Swivel clamp

model **CTR**

Single acting 7MPa

Pascal

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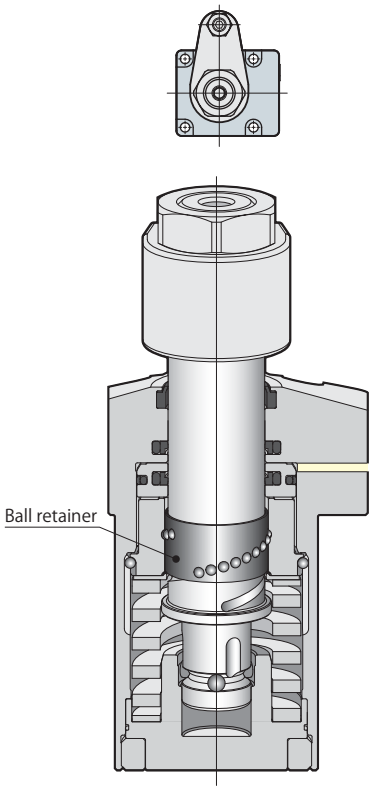
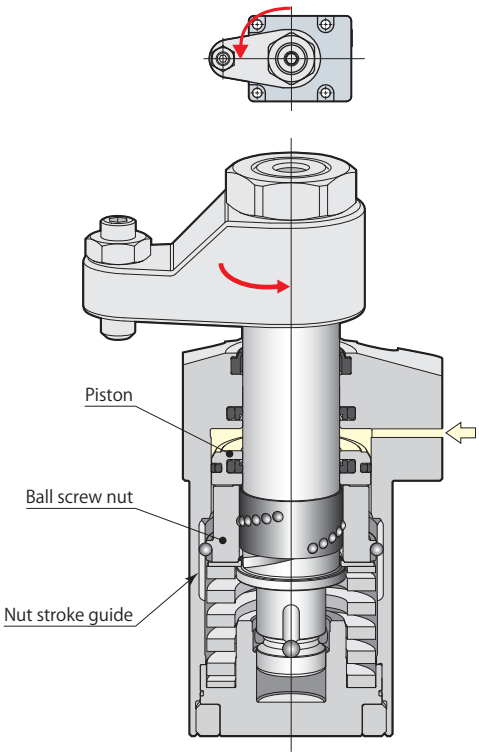
Horizontal swivel action

