

Pascal Swing Clamp

Advanced ball and groove design

Clamp arm

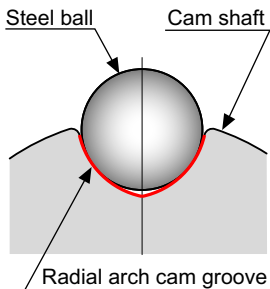
A variety of workpieces can be clamped by replacing the clamp arm. Standard and extended clamp arms are available as options.

Side accessing clamp arm

Handy for mounting and angle adjustment.

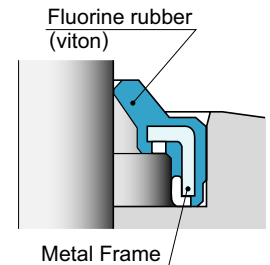
Cam groove with maximum surface contact area

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.)



Heavy-duty scraper

Protects the cylinder from high pressure coolant and machining chips.



Cam shaft

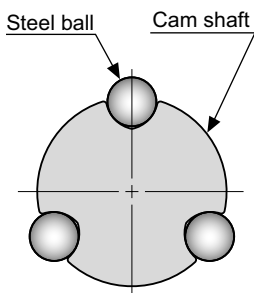
Oil

Ion-nitrided parts

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

3 Steel ball

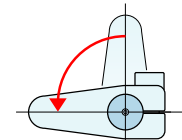
Smooth and stable rotation by 3 steel balls around cam shaft.



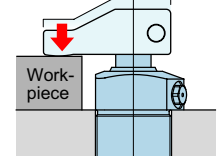
Return spring
(Antirust treated)

High speed swing

90° Swing 0.3 ~ 0.4 sec.



Clamp



Single acting MODEL **CTV**



Model		CTV06	CTV10	CTV16	CTV25
Cylinder force at 5000 psi ※1		1330 lbs	3030 lbs	4080 lbs	5560 lbs
Clamping force ※1, ※2	at 5000 psi	1150 lbs	2620 lbs	3520 lbs	4830 lbs
	at 3500 psi	790 lbs	1790 lbs	2420 lbs	3310 lbs
	at 2000 psi	430 lbs	970 lbs	1310 lbs	1800 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 <td 0.630 in	
Maximum swing torque ※3		0.26 ft-lb	0.71 ft-lb	1.11 ft-lb	1.55 ft-lb
Maximum oil flow rate		26 in ³ /min	75 in ³ /min	91 in ³ /min	165 in ³ /min
Cylinder oil capacity		0.24 in ³	0.70 in ³	1.07 in ³	1.83 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 : At the center of clamp stroke

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

※3 : 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)

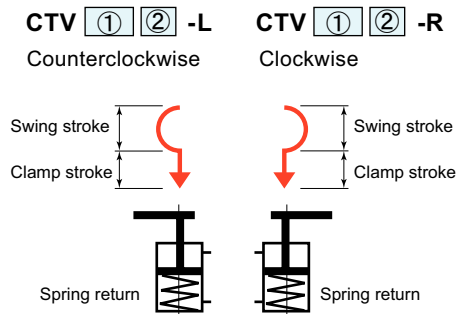
Class Definition (Example : CTV16U-L)

CTV	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)

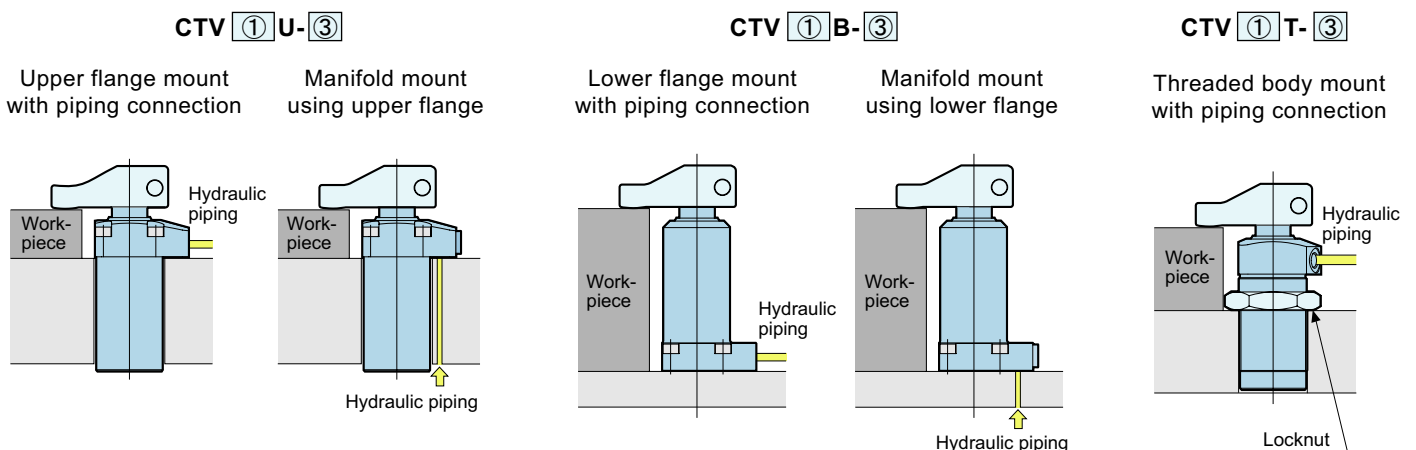
※1 : Refer to specification table. ※2 : Refer to mounting example.

