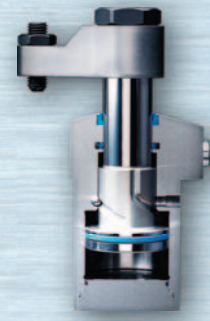


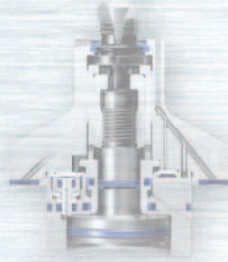
### 7MPa Work clamping system

- CTU CTT
- CLU CLT
- CNA CMC CMD
- CSU CST CSN CSY CSK
- CEK CEA CVH
- VCB VCP VHD VRG VEF WPB WPC
- HCD HCS HCT X63 WRA WRB



### Expansion clamp

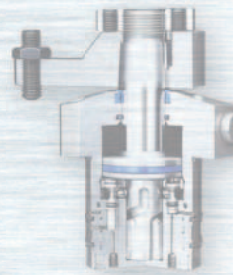
- CGC
- CGT
- CGU
- CGE
- CGY



Refer to separate catalog for details.

### 7MPa Sensing clamp

- CTM
- CTN
- CLM
- CLN
- CNB



Refer to separate catalog for details.

### Pal system

- CPC
- CPH
- CPY
- CPK
- WVP



Refer to separate catalog for details.

### air Work clamping system

- CTX
- CTY
- CLX
- CLY
- CSS
- CSX




Refer to separate catalog for details.

Swing clamp

Product lineup

Page → 3



Swing clamp  
**CTU**

7MPa  
Double acting

Page → 6



Swing clamp  
**CTT**

7MPa  
Single acting

Page → 28



Flow control valve  
**VCF**

Option

Page → 52



Air bleeding valve  
**VCE**


Option

Page → 54

Link clamp

Product lineup


Page → 57



Link clamp  
**CLU**

7MPa  
Double acting

Page → 60



Link clamp  
**CLT**

7MPa  
Single acting

Page → 76



Flow control valve  
**VCF**

Option

Page → 86



Air bleeding valve  
**VCE**


Option

Page → 88

Clamp cylinder

Product lineup


Page → 90



Push, pull cylinder  
**CNA**

7MPa  
Double acting

Page → 94



Push cylinder  
**CMC**

35MPa  
Single acting

Page → 114



Pull cylinder  
**CMD**

35MPa  
Single acting

Page → 118



Flow control valve  
**VCF**

Option

Page → 122



Air bleeding valve  
**VCE**

Option

Page → 124

Work support	Product lineup Page → 126
--------------	------------------------------

	Work support Standard <b>CSU</b> Hydraulic lift 7MPa Page → 130
---	---

	Work support Force enhanced <b>CSU-H</b> Hydraulic lift 7MPa Page → 130
---	---

	Work support <b>CST</b> Spring lift 7MPa Page → 131
--	---

	Work support Standard <b>CSN</b> Hydraulic lift 7MPa Page → 146
---	---

	Work support Force enhanced <b>CSY</b> Hydraulic lift 7MPa Page → 146
---	---

	Work support <b>CSK</b> Spring lift 7MPa Page → 147
---	---

	Flow control valve <b>VCF</b> Option Page → 170
---	--


	Air bleeding valve <b>VCE</b> Option Page → 172
--	--

Option Other	
-----------------	--

	G port piping flareless fitting <b>8FK</b> Option Page → 174
--	---

	Work positioning cylinder <b>CEK</b> 7MPa Double acting Page → 178
---	--

	<b>New</b> Air work sensor <b>CEA</b> air Page → 190
---	--

	Centering vise <b>CVH</b> 7MPa Double acting Page → 196
--	---

Control system	
----------------	--

	Control system <b>VCB</b> 7MPa Double acting Page → 214
--	---





Pilot check valve  
**VCP**

7MPa  
Double acting  
Page → 216



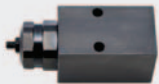
Control system  
**VHD**

7MPa  
Single acting  
Page → 218



Reducing valve  
**VRG**

7MPa  
Page → 220



Sequence valve  
**VEF**

7MPa  
Page → 222



Accumulator  
**WPB**  
Spring

7MPa  
Page → 224



Accumulator  
**WPC**  
N<sub>2</sub> gas

7MPa  
Page → 228



Control unit  
**HCD**  
Manual operated

7MPa  
Double acting  
Page → 230



Control unit  
**HCD**  
Manual operated

7MPa  
Single acting  
Page → 231



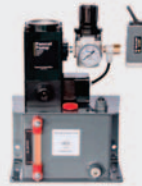
Control unit  
**HCS**  
Solenoid operated

7MPa  
Double acting  
Page → 232



Control unit  
**HCS**  
Solenoid operated

7MPa  
Single acting  
Page → 233



Control unit  
**HCT**  
Manual operated

7MPa  
Single acting  
Page → 234



Pascal pump  
**X63**

Page → 235



Rotary joint  
**WRA**  
Single rotary standard

25MPa  
Page → 238



Rotary joint  
**WRA**  
Single rotary with flange

25MPa  
Page → 240



Rotary joint  
**WRA**  
Double rotary with flange

25MPa  
Page → 242
















Rotary joint  
**WRB**  
Single rotary with flange

7MPa  
Page → 244







<b>Swing clamp</b>		model <b>CTU</b> Page →4		model <b>CTT</b> Page →26		
						
Specifications		7MPa Double acting		7MPa Single acting		
Features		Standard model		Standard model		
Clamp stroke		Standard	Long stroke	Standard	Long stroke	
Variations	Standard		CTU Page →10	CTU-S Page →22	CTT Page →32	—
	Dual rod		CTU-E Page →14	*	—	
	Pin rod		CTU-P Page →15	*	CTT-P Page →35	—
	Air sensor		CTU-A Page →16	*	—	
	Swing angle 30°, 45°, 60°		CTU-N□ Page →21	*	CTT-N□ Page →37	—
Option	Taper sleeve		CTH-TS Pages →25, 39			
	Perfect nut		CTH-TN Page →41			
	Perfect release nut		CTH-TNR Page →43			
	Quick arm change		CTH-CQ Page →48			
	Flow control valve		VCF Page →52			
	Air bleeding valve		VCE Page →54			

\* : Contact Pascal for the details.



Table of contents

Structure, Hydraulic circuit diagram .....	6
Specifications, Piping .....	7
Performance table .....	8
Swing speed adjustment .....	9
Dimensions	
Standard CTU .....	10
Dual rod CTU-E .....	14
Pin rod CTU-P .....	15
Air sensor CTU-A .....	16
Swing angle 30°, 45°, 60° CTU-N .....	21
Long stroke CTU-S .....	22
Clamp arm mounting details .....	24
Option	
Taper sleeve CTH-TS .....	25
Perfect nut CTH-TN .....	41
Perfect release nut CTH-TNR .....	43
Quick arm change CTH-TQ .....	48
Mounting & dismounting of clamp arm .....	50
Flow control valve VCF .....	52
Air bleeding valve VCE .....	54

# Swing clamp

Double acting 7 MPa

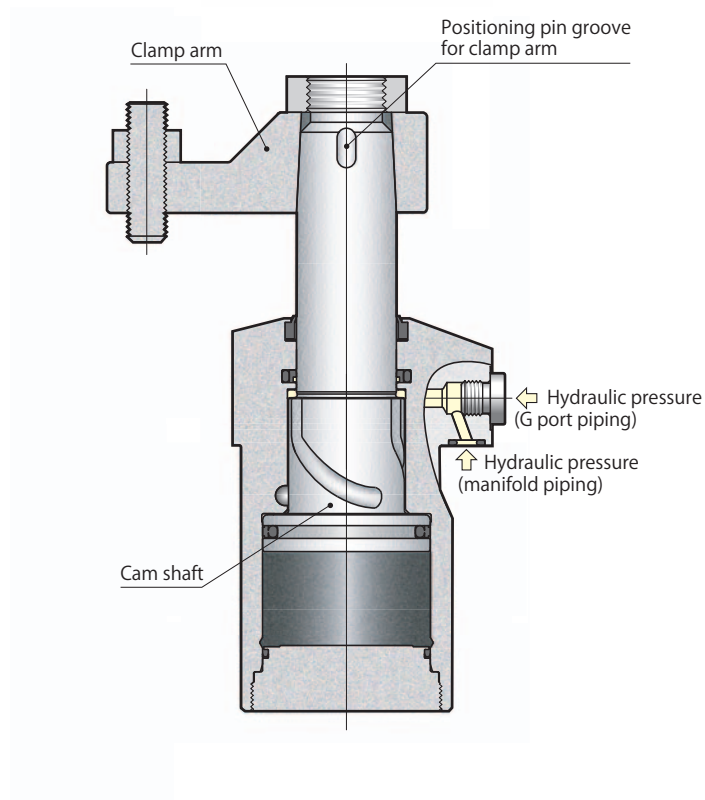
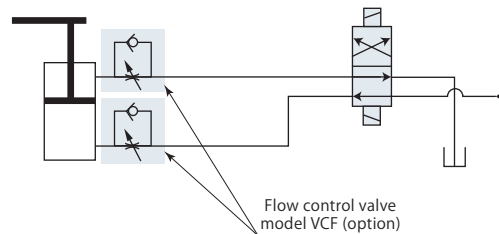
model **CTU**



Standard model  
model CTU06-L

## Standard model

model CTU□-□

Hydraulic circuit diagram

For flow control valve, we recommend the meter-in control. If meter-out control is used, due to the area difference, it will cause back pressure and become high pressure. This can lead to malfunction of the system. Please be aware when designing the circuit.

Specifications	page → 7
Standard	page → 10
Dual rod	page → 14
Pin rod	page → 15
Air sensor	page → 16
Swing angle 30°, 45°, 60°	page → 20
Long stroke	page → 22



## Specifications

<b>CTU</b>	Size	Swing direction (when clamping)	Variation code*1
	<b>01</b>	<b>L</b> : Counter-clockwise	<b>(Nil)</b> : Standard
	<b>02</b>		<b>E</b> : Dual rod
	<b>04</b>		<b>P</b> : Pin rod
	<b>06</b>	<b>R</b> : Clockwise	<b>A</b> : Air sensor
	<b>10</b>		<b>N</b> □ : Swing angle 30°, 45°, 60°
	<b>16</b>		<b>S</b> □ : Long stroke
<b>25</b> *2	■ indicates made to order.		

\*1: All varieties are not available for all sizes. Refer to each relevant page for details.

Contact Pascal for the details of variation codes (models) that are not described in the catalog.

\*2: CTU25-□E, CTU25-□P and CTU25-□S30 are made to order.

