Swivel clamp

model **CTS**

Double acting 7MPa

Pascal

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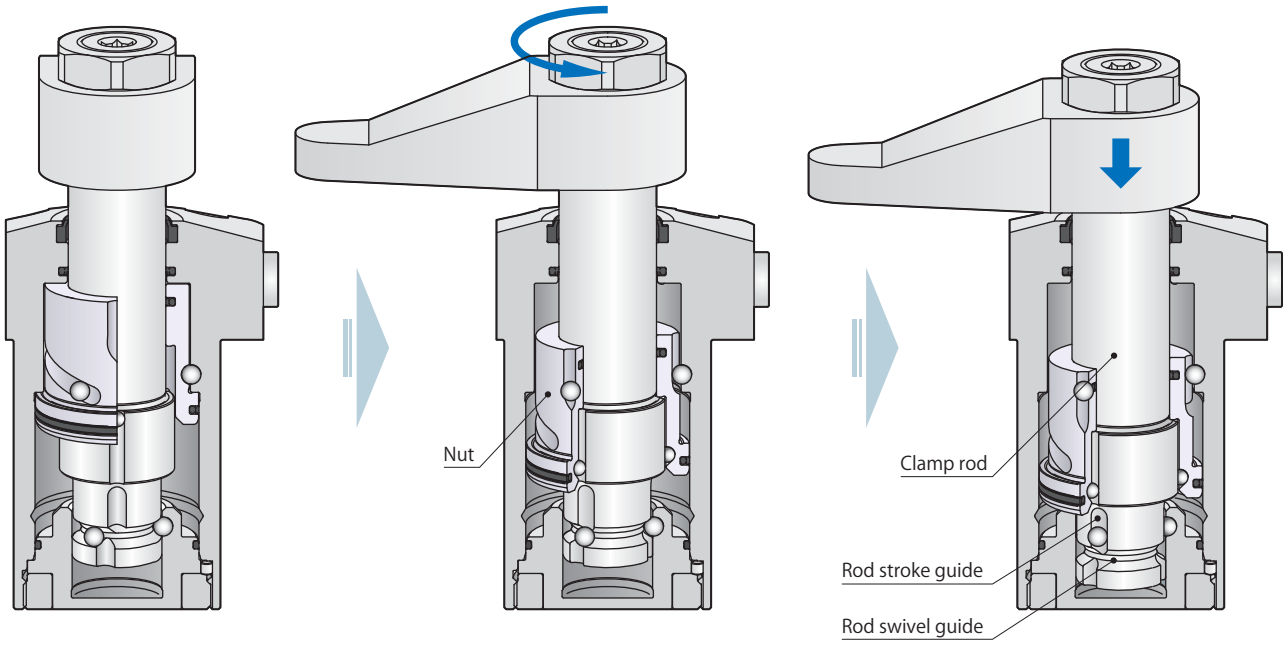
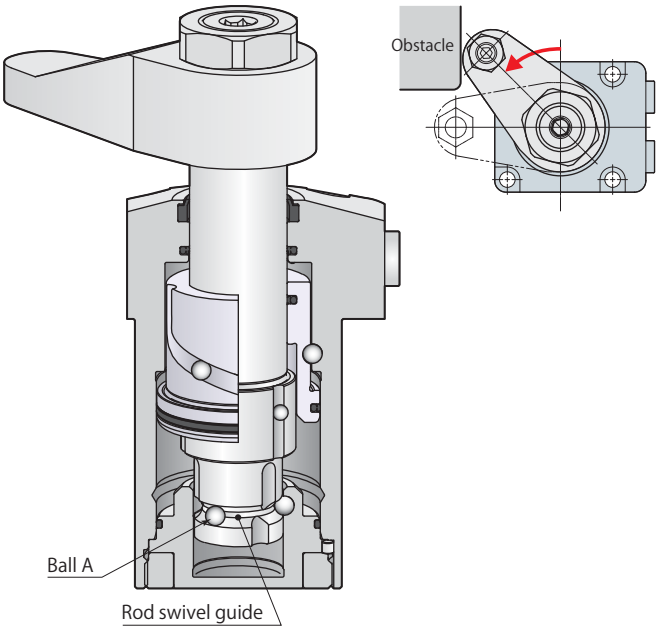
Horizontal Swivel Action