※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〉

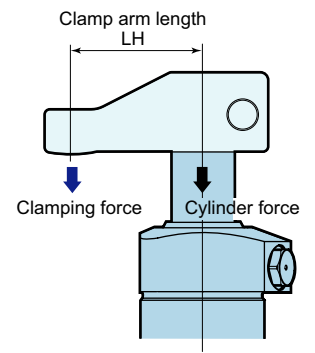
When clamp arm length (LH) 3 inches and clamping force 1600 lbs are required, the applicable hydraulic pressures are as follows.

- CTV06 - Nonusable
- CTV10 - 3500 psi
- CTV16 - 2500 psi
- CTV25 - 2000 psi

〈EXAMPLE : 2〉

When using model CTV10 with hydraulic pressure 2500 psi, clamping forces against the clamp arm are as follows.

- LH= 3 inch - 1160 lbs
- LH= 4 inch - 1090 lbs
- LH= 5 inch - 1030 lbs
- LH= 6 inch - Nonusable







CTV 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	1330	1150					1.6	
4500	1190	1030	990				1.8	
4000	1050	910	880				2.2	
3500	910	790	760				2.5	
3000	780	670	640	590			3.1	
2500	640	550	530	490	450		4.1	
2000	500	430	410	380	350	330	6.0	
1500	360	310	300	280	260	240	8.0	
1000	220	190	180	170	160	150	↑	
500	80	70	70	60	60	50	8.0	

CTV 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	3030	2620					2.0	
4500	2710	2340					2.2	
4000	2390	2070					2.6	
3500	2080	1790	1680				3.1	
3000	1760	1520	1420	1330			3.9	
2500	1440	1240	1160	1090	1030		5.1	
2000	1120	970	910	850	800	760	7.5	
1500	800	690	650	610	570	540	9.5	
1000	490	420	390	370	350	330	↑	
500	170	140	140	130	120	110	9.5	

CTV 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	4080	3520					2.24	
4500	3650	3150					2.28	
4000	3230	2790	2660				2.6	
3500	2800	2420	2310	2180			3.1	
3000	2370	2050	1960	1850	1750		3.8	
2500	1950	1680	1610	1520	1440	1370	5.0	
2000	1520	1310	1260	1190	1120	1070	7.1	
1500	1090	950	900	850	810	770	10.0	
1000	670	580	550	520	490	470	↑	
500	240	210	200	190	180	170	10.0	