Model		CTU01	CTU02	CTU04	CTU06	CTU10	CTU16	CTU25	
Cylinder force (hydraulic pressure 7MPa)	kN	2.4	2.8	4.4	6.3	9.9	16.3	25.8	
Cylinder inner diameter	mm	25	29	36	42	52	65	82	
Rod diameter	mm	14	18	22.4	25	30	35.5	45	
Effective area (clamp)	cm <sup>2</sup>	3.4	4.1	6.2	8.9	14.2	23.3	36.9	
Swing angle		90° ± 3°							
Positioning pin groove position accuracy		± 1°							
Repeated clamp positioning accuracy		± 0.5°							
Full stroke	mm	16	18	20.5	23.5	26.5	28.5	36	
90° swing stroke	mm	8	10	12.5	13.5	16.5	18.5	23	
Clamp stroke	mm	8	8	8	10	10	10	13	
Max. swing torque*1	N·m	0.6	0.7	1.6	1.8	3.4	5.6	9.3	
Cylinder capacity	Clamp	cm <sup>3</sup>	5.4	7.3	12.8	21.0	37.5	66.4	132.9
	Unclamp	cm <sup>3</sup>	7.9	11.9	20.9	32.6	56.3	94.6	190.1
Mass	kg	0.7	0.9	1.3	1.7	2.8	4.7	9.9	
Recommended tightening torque of mounting screws*2	N·m	3.5	7	7	12	29	57	77	
Recommended tightening torque of nut	N·m	12	26	51	60	86	120	180	

● Pressure range: 1–7 MPa    ● Proof pressure: 10.5 MPa    ● Operating temperature: 0–70 °C

● Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)

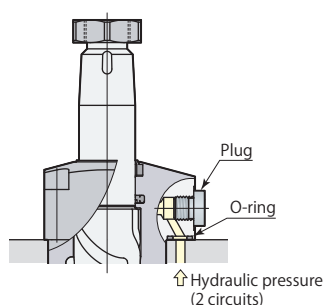
● Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

\*1: This is the limit value for lifting arm at 1 MPa when mounted vertically.    \*2: ISO R898 class 12.9

### Manifold piping and G port piping are available.

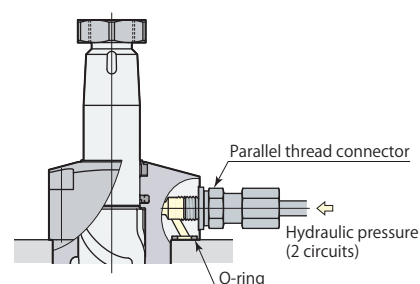
#### Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the clamp.



#### G port piping

Remove plugs when choosing G port piping. (O-ring must be used.) Refer to **page → 174** for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.



Performance table

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

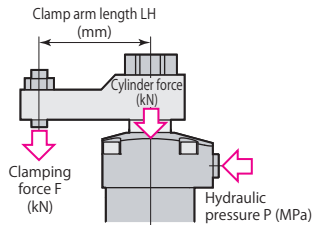
Clamping force calculation formula

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

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

CTU06 with clamp arm length (LH) = 60 mm

at hydraulic pressure of 7 MPa,  
Clamping force F is calculated by  
 $7 / (1.12 + 0.00422 \times 60) = 5.1 \text{ kN}$



Do not use the clamp in the nonusable range.

It may cause damage to the cylinder and rod.

model CTU02		Clamping force $F = P / (2.46 + 0.0116 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		35	40	50	60	80	100	120	140		
7	2.8	2.4	2.4	2.3	2.2	2.1				80	
6.5	2.6	2.3	2.2	2.1	2.1	1.9				89	
6	2.4	2.1	2.1	2.0	1.9	1.8	1.7			101	
5.5	2.2	1.9	1.9	1.8	1.7	1.6	1.5			115	
5	2.0	1.7	1.7	1.6	1.6	1.5	1.4	1.3		135	
4.5	1.8	1.6	1.5	1.5	1.4	1.3	1.2	1.2	1.1	162	
4	1.6	1.4	1.4	1.3	1.3	1.2	1.1	1.0	1.0	202	
3.5	1.4	1.2	1.2	1.2	1.1	1.0	1.0	0.9	0.9	↑	
3	1.2	1.0	1.0	1.0	1.0	0.9	0.8	0.8	0.7	↑	
2.5	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	↑	
2	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	↑	
1.5	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	↑	
1	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	202	

model CTU06		Clamping force $F = P / (1.12 + 0.00422 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		50	60	80	100	120	140	160	180		
7	6.3	5.3	5.1	4.8						96	
6.5	5.8	4.9	4.7	4.5	4.2					107	
6	5.4	4.5	4.4	4.1	3.9	3.7				120	
5.5	4.9	4.1	4.0	3.8	3.6	3.4				137	
5	4.5	3.8	3.6	3.4	3.2	3.1	2.9	2.8		160	
4.5	4.0	3.4	3.3	3.1	2.9	2.8	2.6	2.5	2.4	191	
4	3.6	3.0	2.9	2.7	2.6	2.5	2.3	2.2	2.1	238	
3.5	3.1	2.6	2.5	2.4	2.3	2.2	2.0	1.9	1.9	↑	
3	2.7	2.3	2.2	2.1	1.9	1.8	1.8	1.7	1.6	↑	
2.5	2.2	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	↑	
2	1.8	1.5	1.5	1.4	1.3	1.2	1.2	1.1	1.1	↑	
1.5	1.3	1.1	1.1	1.0	1.0	0.9	0.9	0.8	0.8	↑	
1	0.9	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.5	238	

model CTU16		Clamping force $F = P / (0.429 + 0.00128 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		70	80	100	120	140	160	180	200		
7	16.3	13.5	13.2							99	
6.5	15.2	12.5	12.2	11.7						110	
6	14.0	11.6	11.3	10.8	10.3					123	
5.5	12.8	10.6	10.4	9.9	9.4					139	
5	11.7	9.6	9.4	9.0	8.6	8.2	7.9			161	
4.5	10.5	8.7	8.5	8.1	7.7	7.4	7.1	6.8		190	
4	9.3	7.7	7.5	7.2	6.9	6.6	6.3	6.1	5.8	231	
3.5	8.2	6.7	6.6	6.3	6.0	5.8	5.5	5.3	5.1	↑	
3	7.0	5.8	5.6	5.4	5.1	4.9	4.7	4.5	4.4	↑	
2.5	5.8	4.8	4.7	4.5	4.3	4.1	3.9	3.8	3.6	↑	
2	4.7	3.9	3.8	3.6	3.4	3.3	3.2	3.0	2.9	↑	
1.5	3.5	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.2	↑	
1	2.3	1.9	1.9	1.8	1.7	1.6	1.6	1.5	1.5	231	

model CTU01		Clamping force $F = P / (2.97 + 0.0153 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		30	35	40	50	60	80	100	120		
7	2.4	2.0	2.0							39	
6.5	2.2	1.9	1.9	1.8						43	
6	2.0	1.7	1.7	1.7						48	
5.5	1.9	1.6	1.6	1.5	1.5					53	
5	1.7	1.5	1.4	1.4	1.3	1.3				61	
4.5	1.5	1.3	1.3	1.3	1.2	1.2				70	
4	1.3	1.2	1.1	1.1	1.1	1.0	1.0			83	
3.5	1.2	1.0	1.0	1.0	0.9	0.9	0.8	0.8		102	
3	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.6	131	
2.5	0.8	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	↑	
2	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	↑	
1.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	↑	
1	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	131	

model CTU04		Clamping force $F = P / (1.60 + 0.00664 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		40	50	60	80	100	120	140	160		
7	4.4	3.8	3.6	3.5	3.3	3.1				105	
6.5	4.1	3.5	3.4	3.3	3.0	2.9				117	
6	3.8	3.2	3.1	3.0	2.8	2.7	2.5			133	
5.5	3.4	2.9	2.8	2.8	2.6	2.4	2.3	2.2		153	
5	3.1	2.7	2.6	2.5	2.3	2.2	2.1	2.0	1.9	181	
4.5	2.8	2.4	2.3	2.3	2.1	2.0	1.9	1.8	1.7	220	
4	2.5	2.1	2.1	2.0	1.9	1.8	1.7	1.6	1.5	↑	
3.5	2.2	1.9	1.8	1.8	1.6	1.5	1.5	1.4	1.3	↑	
3	1.9	1.6	1.6	1.5	1.4	1.3	1.3	1.2	1.1	↑	
2.5	1.6	1.3	1.3	1.3	1.2	1.1	1.0	1.0	0.9	↑	
2	1.3	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	↑	
1.5	0.9	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.6	↑	
1	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	220	

model CTU10		Clamping force $F = P / (0.706 + 0.00228 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		60	80	100	120	140	160	180	200		
7	9.9	8.3	7.9	7.5						102	
6.5	9.2	7.7	7.3	7.0						113	
6	8.5	7.1	6.8	6.4	6.1					127	
5.5	7.8	6.5	6.2	5.9	5.6	5.4				144	
5	7.1	5.9	5.6	5.4	5.1	4.9	4.7			167	
4.5	6.4	5.3	5.1	4.8	4.6	4.4	4.2	4.0		199	
4	5.7	4.7	4.5	4.3	4.1	3.9	3.7	3.6	3.4	245	
3.5	5.0	4.2	3.9	3.7	3.6	3.4	3.3	3.1	3.0	↑	
3	4.2	3.6	3.4	3.2	3.1	2.9	2.8	2.7	2.6	↑	
2.5	3.5	3.0	2.8	2.7	2.6	2.4	2.3	2.2	2.2	↑	
2	2.8	2.4	2.3	2.1	2.0	2.0	1.9	1.8	1.7	↑	
1.5	2.1	1.8	1.7	1.6	1.5	1.5	1.4	1.3	1.3	↑	
1	1.4	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.9	245	

model CTU25		Clamping force $F = P / (0.271 + 0.000658 \times \text{LH})$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm	
		Clamp arm length LH mm									
		90	100	120	140	160	180	200	240		
7	25.8	21.2	20.8	20.0						129	
6.5	24.0	19.7	19.3	18.6	17.9					143	
6	22.1	18.2	17.8	17.1	16.5	15.9				161	
5.5	20.3	16.7	16.3	15.7	15.1	14.6	14.1			183	
5	18.5	15.1	14.8	14.3	13.8	13.3	12.8	12.4		212	
4.5	16.6	13.6	13.4	12.9	12.4	12.0	11.6	11.2	10.5	251	
4	14.8	12.1	11.9	11.4	11.0	10.6	10.3	9.9	9.3	308	
3.5	12.9	10.6	10.4	10.0	9.6	9.3	9.0	8.7	8.2	↑	
3	11.1	9.1	8.9	8.6	8.3	8.0	7.7	7.5	7.0	↑	
2.5	9.2	7.6	7.4	7.1	6.9	6.6	6.4	6.2	5.8	↑	
2	7.4	6.1	5.9	5.7	5.5	5.3	5.1	5.0	4.7	↑	
1.5	5.5	4.5	4.5	4.3	4.1	4.0	3.9	3.7	3.5	↑	
1	3.7	3.0	3.0	2.9	2.8	2.7	2.6	2.5	2.3	308	

● See the formula shown on page →15 for clamping force calculation when pin rod type (CTU□-□P) is selected.

