

Pascal Swing Clamp

Advanced ball and groove design

Clamp arm

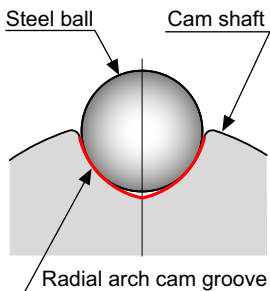
A variety of workpieces can be clamped by replacing the clamp arm. Standard and extended clamp arms are available as options.

Side accessing clamp arm

Handy for mounting and angle adjustment.

Cam groove with maximum surface contact area

Adopted **Radial Contact** shaped cam groove. Its broad contact width against the steel balls brings a lower contact surface pressure that leads to higher durability than point contact designs. (PATENT P.)

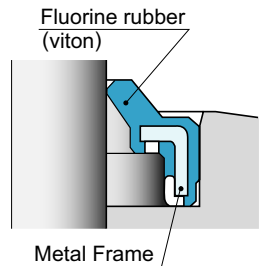


Cam shaft

Side bolt

Heavy-duty scraper

Protects the cylinder from high pressure coolant and machining chips.



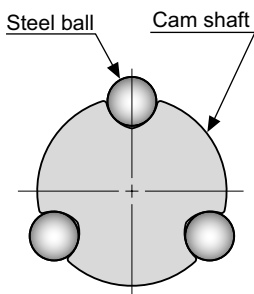
Oil

Ion-nitrided parts

Casing and cylinder cap are ion-nitrided for anti-abrasive and antirust durability.

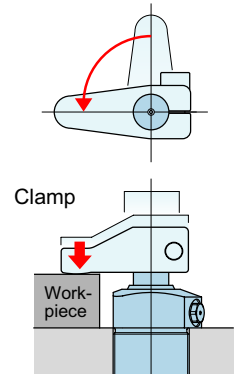
3 Steel ball

Smooth and stable rotation by 3 steel balls around cam shaft.

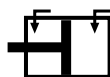


High speed swing

90° Swing 0.3 ~ 0.4 sec.



Double acting MODEL **CTW**



Model	CTW06	CTW10	CTW16	CTW25
Cylinder force at 5000 psi	1390 lbs	3180 lbs	4260 lbs	5820 lbs
Clamping force ※1	at 5000 psi	1200 lbs	2750 lbs	5060 lbs
	at 3500 psi	840 lbs	1920 lbs	3540 lbs
	at 2000 psi	480 lbs	1100 lbs	2020 lbs
Standard clamp arm length (LH)	1.57 in	1.97 in	2.24 in	2.56 in
Cylinder inner diameter	0.87 in	1.26 in	1.57 in	1.75 in
Rod diameter	0.63 in	0.88 in	1.18 in	1.26 in
Cylinder effective area	0.28 in ²	0.64 in ²	0.85 in ²	1.16 in ²
Swing angle	90° (Repeatability ±0.5°)			
Full stroke	0.866 in	1.102 in	1.260 in	1.575 in
Swing stroke (90°)	0.472 in	0.590 in	0.709 in	0.945 in
Clamp stroke	0.394 in	0.512 in	0.551 in	0.630 in
Maximum swing torque ※2	0.26 ft-lb	0.71 ft-lb	1.11 ft-lb	1.55 ft-lb
Maximum oil flow rate	Clamping side	26 in ³ /min	75 in ³ /min	91 in ³ /min
	Unclamping side	56 in ³ /min	147 in ³ /min	207 in ³ /min
Cylinder oil capacity	Clamping side	0.24 in ³	0.70 in ³	1.07 in ³
	Unclamping side	0.51 in ³	1.37 in ³	2.45 in ³
Weight	2.0 lbs	4.4 lbs	7.5 lbs	10.4 lbs

Working pressure range 500~ 5000 psi, Ambient temperature 32 ~ 158°F

※1 : With standard length clamp arm (W1 and W2 series, See page 21) equipped

※2 : When using a large clamp arm vertically (direction of clamp rod is horizontal), make sure that the torque required to turn the clamp arm is less than above specified maximum swing torque.

※ : Fluorine rubber (Viton) is adopted at the sealing portions for protection against chlorine coolant. (This is not a heat proof specification)

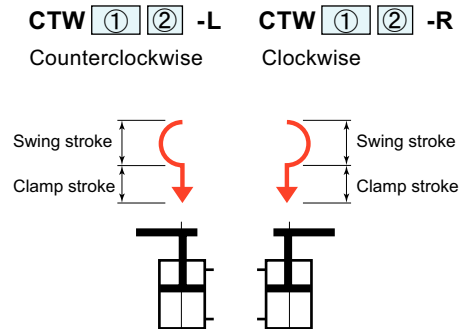
Class Definition (Example : CTW16T-R)

CTW	① Size ※1	② Type of mounting ※2	③ Swing orientation ※3
		06 10 16 25	U : Upper flange type B : Lower flange type T : Threaded body type (Unified thread)

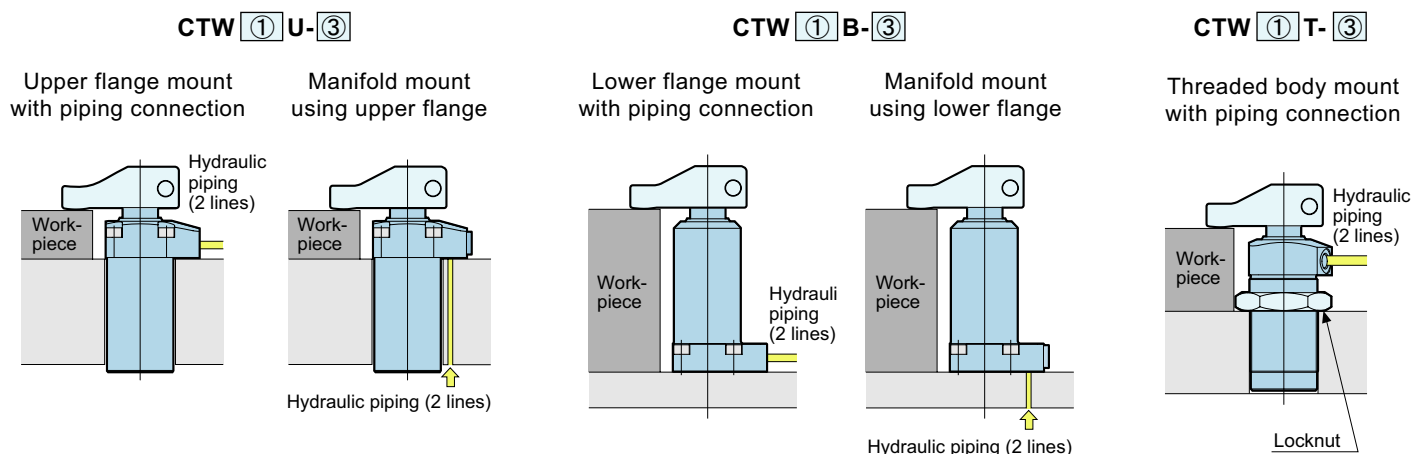
※1 : Refer to specification table. ※2 : Refer to mounting example.