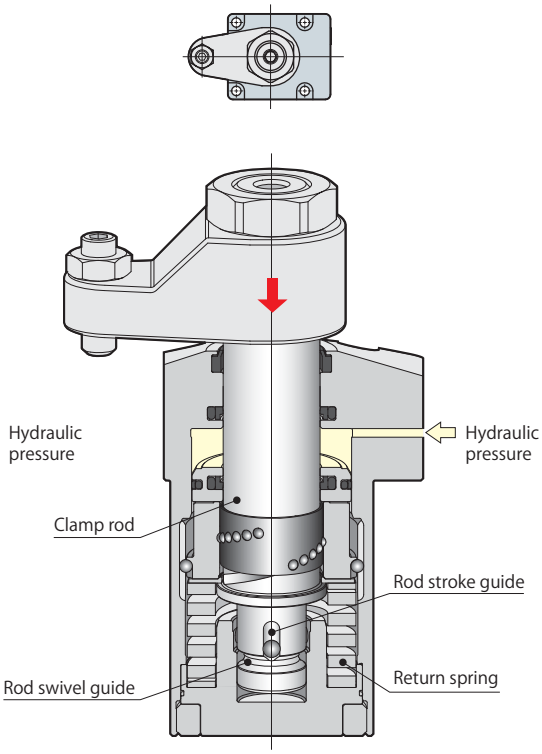
① Unclamp



② 90° horizontal swivel

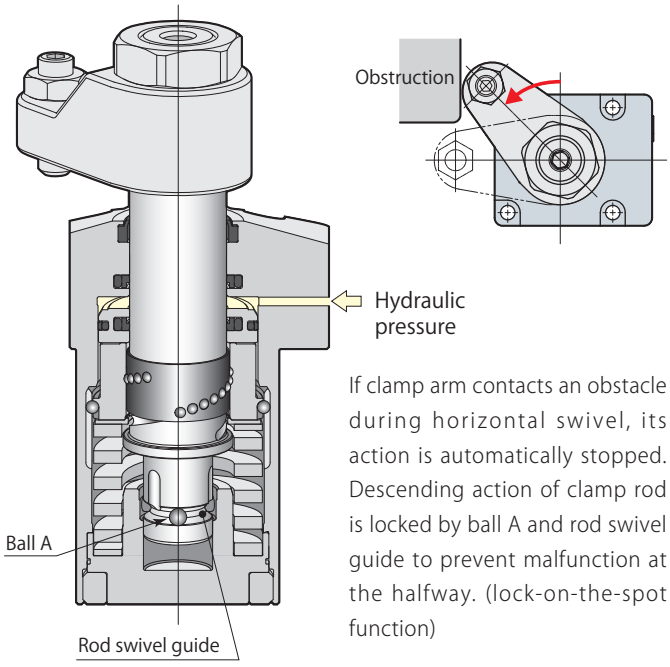


③ Clamp



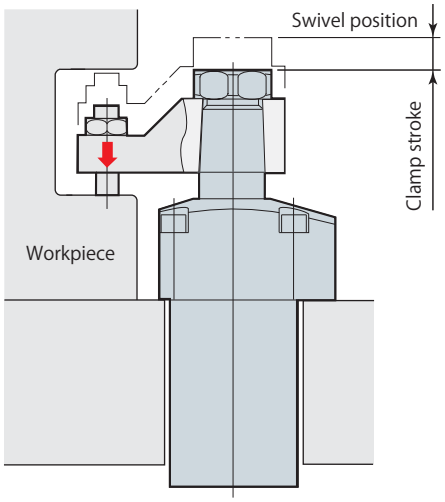
Ball screw nut goes down by piston's stroke along nut stroke guide. Clamp rod horizontally swivels 90° along rod swivel guide. When clamp rod reaches clamping position (90°), clamp rod goes down vertically along rod stroke guide to clamp the workpiece. At unclamping, strong return spring and ball screw assures smooth and stable action.

Securely avoids malfunctioning during 90° swivel



If clamp arm contacts an obstacle during horizontal swivel, its action is automatically stopped. Descending action of clamp rod is locked by ball A and rod swivel guide to prevent malfunction at the halfway. (lock-on-the-spot function)

Minimized interfering space



Due to horizontal swivel of clamp arm, interfering space becomes decreased compared with swing type clamp, so that above shown workpiece can be easily clamped.

Specifications

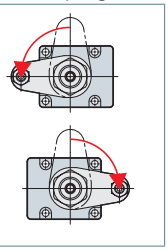
Model		CTR0.4	CTR0.6	CTR1	CTR1.6
Cylinder force (hydraulic pressure 7MPa) *1	kN	3.8	5.4	8.8	14.4
Clamping force (hydraulic pressure 7MPa) *1*2	kN	3.2	4.5	7.2	11.7
Standard clamp arm length (LH)	mm	40	50	60	70
Cylinder inner diameter	mm	37	43	52	65
Rod diameter	mm	22.4	25	30	35.5
Effective area (clamp)	cm^2	6.8	9.6	14.2	23.3
Swivel angle		90° ±3° (Repeated clamp positioning accuracy ±0.5°)			
Clamp stroke (full stroke)	mm	8	10	10	10
Recommended clamp stroke	mm	2 ～ 6	2.5 ～ 8	2.5 ～ 8	3 ～ 8
Max. swing torque *3	N·m	0.2	0.3	0.4	0.8
Return spring force	kN	0.77 ～ 1.06	1.08 ～ 1.42	1.10 ～ 1.27	1.86 ～ 2.47
Cylinder capacity (clamp)	cm^3	8.8	14.4	22.7	39.6
Recommended piping inner diameter *4	mm	ø6	ø6	ø8	ø8
Mass	kg	1.4	1.8	3.1	5.1
Recommended tightening torque of mounting screws *5	N·m	7	12	29	57
Recommended tightening torque of nut	N·m	51	60	86	120