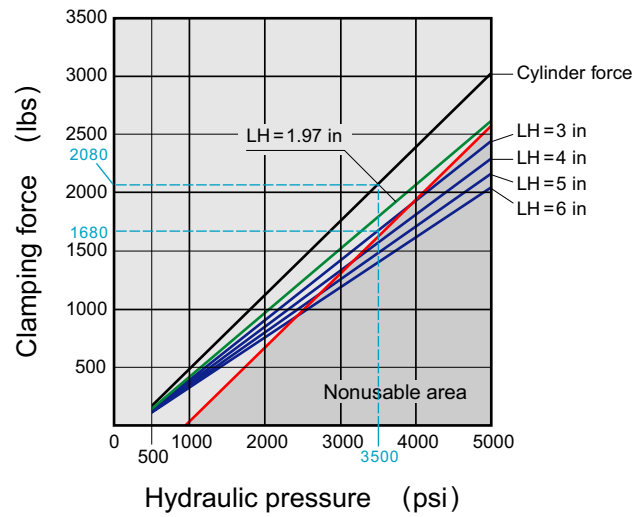
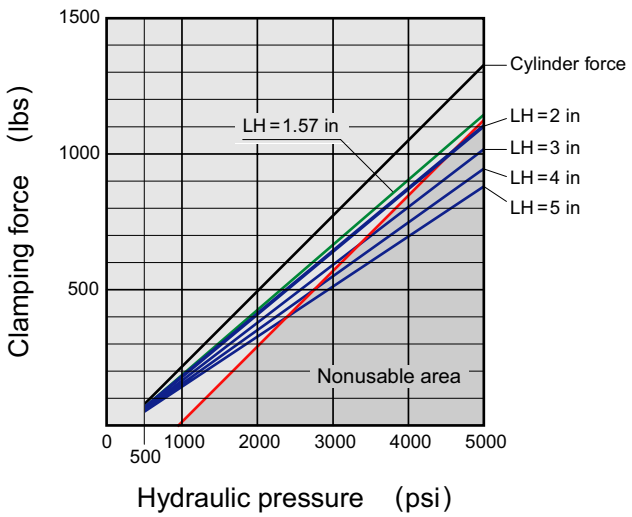
CTV 25								indicates nonusable range.
Hydraulic pressure (psi)	Cylinder force (lbs)	Clamping force (lbs)					Maximum clamp arm length (LH) (in)	
		Clamp arm length LH (in)						
		2.56	3	4	5	6		7
5000	5560	4830					2.56	
4500	4980	4330	4230				2.6	
4000	4400	3820	3740				3.0	
3500	3820	3320	3240	3090			3.6	
3000	3230	2810	2750	2620	2500		4.5	
2500	2650	2300	2250	2150	2050	1960	5.8	
2000	2070	1800	1760	1670	1600	1530	8.2	
1500	1490	1290	1260	1200	1150	1100	10.5	
1000	910	790	770	730	700	670	↑	
500	320	280	270	260	250	240	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 CTV10 with clamp arm length (LH) 3 inches and hydraulic pressure 3500 psi, cylinder force and clamping force are as follows.
 Cylinder force - 2080 psi
 Clamping force - 1680 psi

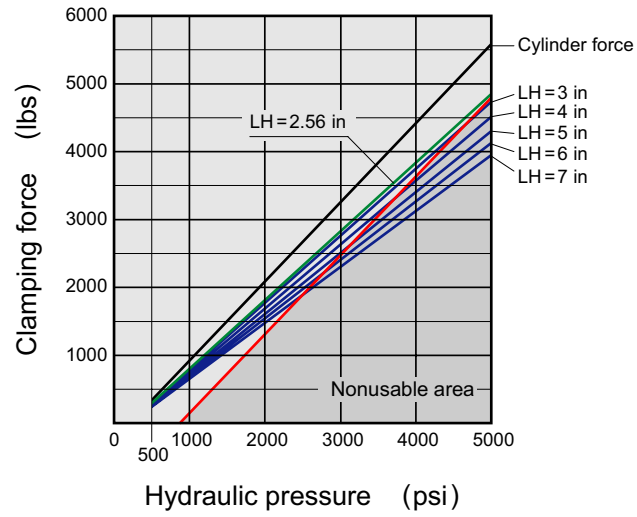
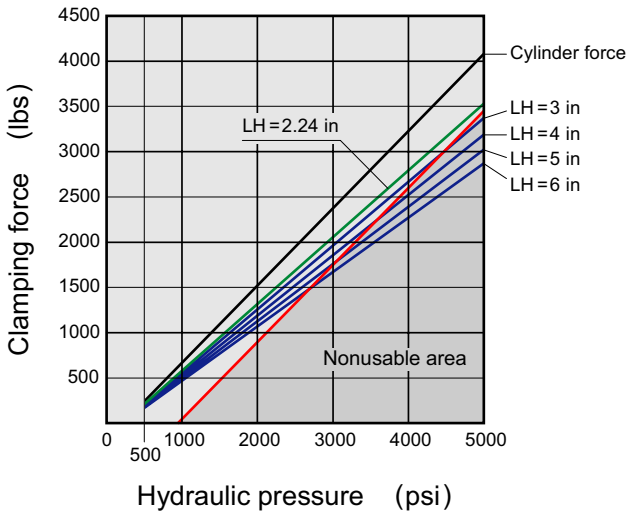
CTV 06