※3 : Refer to clamping action.

Clamping action

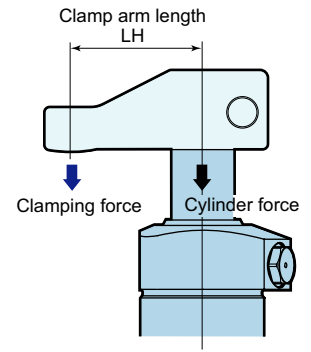


Mounting example



Clamp arm length (LH) and clamping force (Performance table and diagram)

The clamping force varies according to the clamp arm length (LH) and hydraulic force. Select the most suitable model considering clamp arm length (LH), working pressure applicable and mounting dimension, etc.



<EXAMPLE : 1>

When clamp arm length (LH) 3 inches and clamping force 1800 lbs are required, the applicable hydraulic pressures are as follows.

- CTW06 - Nonusable
- CTW10 - 3500 psi
- CTW16 - 3000 psi
- CTW25 - 2000 psi

<EXAMPLE : 2>

When using model CTW10 with hydraulic pressure 2500 psi, clamping forces against the clamp arm are as follows.





- LH= 3 inch - 1280 lbs
- LH= 4 inch - 1210 lbs
- LH= 5 inch - 1140 lbs
- LH= 6 inch - Nonusable

CTW 06								indicates nonusable range.
Hydraulic pressure (psi)	Cylinder force (lbs)	Clamping force (lbs)					Maximum clamp arm length (LH) (in)	
		Clamp arm length LH (in)						
		1.57	2	3	4	5		
5000	1390	1200					1.57	
4500	1250	1080					1.7	
4000	1110	960	920				2.0	
3500	970	840	810				2.3	
3000	830	720	690	640			2.9	
2500	690	600	580	530	490		3.6	
2000	560	480	460	430	400	370	5.1	
1500	420	360	350	320	300	280	8.0	
1000	280	240	230	210	200	180	↑	
500	140	120	120	110	100	90	8.0	

CTW 10								indicates nonusable range.
Hydraulic pressure (psi)	Cylinder force (lbs)	Clamping force (lbs)					Maximum clamp arm length (LH) (in)	
		Clamp arm length LH (in)						
		1.97	3	4	5	6		
5000	3180	2750					1.97	
4500	2860	2470					2.1	
4000	2540	2200					2.4	
3500	2230	1920	1800				2.9	
3000	1910	1650	1540				3.5	
2500	1590	1370	1280	1210	1140		4.4	
2000	1270	1100	1030	970	910	860	6.1	
1500	950	830	770	720	680	650	9.5	
1000	640	550	510	480	460	430	↑	
500	320	280	260	240	230	220	9.5	

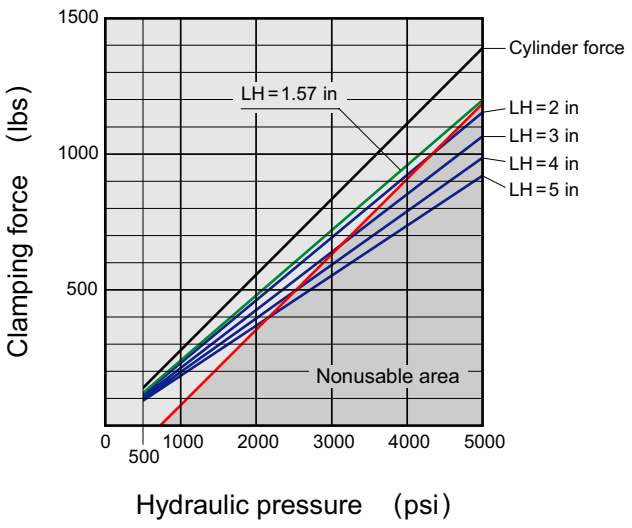
CTW 16								indicates nonusable range.
Hydraulic pressure (psi)	Cylinder force (lbs)	Clamping force (lbs)					Maximum clamp arm length (LH) (in)	
		Clamp arm length LH (in)						
		2.24	3	4	5	6		
5000	4260	3680					2.24	
4500	3840	3310					2.24	
4000	3410	2940	2810				2.4	
3500	2980	2580	2460				2.9	
3000	2560	2210	2110	1990			3.5	
2500	2130	1840	1760	1660	1580		4.4	
2000	1710	1470	1410	1330	1260	1200	6.0	
1500	1280	1100	1060	1000	950	900	9.3	
1000	850	740	700	670	630	600	10.0	
500	430	370	350	330	320	300	10.0	

CTW 25								indicates nonusable range.
Hydraulic pressure (psi)	Cylinder force (lbs)	Clamping force (lbs)					Maximum clamp arm length (LH) (in)	
		Clamp arm length LH (in)						
		2.56	3	4	5	6		7
5000	5820	5060					2.56	
4500	5240	4550	4450				2.56	
4000	4660	4050	3960				2.8	
3500	4080	3540	3460	3300			3.3	
3000	3490	3030	2970	2830			4.0	
2500	2910	2530	2470	2360	2250	2150	5.1	
2000	2330	2020	1980	1880	1800	1720	6.9	
1500	1750	1520	1480	1410	1350	1290	10.5	
1000	1170	1010	990	940	900	860	820	↑
500	580	510	500	470	450	430	410	10.5