### Swing speed adjustment

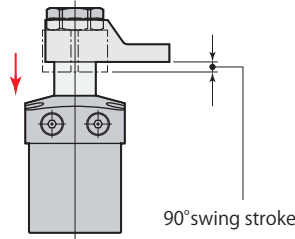
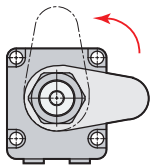
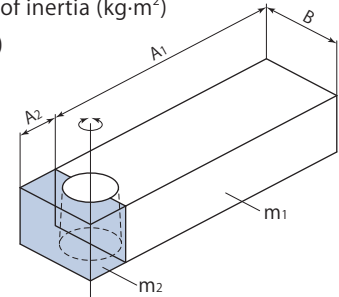
Swing time is restricted by the mass and length of the clamp arm (moment of inertia) since the 90° swing action impacts the cam shaft.

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

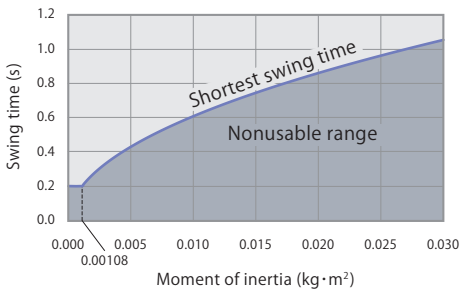
$$I = \frac{1}{12} m_1(4A_1^2 + B^2) + \frac{1}{12} m_2(4A_2^2 + B^2)$$

I : Moment of inertia (kg·m<sup>2</sup>)  
m : Mass (kg)



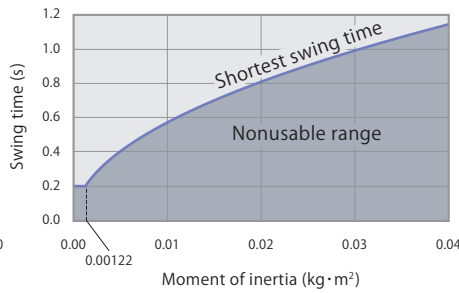
model CTU01

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0270}}$



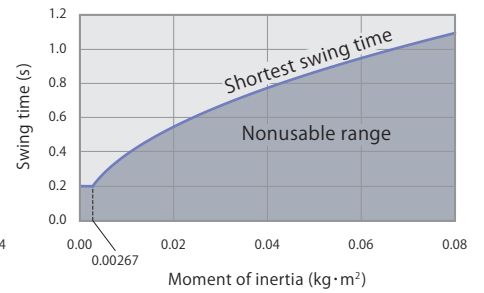
model CTU02

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0305}}$



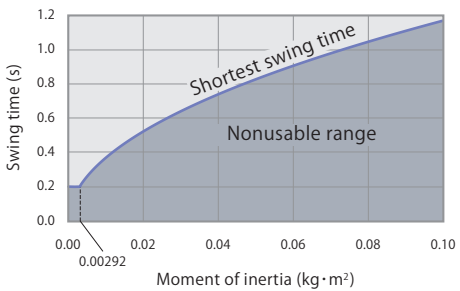
model CTU04

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0668}}$



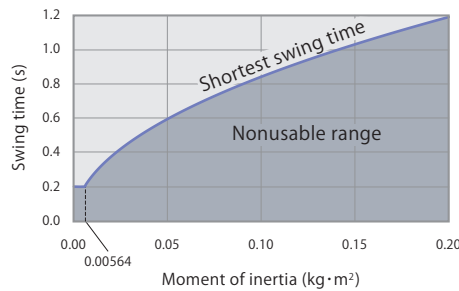
model CTU06

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0730}}$



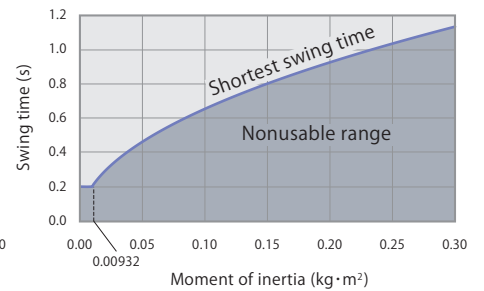
model CTU10

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.141}}$



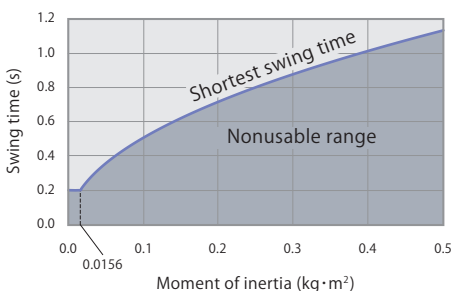
model CTU16

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.233}}$



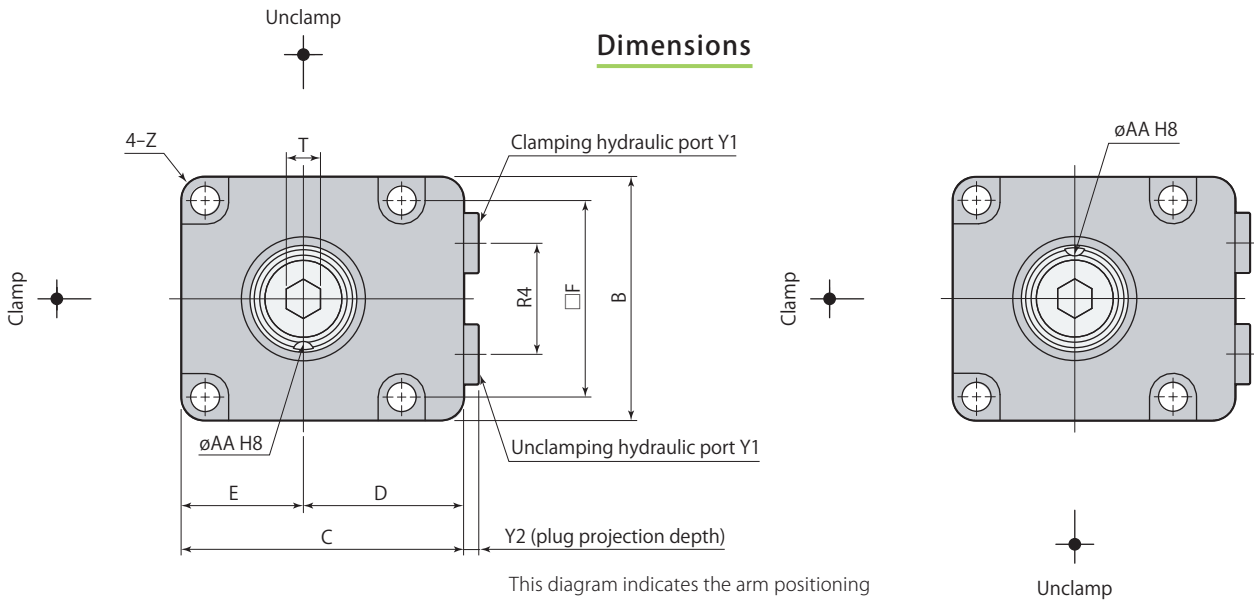
model CTU25

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.389}}$





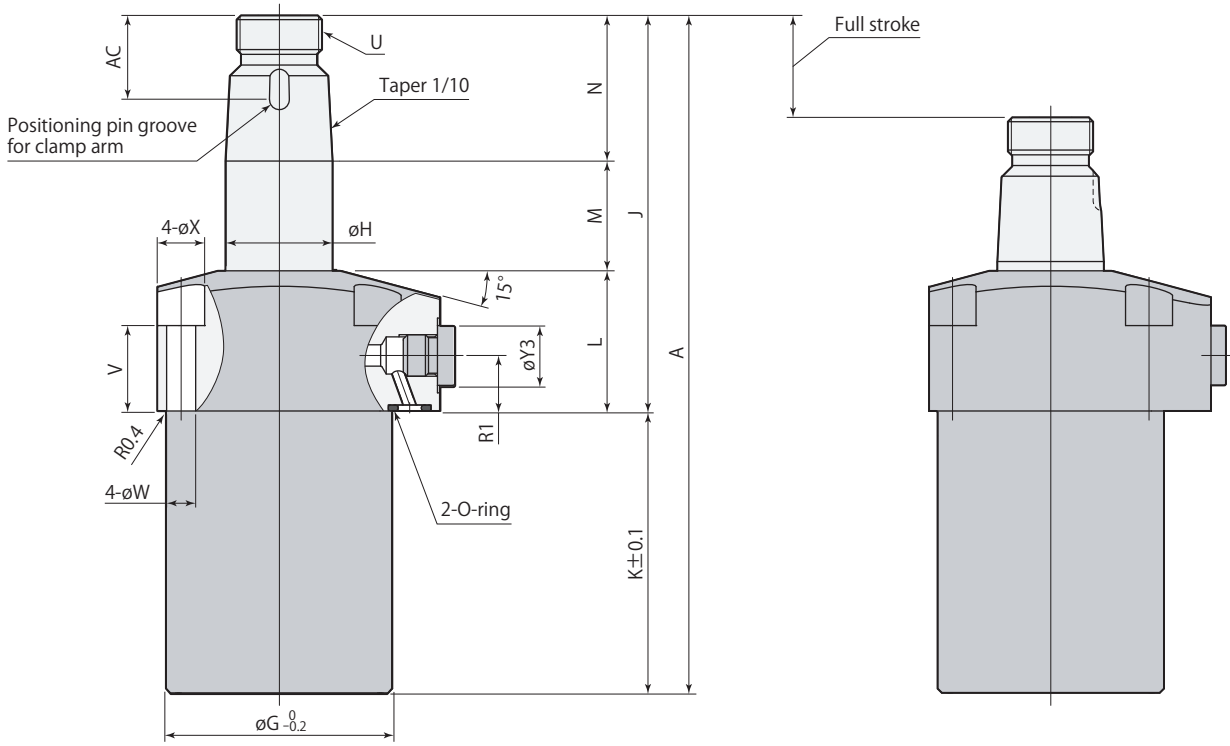
Dimensions



This diagram indicates the arm positioning pin groove at unclamped condition.

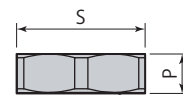
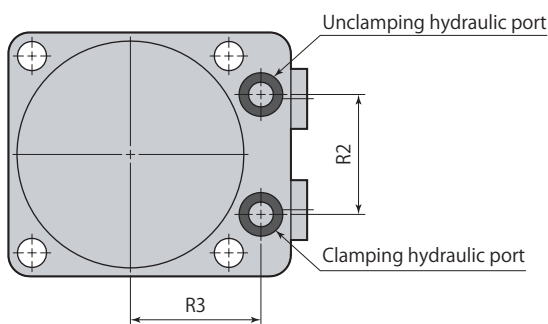
Swing direction L (counter-clockwise)

Swing direction R (clockwise)



Unclamp

Stroke end



Hex nut for arm mount

- Hex nut for arm mount is included.
- Refer to **page →41** for the details of perfect nut.
- Clamp arm, positioning pin and mounting screws are not included.

