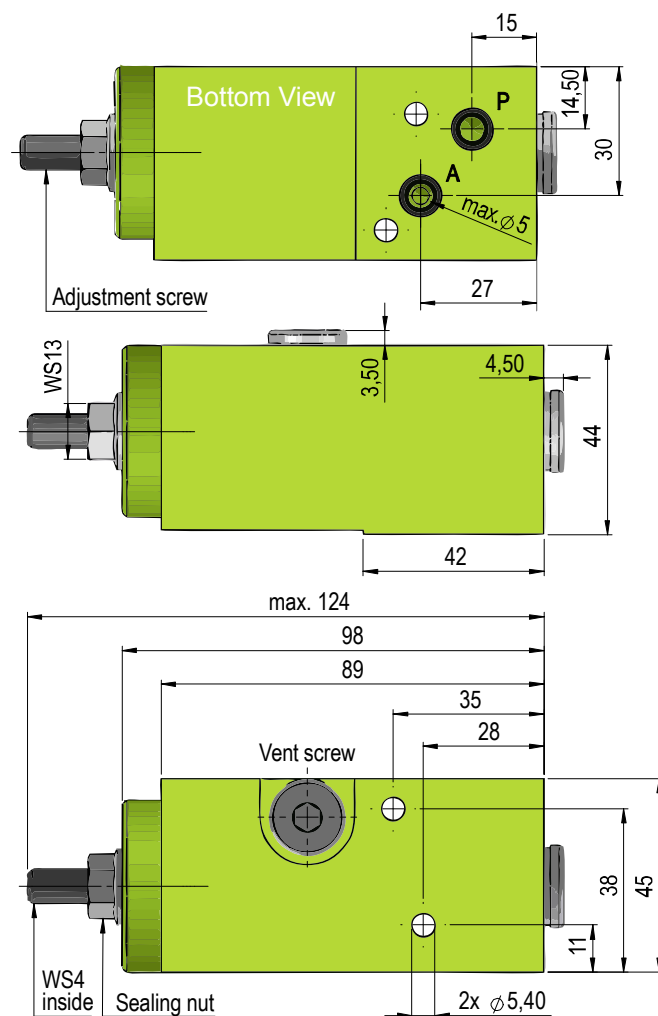
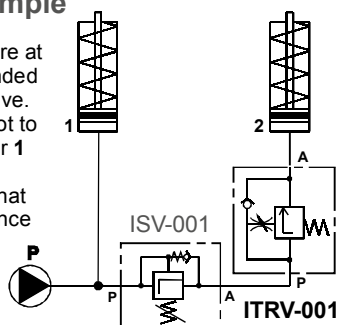
Technical Data	Unit	Value
Max. volume flow	l/min	8
Adjustment area for relay	s	4-25 *
Min. Working pressure	bar	40
Max. working pressure	bar	250
Weight	kg	1,3
Max. working temperature	°C	80
Part number		ITRV-001



Circuit diagram example

To avoid a drop of the pressure at the cylinder 1, it is recommended to skip ahead a sequence valve. At the sequence valve the "not to undercut" pressure of cylinder 1 has to be adjusted.

As a general rule to note is, that this **timer** is not a real sequence valve.



Function:

The hydraulic oil at the valve is supplied in the base at the port **P** via a throttle screw to a differential piston. At the same time, the hydraulic pressure in an integrated **non-return valve** is on, which cuts off the flow to the port **A**.

Depending on the position of the **adjustment screw**, the differential piston moves forward in a certain time and the check valve opens. Because of that, the flow from port **P** is released to port **A** and provides subsequent Hydraulic components with pressure oil.

When the hydraulic pressure is removed, the spring moves the differential piston into the initial position. The hydraulic oil flows through a check valve - inside of the throttle screw - to port **P**.



Description:

The outer parts are made of a **high strength aluminum** with a hard anodized surface.

Each segment of the **stator** serves one core of the medium and it is **adjustable** in its position in **60° increments**. The threaded connection size is G1/4" on media side.

Later on the rotary joints are still individually **extendable** or **reduceable**. Furthermore, single elements can be exchanged.

The inner rotary piston (rotor) is made of **hardened stainless steel**.

Frontally the **rotor** can be connected with the media by **manifold mounting** (O-ring/flange or with the integrated G1/4" threads). Similarly, the connection can be sideways by G1/4".

Furthermore, from above the rotor is to connect with 6x M10 screws or with M8 DIN912 screws from below with the counter part. All components are highly accurate and pinned.

The rotary joints are suitable for many established media.

For example, these include hydraulic oil, compressed air, cooling lubricant, coolant, vacuum (conditional) and various others.

The maximum temperature range is -10 to + 80 ° C.

Because of the above-mentioned materials, the rotary joints have a low weight and the stator connections are in 60° steps freely adjustable.

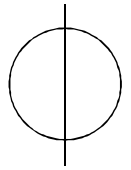
Unused ports of the rotor are protected with plastic screws.



Each segment/line is 6x60° adjustable

Advantages:

- ✓ Modular extendable
- ✓ Light weight
- ✓ Cost-efficient
- ✓ Position of the housing connections adjustable
- ✓ Multifarious connection possibilities
- ✓ Suitable for different media and gases
- ✓ With additional slide bearings



Recommendations for use:

Rotary joints are used wherever a liquid or gaseous medium must be transferred from a stationary to a rotating machine part. For example, in machine tools, rotary tables, excavators, cranes.

The rotary joints may fasten at the 4 threads M8x12 for torque support, only to avoid twisting. They don't have to be tensed up.

Means: There doesn't have to be a side load.

Fast oscillating movements (direction changes <2 sec.) reduce the service life by approximately 30%.

It is important to ensure sufficient media flow to prevent overheating of the rotating union (> 80 ° C).

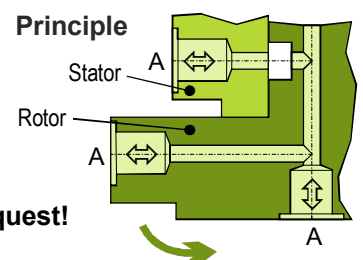
While leading different or several media through the rotary joint, a leakage line is recommended for safety reasons. This can be realized by two additional segments.

Depending on assignment, number of connections and media used, the generated torque and especially the starting torque can vary strongly.

To determine the required driving torque, the values for the calculation can be found on the following page.

To ensure a safe operation, the main use should be specified in the order.

Therefore the data such as pressure, speed, medium and operating temperature are important, to do the potential necessary adjustments for each specific application.