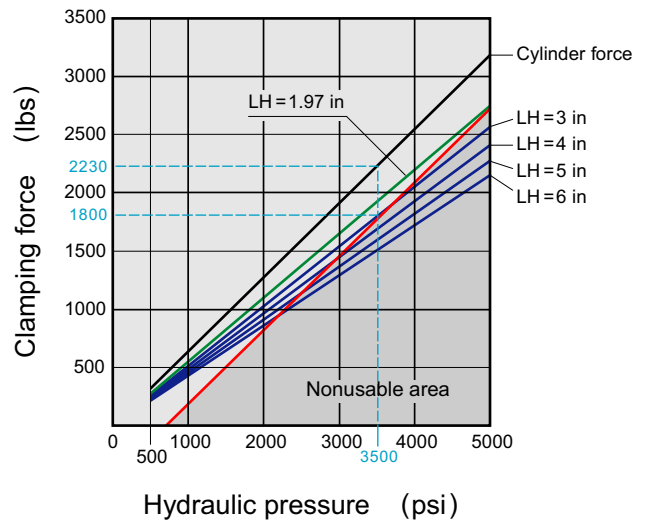
1. The line  on the diagrams in this page indicates the relation between clamping force and hydraulic pressure to the clamp arm length (LH).
2. Do not apply the hydraulic pressure under the line  in the diagram. The use at excessive pressure may cause malfunction or damage at cylinder.
3. The line  in the diagram shows the performance when the standard length clamp arm model CTH  -W1 or W2 is used.

〈How to view the diagram〉
 When using model CTW10 with clamp arm length (LH) 3 inches and hydraulic pressure 3500 psi, cylinder force and clamping force are as follows.
 Cylinder force - 2230 psi
 Clamping force - 1800 psi

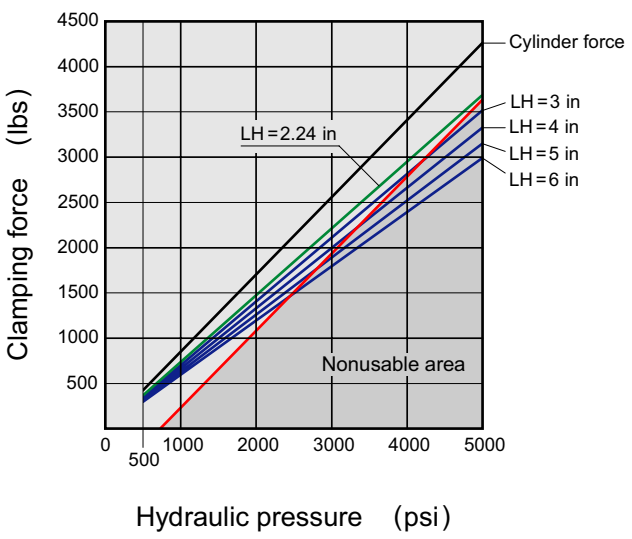
CTW 06



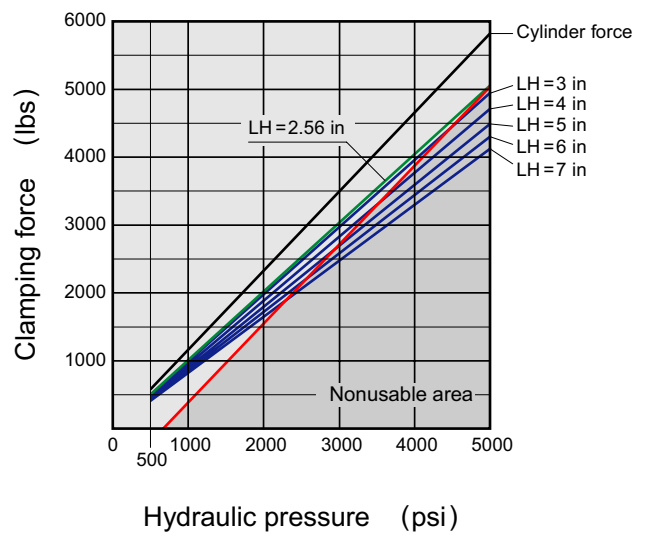
CTW 10



CTW 16

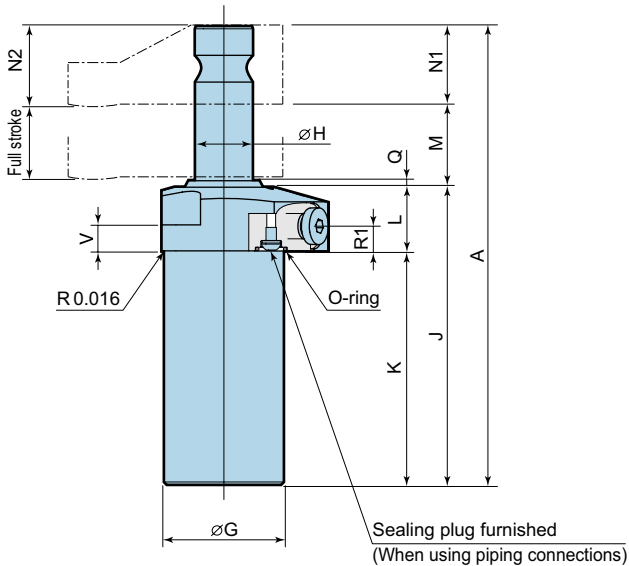
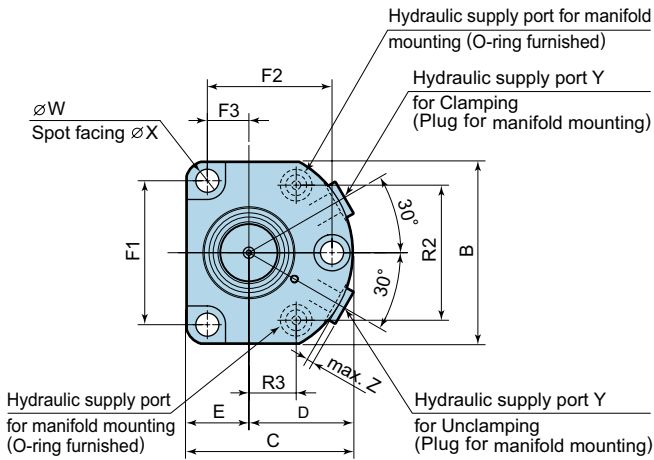