Working pressure range：2.5 ～ 7 MPa　Proof pressure：10.5 MPa　Operating temperature：0 ～ 70℃
Fluid used：General mineral based hydraulic oil (ISO-VG32 equivalent)
＊1 : This is value for central position of clamp stroke.
＊2 : Clamping force at time standard clamp arm is mounted. (Clamping force varies depending on clamp arm length. Refer to performance table for details.)
＊3 : Care must be taken when you horizontally mount a clamp with large clamp arm on.
＊4 : Care must be taken when numerous clamps are used or when hydraulic piping is long.　＊5：ISO R898 class 12.9
Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

Model designation

CTR ①②-③　(Example：CTR0.6S-R)

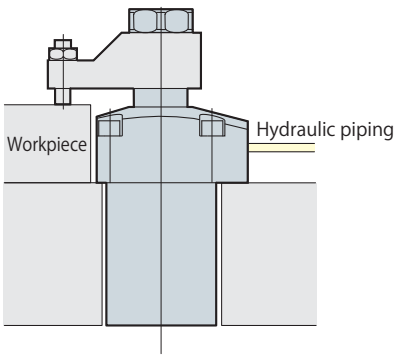
	① Size	② Mounting and piping types		③ Swivel direction (when clamping)
CTR	**0.4** **0.6** **1** **1.6**	**S** : Piping mounting **G** : Manifold mounting	–	**L** : Counter-clockwise **R** : Clockwise



Mounting example

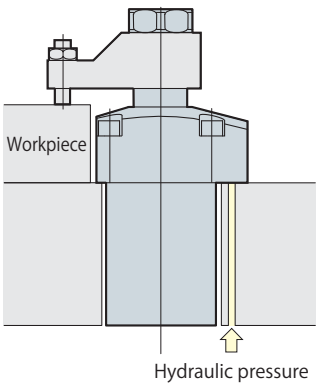
Piping mounting

CTR ①S-③

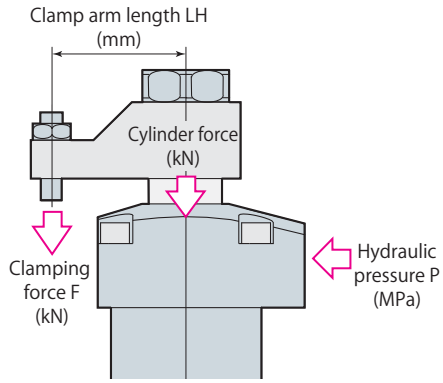


Manifold mounting

CTR ①G-③



Performance table



Clamping force varies depending on the clamp arm length (LH) and hydraulic pressure (P).

Clamping force calculation formula

F＝(P-Coefficient 1) / (Coefficient 2+Coefficient 3×LH)

F：Clamping force　P：Hydraulic pressure　LH：Clamp arm length

CTR1 with clamp arm length (LH) = 50 mm at hydraulic pressure of 7 MPa, Clamping force F is calculated by

(7-0.840) /(0.706+0.00244×50)=7.4 kN

Do not use the clamp in the nonusable range. It may cause damage to the cylinder and rod.

CTR 0.4

Clamping force　F = (P-1.34) / (1.47+0.00663×LH)

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN — Clamp arm length LH mm							Max. arm length Max. LH mm
		40	50	60	70	80	100	120	
7	3.9	3.3	3.1	3.0	2.9	Nonusable range			70
6.5	3.5	3.0	2.9	2.8	2.7				79
6	3.2	2.7	2.6	2.5	2.4	2.3			92
5.5	2.8	2.4	2.3	2.2	2.2	2.1	2.0		109
5	2.5	2.1	2.0	2.0	1.9	1.8	1.7	1.6	134
4.5	2.1	1.8	1.8	1.7	1.6	1.6	1.5	1.4	↑
4	1.8	1.5	1.5	1.4	1.4	1.3	1.2	1.2	↑
3.5	1.5	1.2	1.2	1.2	1.1	1.1	1.0	1.0	↑
3	1.1	1.0	0.9	0.9	0.9	0.8	0.8	0.7	↑
2.5	0.8	0.7	0.6	0.6	0.6	0.6	0.5	0.5	134