Special solutions on request!

Contact

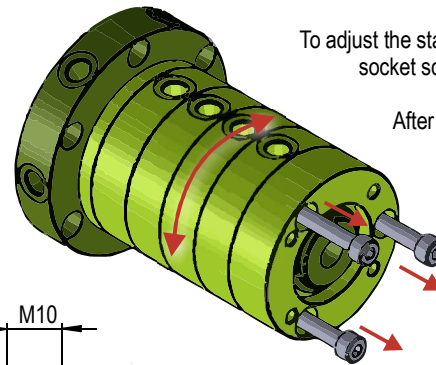
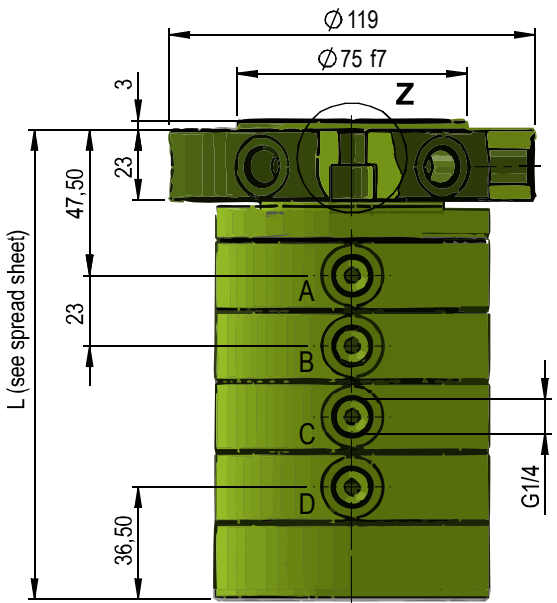
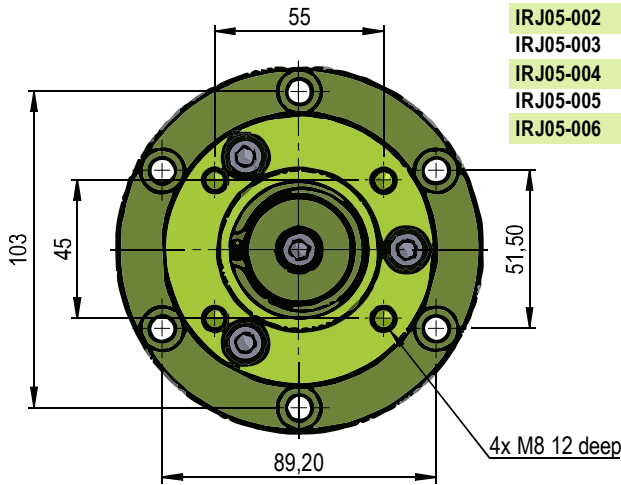
iNOSOL GmbH
Frankfurter Str. 18
35315 Homberg/Ohm (Germany)

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email: info@inosol.solutions
tel.: (+49) 6633 / 368 95 25

up to 250 bar, nominal diameter 5, 1-6 ports

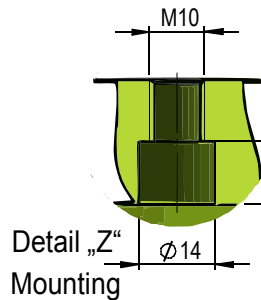
Part number	# Channels	Dim. "L"	Weight (kg)	Used Channels	Leakage rate max.
IRJ05-001	1	84	2,31	A	10 ccm/100h
IRJ05-002	2	107	2,76	A, B	20 ccm/100h
IRJ05-003	3	130	3,21	A, B, C	30 ccm/100h
IRJ05-004	4	153	3,66	A, B, C, D	40 ccm/100h
IRJ05-005	5	176	4,11	A, B, C, D, E	50 ccm/100h
IRJ05-006	6	199	4,56	A, B, C, D, E, F	60 ccm/100h

Leakage rate for HLP22 at 300 bar

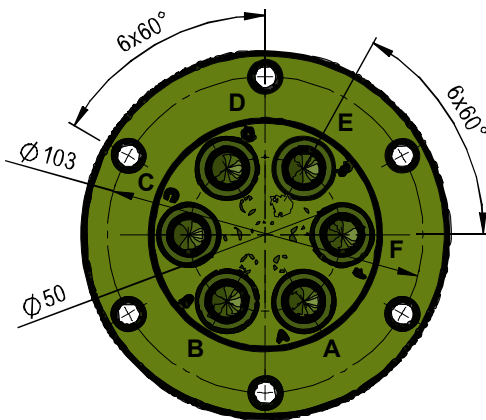
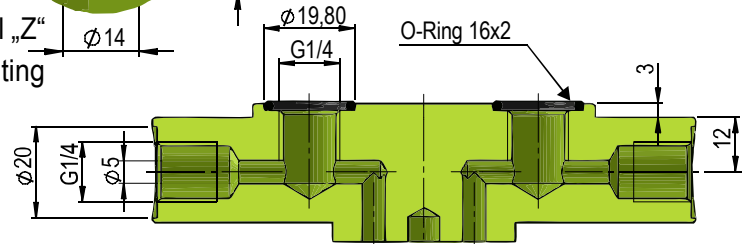


To adjust the stator segments, the 3 hexagon socket screws on the outer circle must be removed. After the adjustment, they must be tightened again with a torque of 40 Nm. The segments can be set up in 60° increments.

The same workflow applies to the extension or reduction of the rotary joint. Then the modified length of the screws must be observed.

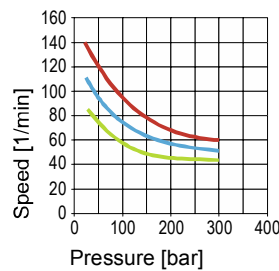


Alternate connecting possibilities

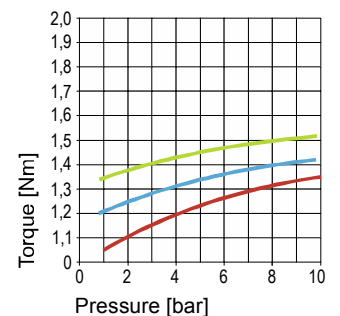
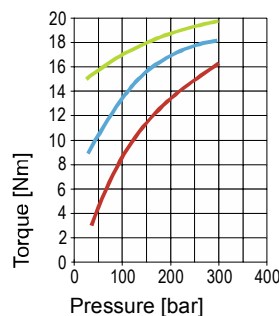
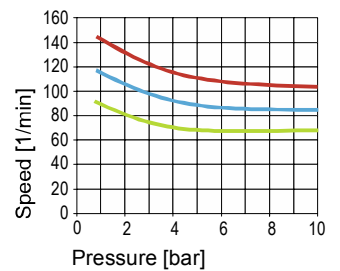


The front connection of the ports can be optionally done by G1/4" or manifold mounting (O-ring/flange; see detail). The rotor can also be fixed with M8 or M10 screws (See detail Z).