CTW 25

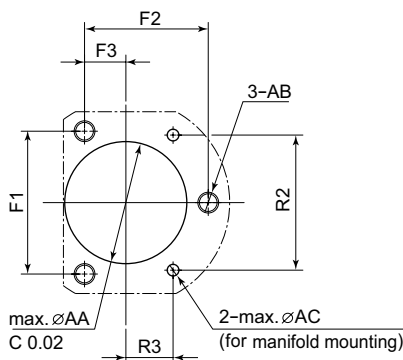


(inch-accept where noted)

CTW 06 & 10 U

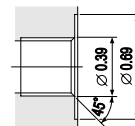


Mounting details



Model	CTW06U	CTW10U
A	5.39	6.95
B	2.20	2.76
C	1.99	2.52
D	1.28	1.57
E	0.71	0.94
F1	1.70	2.18
F2	1.48	1.89
F3	0.49	0.63
G	1.291-1.295	1.803-1.807
H	0.63	0.88
J	3.56	4.51
K	2.60	3.54
L	0.96	0.96
M	1.00	1.26
N1	0.83	1.18
N2	0.85	1.22
Q	0.08	0.10
R1	0.37	0.37
R2	1.61	2.06
R3	0.56	0.72
V	0.51	0.39
W	0.28	0.35
X	0.43	0.55
Y	※1	G1/8
Z	0.11	0.11
O-ring	※2	P9
AA	1.34	1.85
AB	1/4-20 (M6)	5/16-18 (M8)
AC	0.28	0.28

G1/8(BSPP)



※1 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

※2 : O-ring material is fluorine rubber (hardness Hs90).

※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

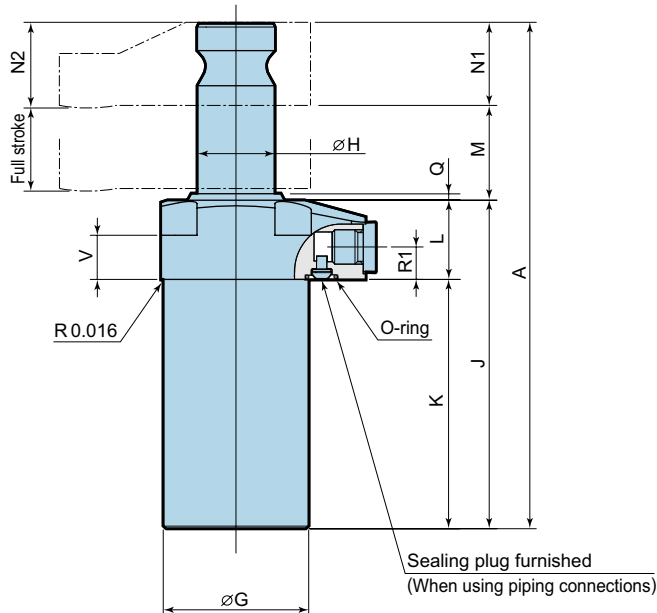
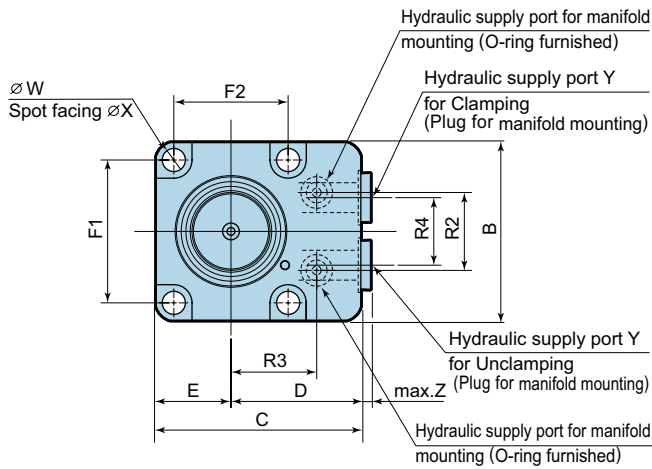
1. For manifold mounting, the o-ring sealing area should have a minimum surface finish of 63 MU in.
2. Mounting bolts are not furnished.

Dimensions (Type U — size 16 & 25)

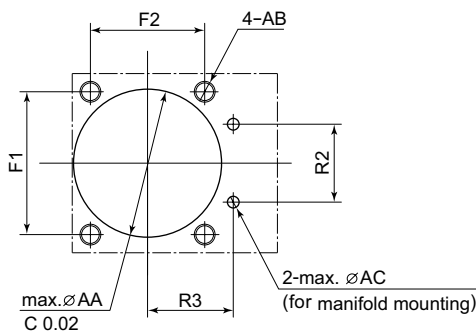
Double Acting 

(inch-accept where noted)

CTW 16 & 25 U

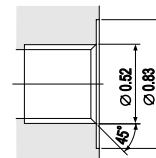


Mounting details



Model	CTW16U	CTW25U
A	7.68	8.90
B	2.72	2.72
C	3.11	3.44
D	1.97	2.09
E	1.14	1.36
F1	2.17	2.17
F2	1.73	2.17
G	2.197-2.201	2.413-2.417
H	1.18	1.26
J	4.98	5.79
K	3.76	4.57
L	1.20	1.22
M	1.44	1.73
N1	1.26	1.38
N2	1.30	1.44
Q	0.10	0.08
R1	0.49	0.49
R2	1.18	1.18
R3	1.30	1.42
R4	1.02	1.02
V	0.67	0.67
W	0.35	0.35
X	0.55	0.55
Y	※1	G1/4
Z	0.17	0.17
O-ring	※2	P9
AA	2.24	2.46
AB	5/16-18 (M8)	5/16-18 (M8)
AC	0.28	0.28

G1/4(BSP)



※1 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

※2 : O-ring material is fluorine rubber (hardness Hs90).