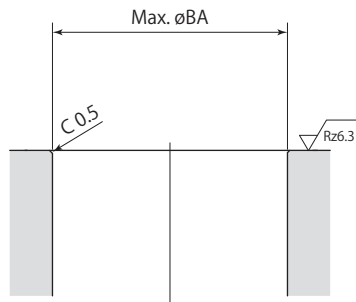
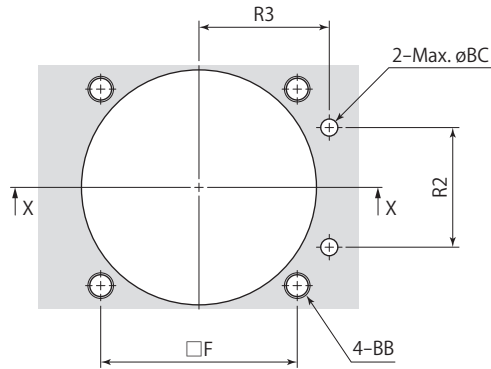
<b>CTU</b> □-□	<b>Swing clamp Standard model</b>						<b>7MPa</b>	<b>Double acting</b>
----------------	-----------------------------------	--	--	--	--	--	-------------	----------------------

Model	CTU01-□	CTU02-□	CTU04-□	CTU06-□	CTU10-□	CTU16-□	CTU25-□	
A	117	131	148.5	158.5	178.5	201.5	244	
B	38	45	50	57	70	86	108	
C	48	55	60	66	82	96	120	
D	29	32.5	35	37.5	47	53	66	
E	19	22.5	25	28.5	35	43	54	
F	30.5	35	40	46	56	68	88	
øG	35	39	47	53	63	78	100	
øH	14	18	22.4	25	30	35.5	45	
J	68.5	77	87.5	92.5	101.5	117.5	147	
K	48.5	54	61	66	77	84	97	
L	28.5	29	31	33	36	40.5	51.5	
M	17.5	20	22.5	25.5	28.5	30	37.5	
N	22.5	28	34	34	37	47	58	
P	6.5	8	9	9	10	12	13	
R1	12.5	12.5	12.5	12.5	14	14	21	
R2	18	22	24	28	36	45	50	
R3	22.5	25	28	30.5	36	42	57	
R4	16.2	20	22	26	30	38	50	
S (nut width across flats)	19	22	27	30	36	46	55	
T (hex socket)	5	6	6	8	8	10	14	
U	M12×1.5	M14×1.5	M18×1.5	M20×1.5	M24×1.5	M30×1.5	M39×1.5	
V	20	19.5	20	20	19.5	20	26	
øW	4.3	5.5	5.5	6.8	9	11	14	
øX	8	9.5	9.5	11	14	17.5	20	
Y1	G1/8	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8	
Y2	3.8	3.8	3.8	3.8	4.8	4.8	4.8	
øY3	14	14	14	14	19	19	22	
Z	R3	R3	R3	R5	R6	R7	R10	
øAA (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	
AC	15.5	18.5	19.5	19.5	22.5	24.5	27.5	
Positioning pin (dowel pin)	ø3(h8)×8	ø4(h8)×10	ø4(h8)×10	ø5(h8)×10	ø6(h8)×12	ø6(h8)×12	ø6(h8)×14	
O-ring (fluorocarbon hardness Hs90)	P7	P7	P7	P7	P8	P8	P10	
Taper sleeve	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS	
Flow control valve*	Meter-in	VCF01	VCF01	VCF01	VCF01	VCF02	VCF02	VCF03
	Meter-out	VCF01-O	VCF01-O	VCF01-O	VCF01-O	VCF02-O	VCF02-O	VCF03-O
Air bleeding valve*	VCE01	VCE01	VCE01	VCE01	VCE02	VCE02	VCE03	

\* : Select the right model of VCF and VCE according to the size of the clamp.

Refer to each page for the details of options.

● Taper sleeve **page →25**   ● Flow control valve **page →52**   ● Air bleeding valve **page →54**

Mounting details

X-X

Rz: ISO4287(1997)

Model	CTU01-□	CTU02-□	CTU04-□	CTU06-□	CTU10-□	CTU16-□	CTU25-□
F	30.5	35	40	46	56	68	88
R2	18	22	24	28	36	45	50
R3	22.5	25	28	30.5	36	42	57
øBA	36	40	48	54	64	79	101
BB	M4	M5	M5	M6	M8	M10	M12
øBC	4	4	4	4	6	6	8

mm



Size

Swing direction (when clamping)

**L** : Counter-clockwise

**R** : Clockwise

**E** : Dual rod

CTU **01** -

CTU **02**

CTU **04**

CTU **06**

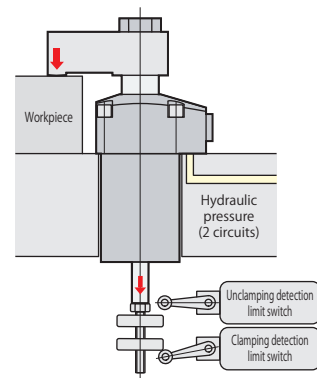
CTU **10**

CTU **16**

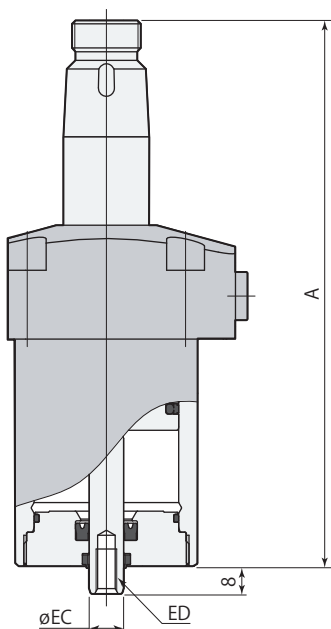
CTU **25**

■ indicates made to order.

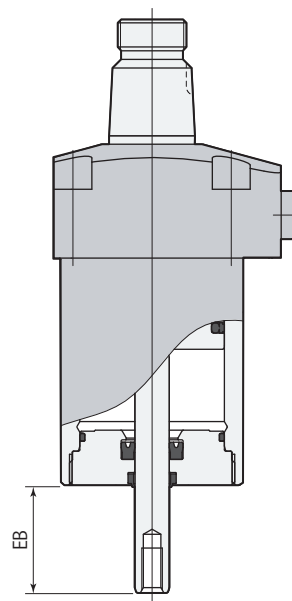
Usage example



Dimensions



Unclamp



Stroke end

- This diagram indicates a swing direction L (L stands for counter-clockwise).
- Refer to specifications (page →7), dimensions (page →10) for other specifications and dimensions that are not shown in the diagram.

Model	CTU01-□E	CTU02-□E	CTU04-□E	CTU06-□E	CTU10-□E	CTU16-□E	CTU25-□E
Cylinder capacity (unclamp)	7.0 cm <sup>3</sup>	11.0 cm <sup>3</sup>	19.3 cm <sup>3</sup>	30.7 cm <sup>3</sup>	53.3 cm <sup>3</sup>	91.3 cm <sup>3</sup>	182.9 cm <sup>3</sup>
A	117	131	148.5	158.5	178.5	201.5	244
EB	24	26	28.5	31.5	34.5	36.5	44
øEC	8	8	10	10	12	12	16
ED	M5×0.8 depth 8	M5×0.8 depth 8	M6×1 depth 11	M6×1 depth 11	M8×1.25 depth 15	M8×1.25 depth 15	M10×1.5 depth 18
Mass	0.7 kg	0.9 kg	1.3 kg	1.7 kg	2.8 kg	4.7 kg	9.9 kg

mm

Size

01  
02  
04  
06  
10  
16  
25

CTU

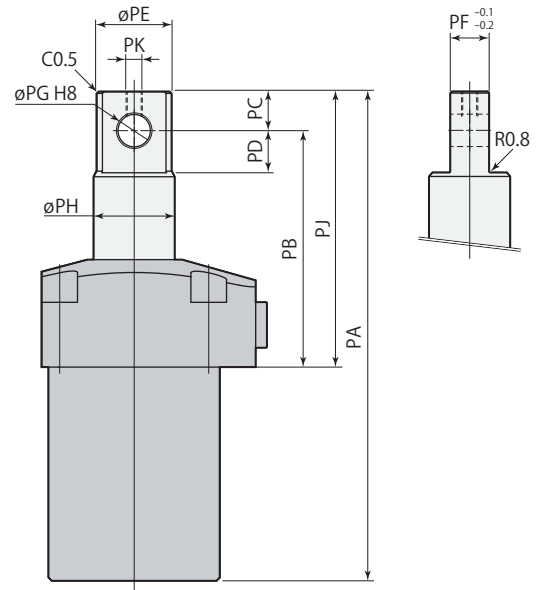
Swing direction (when clamping)

L : Counter-clockwise  
R : Clockwise

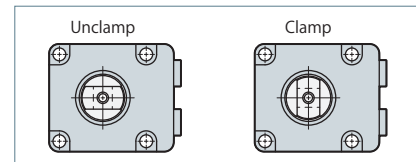
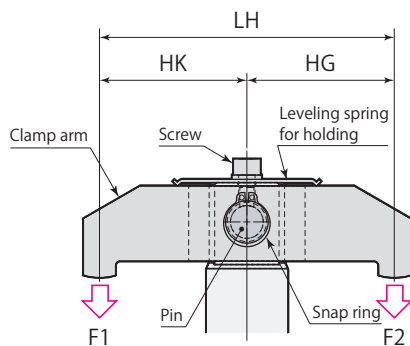
P : Pin rod

■ indicates made to order.

Dimensions



Usage example



Clamping performance

Clamping force calculation formula

$$F1 = \frac{HG}{LH} \times n \times P$$

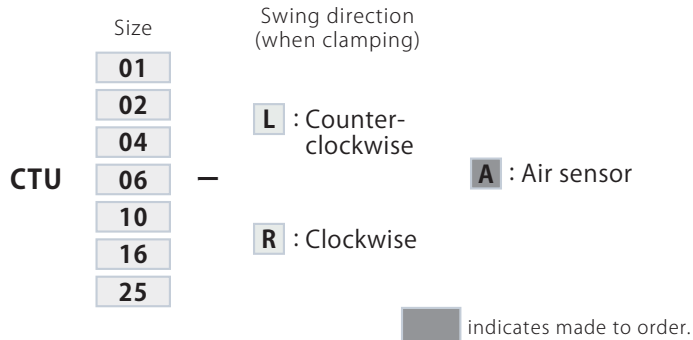
$$F2 = \frac{HK}{LH} \times n \times P$$

F1, F2=Clamping force (kN),  
n=Coefficient (refer to right table),  
P=Hydraulic pressure (MPa),  
HG, HK=Distance from center of piston to clamping point (mm), LH=(mm)

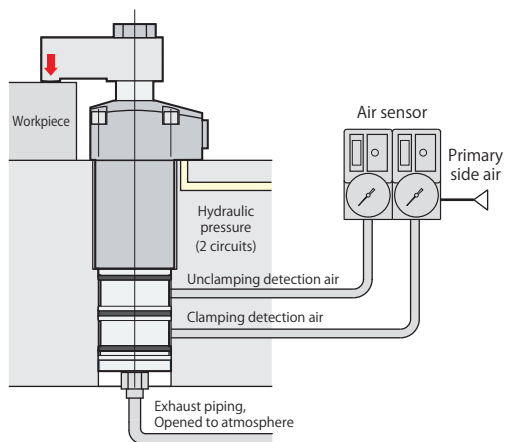
Model	Coefficient n
CTU01-□P	0.336
CTU02-□P	0.406
CTU04-□P	0.624
CTU06-□P	0.895
CTU10-□P	1.42
CTU16-□P	2.33
CTU25-□P	3.69

- This diagram indicates unclamped condition. Direction of pin hole will be hydraulic port side at the time of clamping.
- Clamp arm, pin and snap ring are not included. Customers must arrange for them.
- Thread at top portion of the rod is for attaching a leveling spring. Screw and leveling spring are not included.
- Refer to specifications (page →7), dimensions (page →10) for other specifications and dimensions that are not shown in the diagram.