① Unclamp　② 90° horizontal swivel　③ Clamp

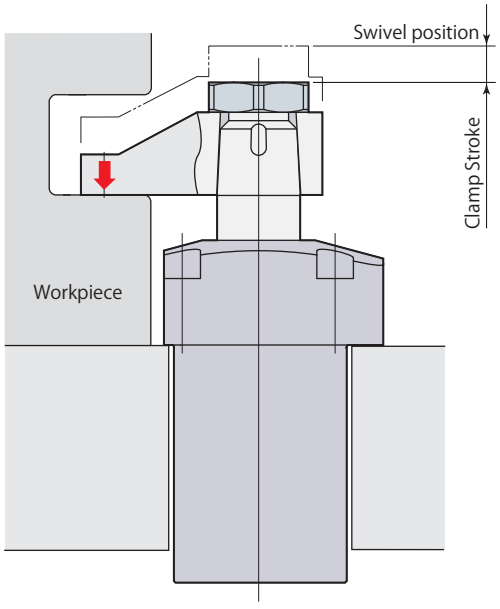


Securely avoids malfunctioning during 90 degrees swivel



If clamp head 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



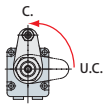
Due to horizontal swivel of clamp arm, interfering space becomes decreased compared with swing type clamp, so that above shown workpiece can be easily clamped.

Specifications

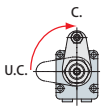
Size / Swing direction (when clamping)

CTS — 04 / 06 / 10 / 16 —

L : Counter-clockwise



R : Clockwise



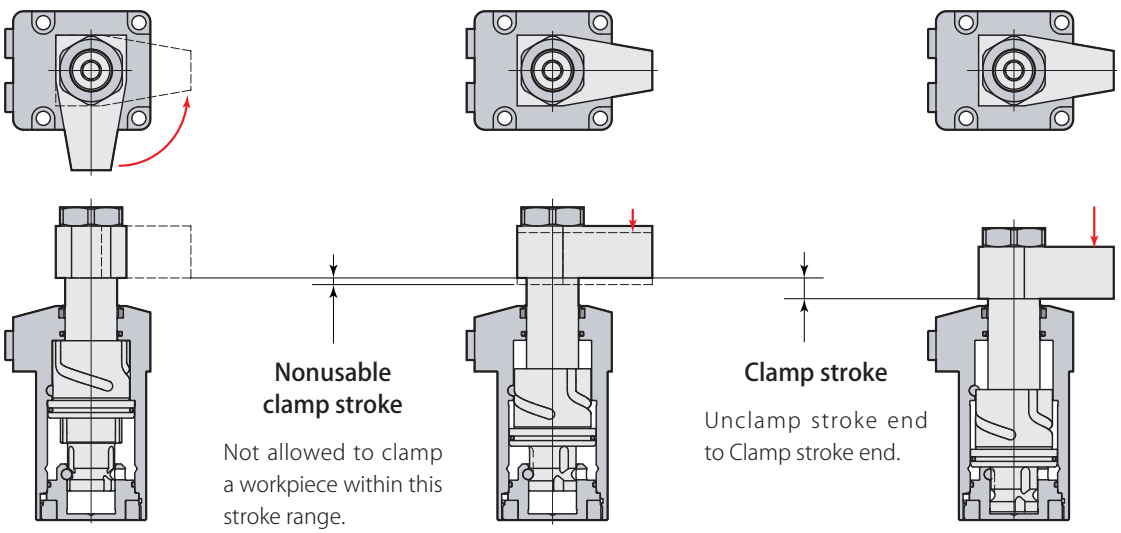
(Nil) : Standard

E : Dual rod page→ 7

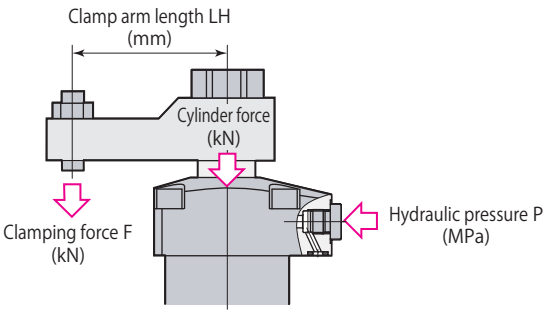
Model				CTS04	CTS06	CTS10	CTS16
Cylinder force (hydraulic pressure 7MPa)			kN	4.4	6.3	9.9	16.3
Cylinder inner diameter			mm	36	42	52	65
Rod diameter			mm	22.4	25	30	35.5
Effective area (clamp)			cm^2	6.2	8.9	14.2	23.3
Swing angle				90°±3°			
Positioning pin groove position accuracy				±1°			
Repeated clamp positioning accuracy				±0.5°			
Full stroke			mm	8	10	10	10
90° swing stroke			mm	0			
Nonusable clamp stroke (shown below)			mm	0~2.5	0~2.5	0~3	0~3.5
Clamp stroke (shown below)			mm	8	10	10	10
Cylinder capacity	Clamp		cm^3	12.5	21.0	36.9	72.2
	Unclamp	Standard	cm^3	15.6	25.9	43.9	82.1
		Dual rod	cm^3	14.7	24.8	41.9	80.1
Mass	Standard		kg	1.4	1.9	3.0	5.2
	Dual rod		kg	1.4	2.0	3.2	5.2
Recommended tightening torque of mounting screws*			N·m	7	12	29	57
Recommended tightening torque of nut			N·m	51	60	86	120