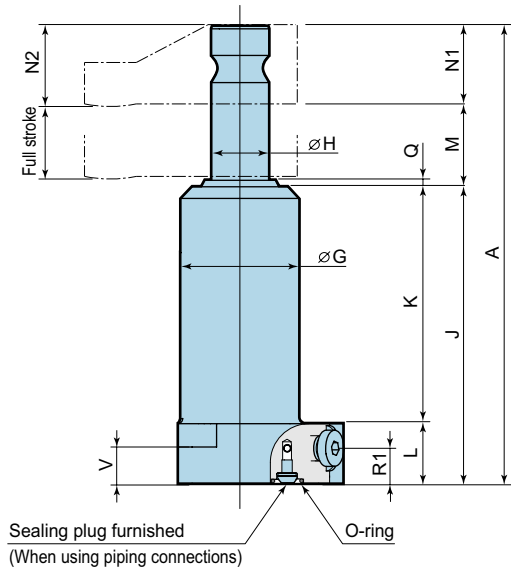
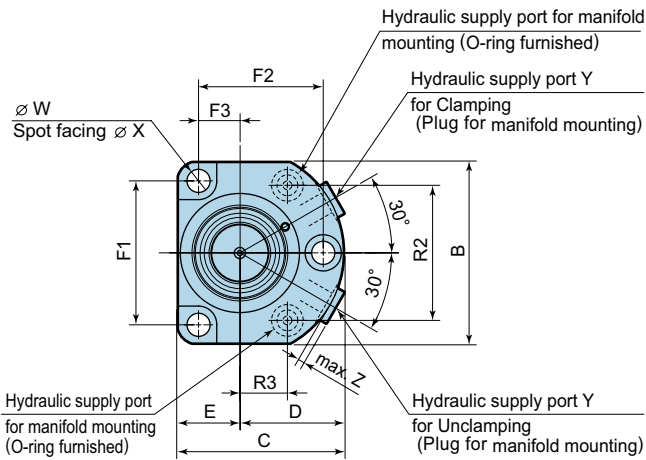
※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

1. For manifold mounting, the o-ring sealing area should have a minimum surface finish of 63 MU in.

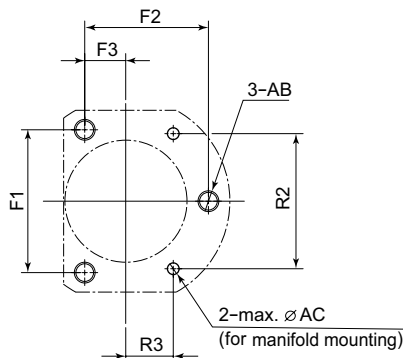
2. Mounting bolts are not furnished.

(inch-accept where noted)

CTW 06 & 10 B

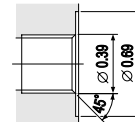


Mounting details



Model	CTW06B	CTW10B
A	5.39	6.95
B	2.20	2.76
C	1.99	2.52
D	1.28	1.57
E	0.71	0.94
F1	1.70	2.18
F2	1.48	1.89
F3	0.49	0.63
G	1.38	1.81
H	0.63	0.88
J	3.56	4.51
K	2.66	3.60
L	0.91	0.91
M	1.00	1.26
N1	0.83	1.18
N2	0.85	1.22
Q	0.08	0.10
R1	0.53	0.53
R2	1.61	2.06
R3	0.56	0.72
V	0.63	0.55
W	0.28	0.35
X	0.43	0.55
Y	※1	G1/8
Z	0.11	0.11
O-ring	※2	P9
AB	1/4-20 (M6)	5/16-18 (M8)
AC	0.28	0.28

G1/8(BSPP)



※1 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

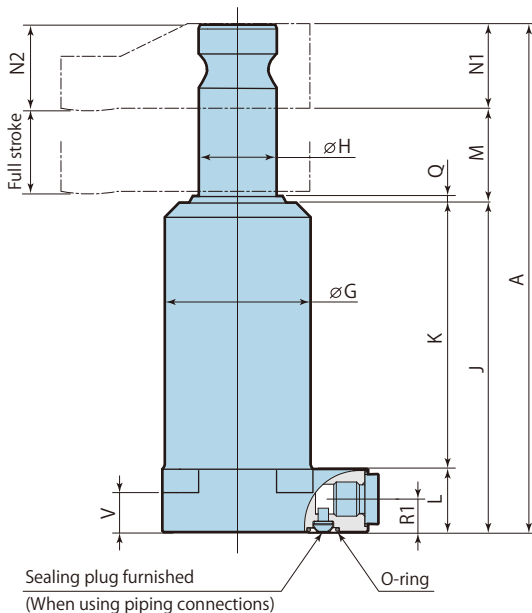
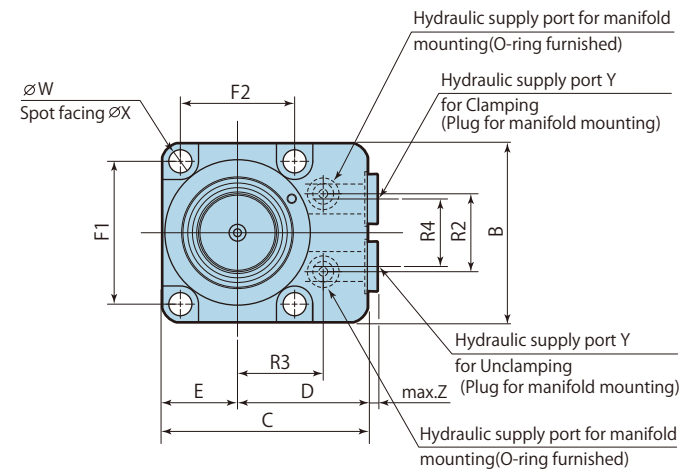
※2 : O-ring material is fluorine rubber (hardness Hs90).