CTV 10



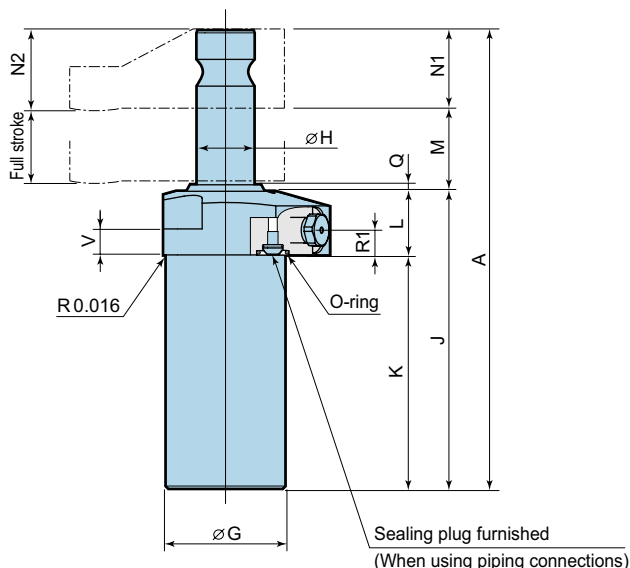
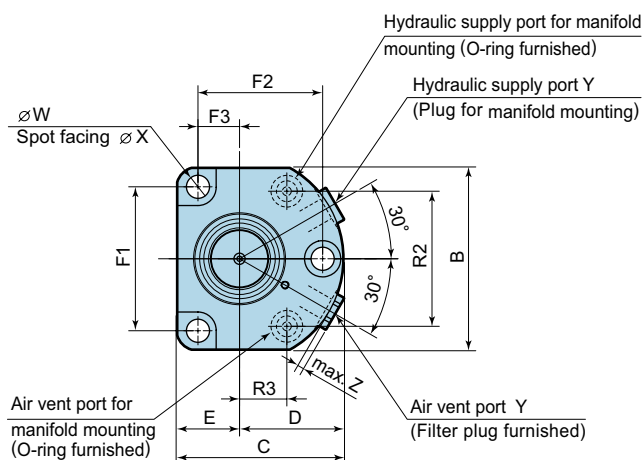
CTV 16

CTV 25

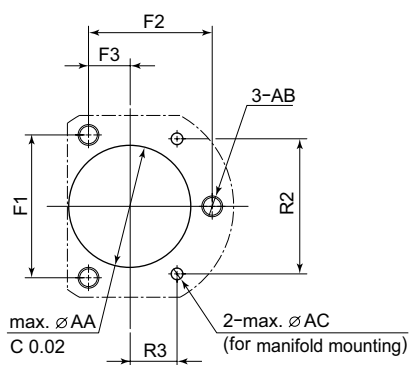


(inch-accept where noted)

CTV 06 & 10 U



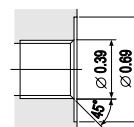
Mounting details



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

Model	CTV06U	CTV10U
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(BSP)