Maximum starting-torque and rotation speed for hydraulic oil HLP22



Maximum starting-torque and rotation speed for unooled Air



— 2 Lines — 4 Lines — 6 Lines

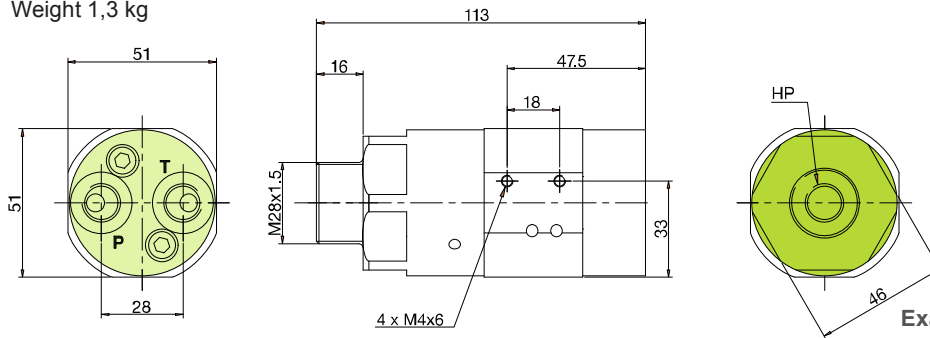
The intermediate values for 1, 3 and 5 lines need to be interpolated. These values are given only as a guide!

Max. 800 bar

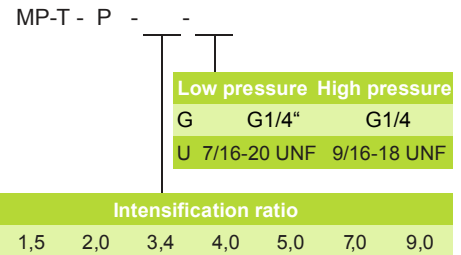
MP-T-P

Ratio (i)	Max. Inlet flow (LPM / GPM)	Outlet Flow Q1 (LPM / GPM)	Outlet Flow Q2 (LPM / GPM)	Max. Supply Pressure (bar / psi)	Max. Output Pressure (bar / psi)
1,5	8,0 / 2,1	0,8 / 0,21	0,3 / 0,08	200 / 2.900	300 / 4.350
2,0	8,0 / 2,1	0,8 / 0,21	0,2 / 0,08	200 / 2.900	400 / 5.800
3,4	15,0 / 4,0	2,2 / 0,58	0,5 / 0,13	200 / 2.900	680 / 9.860
4,0	14,0 / 3,7	1,8 / 0,47	0,4 / 0,10	200 / 2.900	800 / 11.600
5,0	14,0 / 3,7	1,4 / 0,37	0,3 / 0,08	160 / 2.320	800 / 11.600
7,0	13,0 / 3,4	1,1 / 0,29	0,2 / 0,05	114 / 1.653	800 / 11.600
9,0	13,0 / 3,4	0,7 / 0,19	0,1 / 0,03	89 / 1.290	800 / 11.600

Weight 1,3 kg



Specifying a MP-T *



Example

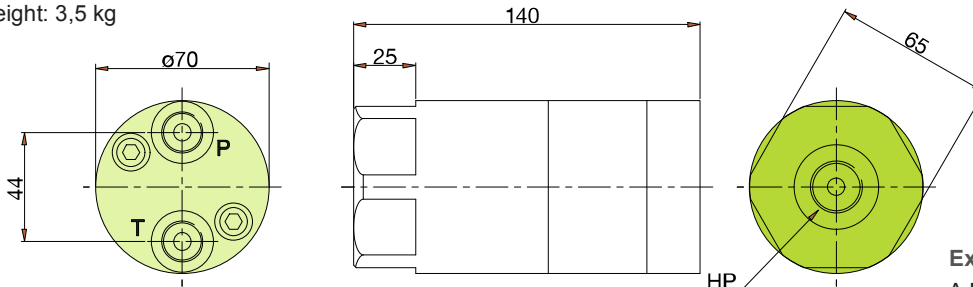
A MP-T-P, with Intensification ratio 5,0:1 and G1/4"
MP-T-P-5,0-G

Max. 800 bar

MP-M

Ratio (i)	Max. Inlet flow (LPM / GPM)	Outlet Flow Q1 (LPM / GPM)	Outlet Flow Q2 (LPM / GPM)	Max. Supply Pressure (bar / psi)	Max. Output Pressure (bar / psi)
1,8	25,0 / 6,6	5,0 / 1,32	1,5 / 0,39	200 / 2.900	360 / 5.220
3,4	35,0 / 9,3	5,0 / 1,32	2,8 / 0,74	200 / 2.900	680 / 9.860
4,0	35,0 / 9,3	4,0 / 1,06	2,4 / 0,63	200 / 2.900	800 / 11.600
5,0	35,0 / 9,3	3,5 / 0,93	1,9 / 0,50	160 / 2.030	800 / 11.600
7,0	35,0 / 9,3	3,0 / 0,80	1,3 / 0,34	114 / 1.450	800 / 11.600

Weight: 3,5 kg



P+T: G 3/8 (3/8" BSP)

HP: G1/2" (1/2" BSP)

Specifying a MP-M *



Example

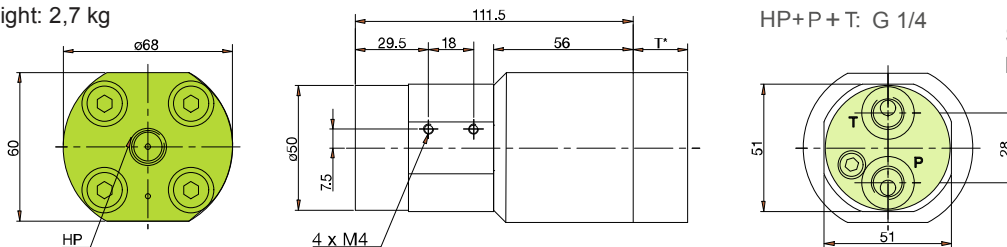
A MP-M with intensification ratio 4,0:1
MP-M-4,0