- Pressure range : 1.5~7 MPa
- Proof pressure : 10.5 MPa
- Operating temperature : 0~70℃
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)
- Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

∗ : ISO R898 class 12.9



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 × LH)

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

CTS06 with clamp arm length (LH) = 50 mm at hydraulic pressure of 7 MPa, Clamping force F is calculated by

7/ (1.118+0.00256×50) = 5.6 kN

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

model CTS04 Clamping force F=P/(1.603+0.00426×LH)

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN, Clamp arm length LH mm								Max. arm length Max. LH mm
		40	50	60	80	100	120	140	160	
7	4.4	3.9	3.9	3.8	3.6					90
6.5	4.1	3.7	3.6	3.5	3.3					99
6	3.7	3.4	3.3	3.2	3.1	3.0	Nonusable range			110
5.5	3.4	3.1	3.0	3.0	2.8	2.7	2.6			121
5	3.1	2.8	2.8	2.7	2.6	2.5	2.4	2.3		142
4.5	2.8	2.5	2.5	2.4	2.3	2.2	2.1	2.0	2.0	165
4	2.5	2.3	2.2	2.2	2.1	2.0	1.9	1.8	1.8	198
3.5	2.2	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1.5	↑
3	1.9	1.7	1.7	1.6	1.5	1.5	1.4	1.4	1.3	↑
2.5	1.6	1.4	1.4	1.3	1.3	1.2	1.2	1.1	1.1	↑
2	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9	0.9	↑
1.5	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	198

model CTS06 Clamping force F=P/(1.118+0.00256×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	180	
7	6.3	5.6	5.5	5.3						83
6.5	5.8	5.2	5.1	4.9						92
6	5.4	4.8	4.7	4.5	4.4	Nonusable range				101
5.5	4.9	4.4	4.3	4.2	4.0					114
5	4.5	4.0	3.9	3.8	3.6	3.5				129
4.5	4.0	3.6	3.5	3.4	3.3	3.2	3.0			149
4	3.6	3.2	3.1	3.0	2.9	2.8	2.7	2.6		176
3.5	3.1	2.8	2.8	2.6	2.5	2.5	2.4	2.3	2.2	214
3	2.7	2.4	2.4	2.3	2.2	2.1	2.0	2.0	1.9	↑
2.5	2.2	2.0	2.0	1.9	1.8	1.8	1.7	1.6	1.6	↑
2	1.8	1.6	1.6	1.5	1.5	1.4	1.4	1.3	1.3	↑
1.5	1.3	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	214

model CTS10 Clamping force F=P/(0.706+0.00174×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	200	
7	9.9	8.6	8.3							94
6.5	9.2	8.0	7.7	7.4						103
6	8.5	7.4	7.1	6.8	Nonusable range					115
5.5	7.8	6.8	6.5	6.3	6.0					129
5	7.1	6.2	5.9	5.7	5.5	5.3				148
4.5	6.4	5.6	5.3	5.1	4.9	4.7	4.6			172
4	5.7	4.9	4.7	4.5	4.4	4.2	4.1	3.9	3.8	206
3.5	5.0	4.3	4.1	4.0	3.8	3.7	3.6	3.4	3.3	↑
3	4.3	3.7	3.5	3.4	3.3	3.2	3.0	2.9	2.8	↑
2.5	3.5	3.1	3.0	2.8	2.7	2.6	2.5	2.5	2.4	↑
2	2.8	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9	↑
1.5	2.1	1.9	1.8	1.7	1.6	1.6	1.5	1.5	1.4	206

model CTS16 Clamping force F=P/(0.429+0.00107×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	200	
7	16.3	13.9	13.6							94
6.5	15.1	12.9	12.6	12.1						104
6	14.0	11.9	11.7	11.2	Nonusable range					115
5.5	12.8	10.9	10.7	10.3	9.9					130
5	11.6	9.9	9.7	9.3	9.0	8.6				149
4.5	10.5	8.9	8.7	8.4	8.1	7.8	7.5			173
4	9.3	7.9	7.8	7.5	7.2	6.9	6.7	6.4	6.2	208
3.5	8.1	6.9	6.8	6.5	6.3	6.0	5.8	5.6	5.4	↑
3	7.0	6.0	5.8	5.6	5.4	5.2	5.0	4.8	4.7	↑
2.5	5.8	5.0	4.9	4.7	4.5	4.3	4.2	4.0	3.9	↑
2	4.7	4.0	3.9	3.7	3.6	3.5	3.3	3.2	3.1	↑
1.5	3.5	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	208

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 to ensure that 90° swing time of the clamp arm is greater than the shortest swing time in the graph shown below.