※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

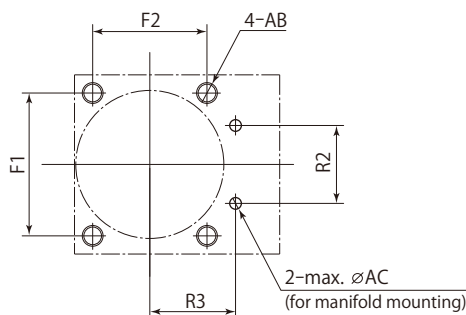
1. For manifold mounting, the o-ring sealing area should have a minimum surface finish of 63 MU in.
2. Mounting bolts are not furnished.

(inch-accept where noted)

CTW 16 & 25 B

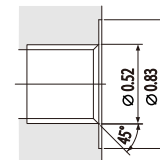


Mounting details



Model	CTW16B	CTW25B
A	7.68	8.90
B	2.72	2.72
C	3.11	3.44
D	1.97	2.09
E	1.14	1.36
F1	2.17	2.17
F2	1.73	2.17
G	2.20	2.42
H	1.18	1.26
J	4.98	5.79
K	4.04	4.84
L	0.94	0.94
M	1.44	1.73
N1	1.26	1.38
N2	1.30	1.44
Q	0.10	0.08
R1	0.49	0.49
R2	1.18	1.18
R3	1.30	1.42
R4	1.02	1.02
V	0.59	0.59
W	0.35	0.35
X	0.55	0.55
Y	※1	G1/4
Z	0.17	0.17
O-ring	※2	P9
AB	5/16-18 (M8)	5/16-18 (M8)
AC	0.28	0.28

G1/4(BSPP)



※1 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

※2 : O-ring material is fluorine rubber (hardness Hs90).

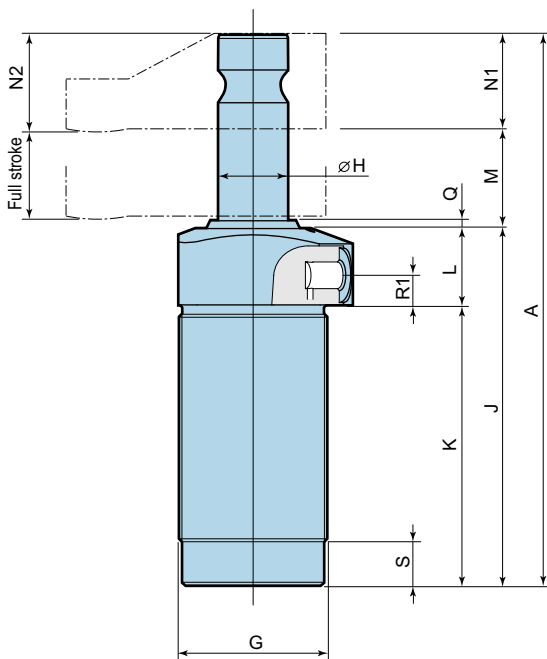
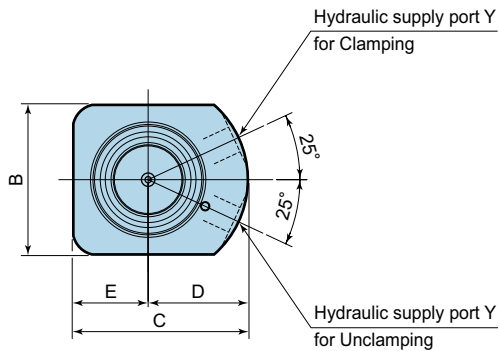
※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

1. For manifold mounting, the o-ring sealing area should have a minimum surface finish of 63 MU in.

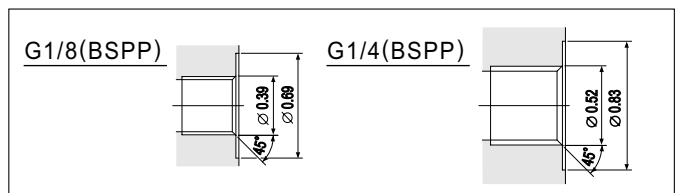
2. Mounting bolts are not furnished.

(inch-accept where noted)

CTW ① T



Model	CTW06T	CTW10T	CTW16T	CTW25T
A	5.39	6.95	7.68	8.90
B	1.42	1.89	2.24	2.50
C	1.85	2.20	2.72	2.91
D	1.14	1.26	1.57	1.65
E	0.71	0.94	1.14	1.26
G	※1 1 3/8 -18	1 7/8 -16	2 1/4 -16	2 1/2 -16
H	0.63	0.88	1.18	1.26
J	3.56	4.51	4.98	5.79
K	2.60	3.54	3.82	4.61
L	0.96	0.96	1.16	1.18
M	1.00	1.26	1.44	1.73
N1	0.83	1.18	1.26	1.38
N2	0.85	1.22	1.30	1.44
Q	0.08	0.10	0.10	0.08
R1	0.37	0.37	0.45	0.45
S	0.43	0.55	0.59	0.59
Y	※2 G1/8	G1/8	G1/4	G1/4



※1 : Metric thread models are also available. Please contact Pascal for additional details.