Max. 2000 bar

MP-2000-P

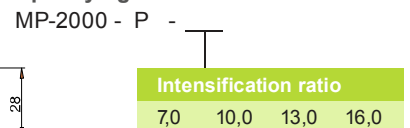
Ratio (i)	Max. Inlet flow (LPM / GPM)	Outlet Flow Q1 (LPM / GPM)	Outlet Flow Q2 (LPM / GPM)	Max. Supply Pressure (bar / psi)	Max. Output Pressure (bar / psi)
7,0	13,0 / 3,40	1,1 / 0,29	0,2 / 0,05	200 / 2.900	1.400 / 20.300
10,0	12,0 / 3,17	0,7 / 0,18	0,2 / 0,05	200 / 2.900	2.000 / 29.000
13,0	10,0 / 2,64	0,5 / 0,13	0,1 / 0,02	154 / 2.233	2.000 / 29.000
16,0	10,0 / 2,64	0,4 / 0,10	0,1 / 0,02	125 / 1.812	2.000 / 29.000

Weight: 2,7 kg



* T depending on the thickness of high pressure top plate

Specifying a MP-2000-P



Example

A MP-2000 with Ir 7,0:1
MP-2000-P-7,0



Advantages:

- ✓ Compact design
- ✓ Suitable for mobile use
- ✓ Well-priced
- ✓ Useable in EX-protected areas
- ✓ Low weight
- ✓ No power supply required
- ✓ High pressure generation possible
- ✓ Larger tank volume available
- ✓ Single- and double acting available

Description

General

Hydro-pneumatic pump units are handy and portable because of a compact design (weights from 5 to 10 kg).

This pressure generators are suitable for use in clamping systems for operating single or double acting clamping elements.

The pressure generator convert a pneumatic input pressure into a hydraulic operating pressure.

Pressure setting and compressed air treatment are carried out in an upstream pneumatic maintenance unit (not supplied).

There are tanks available with a capacity from 1,4 to 2,1 liters as the default, and tank sizes of 5 and 7 liter on request. The output pressures of the oil side is mainly dependent on the pneumatic pressure input.

The volume flow is depending on the pressure of the intake air. It is 0.8 to about 2.7 L/min.

In all models, the pedals are lockable, so that at a pressure drop in both systems a readjustment is guaranteed in case of any leaks (Figure 1).

The model IAHP-001 has a transparent tank. In models IAHP-002 and IAHP-003 a oil level sight glass is integrated to to check the oil level (Figure 2).

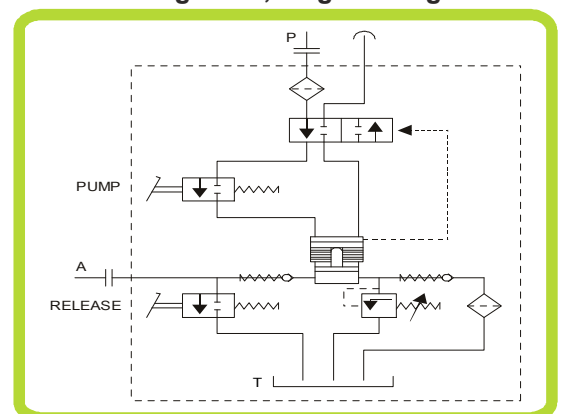
All models are equipped with a replaceable internal air filter and a relief valve provided in order to protect the hydraulic components, regardless of air pressure .

Note

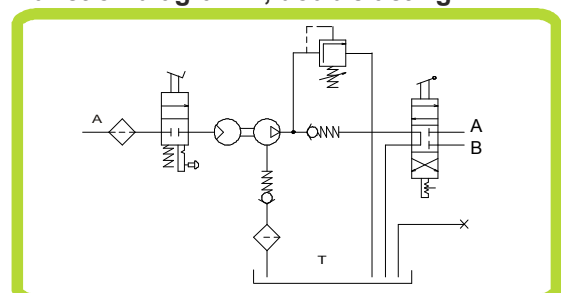
All, in the instructions enclosed operating instructions and maintenance instructions must be observed. We recommend hydraulic oil acc. DIN 51524. Upon delivery, the pressure generators are already filled with oil. A pneumatic maintenance unit for pressure regulation is not included.

The noise level is 75 dBA.

Function diagramm, single acting:



Function diagramm, double acting:

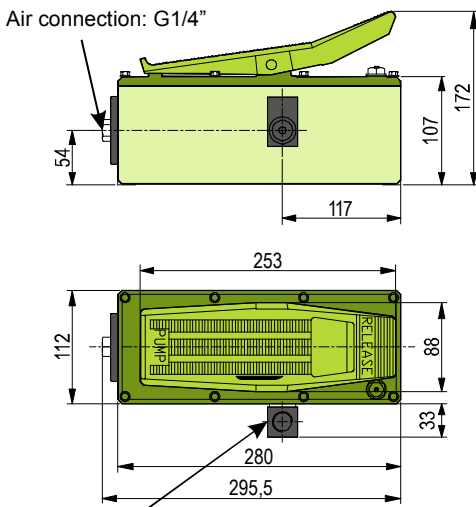


1. Pedal-Lock

2. Sight glass

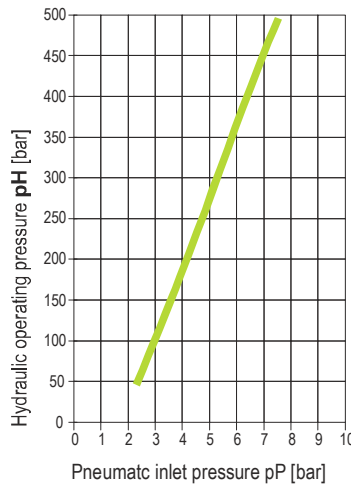


IAHP-001



Oil connection: 3/8 - 18 NPTF

Operating pressure p_H in dependence to inlet pressure p_P



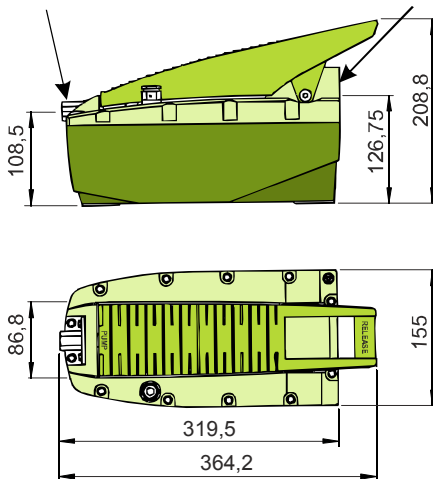
Technical data:

pneumatic inlet pressure p _P	[bar]	2,8 - 7
Operating pressure p _H min.	[bar]	50
Operating pressure p _H max.	[bar]	450
Volume flow max. at 7 bar	[l/min]	1,6-2,2
Air connection, Thread		G1/4
Air consumption max.	[Nl/min]	400
Oil connection, Thread		G3/8
Oil volume	[l]	1,4
Weight (full)	[kg]	5,0