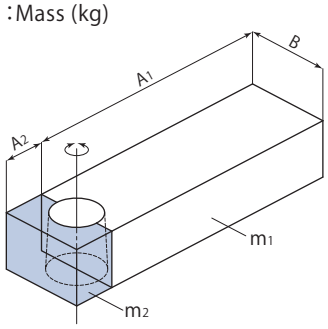
● The cam groove may be damaged in case the swing speed is set at the nonusable range in the graph.

Example of calculation for moment of inertia

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

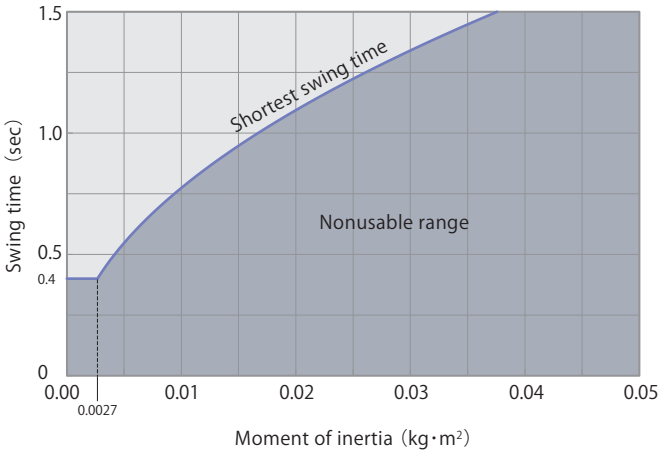
I :Moment of inertia (kg·m²)

m :Mass (kg)