※2 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

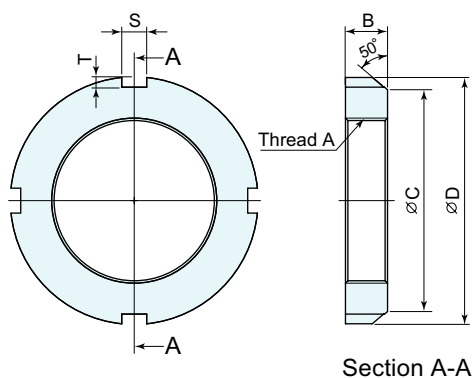
※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

1. Locknut is not furnished.

(inch-accept where noted)

Locknut

model CTH ① -VN



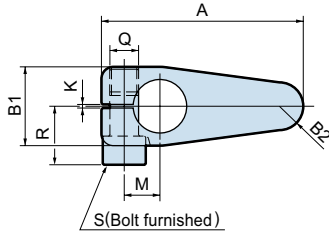
Model	CTH06-VN	CTH10-VN	CTH16-VN	CTH25-VN
A	1 3/8 -18	1 7/8 -16	2 1/4 -16	2 1/2 -16
B	0.448	0.51	0.635	0.635
C	1.813	2.438	2.875	3.125
D	2.063	2.75	3.25	3.50
S	0.178	0.302	0.302	0.302
T	0.094	0.125	0.156	0.156
Clamp model applied	CTW06T	CTW10T	CTW16T	CTW25T

Clamp arms — standard and extended length type

(inch-accept where noted)

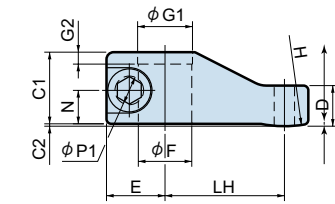
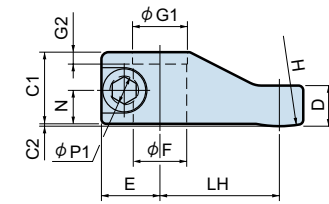
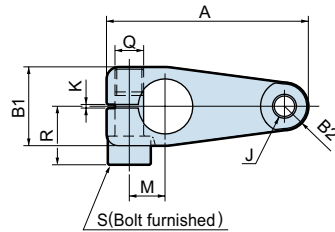
W1 clamp arm

model CTH ①-W1



W2 clamp arm

model CTH ①-W2

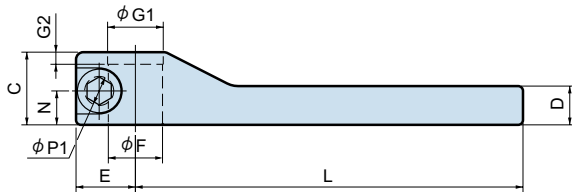
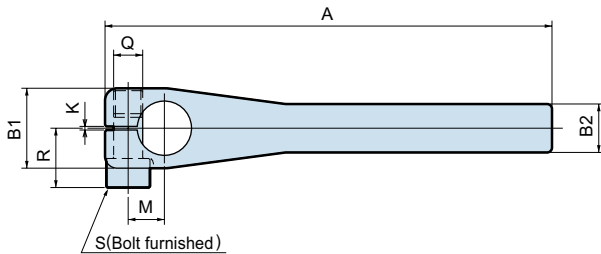


Material : Alloy steel Hardness : HRC30 ~ 37

Clamp arm model	CTH06-W1 CTH06-W2	CTH10-W1 CTH10-W2	CTH16-W1 CTH16-W2	CTH25-W1 CTH25-W2
A	2.54	3.33	3.86	4.45
B1	0.94	1.30	1.69	1.93
B2	0.28	0.39	0.43	0.59
C1	0.83	1.18	1.26	1.38
C2	0.02	0.04	0.04	0.06
D	0.49	0.67	0.83	0.85
E	0.69	0.96	1.18	1.30
F	0.629-0.630	0.881-0.882	1.180-1.181	1.259-1.260
G1	—	0.91	—	1.30
G2	—	0.21	—	0.24
H	1.97	1.97	2.36	2.95
J	M8 × 1.25	M10 × 1.5	M10 × 1.5	M12 × 1.75
K	0.08	0.08	0.08	0.08
LH	1.57	1.97	2.24	2.56
M	0.409-0.417	0.587-0.594	0.744-0.752	0.803-0.811
N	0.39	0.55	0.59	0.63
P1	0.3150-0.3156	0.4724-0.4731	0.5512-0.5519	0.6299-0.6306
Q	M8 × 1.0	M12 × 1.5	M14 × 1.5	M16 × 1.5
R	0.65	0.96	1.16	1.36
S (Bolt)	CTH06-VB	CTH10-VB	CTH16-VB	CTH25-VB
Clamp arm weight	0.28 lbs	0.72 lbs	1.14 lbs	1.71 lbs
Clamp model applied	CTW06 CTV06	CTW10 CTV10	CTW16 CTV16	CTW25 CTV25

WL clamp arm

model CTH ①-WL



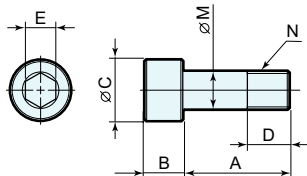
Material : Alloy steel Hardness : HRC30 ~ 37

(inch-accept where noted)

Clamp arm model	CTH06-WL	CTH10-WL	CTH16-WL	CTH25-WL
A	6.00	7.26	7.87	8.39
B1	0.94	1.30	1.69	1.93
B2	0.55	0.79	0.87	1.18
C	0.83	1.18	1.26	1.38
D	0.47	0.63	0.79	0.79
E	0.69	0.96	1.18	1.30
F	0.629-0.630	0.881-0.882	1.180-1.181	1.259-1.260
G1	—	0.91	—	1.30
G2	—	0.20	—	0.24
K	0.08	0.08	0.08	0.08
L	5.31	6.30	6.69	7.09
M	0.409-0.417	0.587-0.594	0.744-0.752	0.803-0.811
N	0.39	0.55	0.59	0.63
P1	0.3150-0.3156	0.4724-0.4731	0.5512-0.5519	0.6299-0.6306
Q	M8 × 1.0	M12 × 1.5	M14 × 1.5	M16 × 1.5
R	0.65	0.96	1.16	1.36
S (Bolt)	CTH06-VB	CTH10-VB	CTH16-VB	CTH25-VB
Clamp arm weight	0.54 lbs	1.28 lbs	1.92 lbs	2.76 lbs
Clamp model applied	CTW06 CTV06	CTW10 CTV10	CTW16 CTV16	CTW25 CTV25

Bolt

model CTH ①-VB



(inch-accept where noted)