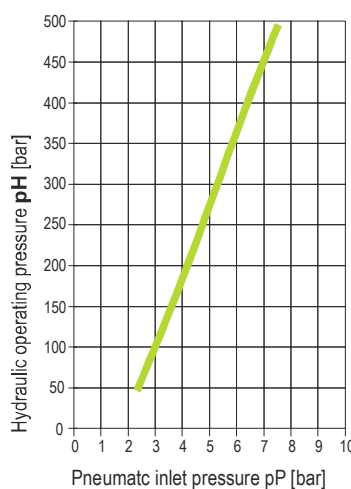
Function: Single acting
Tank: Transparent

IAHP-002

Air connection: G1/4" Oil connection: 3/8 - 18 NPTF



Operating pressure p_H in dependence to inlet pressure p_P

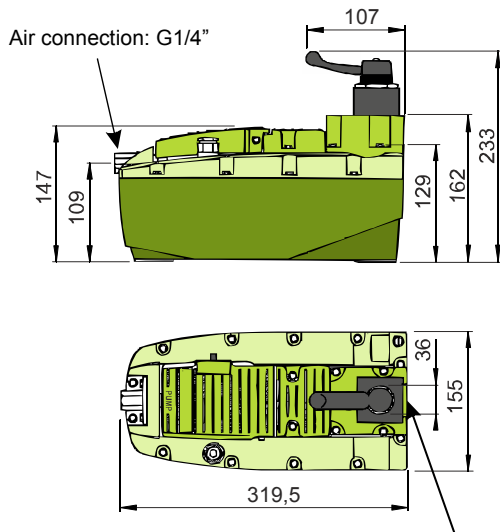


Technical data:

pneumatic inlet pressure p _P	[bar]	2,8 - 7
Operating pressure p _H min.	[bar]	50
Operating pressure p _H max.	[bar]	450
Volume flow max. at 7 bar	[l/min]	1,4-2,1
Air connection, Thread		G1/4
Air consumption max.	[Nl/min]	400
Oil connection, Thread		G3/8
Oil volume	[l]	2,1
Weight (full)	[kg]	6,3

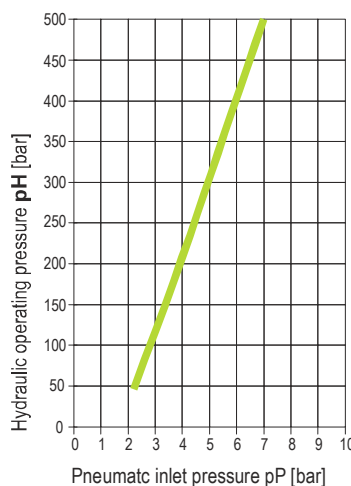
Function: Single acting
Color: Black

IAHP-003



Oil connection: 3/8 - 18 NPTF

Operating pressure p_H in dependence to inlet pressure p_P



Technical data:

pneumatic inlet pressure p _P	[bar]	2,8 - 7
Operating pressure p _H min.	[bar]	50
Operating pressure p _H max.	[bar]	500
Volume flow max. at 7 bar	[l/min]	1,6-2,2
Air connection, Thread		G1/4
Air consumption max.	[Nl/min]	400
Oil connection, Thread		G3/8
Oil volume	[l]	2,1
Weight (full)	[kg]	6,6

Function: Double acting
Color: Black

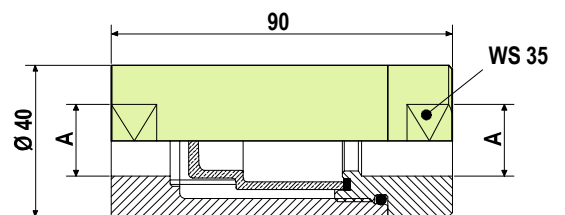
Special solutions on request!



Advantages:

- ✓ Independent of the flow direction useable
- ✓ Very good filtering
- ✓ Pipe mounting
- ✓ Filter-insert exchangeable
- ✓ Low weight because of aluminium housing

Description



In order to ensure the operational reliability of hydraulic systems and to protect the components against wear, it is strongly recommended that the pressure media is filtered.

The complexity of the hydraulic equipment makes not a difference. Even simple hydraulic systems can be contaminated by unacceptable influences in the hydraulic medium.

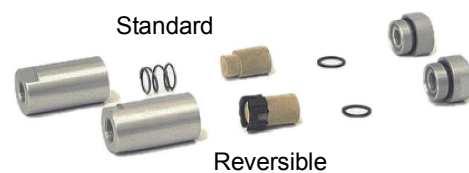
Usually hydraulic filters are integrated in the return line of the system. When using pressure intensifiers or controlled rotary joints/units, an installation in the flow pipe can be very useful also.

If these filters are used at pressures less than 15 bar, a coarser filtering as 25 microns is recommended.

Part number	A	Filtering (μm)
IIF-001	G1/4	10
IIF-002	G1/4	25
IIF-003	G3/8	10
IIF-004	G3/8	25
IIF-005	G1/2	10
IIF-006	G1/2	25

Applications

- The use of in-line filters protects the entire hydraulic circuit.
- When replacing or re-installation of a pressure intensifier it is always advisable to install a filter also.
- Inosol uses only "reversible" filter types, because they are independent of the direction of flow.