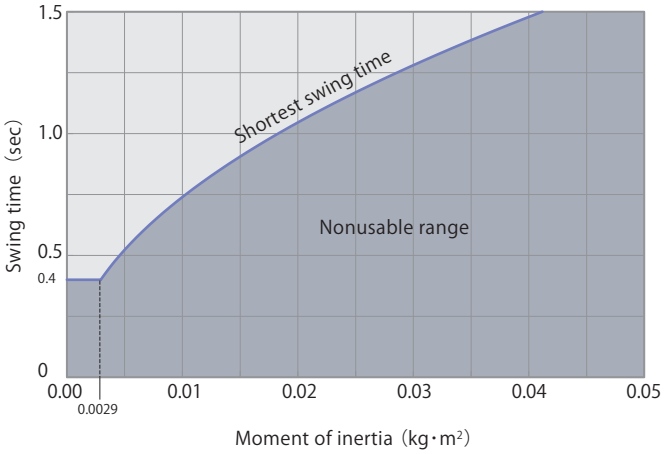
model CTS04

Shortest swing time calculation formula $t=\sqrt{\frac{I}{0.0167}}$



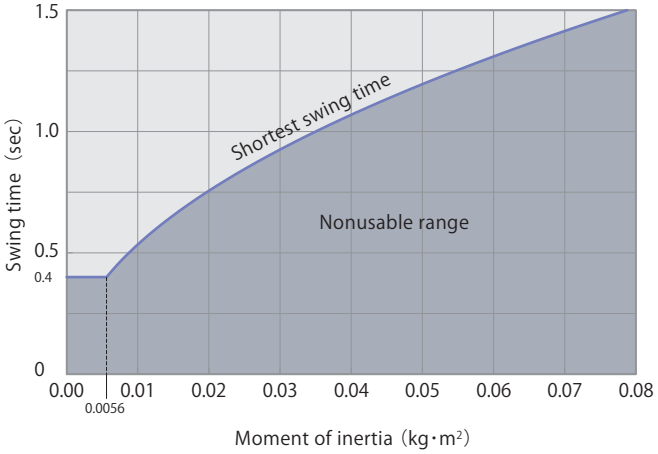
model CTS06

Shortest swing time calculation formula $t=\sqrt{\frac{I}{0.0183}}$



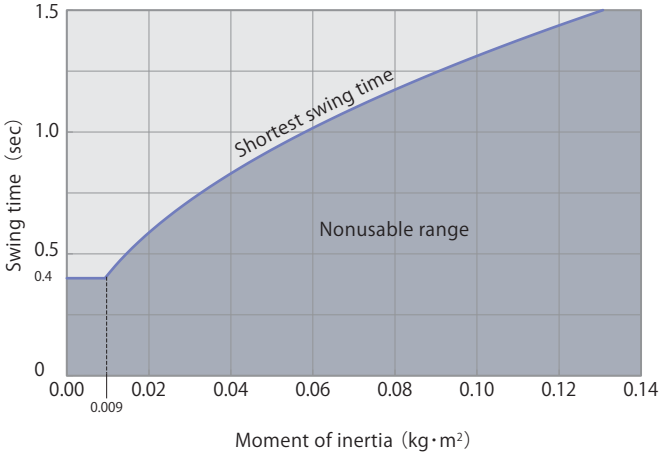
model CTS10

Shortest swing time calculation formula $t=\sqrt{\frac{I}{0.0350}}$

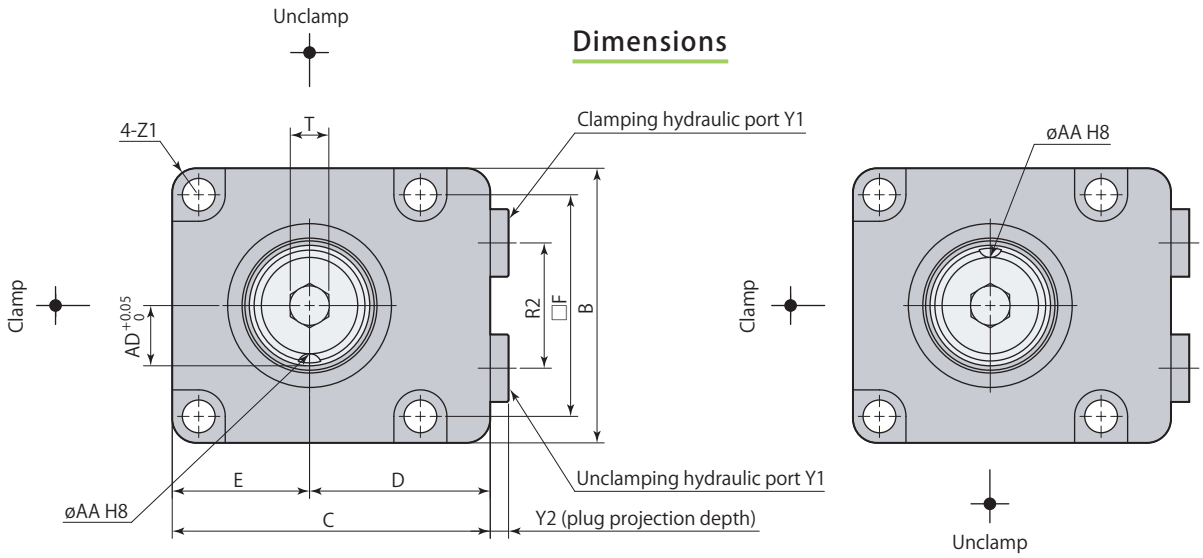


model CTS16

Shortest swing time calculation formula $t=\sqrt{\frac{I}{0.0581}}$

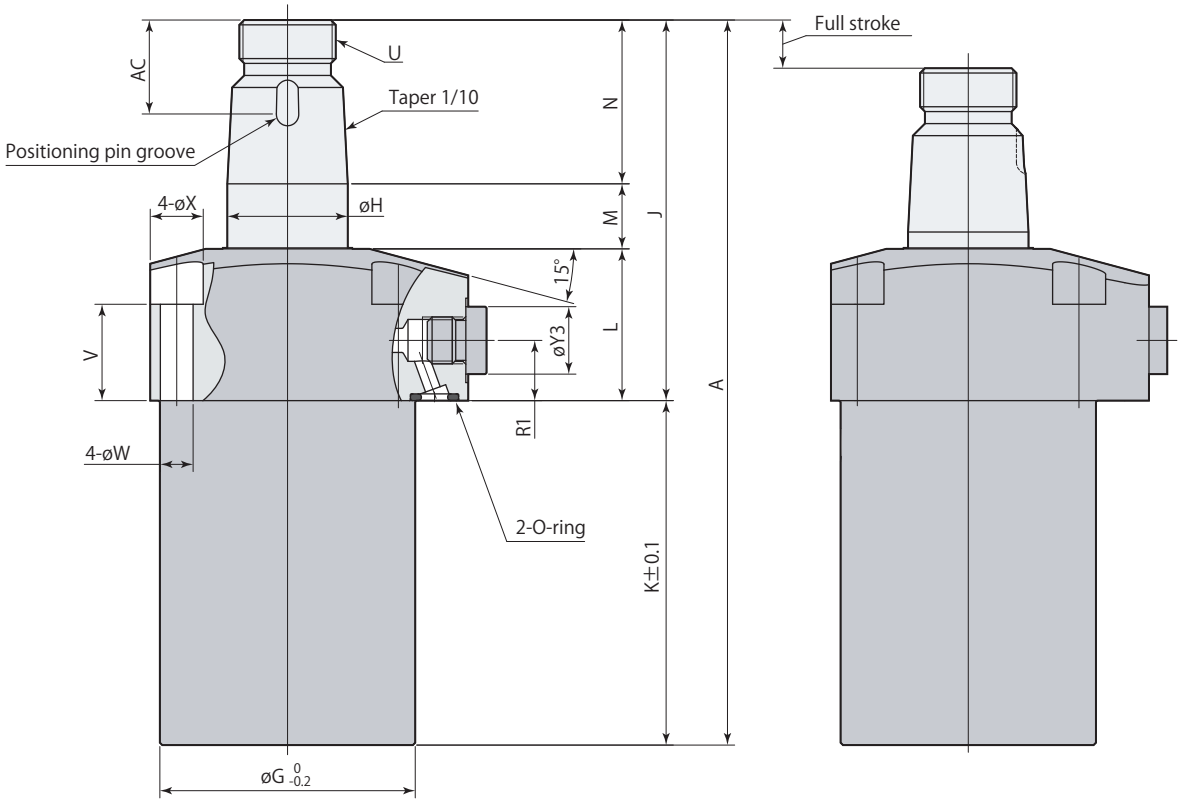


Dimensions



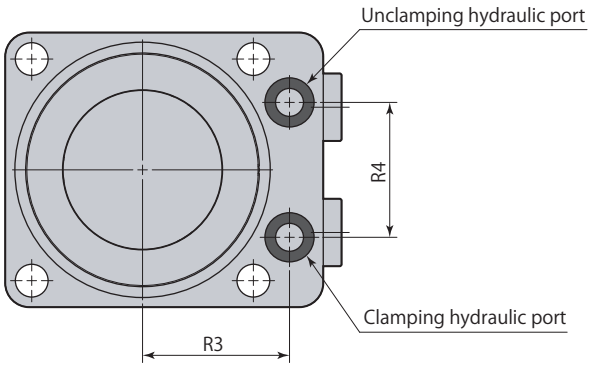
Swing direction L (counter-clockwise)

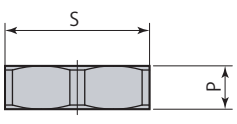
Swing direction R (clockwise)



Unclamp

Stroke end





Hex. nut for arm mount

- Hex nut for arm mount is included.
- Clamp arm, positioning pin and mounting screws are not included.

CTS□-□	Swivel clamp Standard model	7MPa Double acting

mm

Model	CTS04-□	CTS06-□	CTS10-□	CTS16-□
A	137.5	150.5	166	189.5
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
øG	47	53	63	78