CTR 0.6

Clamping force　F = (P-1.30) / (1.04+0.00387×LH)

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN — Clamp arm length LH mm							Max. arm length Max. LH mm
		40	50	60	70	80	100	120	
7	5.5	4.8	4.6	4.5					61
6.5	5.0	4.4	4.2	4.1		Nonusable range			68
6	4.5	3.9	3.8	3.7	3.6				78
5.5	4.0	3.5	3.4	3.3	3.2	3.1			91
5	3.6	3.1	3.0	2.9	2.8	2.7	2.6		110
4.5	3.1	2.7	2.6	2.5	2.4	2.4	2.2	2.1	137
4	2.6	2.3	2.2	2.1	2.1	2.0	1.9	1.8	↑
3.5	2.1	1.8	1.8	1.7	1.7	1.6	1.5	1.5	↑
3	1.6	1.4	1.4	1.3	1.3	1.3	1.2	1.1	↑
2.5	1.2	1.0	1.0	0.9	0.9	0.9	0.8	0.8	137

CTR 1

Clamping force　F = (P-0.840) / (0.706+0.00244×LH)

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN — Clamp arm length LH mm							Max. arm length Max. LH mm
		50	60	80	100	120	140	160	
7	8.7	7.4	7.2						72
6.5	8.0	6.8	6.6	6.3	Nonusable range				81
6	7.3	6.2	6.1	5.7					91
5.5	6.6	5.6	5.5	5.2	4.9				106
5	5.9	5.0	4.9	4.6	4.4	4.2			125
4.5	5.2	4.4	4.3	4.1	3.9	3.7	3.5		152
4	4.5	3.8	3.7	3.5	3.3	3.2	3.0	2.9	193
3.5	3.8	3.2	3.1	3.0	2.8	2.7	2.5	2.4	↑
3	3.1	2.6	2.5	2.4	2.3	2.2	2.1	2.0	↑
2.5	2.4	2.0	1.9	1.8	1.7	1.7	1.6	1.5	193

CTR 1.6

Clamping force　F = (P-0.932) / (0.429+0.00134×LH)

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN — Clamp arm length LH mm							Max. arm length Max. LH mm
		60	80	100	120	140	160	180	
7	14.1	11.9	11.3						82
6.5	13.0	10.9	10.4		Nonusable range				92
6	11.8	9.9	9.5	9.0					105
5.5	10.6	9.0	8.5	8.1	7.7				122
5	9.5	8.0	7.6	7.2	6.9	6.6			145
4.5	8.3	7.0	6.7	6.3	6.0	5.8	5.5		178
4	7.2	6.0	5.7	5.4	5.2	5.0	4.8	4.6	230
3.5	6.0	5.0	4.8	4.6	4.4	4.2	4.0	3.8	↑
3	4.8	4.1	3.9	3.7	3.5	3.4	3.2	3.1	↑
2.5	3.7	3.1	2.9	2.8	2.7	2.5	2.4	2.3	230

Swing speed adjustment

Swing time is restricted by the mass and length of the clamp arm (moment of inertia) since the 90° swing action impacts the cam shaft.

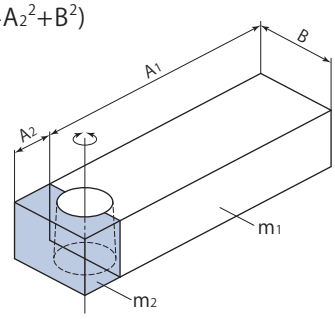
1. Calculate the moment of inertia according to the arm length and mass.
2. Adjust swing speed with flow control valve with check valve to ensure that 90° swing time of the clamp arm is greater than the shortest swing time in the graph shown below.
   (Use flow control valve with cracking pressure of 0.05 MPa or less. Flow control valve model VCF can not be mounted.)