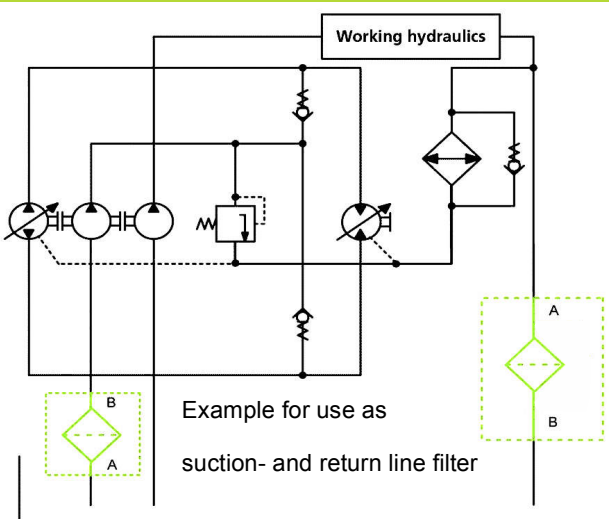
Technical Data

Housing:	Aluminium
O-Rings:	NBR 70
Media:	Hydraulic oils and water glycol
Filtering:	Sinter bronze 10 und 25 μm
Max. pressure:	350 bar
Min. pressure:	15 bar
Working temperature:	-10 bis 80°C

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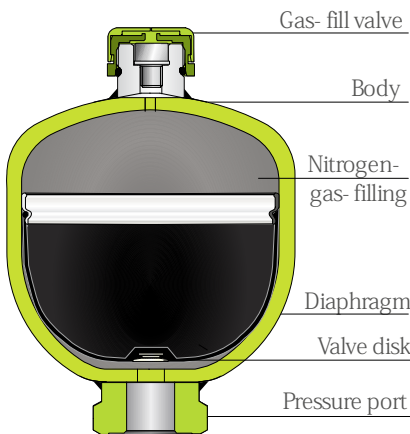


Advantages:

- ✓ Different sizes available
- ✓ Solid design
- ✓ Discharge of hydraulic components under pressure variations and surges
- ✓ Supports energie reduction
- ✓ Reduces wear out of hydraulic components



Description



Function:

The diaphragm is impinged with nitrogen gas. The integrated valve disk prevents damage of the diaphragm during the filling.

At minimum operating pressure a small amount of pressure oil must remain in the reservoir, to keep the diaphragm from closing the oil inlet by the pressure on the valve disk during emptying.

p_0 therefore must be set always lower than p_1 .

The stored amount of liquid is corresponding to the volume change ΔV between minimum and maximum operating pressure.

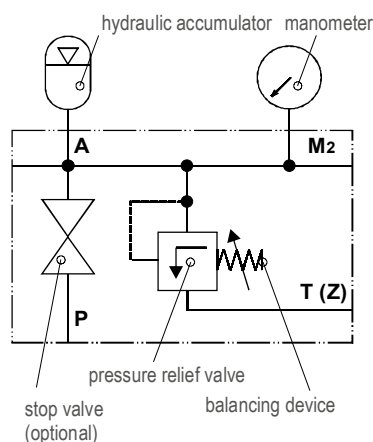
Standard gas filling: Nitrogen

Safety Information:

Germany hydraulic accumulators are subjected to the TRB - Rules Technical Regulations for Pressure Vessels. Therefore the following Additional Equipment for the use of hydraulic accumulators is required:

- Manometer
- Balancing device
- Pressure relief valve
- Stop valve (optional)

Outside of Germany the national rules and regulations of the country apply to the use of pressure vessels.



Caution:

All work on the hydraulic accumulator may only be done by competent persons.

Applications:

Compensate system-internal leakage

In hydraulic clamping systems the pressure generators typically operate in shutdown mode. A pressure switch controls the switching operations of the drive motor.

In case elements with leakage caused by design (e.g. controlled rotary distributors) are installed in the system, it results in frequent switching operations. The hydraulic accumulator reduces the On-Off switching cycles significantly. This saves energy and reduces the wear out of the material.

Compensate volume changes

In disengaged clamping systems, temperature differences can occur. This will inevitably result in significant changes of the clamping pressure (± 10 bar at $\pm 1^\circ$ C).

With their volume memory function, hydraulic accumulators can be used as a source of pressure oil for emergency operation in case of failure of the oil supply.

The installation of an hydraulic accumulator in the system provides a volume compensation, thus preventing the undesirable pressure fluctuations.

Note:

By using hydraulic clamping systems, system internal leakage and volume changes (e.g. by temperature differences) must be compensated. These tasks are performed by the hydraulic accumulator.

In intermittend applications the connected pressure generator fills the hydraulic accumulator during interruptions. The short-term result is a high volume flow, which can be used to save drive power of the pressure generator, if necessary.

Contact

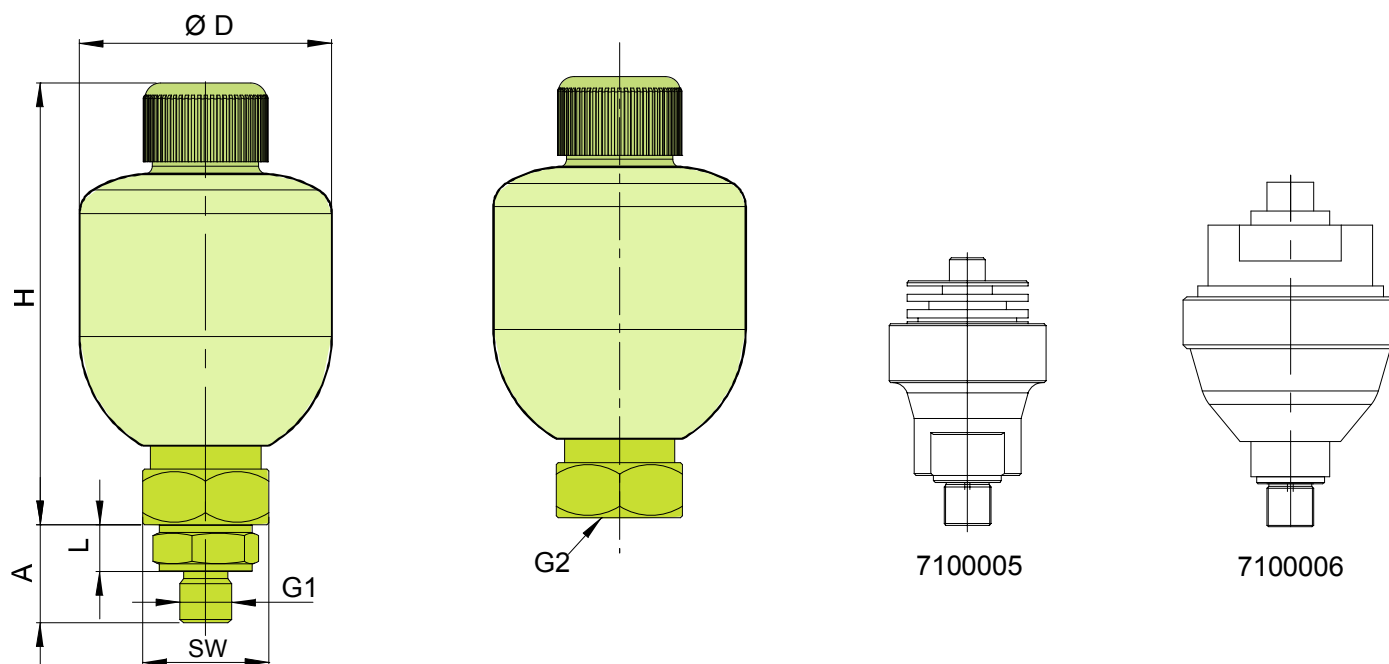
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Pressure Accumulator