øH	22.4	25	30	35.5
J	75	79	85	99
K	62.5	71.5	81	90.5
L	29.5	31.5	34.5	39
M	11.5	13.5	13.5	13
N	34	34	37	47
P	9	9	10	12
R1	12.5	12.5	14	14
R2	22	26	31	38
R3	24	28	36	45
R4	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
øW	5.5	6.8	9	11
øX	9.5	11	14	17.5
Y1	G1/8	G1/8	G1/4	G1/4
Y2	3.8	3.8	4.8	4.8
øY3	14	14	19	19
Z1	R3	R5	R6	R7
øAA (pin groove diameter)	$4^{+0.018}_{0}$	$5^{+0.018}_{0}$	$6^{+0.018}_{0}$	$6^{+0.018}_{0}$
AC	19.5	19.5	22.5	24.5
AD	11	12.5	15	18
Positioning pin (dowel pin)	ø4(h8)×10	ø5(h8)×10	ø6(h8)×12	ø6(h8)×12
O-ring (fluorocarbon hardness Hs90)	P7	P7	P8	P8
Taper sleeve	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS
Flow control valve* Meter-in	VCF01S	VCF01	VCF02	VCF02
Air bleeding valve*	VCE01	VCE01	VCE02	VCE02

∗: Select the right model of VCF and VCE according to the size of the clamp.
Refer to separate documents (CLS-33 or CLS-35) for the details of options.

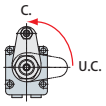
Dual rod

Size

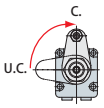
CTS — 04 / 06 / 10 / 16

Swing direction (when clamping)