- The cam groove may be damaged in case the swing speed is set at the nonusable range in the graph.

Example of calculation for moment of inertia

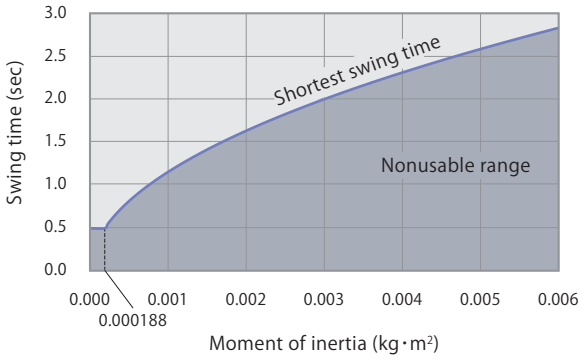
$$I = \frac{1}{12} m_1(4A_1^2+B^2)+\frac{1}{12}m_2(4A_2^2+B^2)$$

I : Moment of inertia (kg·m²)
m: Mass (kg)



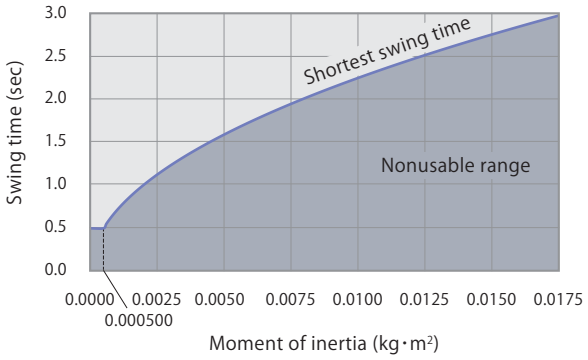
CTR 0.4

Shortest swing time calculation formula $t = \sqrt{\frac{I}{0.000750}}$



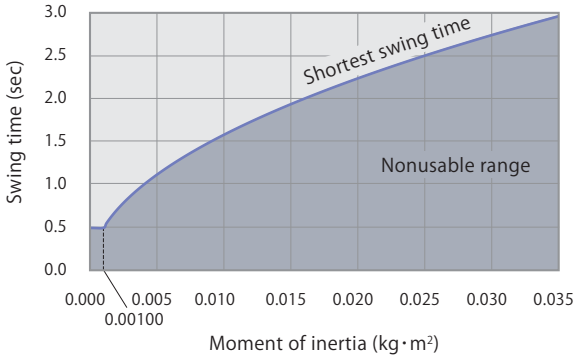
CTR 0.6

Shortest swing time calculation formula $t = \sqrt{\frac{I}{0.00200}}$



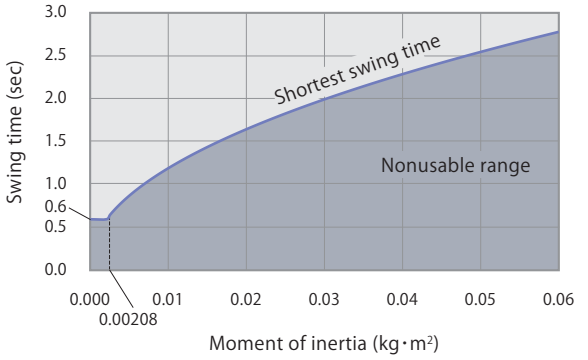
CTR 1