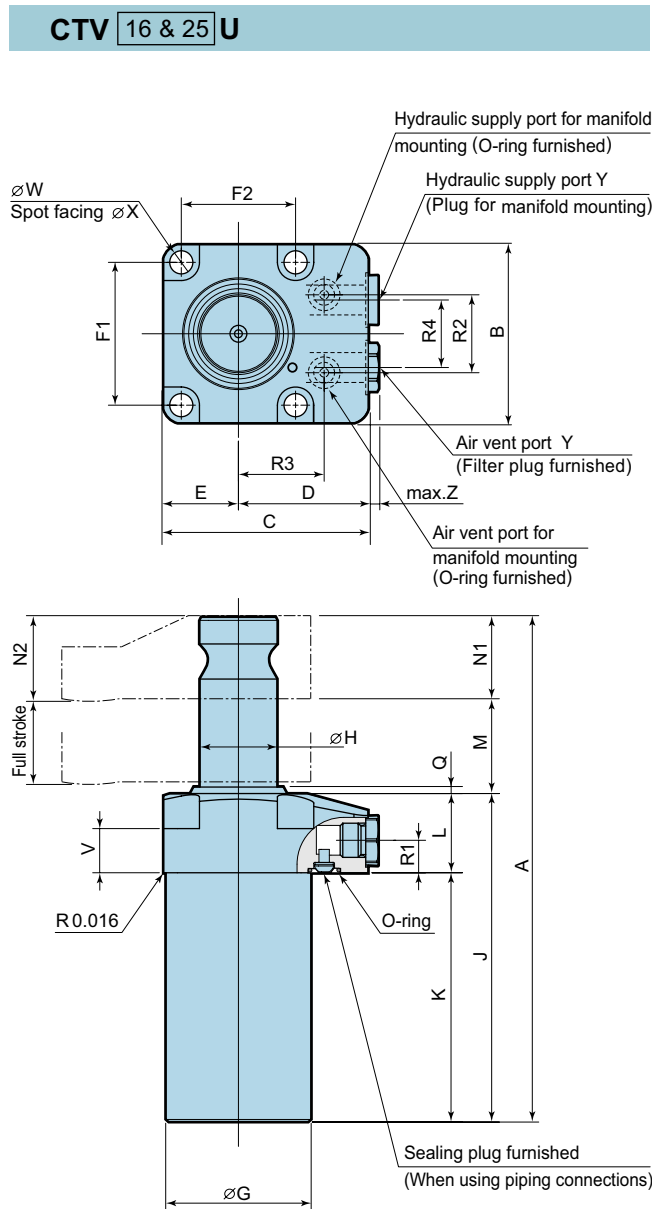


※1 : BSP tube fittings are available from Pascal. Please refer to separate listing for model number.

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

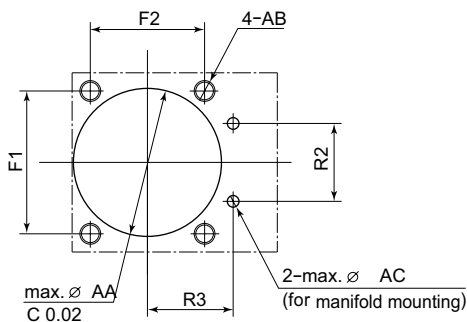
1. For manifold mounting, the o-ring sealing area should have a minimum surface finish of 63 MU in.
2. Mounting bolts are not furnished.
3. Do not block the air vent. If there is a chance of coolant or debris entering the air vent, pipe to a clean area of the fixture.

(inch-accept where noted)

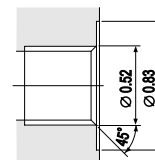


Model	CTV16U	CTV25U
A	7.68	8.90
B	2.72	2.72
C	3.11	3.44
D	1.97	2.09
E	1.14	1.36
F1	2.17	2.17
F2	1.73	2.17
G	2.197-2.201	2.413-2.417
H	1.18	1.26
J	4.98	5.79
K	3.78	4.57
L	1.20	1.22
M	1.44	1.73
N1	1.26	1.38
N2	1.30	1.44
Q	0.10	0.08
R1	0.49	0.49
R2	1.18	1.18
R3	1.30	1.42
R4	1.02	1.02
V	0.67	0.67
W	0.35	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

Mounting details



G1/4(BSPP)



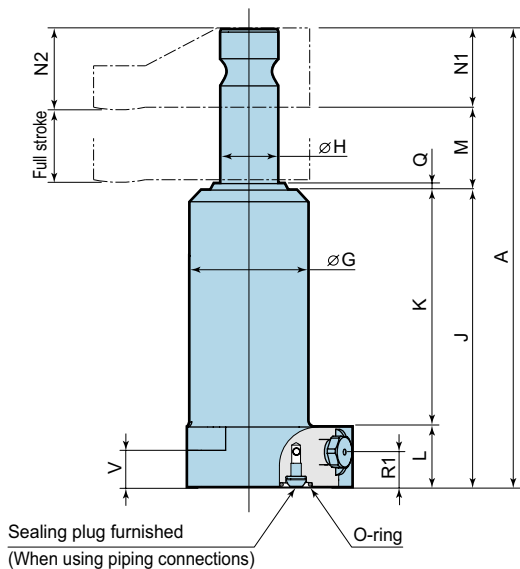
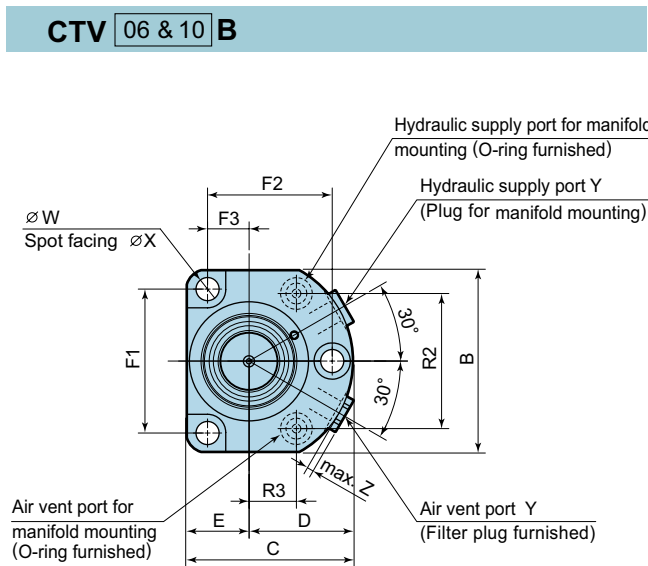
※1 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