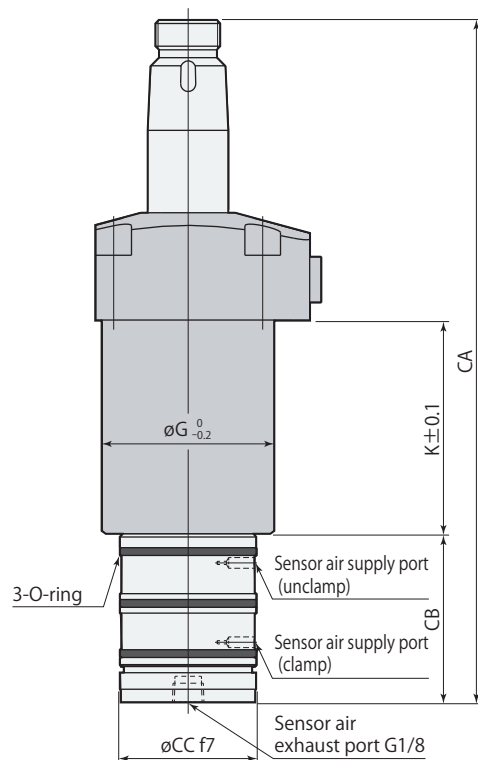
Model	CTU01-□P	CTU02-□P	CTU04-□P	CTU06-□P	CTU10-□P	CTU16-□P	CTU25-□P
PA	113	121.5	137	151	172	195	236.5
PB	56.5	59.5	66	73	81	92	115.5
PC	8	8	10	12	14	19	24
PD	9	9	11	13	15	20	25
øPE	12	16	20.4	23	28	33.5	43
PF	8	8	10	12	16	18	22
øPG	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	8 <sup>+0.022</sup> <sub>0</sub>	10 <sup>+0.022</sup> <sub>0</sub>	12 <sup>+0.027</sup> <sub>0</sub>	16 <sup>+0.027</sup> <sub>0</sub>	20 <sup>+0.033</sup> <sub>0</sub>
øPH	14	18	22.4	25	30	35.5	45
PJ	64.5	67.5	76	85	95	111	139.5
PK	M3×0.5	M3×0.5	M4×0.7	M5×0.8	M6×1	M6×1	M8×1.25
Mass	0.6 kg	0.9 kg	1.3 kg	1.8 kg	3.0 kg	4.9 kg	9.5 kg



Usage example



Dimensions



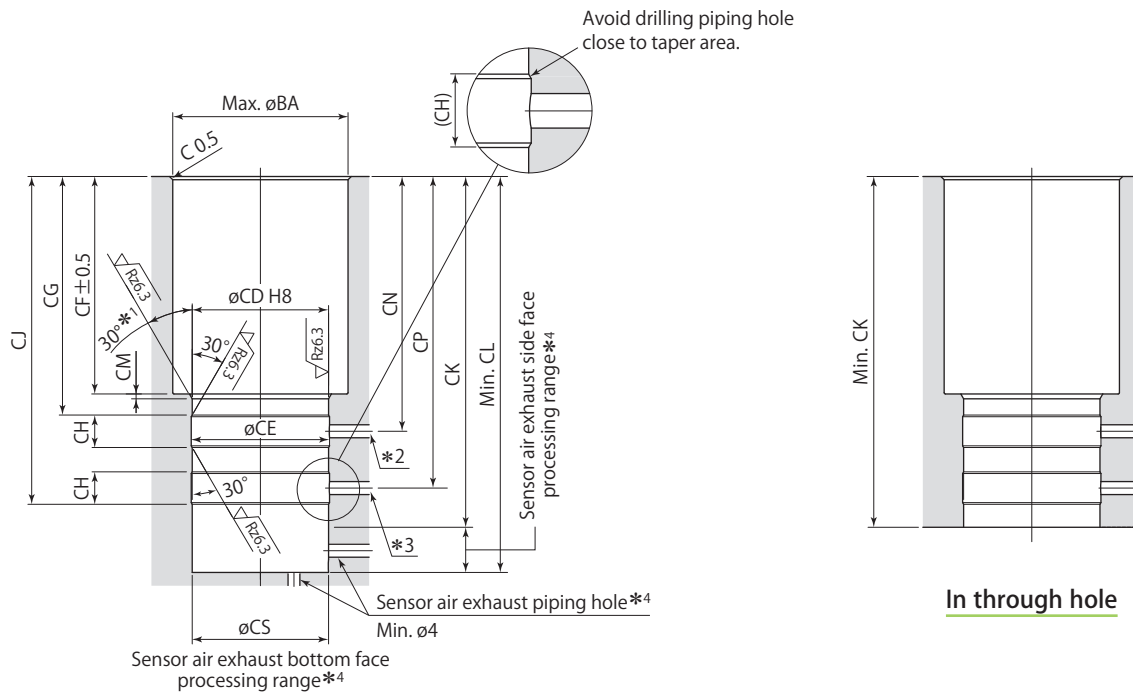
- This diagram indicates unclamped condition of swing direction L (L stands for counter-clockwise). Direction of positioning pin groove will be hydraulic port side at the time of clamping.
- Exhaust port must be opened to atmosphere.  
If sensor is embedded, prepare an exhaust piping hole.  
Furthermore, provide the piping if there is a risk of coolant or metal chips intrusion.  
Use one-touch fittings manufactured by SMC for G port piping. (See SMC catalog for the details of the fitting.)
- Refer to specifications (page →7), dimensions (page →10) for other specifications and dimensions that are not shown in the diagram.

Model	CTU01-□A	CTU02-□A	CTU04-□A	CTU06-□A	CTU10-□A	CTU16-□A	CTU25-□A
Cylinder capacity (unclamp)	7.0 cm <sup>3</sup>	11.0 cm <sup>3</sup>	19.3 cm <sup>3</sup>	30.7 cm <sup>3</sup>	53.3 cm <sup>3</sup>	91.3 cm <sup>3</sup>	182.9 cm <sup>3</sup>
CA	159	175	197.5	210.5	233.5	258.5	311.5
CB	42	44	49	52	55	57	67.5
øCC	33 <sup>-0.025 -0.050</sup>	38 <sup>-0.025 -0.050</sup>	42 <sup>-0.025 -0.050</sup>	42 <sup>-0.025 -0.050</sup>	45 <sup>-0.025 -0.050</sup>	45 <sup>-0.025 -0.050</sup>	52 <sup>-0.030 -0.060</sup>
øG	35	39	47	53	63	78	100
K	48.5	54	61	66	77	84	97
O-ring (fluorocarbon hardness Hs70)	AS568-025	AS568-028	AS568-029	AS568-029	AS568-030	AS568-030	AS568-032
Mass	0.8 kg	1.0 kg	1.6 kg	2.0 kg	3.2 kg	5.2 kg	10.1 kg

mm



**Mounting details**



**In blind hole**

Rz: ISO4287(1997)

- \*1: 15° only for CTU01-□A , CTU02-□A
- \*2: Sensor air piping hole (unclamp) ø4 to ø6. ø4 to ø5 only for CTU01-□A.
- \*3: Sensor air piping hole (clamp) ø4 to ø6. ø4 to ø5 only for CTU01-□A.
- \*4: Sensor air exhaust piping hole must be made on either side or bottom face.

- Apply an appropriate amount of grease to the chamfer and the bore when mounting. Excessive grease may be a blockage in the air passage, causing malfunction of the sensor.
- The 30° taper machining must be provided to avoid the damage of the O-ring. Ensure that there are no interference on taper area when drilling the hole for sensor air.

mm

Model	CTU01-□A	CTU02-□A	CTU04-□A	CTU06-□A	CTU10-□A	CTU16-□A	CTU25-□A
øCD	33 <sup>+0.039</sup> <sub>0</sub>	38 <sup>+0.039</sup> <sub>0</sub>	42 <sup>+0.039</sup> <sub>0</sub>	42 <sup>+0.039</sup> <sub>0</sub>	45 <sup>+0.039</sup> <sub>0</sub>	45 <sup>+0.039</sup> <sub>0</sub>	52 <sup>+0.046</sup> <sub>0</sub>
øCE	33.6	38.6	42.6	42.6	45.6	45.6	52.6
CF	49.5	55	62	67	78	85	98
CG	56 <sup>+0.5</sup> <sub>0</sub>	61.5 <sup>+0.5</sup> <sub>0</sub>	68.5 <sup>+1</sup> <sub>0</sub>	73.5 <sup>+1</sup> <sub>0</sub>	84.5 <sup>+1</sup> <sub>0</sub>	91.5 <sup>+1</sup> <sub>0</sub>	104.5 <sup>+1</sup> <sub>0</sub>
CH	8	8.5	10	10	10	10	10
CJ	77 <sup>0</sup> <sub>-0.5</sub>	84.5 <sup>0</sup> <sub>-0.5</sub>	95.5 <sup>0</sup> <sub>-1</sub>	101 <sup>0</sup> <sub>-1</sub>	116.5 <sup>0</sup> <sub>-1</sub>	123.5 <sup>0</sup> <sub>-1</sub>	144.5 <sup>0</sup> <sub>-1</sub>
CK	84	91.5	101.5	106.5	123.5	130.5	156
CL	94.5	102	114	122	136	145	168.5
CM	1	1	1.5	1.5	1.5	1.5	1.5
CN	60	66	73.5	78.5	89.5	96.5	109.5
CP	73	80	90.5	96	111.5	118.5	139.5
øCS	33	38	42	42	45	45	52
øBA	36	40	48	54	64	79	101

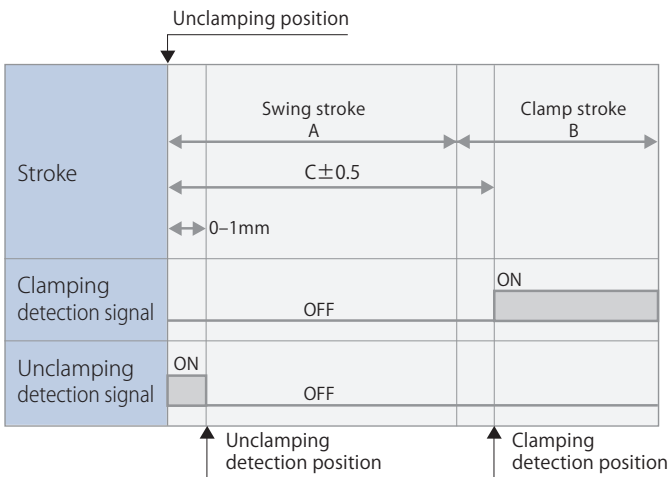
Air sensor unit

Supplier and model	ISA3-G series manufactured by SMC
	GPS2-05 series manufactured by CKD
Air supply pressure	0.2 MPa
Inner diameter of piping	ø4 mm
Overall piping length	5 m or less

- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.