Bolt model	CTH06-VB	CTH10-VB	CTH16-VB	CTH25-VB
A	0.79	1.10	1.38	1.61
B	0.31	0.47	0.55	0.63
C	0.51	0.71	0.83	0.94
D	0.35	0.43	0.51	0.59
E	0.24	0.39	0.47	0.55
M	0.3130-0.3146	0.3917-0.3933	0.4705-0.4720	0.6280-0.6295
N	M8 × 1.0	M12 × 1.5	M14 × 1.5	M16 × 1.5
Clamp model applied	CTW06 CTV06	CTW10 CTV10	CTW16 CTV16	CTW25 CTV25

⚠ Caution in use

Swing speed adjustment

If the swing speed of the clamp arm is too fast, it may become a cause of damage. Adjust the swing speed by using a flow control valve with a reverse check in order to make the 90° swing time longer than the time specified at “Minimum swing time” in the below table. Note that the 90° swing time does not include the time for the straight travel stroke.

Clamp model	Minimum swing time	Maximum oil flow rate (reference)	
		Clamping side	Unclamping side
CTW06/CTV06	0.3 sec	26 in ³ /min	56 in ³ /min※
CTW10/CTV10	0.3 sec	75 in ³ /min	147 in ³ /min※
CTW16/CTV16	0.4 sec	91 in ³ /min	207 in ³ /min※
CTW25/CTV25	0.4 sec	165 in ³ /min	342 in ³ /min※

※ For double acting model CTW only.

Inertia of clamp arm

Large inertia force can also be a cause of damage. When fabricating a custom clamp arm, be sure to make its inertia force lower than the figures at “Maximum inertia of clamp arm” specified in the table below.

Clamp model	Maximum inertia of clamp arm
CTW06 / CTV06	3.80×10^{-2} ft ² -lb
CTW10 / CTV10	1.22×10^{-1} ft ² -lb
CTW16 / CTV16	2.03×10^{-1} ft ² -lb
CTW25 / CTV25	3.30×10^{-1} ft ² -lb

Inertia of Standard and Extended length type clamp arm (reference)

Clamp arm model		Inertia
standard type	CTH06-W1 / CTH06-W2	1.44×10^{-3} ft ² -lb
	CTH10-W1 / CTH10-W2	6.08×10^{-3} ft ² -lb
	CTH16-W1 / CTH16-W2	1.31×10^{-2} ft ² -lb
	CTH25-W1 / CTH25-W2	2.70×10^{-2} ft ² -lb
Extended length type	CTH06-WL	2.55×10^{-2} ft ² -lb
	CTH10-WL	8.26×10^{-2} ft ² -lb
	CTH16-WL	1.38×10^{-1} ft ² -lb
	CTH25-WL	2.26×10^{-1} ft ² -lb

Mounting & Dismounting clamp arm

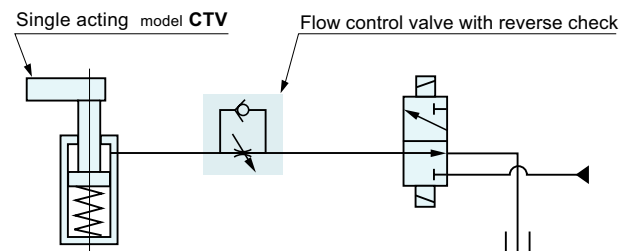
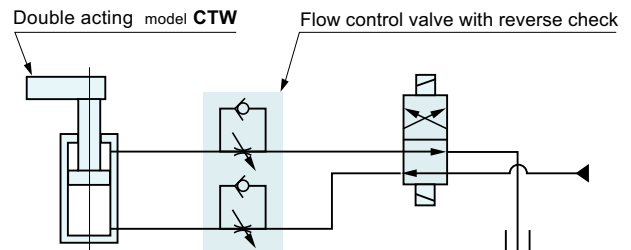
The swing clamp has a cam structure with lead grooves that could be damaged if excessive torque were to be applied to the piston rod. Be certain to loosen the side bolt before repositioning the clamp arm.

When tightening a side bolt, refer to the below table for its torque.

Clamp model	Bolt size	Tightening torque
CTW06 / CTV06	M 8	21 ft-lb
CTW10 / CTV10	M12	70 ft-lb
CTW16 / CTV16	M14	110 ft-lb
CTW25 / CTV25	M16	180 ft-lb

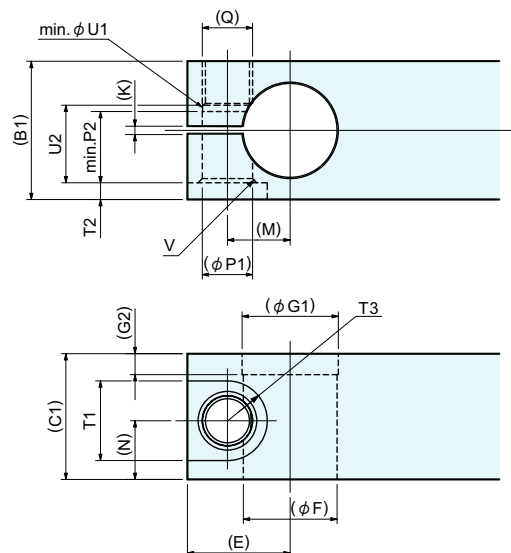
Hydraulic circuit diagram (reference)

Flow control valve with a reverse check should always be used as “Meter-in”. If used as “Meter-out”, there could be excessive backpressure on the clamping side of cylinder. This backpressure could cause damage.



Detail of arm machining dimensions (reference)

When fabricating a clamp arm, refer to the following drawing.



Clamp model	CTW06 CTV06	CTW10 CTV10	CTW16 CTV16	CTW25 CTV25
P2	0.43	0.67	0.87	1.02
T1	0.551	0.748	0.866	0.984
T2	0.14	0.16	0.24	0.24
T3	0.276	0.374	0.433	0.492
U1	0.31	0.47	0.55	0.63
U2	0.49	0.73	0.93	1.08
V	C0.04	C0.04	C0.06	C0.06

For the dimensions in (), refer to page 21.