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

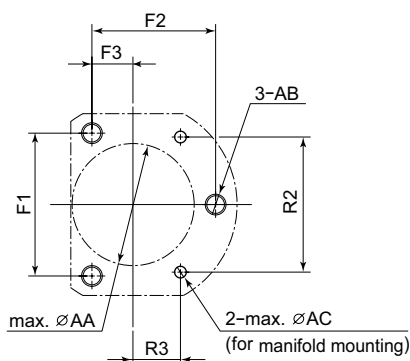
※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

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.
3. Do not block the air vent. If there is a chance of coolant or debris entering the air vent, pipe to a clean area of the fixture.

(inch-accept where noted)



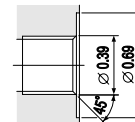
Mounting details



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

Model	CTV06B	CTV10B
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	G1/8
Z	0.11	0.11
O-ring ※2	P9	P9
AB	1/4-20 (M6)	5/16-18 (M8)
AC	0.28	0.28

G1/8(BSPP)



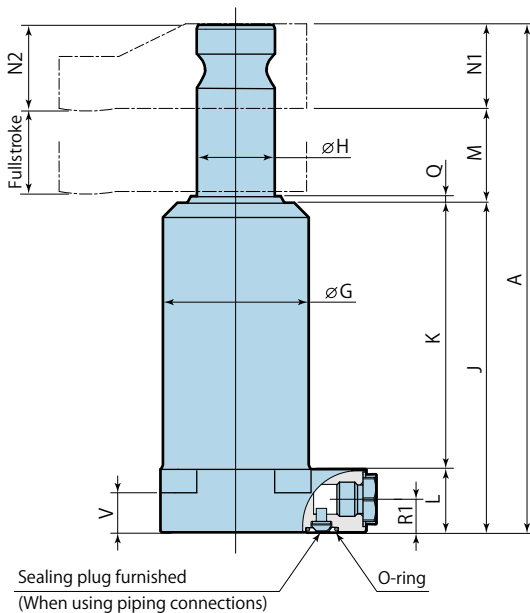
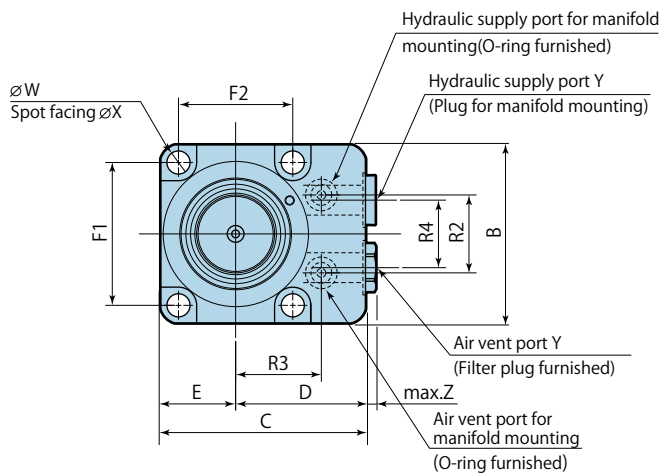
※1 : BSPP tube fittings are available from Pascal. Please refer to separate listing for model number.

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

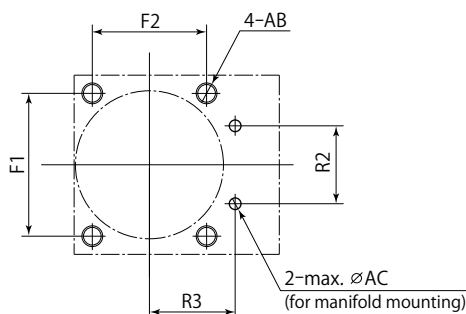
1. For manifold mounting, the o-ring sealing area should have a minimum surface finish of 63 MU in.
2. Mounting bolts are not furnished.
3. Do not block the air vent. If there is a chance of coolant or debris entering the air vent, pipe to a clean area of the fixture.

(inch-accept where noted)

CTV 16 & 25 B

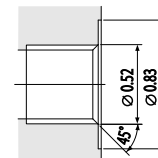


Mounting details



Model	CTV16B	CTV25B
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.