Shortest swing time calculation formula $t = \sqrt{\frac{I}{0.00400}}$

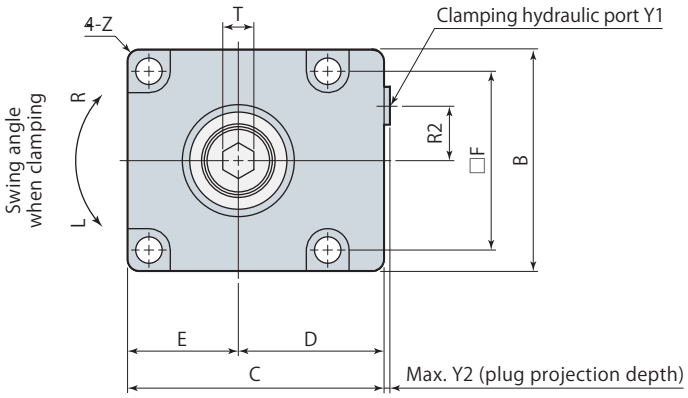


CTR 1.6

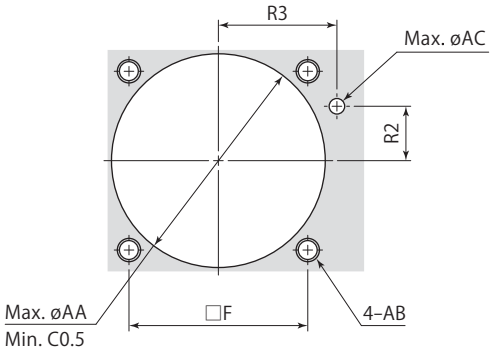
Shortest swing time calculation formula $t = \sqrt{\frac{I}{0.00830}}$

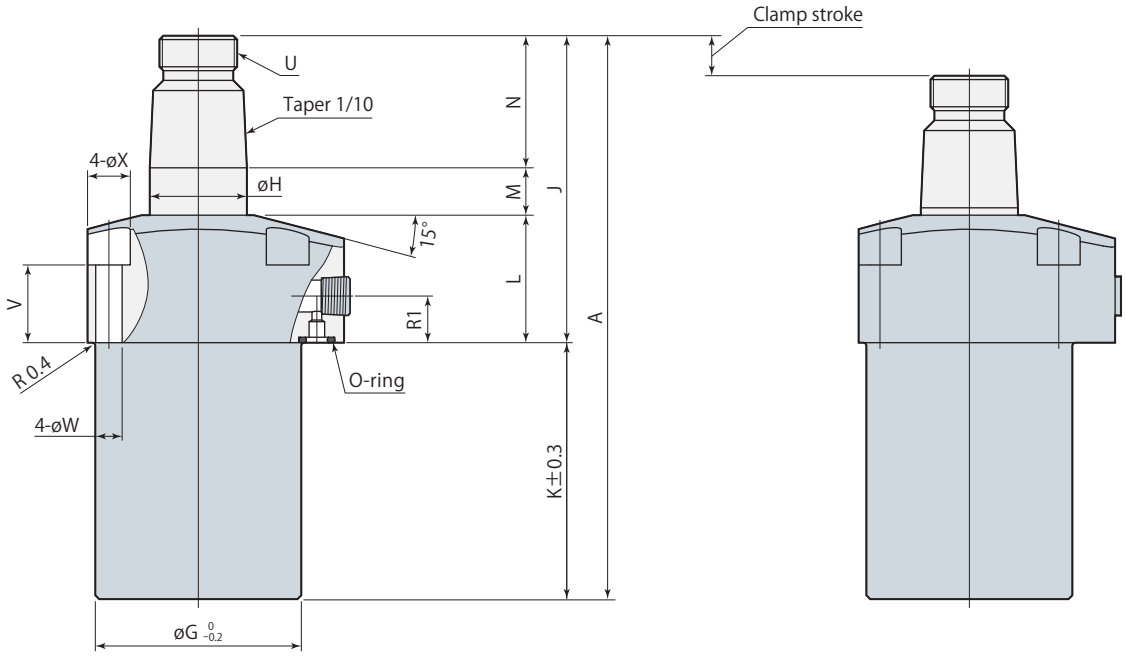


Dimensions



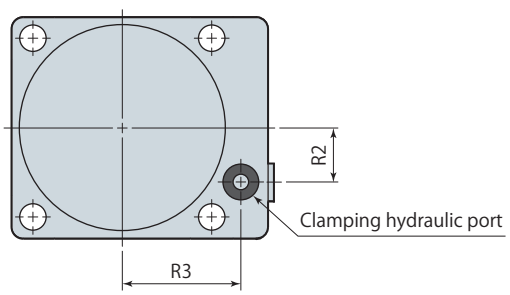
Mounting details

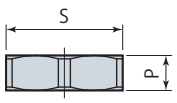




Unclamp

Stroke end





Hex. nut for arm mount

- Hex. nut for arm mount is included.
- Clamp arm, and mounting screws are not included.
- This diagram represents external contour of CTR□G.
  CTR□S : O-ring and hex socket plug are not included.