Diaphragm Accumulator, hydraulic, up to 500 bar

Details



Part number	Dimensions			(mm)				Surface coating
	G1	G2	D	H	L	SW	A	
7100005	1/4		44	62,5		22		galvanised
7100006	1/4		60	82,5		22		galvanised
MAEK 007-250-C-1-G-50-100	1/4	1/2	64	118	11	22	23	paint, black
MAEK 016-250-C-1-G-50-120	3/8	1/2	75	127	11	22	23	paint, black
MAEK 05-250-C-1-G-50-120	3/8	1/2	107	159	11	22	23	paint, black
MAEK 075-350-C-1-G-50-130	3/8	1/2	128,5	180	11	22	23	paint, black

Gas volume	Max. Pressure	Standard-Gas-	Temperature	Weight	p max / p min	Part number
liter	bar	preload pressure (bar)	from °C to °C	kg	Δp (bar) isotherm	
0,013	500	80	-10...+80	0,30	4:1	7100005
0,04	400	100	-10...+80	0,65	4:1	7100006
0,07	250	100	-10...+80	0,80	8:1	MAEK 007-250-C-1-G-50-100
0,16	250	120	-10...+80	1,00	6:1	MAEK 016-250-C-1-G-50-120
0,5	250	120	-10...+80	1,50	8:1	MAEK 05-250-C-1-G-50-120
0,75	350	130	-10...+80	4,00	8:1	MAEK 075-350-C-1-G-50-130

Different preloads and connectors on request!

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Parameters

Parameters and abbreviations for rough calculation

- p_0 = Precharge Pressure (bar)
- p_1 = min. operating pressure (bar)
- p_2 = max. operating pressure (bar)
- ΔV = effective volume (l) (W 2)
- T_1 = min. operating temperature (°C)
- T_2 = max. operating temperature (°C)
- t = charging or discharging time (sec)
- V_0 = effective gas volume of (l)
- V_1 = Gas volume at p_1 (l)
- V_2 = Gas volume at p_2 (l)
- n = Polytropic exponent
- p_m = Mean working pressure (bar)

The operations on the gas filling related to labor and/or heat exchange can be described with

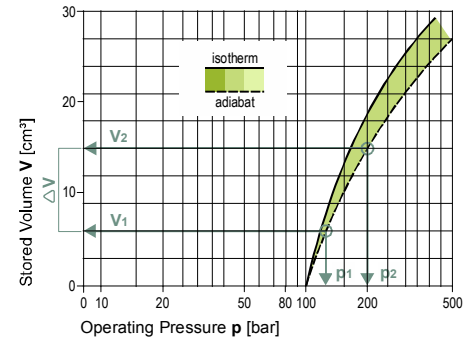
- isobars (constant pressure)
- isochor (constant volume)
- isotherm (constant temperature)
- adiabatic (heat sealed) or
- polytropic (between isotherm und adiabat)

changes of state.

In the rough calculation shown here a **isotherm** change of state is assumed.

$$p \cdot V = \text{constant} \quad \text{at } T \text{ constant}$$

Example



Calculation

For all accumulator calculations following absolute pressures should be used (**relativ + 1 bar**). The temperatures T_1 and T_2 in ° Kelvin ($T + 273$).

For energy reserve:

Formula-Calculation of the gas volume V_0 :

$$V_0 = \frac{\Delta V \cdot p_1}{p_0 \cdot \left(1 - \left(\frac{p_1}{p_2}\right)^{\frac{1}{n}}\right)}$$

Formula-Calculation of the effective volume V :

$$\Delta V = V_0 \cdot p_0 \cdot \frac{1 - \left(\frac{p_1}{p_2}\right)^{\frac{1}{n}}}{p_1}$$

Calculation of the charging pressure p_0 bei 20 °C

$$p_{0 \text{ bei } 20^\circ \text{C}} = p_{0 \text{ bei } T_2} \cdot \frac{273 + 20}{T_2}$$

This calculation steps show only a rough calculation for a hypothetical application.

As temperature, discharging time and situation of the gas filling change the calculation steps and accumulator size change as well.

Please note that by supplying pressure vessels in countries such as USA, Canada, China a.s.o. different regulations might apply. This can include the type of filling gas.

In General:

At energy storage/ safety reserve/ weight balance

$$P_0 = 0,8 \cdot p_1 \quad \text{bei } T_2$$

Der Polytropic exponent „n“ can be assumed with **1,2**

Calculation Example

Given:

- max. operating pressure p_2 190 bar
- min. operating pressure p_1 100 bar
- dispensed effective volume (Δ) $V = 1$ l
- max. operating temperature $T_2 = 45$ °C

Sought:

Accumulator size, means required gas volume V_0

Solution:

a) Determination of the gas charging pressure bei p_0 maximum operating temperature

$$p_0 = 0,8 \cdot 101 = 81 \text{ bar} = 80 \text{ bar relativ}$$

b) Determination of the gas volume V_0

$$V_0 = \frac{\Delta V \cdot p_1}{p_0 \cdot \left(1 - \left(\frac{p_1}{p_2}\right)^{\frac{1}{n}}\right)} = \frac{1 \cdot \frac{101}{80}}{1 - \left(\frac{101}{191}\right)^{\frac{1}{1,2}}} = 3,06 \text{ l}$$