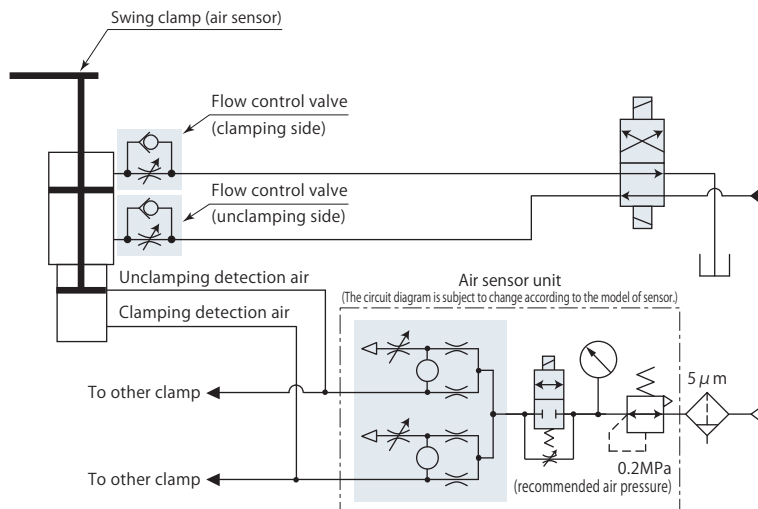
- There is a case that air sensing cannot be successfully made as designed when it is used out of the usage shown on the left. Contact Technical service center for more details.
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- Maximum 6 pieces of clamp can be detected at 0.2MPa air pressure by means of 1 piece of sensor. In case of 0.1MPa air pressure, maximum 3 pieces of clamp are detectable.

Air sensor triggering point



Model	Swing stroke A	Clamp stroke B	Clamping detection position C
CTU01-□A	8	8	9
CTU02-□A	10	8	11
CTU04-□A	12.5	8	13.5
CTU06-□A	13.5	10	14.5
CTU10-□A	16.5	10	17.5
CTU16-□A	18.5	10	19.5
CTU25-□A	23	13	24

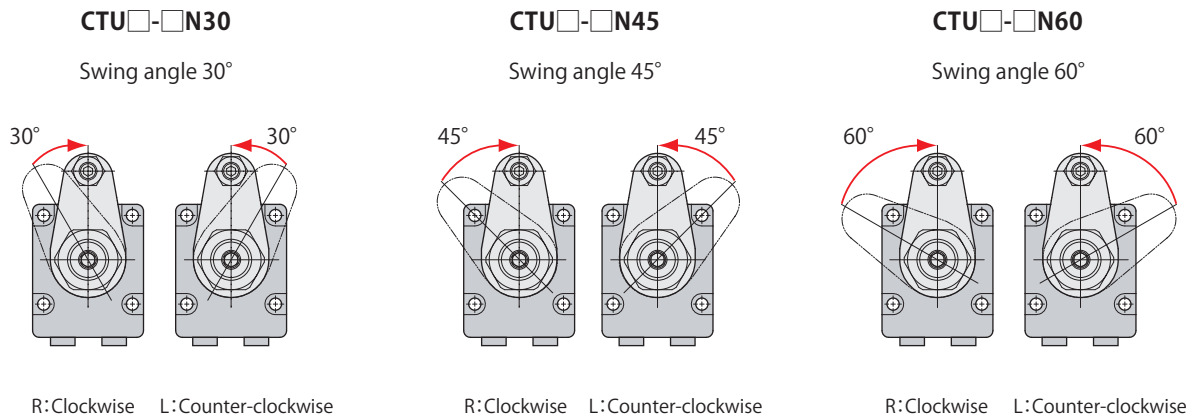
Hydraulic and pneumatic circuit diagram





<b>CTU</b>	Size		Swing direction (when clamping)	
	01	-	L : Counter-clockwise	N30 : Swing angle 30°
	02			
	04		R : Clockwise	N45 : Swing angle 45°
	06			
	10			
	16		N60 : Swing angle 60°	
25				

Swing angle



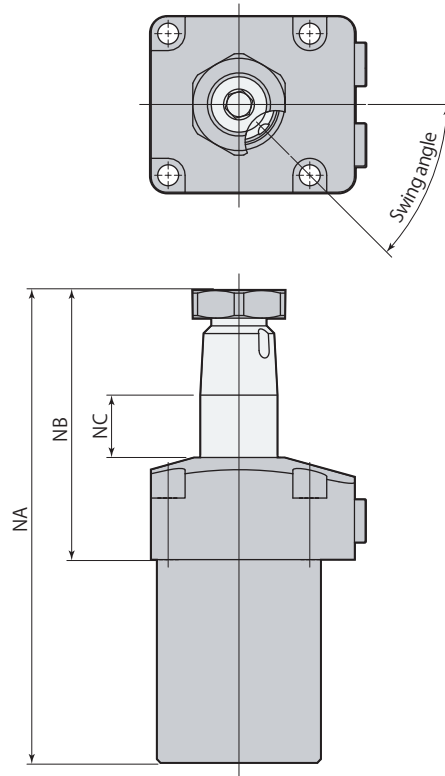
Specifications

Model		CTU01-□N□			CTU02-□N□			CTU04-□N□			CTU06-□N□			
Swing angle		30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	
Full stroke	mm	11.8	12.7	13.7	13.0	14.3	15.5	14.3	15.8	17.4	16.8	18.4	20.1	
Swing stroke	mm	3.8	4.7	5.7	5.0	6.3	7.5	6.3	7.8	9.4	6.8	8.4	10.1	
Clamp stroke	mm	8			8			8			10			
Cylinder capacity	Clamp	cm <sup>3</sup>	4.0	4.3	4.6	5.3	5.8	6.3	8.9	9.9	10.8	15.0	16.5	18.0
	Unclamp	cm <sup>3</sup>	5.8	6.2	6.7	8.6	9.4	10.2	14.5	16.1	17.7	23.3	25.5	27.9

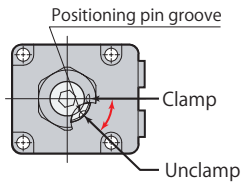
Model		CTU10-□N□			CTU16-□N□			CTU25-□N□			
Swing angle		30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	
Full stroke	mm	18.3	20.3	22.4	19.3	21.6	23.9	24.5	27.4	30.3	
Swing stroke	mm	8.3	10.3	12.4	9.3	11.6	13.9	11.5	14.4	17.3	
Clamp stroke	mm	10			10			13			
Cylinder capacity	Clamp	cm <sup>3</sup>	25.9	28.8	31.7	44.8	50.2	55.6	90.4	101.0	111.6
	Unclamp	cm <sup>3</sup>	38.8	43.1	47.5	63.9	71.5	79.2	129.4	144.6	159.8

● Refer to **page →7** for the specifications of products that are not listed on this page.

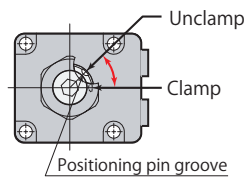
Dimensions



Swing direction L (counter-clockwise)



Swing direction R (clockwise)



● This diagram indicates unclamped condition of swing direction L (L stands for counter-clockwise). Direction of positioning pin groove will be hydraulic port side at the time of clamping.

● Refer to **page →10** for the dimensions of products that are not listed on this page.

Model	CTU01-□N□			CTU02-□N□			CTU04-□N□			CTU06-□N□		
	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°
NA	112.8	113.7	114.7	126.0	127.3	128.5	142.3	143.8	145.4	151.8	153.4	155.1
NB	64.3	65.2	66.2	72.0	73.3	74.5	81.3	82.8	84.4	85.8	87.4	89.1
NC	13.3	14.2	15.2	15.0	16.3	17.5	16.3	17.8	19.4	18.8	20.4	22.1

Model	CTU10-□N□			CTU16-□N□			CTU25-□N□		
	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°
NA	170.3	172.3	174.4	192.3	194.6	196.9	232.5	235.4	238.3
NB	93.3	95.3	97.4	108.3	110.6	112.9	135.5	138.4	141.3
NC	20.3	22.3	24.4	20.8	23.1	25.4	26.0	28.9	31.8

<b>CTU</b>	Size	Swing direction (when clamping)	Clamp stroke
	<b>01</b>	<b>L</b> : Counter-clockwise	<b>S16</b> : 16mm
	<b>02</b>		<b>S20</b> : 20mm
	<b>04</b>	<b>R</b> : Clockwise	<b>S25</b> : 25mm
	<b>06</b>		<b>S30</b> : 30mm
	<b>10</b>		<b>S50</b> : 50mm
	<b>16</b>		
<b>25</b>			

■ indicates made to order.