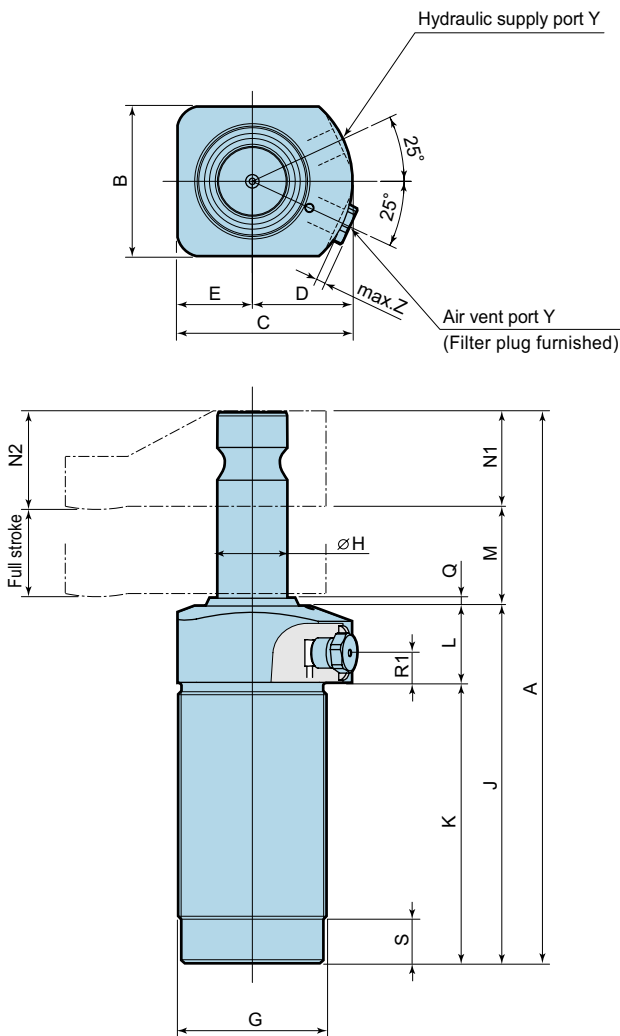
※2 : O-ring material is fluorine rubber (hardness Hs90).

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.
3. Do not block the air vent. If there is a chance of coolant or debris entering the air vent, pipe to a clean area of the fixture.

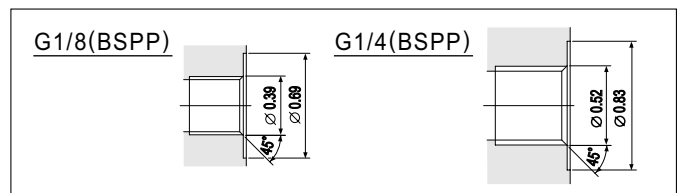
※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

(inch-accept where noted)

CTV T



Model	CTV06T	CTV10T	CTV16T	CTV25T
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
Z	0.10	0.10	0.14	0.14



※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.

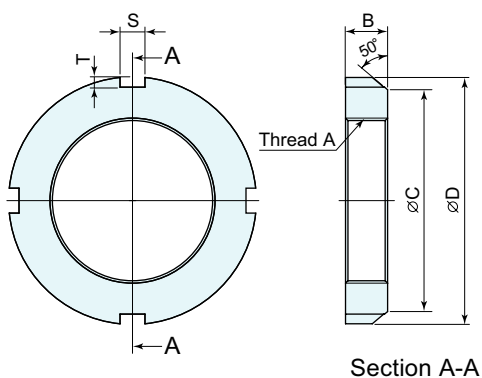
※ Outline drawing for 2D/3D CAD can be downloaded from our URL : <http://www.pascaleng.co.jp/>

1. Locknut is not furnished.
2. Do not block the air vent. If there is a chance of coolant or debris entering the air vent, pipe to a clean area of the fixture.

(inch-accept where noted)

Locknut

model CTH  -VN



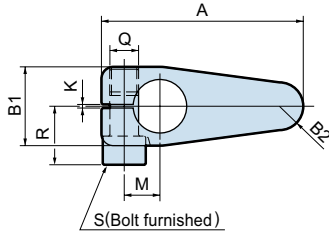
Model	CTH06-VN	CTH10-VN	CTH16-VN	CTH25-VN
A	1 3/8-18	1 7/8-16	2 1/4-16	2 1/2-16
B	0.448	0.51	0.635	0.635
C	1.813	2.438	2.875	3.125
D	2.063	2.75	3.25	3.50
S	0.178	0.302	0.302	0.302
T	0.094	0.125	0.156	0.156
Clamp model applied	CTV06T	CTV10T	CTV16T	CTV25T