c) Determination of the gas charging pressure p_0 bei 20 °C

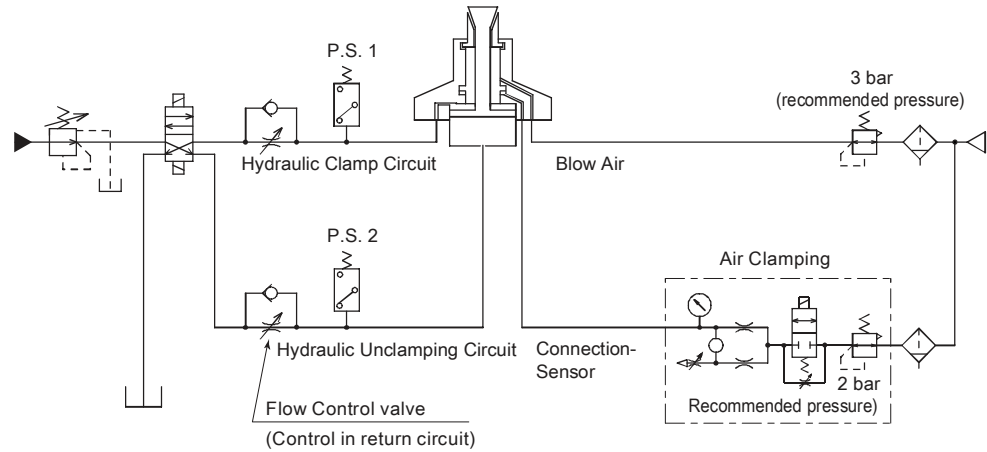
$$p_{0 \text{ bei } 20^\circ \text{C}} = 0,8 \cdot p_1 \cdot \frac{273 + 20}{T_2} = 0,8 \cdot 101 \cdot \frac{273 + 20}{318} = 74 \text{ bar} = 73 \text{ bar relativ}$$

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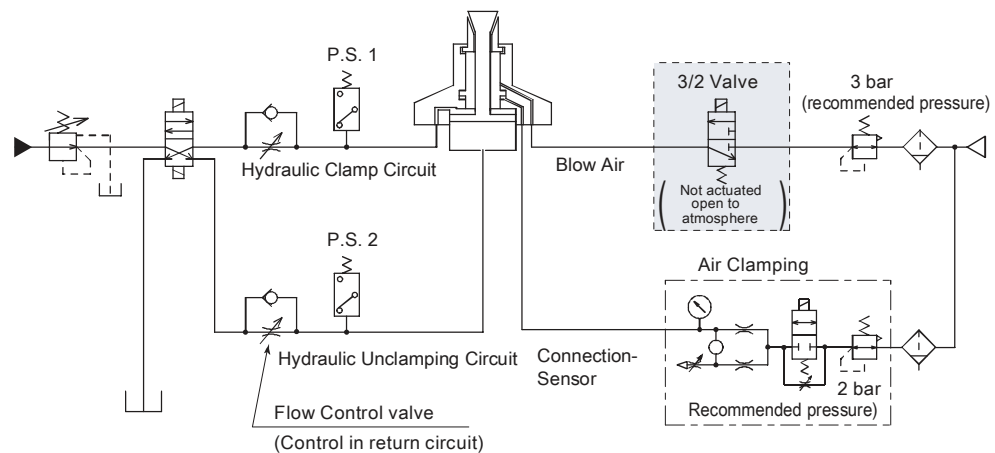
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Hydraulic- and Pneumatic diagramm for Type with Blow Air (Reference)



- In the return circuit must be a Flow Control Valve placed and the clamping speed must be adjusted in that way, that the piston for the clamping process needs 0,3s without any workpiece.
- During loading and unloading of the fixture with workpieces, there must be a constant blow with air for cleaning. If there are chips sticking on the gripper during preparation, the blow air process must continued while the complete preparation.

Hydraulic- and Pneumatic diagramm for Type with constant Blow Air (Reference)



- In the return circuit must be a Flow Control Valve placed and the clamping speed must be adjusted in that way, that the piston for the clamping process needs 0,3s without any workpiece.
- During loading and unloading of the fixture with workpieces, there must be a constant blow with air for cleaning. If there are chips sticking on the gripper during preparation, the blow air process must continued while the complete preparation.
- The monitoring of the clamping status or clamping control through a sensor must be processed with switched off blowout. In addition, an atmospheric open valve switching is to use, so that while switched off - blow-out it can be used as air outlet for the air sensor for clamping.

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Materials

The cylinder bodies of the clamping elements are, in the most cases, made of thermally treated free-cutting steel, in order to increase the wear resistance, to improve the ease of movement and to reduce the necessary reworking.

The surfaces are either burnished or nitrided to ensure optimum corrosion protection. The inner components consist mostly of high-quality stainless steel with hardened and ground surface.

The clamp arms are generally made of tempered steel and are usually burnished.

Coupling elements are made of stainless steel, with sealing material according to the requirement.

The housings of our rotary joints are either made of gray cast iron or high-strength aluminium.

iNOSOL uses only high-quality seals which are optimally adapted to the operating characteristics of the hydraulic component and the respective application.

In case of customer specific requests, the materials are chosen according to temperature and used operating media.



Hydraulic Oil

For the clamping elements only mineral oil-based hydraulic oils must be used (DIN 51524).

The use of other non-approved media may affect and/or damage the operability of the cylinders and other components.

The viscosity should be according to the parameters of ISO standard 3448. For an oil temperature of + 10 ° to + 60 ° C, we recommend a viscosity according to ISO VG 22-64.

The oil pollution should not be higher than class 18/14 according to ISO 4406. The purity of the hydraulic oil is essential for the perfect operation and the reliability of the cylinders and all other components of a hydraulic system.

It is therefore recommended to use filters with a filter fineness of at least 25 micron.



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Working temperature

Should nothing deviant be specified, the following operating temperatures are observed:

- Ambient temperature: $-10^{\circ}\text{C} / +60^{\circ}\text{C}$
- Oil temperature: $+10^{\circ}\text{C} / +60^{\circ}\text{C}$

Product testing

All components of i N O S O L are tested on a special computer-controlled test bench, carefully to the customer's specified pressure or with the appropriate standard or maximum pressure. Likewise, all the coupling elements are checked. This includes the actual coupling process! Certainly this test only applies to pneumatic and oil hydraulics. If different media are used, we have currently no possibility to use this as a test medium.



Warranty

i N O S O L guarantee for all products, the statutory period of 24 months after delivery to manufacturing and material defects. The guarantee does not cover damage caused by improper or non-intended use of the products, as well as by using non-approved for the purpose in resources. Even the normal wear of the products is excluded from the guarantee.

i N O S O L strives to improve products through consistent development continuously. For this reason, we reserve the right to make all necessary technical amendments in our opinion at without notice and any time. Because of that, the information in the data sheets / catalog are only binding in the latest issue.

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