Size, stroke and shape of flange

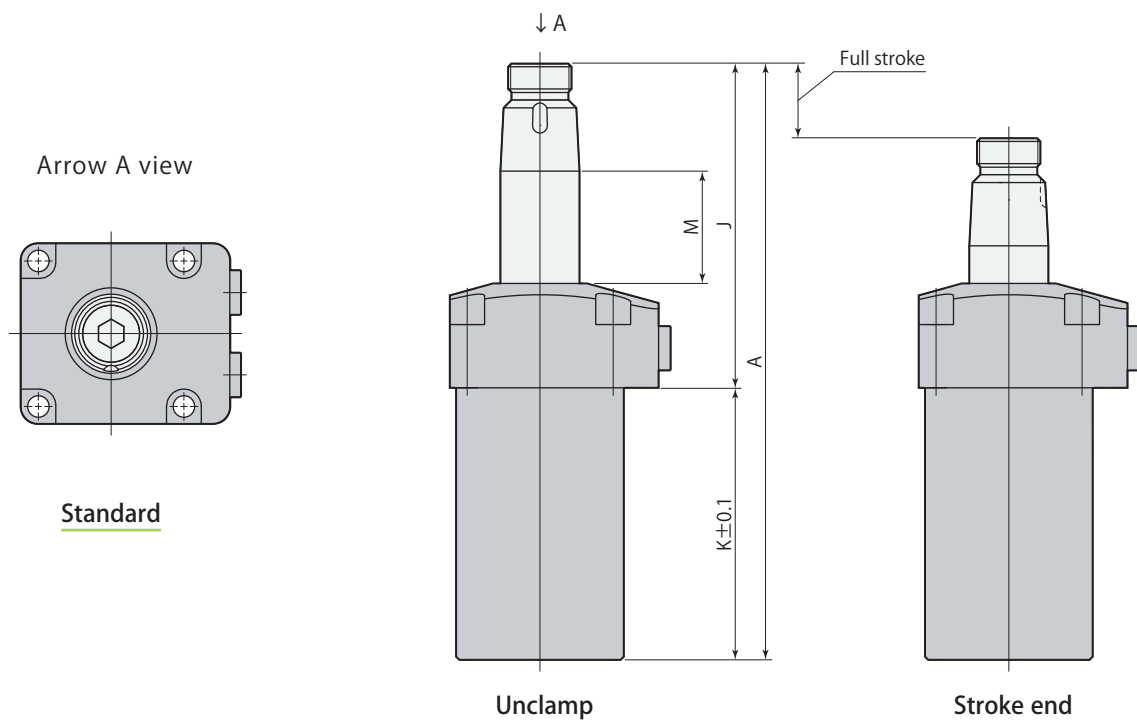
CTU size	01	02	04	06	10	16	25	Shape of flange
Clamp stroke mm	16		20		30			Standard page →22
	-	25	30	30	50	-		Round page →23

Specifications

Model		CTU01-□S16	CTU02-□S16	CTU04-□S16	CTU06-□S20	CTU10-□S20	CTU16-□S20	CTU25-□S30
Full stroke	mm	24	26	28.5	33.5	36.5	38.5	53
Clamp stroke	mm	16	16	16	20	20	20	30
Cylinder capacity	Clamp	cm <sup>3</sup>	8.1	10.6	17.8	30.0	51.7	89.6
	Unclamp	cm <sup>3</sup>	11.8	17.2	29.0	46.4	77.5	127.8
Mass	kg	0.8	1.1	1.6	2.1	3.4	5.5	11.7

● Refer to standard (page →7) for the specifications of products that are not listed on this page.

Dimensions



● Flange size is same as standard stroke model.

Refer to section for standard stroke model (page →10) for the dimensions of products that are not listed on this page.

Model	CTU01-□S16	CTU02-□S16	CTU04-□S16	CTU06-□S20	CTU10-□S20	CTU16-□S20	CTU25-□S30
A	141	155	172.5	188.5	208.5	231.5	295
J	76.5	85	95.5	102.5	111.5	127.5	164
K	64.5	70	77	86	97	104	131
M	25.5	28	30.5	35.5	38.5	40	54.5

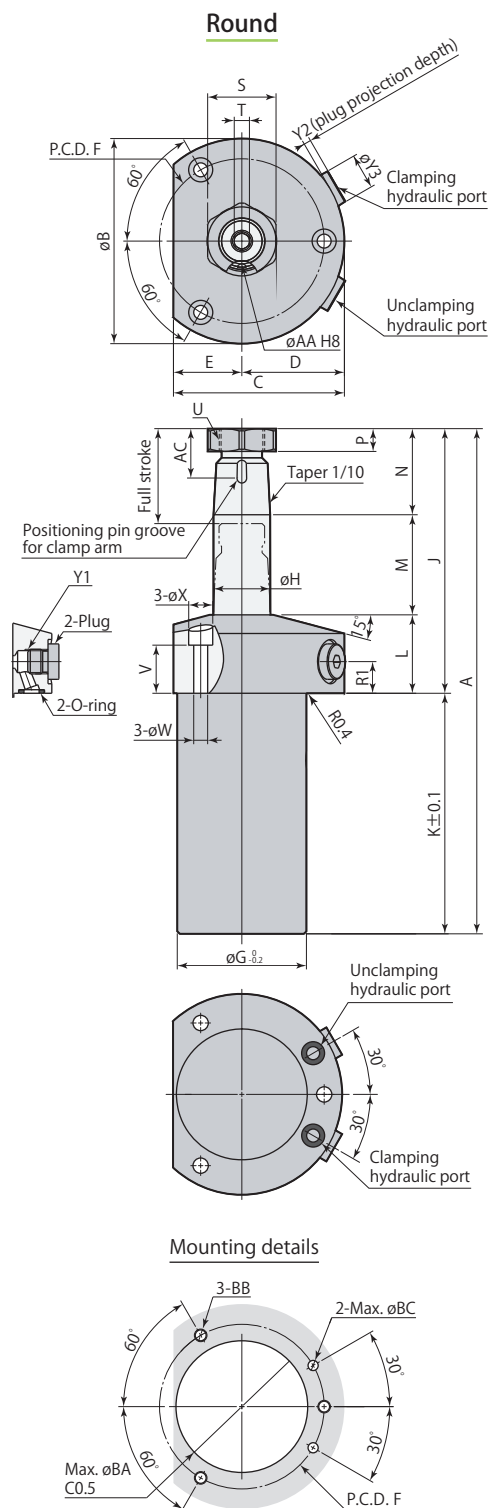
mm

## Specifications

Model		CTU04-□S25	CTU06-□S30	CTU10-□S30	CTU10-□S50	CTU16-□S30	CTU16-□S50
Full stroke	mm	37.5	43.5	46.5	66.5	48.5	68.5
Clamp stroke	mm	25	30	30	50	30	50
Cylinder capacity	Clamp	cm <sup>3</sup>	23.4	38.9	65.9	94.2	112.9
	Unclamp	cm <sup>3</sup>	38.2	60.3	98.8	141.2	160.9
Mass	kg	2.3	3.1	5.0	6.0	7.5	8.7

● Refer to standard (page →7) for the specifications of products that are not listed on this page.

## Dimensions



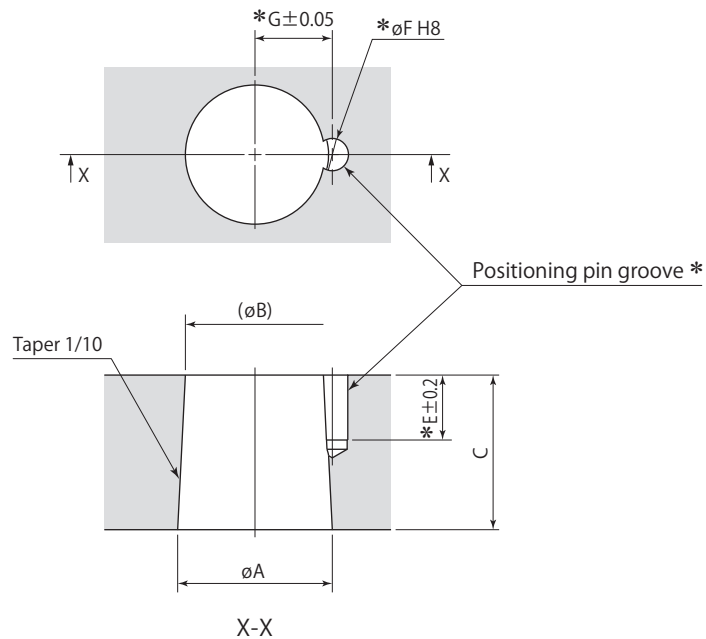
Model	CTU04-□S25	CTU06-□S30	CTU10-□S30	CTU10-□S50	CTU16-□S30	CTU16-□S50
A	199.5	218.5	238.5	298.5	261.5	321.5
$\phi B$	81	89	112	112	125	125
C	67.5	75	92.5	92.5	105.5	105.5
D	40.5	44.5	56	56	62.5	62.5
E	27	30.5	36.5	36.5	43	43
F	65	73	88	88	101	101
$\phi G$	51	58	70	70	83	83
$\phi H$	22.4	25	30	30	35.5	35.5
J	104.5	112.5	121.5	141.5	137.5	157.5
K	95	106	117	157	124	164
L	31	33	36	36	40.5	40.5
M	39.5	45.5	48.5	68.5	50	70
N	34	34	37	37	47	47
P (nut thickness)	9	9	10	10	12	12
R1	12.5	12.5	14	14	14	14
S (nut width across flats)	27	30	36	36	46	46
T (hex socket)	6	8	8	8	10	10
U	M18×1.5	M20×1.5	M24×1.5	M24×1.5	M30×1.5	M30×1.5
V	19	19.5	19	19	20	20
$\phi W$	5.5	6.8	9	9	11	11
$\phi X$	9.5	11	14	14	17.5	17.5
Y1	G1/8	G1/8	G1/4	G1/4	G1/4	G1/4
Y2	2.8	2.8	3.8	3.8	3.8	3.8
$\phi Y3$	14	14	19	19	19	19
O-ring*	P7	P7	P8	P8	P8	P8
$\phi AA$ (pin groove diameter)	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
AC	19.5	19.5	22.5	22.5	24.5	24.5
$\phi BA$	52	59	71	71	84	84
BB	M5	M6	M8	M8	M10	M10
$\phi BC$	4	4	6	6	6	6
Positioning pin (dowel pin)	$\phi 4(h8) \times 10$	$\phi 5(h8) \times 10$	$\phi 6(h8) \times 12$	$\phi 6(h8) \times 12$	$\phi 6(h8) \times 12$	$\phi 6(h8) \times 12$

\*: Fluorocarbon hardness Hs90 ● This diagram indicates unclamped condition of swing direction L (L stands for counter-clockwise).



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 (E,  $\phi F$ , G) unless positioning pin is used for the arm.  
The positioning pin enables a clamp arm to locate on the clamp firmly and easily.