mm

Model	CTR0.4$^{S\text{-}L}_{G\text{-}R}$	CTR0.6$^{S\text{-}L}_{G\text{-}R}$	CTR1$^{S\text{-}L}_{G\text{-}R}$	CTR1.6$^{S\text{-}L}_{G\text{-}R}$
A	136	151	162	183
B	50	57	70	86
C	60	66	82	96
D	35	37.5	47	53
E	25	28.5	35	43
F	40	46	56	68
ø G	47	53	63	78
ø H	22.4	25	30	35.5
J	75	79	85	99
K	61	72	77	84
L	31	33	36	40.5
M	10	12	12	11.5
N	34	34	37	47
P	9	9	10	12
R1	11	12	12.5	12.5
R2	12	14	18	22.5
R3	28	30.5	36	42
S (nut width across flats)	27	30	36	46
T (hex. socket)	6	8	8	10
U	M18×1.5	M20×1.5	M24×1.5	M30×1.5
V	20	20	19.5	20
ø W	5.5	6.8	9	11
ø X	9.5	11	14	17.5
Y1	Rc1/8	Rc1/8	Rc1/4	Rc1/4
Y2	3	3	4	4
Z	R3	R5	R6	R7
O-ring (fluorocarbon hardness Hs90) (manifold mounting)	P6	P6	P8	P8
ø AA	49	55	65	80
AB	M5	M6	M8	M10
ø AC	4	4	6	6
Taper sleeve	CTH0.4-GS	CTH0.6-GS	CTH1-GS	CTH1.6-GS

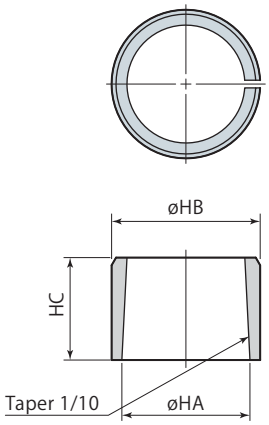
Model designation

CTH ①-GS (Example : CTH0.6-GS)

① Size

CTH	**0.4** **0.6** **1** **1.6**	—	**GS** : Taper sleeve

Taper sleeve



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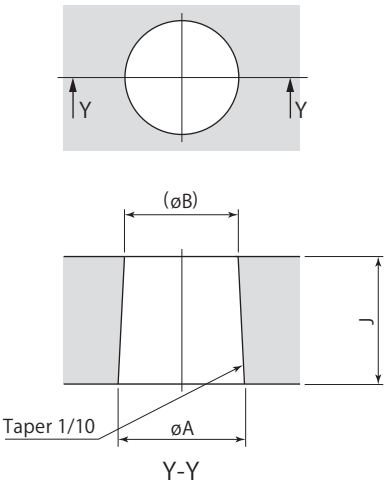
Model	CTH0.4-GS	CTH0.6-GS	CTH1-GS	CTH1.6-GS
ø HA	22.4	25	30	35.5
ø HB	26	29	34	40
HC	21	20	22	29