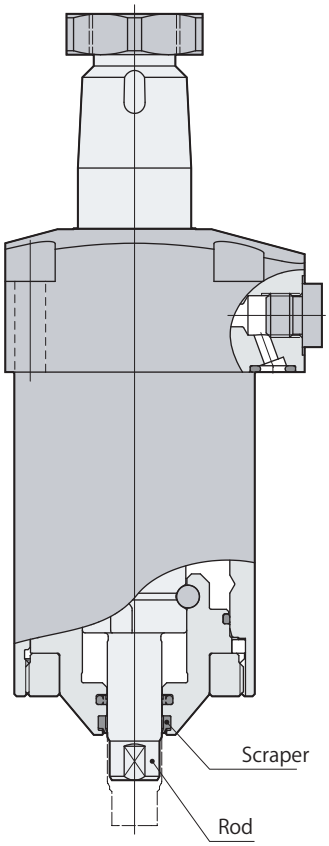
L : Counter-clockwise



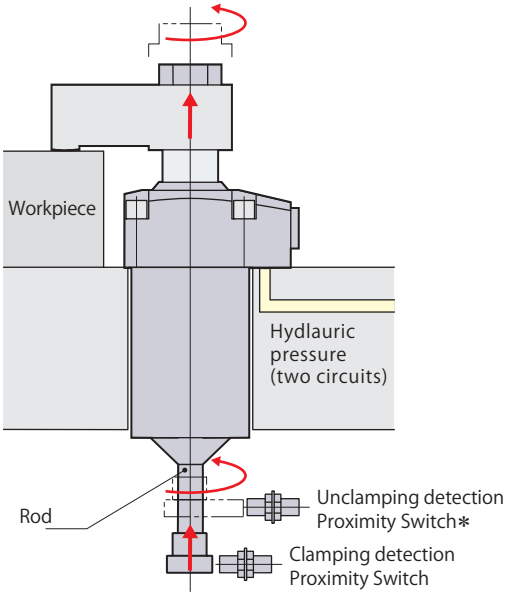
R : Clockwise



E : Dual rod

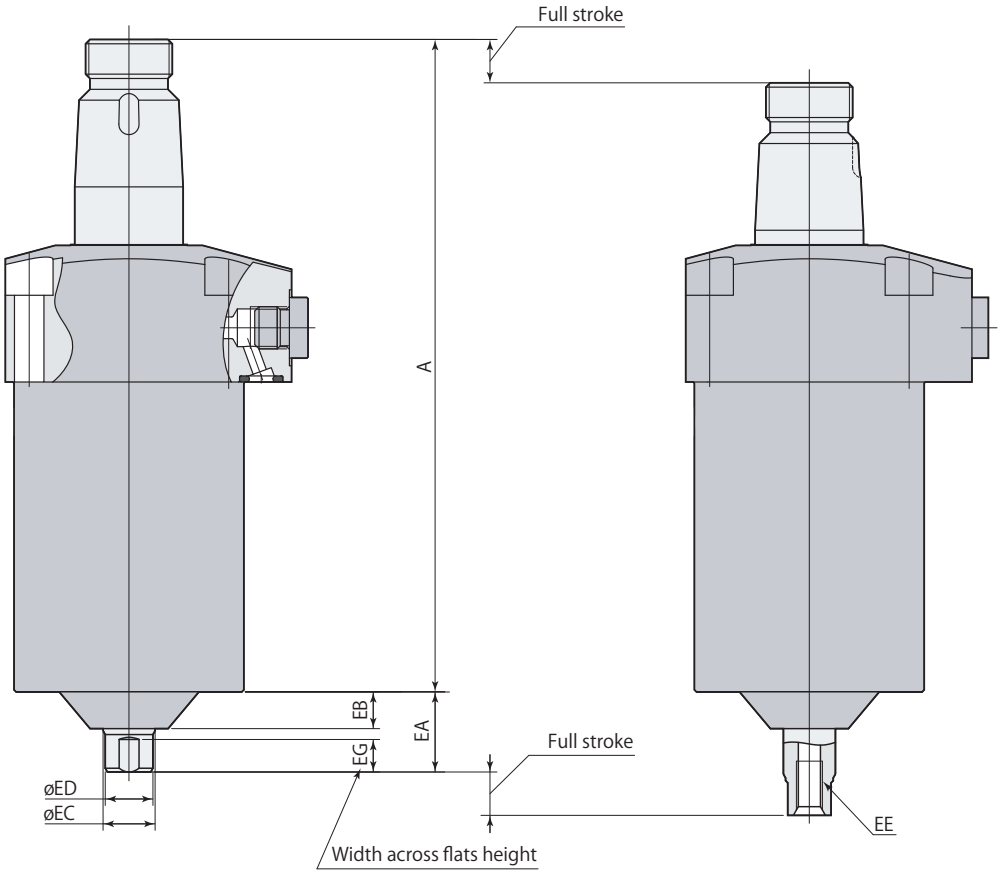


Example



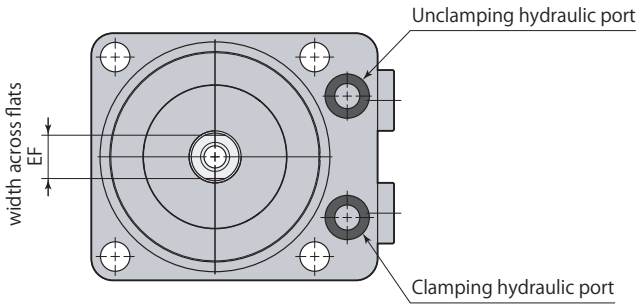
∗:Model CTS unclamp detection shall be made by the rod swing angle because of a horizontal swiveling arm mechanism.