Clamp arms — standard and extended length type

(inch-accept where noted)

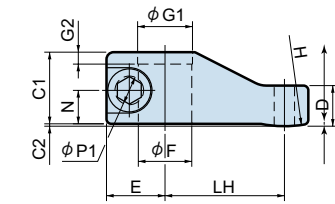
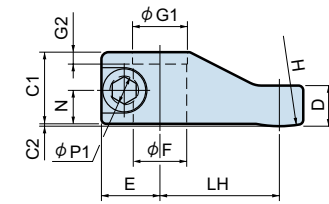
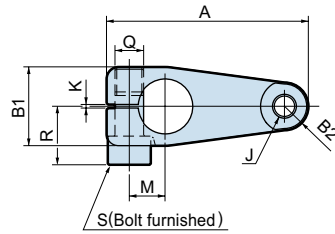
W1 clamp arm

model CTH ①-W1



W2 clamp arm

model CTH ①-W2

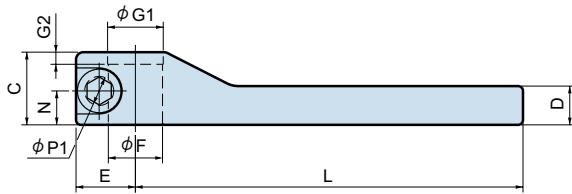
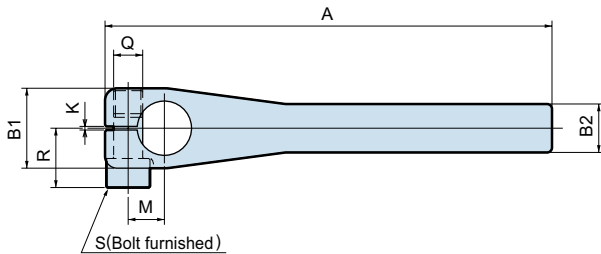


Material : Alloy steel Hardness : HRC30 ~ 37

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



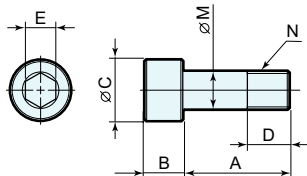
Material : Alloy steel Hardness : HRC30 ~ 37

(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

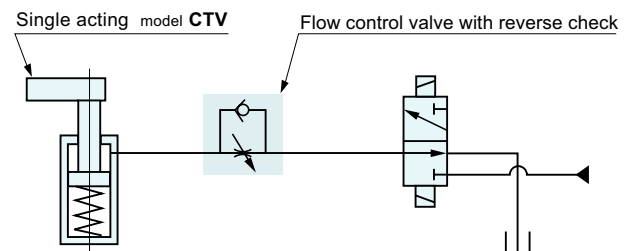
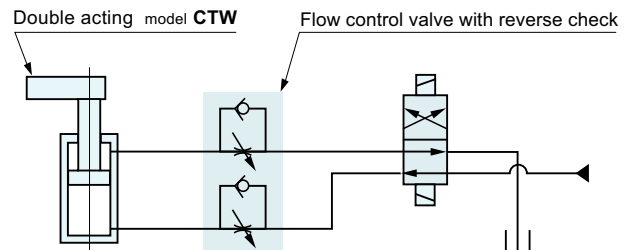
The swing clamp has a cam structure with lead grooves that could be damaged if excessive torque were to be applied to the piston rod. Be certain to loosen the side bolt before repositioning the clamp arm.

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

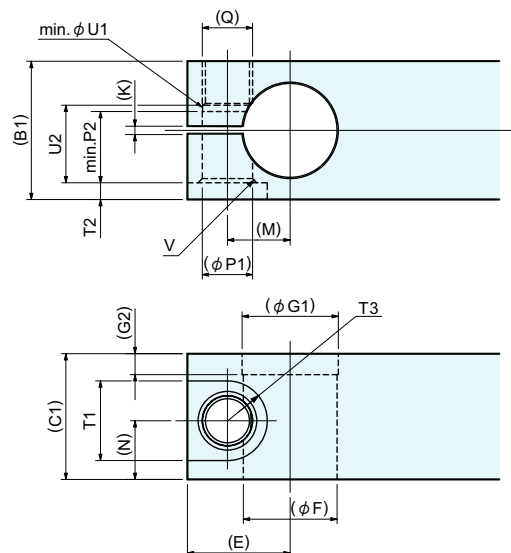
Hydraulic circuit diagram (reference)

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.