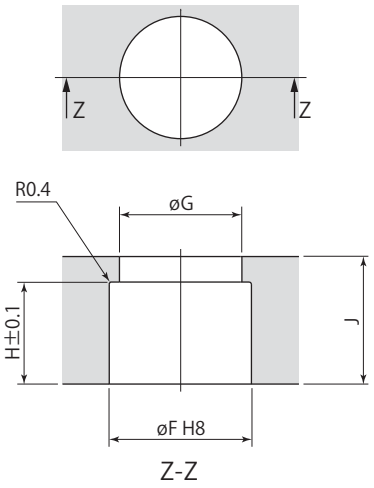
Clamp arm details

Not using taper sleeve



Y-Y

Using taper sleeve



Z-Z

mm

Clamp models	CTR0.4	CTR0.6	CTR1	CTR1.6
ø A	22.4 $^{-0.020}_{-0.041}$	25 $^{-0.020}_{-0.041}$	30 $^{-0.020}_{-0.041}$	35.5 $^{-0.025}_{-0.050}$
ø B	19.9	22.5	27.3	32
ø F	26 $^{+0.033}_{0}$	29 $^{+0.033}_{0}$	34 $^{+0.039}_{0}$	40 $^{+0.039}_{0}$
ø G	21	24	28.5	34
H	21	20	22	29
J	25	25	27	35
Taper sleeve models	CTH0.4-GS	CTH0.6-GS	CTH1-GS	CTH1.6-GS

⚠ WARNING

Do not disassemble clamp. As high power spring is built-in, components may jump out to cause injury.

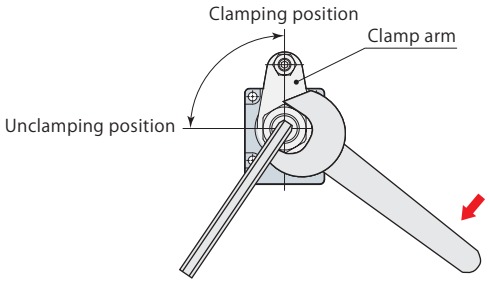
Caution for hydraulic piping

1. Most problems that occur with hydraulic equipment are caused by foreign substances such as metal chips and dust that enter into hydraulic circuits. Refer to "Piping Hydraulic & Pneumatic Equipment-Practical Notes" provided with the product for mounting and hydraulic piping of the product.
2. Inner diameter of hydraulic piping should be larger than the one specified on specification table. Especially when many number of clamp is used and piping is longer than 5 m, time to unclamp becomes longer.
3. After performing hydraulic piping, always be sure to bleed out air in the hydraulic circuit. Insufficient bleeding can lead to malfunction.
4. When using multiple clamps, operating speeds and timings vary due to variance in pipe resistance and internal resistance of clamps.

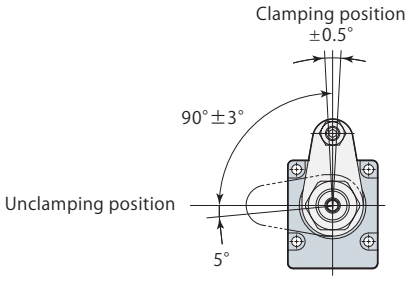
Mounting & dismounting of clamp arm

Swivel clamp may be damaged if excessive torque is applied, since structure is intended for the rotation by ball screw function. Follow instructions shown below to prevent excessive torque from being applied on piston rod when mounting or dismounting clamp arm.

Mounting of clamp arm

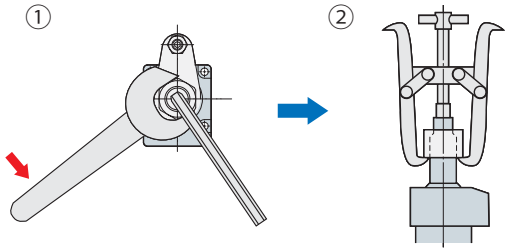


Set the clamp body to jig to make a clamped condition. Set the clamp arm at desired orientation as shown in diagram above. Insert a hex wrench to hex socket at tip section of piston rod to hold it and tighten locknut with a wrench.



Structurally, model CTR has a backrush of 5° at unclamping position. When swivel speed is fast or inertia of clamp arm is large, clamp arm may rotate as much as this backrush. Install clamp arm by setting clamping position always at first.

Dismounting of clamp arm



① Insert hex wrench to hex socket at tip section of piston rod to ensure that piston rod is held in place, then loosen locknut with wrench.
② After dismounting the locknut, pull out clamp arm using gear puller. A flat saddle type of gear puller should be used when removing an arm not to convey any rotating force to the piston rod.

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CERTIFICATE OF APPROVAL ISO9001

CLS-11E-7
2023. 04

Specifications are subject to change without prior notice.