Dimensions



Unclamp

Stroke end

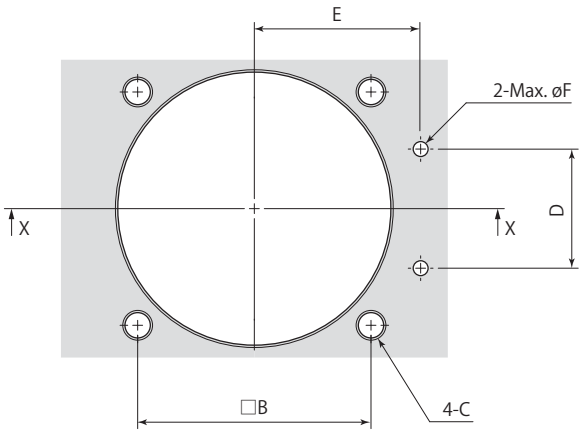


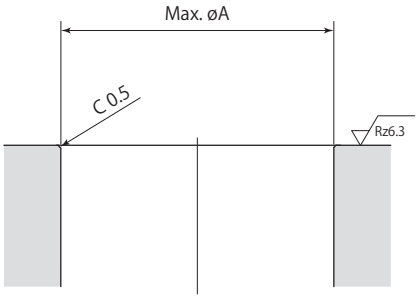
● Refer to dimensions (**page →5**) for dimensions of products that are not listed on this page.

mm

Model	CTS04-□E	CTS06-□E	CTS10-□E	CTS16-□E
A	137.5	150.5	166	189.5
EA	15.5	18.5	18.5	15
EB	5.5	8.5	6	3
øEC	12	12	16	16
øED	11	11	15	15
EE	M6×1 depth 12	M6×1 depth 12	M8×1.25 depth 15	M8×1.25 depth 15
EF	10	10	13	13
EG	7.5	7.5	7.5	7.5

Mounting details





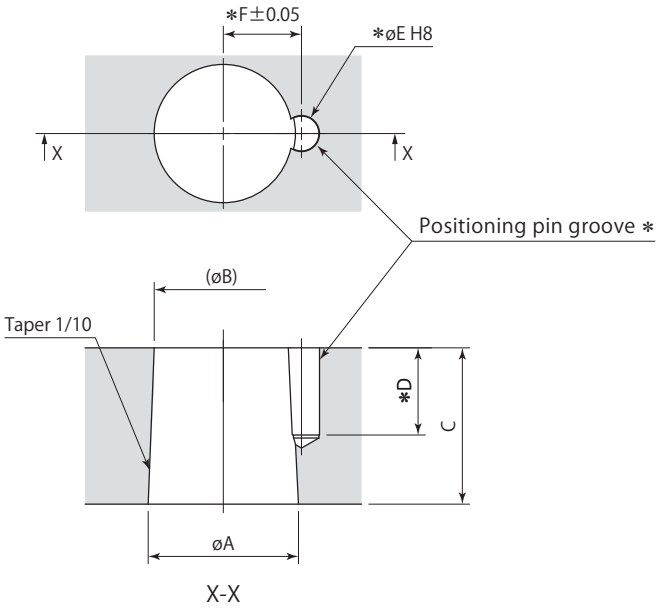
X-X

mm

Model	CTS04	CTS06	CTS10	CTS16
øA	48	54	64	79
B	40	46	56	68
C	M5	M6	M8	M10
D	24	28	36	45
E	28	30.5	36	42
øF	4	4	6	6

Clamp arm mounting details

Clamp arm is not included. Manufacture a clamp arm with the dimensions shown in the table below.



∗ : No need to machine the pin groove (D, øE, F) unless positioning pin is used for the arm.
The positioning pin enables a clamp arm to locate on the clamp firmly and easily.

mm

Model	CTS04	CTS06	CTS10	CTS16
øA	$22.4^{-0.020}_{-0.041}$	$25^{-0.020}_{-0.041}$	$30^{-0.020}_{-0.041}$	$35.5^{-0.025}_{-0.050}$
øB	19.9	22.5	27.3	32
C	25	25	27	35
D	10.5	10.5	12.5	12.5
øE (pin groove diameter)	$4^{+0.018}_{0}$	$5^{+0.018}_{0}$	$6^{+0.018}_{0}$	$6^{+0.018}_{0}$
F	11.1	12.6	15.1	18.1

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