Swing clamp	CTU01	CTU02	CTU04	CTU06	CTU10	CTU16	CTU25
$\phi A$	14 <sup>-0.016</sup> <sub>-0.034</sub>	18 <sup>-0.016</sup> <sub>-0.034</sub>	22.4 <sup>-0.020</sup> <sub>-0.041</sub>	25 <sup>-0.020</sup> <sub>-0.041</sub>	30 <sup>-0.020</sup> <sub>-0.041</sub>	35.5 <sup>-0.025</sup> <sub>-0.050</sub>	45 <sup>-0.025</sup> <sub>-0.050</sub>
$\phi B$	12.4	16	19.9	22.5	27.3	32	40.5
C	16	20	25	25	27	35	45
E	9	10.5	10.5	10.5	12.5	12.5	14.5
$\phi F$ (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
G	7.55	9.1	11.1	12.6	15.1	18.1	22.6

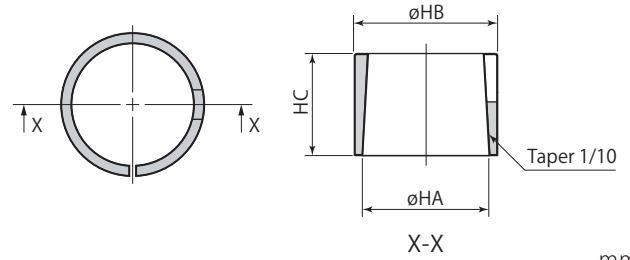
mm

### Taper sleeve

Size

01
02
04
06
10
16
25

**CTH** — **TS** : Taper sleeve

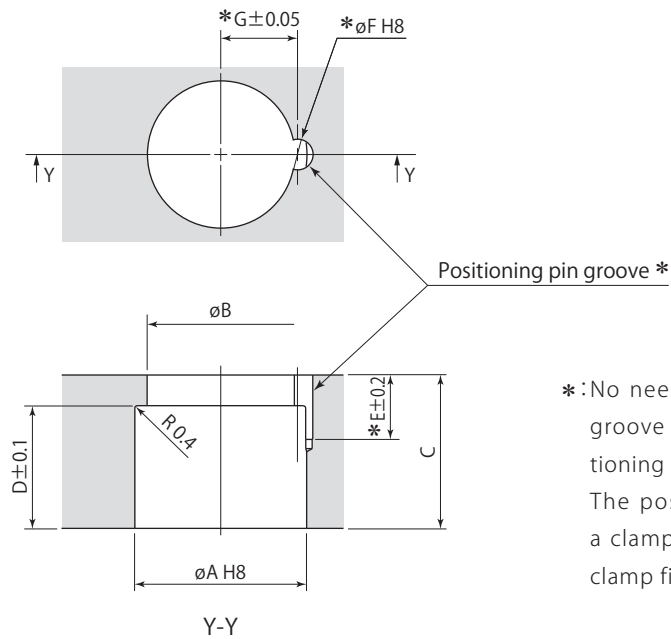


Taper sleeve	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS
Applicable swing clamp	CTU01	CTU02	CTU04	CTU06	CTU10	CTU16	CTU25
øHA	14	18	22.4	25	30	35.5	45
øHB	16	20	25	28	34	40	49
HC	13	16	21	20	22	29	38

### Clamp arm mounting details

(Using taper sleeve)

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



\*: No need to machine the pin groove (E, øF, G) unless positioning pin is used for the arm. The positioning pin enables a clamp arm to locate on the clamp firmly and easily.

Taper sleeve	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS
Applicable swing clamp	CTU01	CTU02	CTU04	CTU06	CTU10	CTU16	CTU25
øA	16 <sup>+0.027</sup> <sub>0</sub>	20 <sup>+0.033</sup> <sub>0</sub>	25 <sup>+0.033</sup> <sub>0</sub>	28 <sup>+0.033</sup> <sub>0</sub>	34 <sup>+0.039</sup> <sub>0</sub>	40 <sup>+0.039</sup> <sub>0</sub>	49 <sup>+0.039</sup> <sub>0</sub>
øB	13	17	21	24	28.5	34	42
C	16	20	25	25	27	35	45
D	13	16	21	20	22	29	38
E	9	10.5	10.5	10.5	12.5	12.5	14.5
øF (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
G	7.55	9.1	11.1	12.6	15.1	18.1	22.6

Table of contents

Structure, Hydraulic circuit diagram .....	28
Specifications, Piping .....	29
Performance table .....	30
Swing speed adjustment .....	31
Dimensions	
Standard CTT .....	32
Pin rod CTT-P .....	35
Swing angle 30°, 45°, 60° CTT-N .....	37
Clamp arm mounting details .....	38
Option	
Taper sleeve CTH-TS .....	39
Perfect nut CTH-TN .....	41
Perfect release nut CTH-TNR .....	43
Quick arm change CTH-CQ .....	48
Mounting & dismounting of clamp arm .....	50
Flow control valve VCF .....	52
Air bleeding valve VCE .....	54

# Swing clamp

Single acting 7 MPa

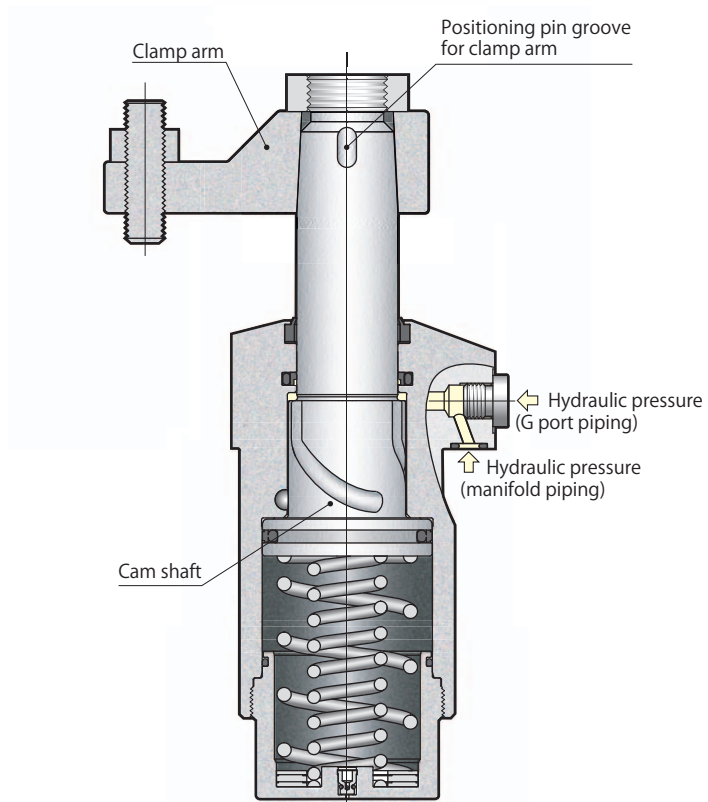
model **CTT**



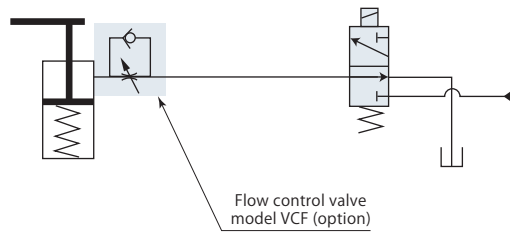
Single acting Swing clamp  
model CTT06-L

Standard model

model CTT□-□



Hydraulic circuit diagram



Use flow control valve for meter-in control.

- Specifications page → 29
- Standard page → 32
- Pin rod page → 35
- Swing angle 30°, 45°, 60° page → 36

## Specifications

CTT	Size	Swing direction (when clamping)	Variation code*
	<b>01</b>	<b>L</b> : Counter-clockwise	<b>(Nil)</b> : Standard
	<b>02</b>		
	<b>04</b>		
	<b>06</b>	<b>R</b> : Clockwise	<b>P</b> : Pin rod
	<b>10</b>		<b>N□</b> : Swing angle 30°, 45°, 60°
<b>16</b>			
<b>25</b>			

■ indicates made to order.

\*: Contact Pascal for the details of variation codes (models) that are not described in the catalog.

Model		CTT01	CTT02	CTT04	CTT06	CTT10	CTT16	CTT25	
Cylinder force (hydraulic pressure 7MPa)*1	kN	2.0	2.4	3.4	5.1	8.1	13.3	20.5	
Cylinder inner diameter	mm	25	29	36	42	52	65	82	
Rod diameter	mm	14	18	22.4	25	30	35.5	45	
Effective area (clamp)	cm <sup>2</sup>	3.4	4.1	6.2	8.9	14.2	23.3	36.9	
Swing angle		90° ± 3°							
Positioning pin groove position accuracy		± 1°							
Repeated clamp positioning accuracy		± 0.5°							
Full stroke	mm	16	18	20.5	23.5	26.5	28.5	36	
90° swing stroke	mm	8	10	12.5	13.5	16.5	18.5	23	
Clamp stroke	mm	8	8	8	10	10	10	13	
Max. swing torque*2	N·m	0.15	0.2	0.6	1.0	1.8	3.6	5.4	
Cylinder capacity (clamp)	cm <sup>3</sup>	5.4	7.3	12.8	21.0	37.5	66.4	132.9	
Return spring force	Unclamp	kN	0.23	0.29	0.50	0.74	1.13	1.79	2.92
	Clamp stroke central position	kN	0.37	0.47	0.94	1.12	1.79	2.99	5.32
	Clamp end	kN	0.42	0.52	1.05	1.22	1.94	3.25	5.85
Recommended piping inner diameter*3	mm	ø6	ø6	ø6	ø6	ø8	ø8	ø10	
Mass	kg	0.7	1.0	1.5	2.0	3.3	5.5	10.4	
Recommended tightening torque of mounting screws*4	N·m	3.5	7	7	12	29	57	77	
Recommended tightening torque of nut	N·m	12	26	51	60	86	120	180	

- Pressure range: 2.5–7 MPa
- Proof pressure: 10.5 MPa
- Operating temperature: 0–70 °C
- Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)
- Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

\*1: This is value for central position of clamp stroke.

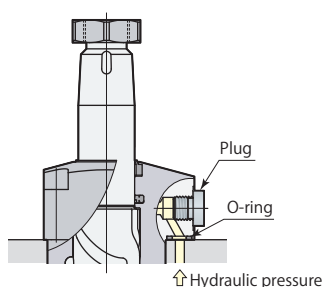
\*2: This is the limit value for lifting arm with spring force (unclamp) when mounted vertically.

\*3: Care must be taken when numerous clamps are used or when hydraulic piping is long. \*4: ISO R898 class 12.9

## Manifold piping and G port piping are available.

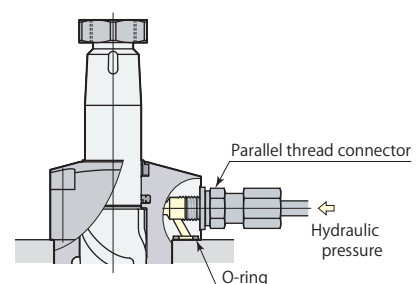
### Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the clamp.



### G port piping

Remove plug when choosing G port piping. (O-ring must be used.) Refer to **page → 174** for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.



Performance table

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

Clamping force calculation formula

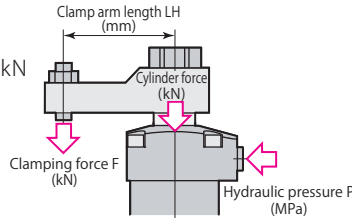
$$F = (P - \text{Coefficient 1}) / (\text{Coefficient 2} + \text{Coefficient 3} \times LH)$$

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

CTT06 with clamp arm length (LH) = 60 mm

at hydraulic pressure of 7 MPa,

Clamping force F is calculated by  $(7 - 1.25) / (1.12 + 0.00422 \times 60) = 4.2 \text{ kN}$



Do not use the clamp in the nonusable range.

It may cause damage to the cylinder and rod.

model CTT01		Clamping force $F = (P - 1.10) / (2.97 + 0.0153 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		30	35	40	50	60	80	100	120	
7	2.0	1.7	1.7	1.6						49
6.5	1.8	1.6	1.5	1.5	1.4					55
6	1.6	1.4	1.4	1.4	1.3	1.3	Nonusable range			62
5.5	1.5	1.3	1.3	1.2	1.2	1.1				73
5	1.3	1.1	1.1	1.1	1.0	1.0	0.9			87
4.5	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8		107
4	1.0	0.8	0.8	0.8	0.8	0.7	0.7	0.6	0.6	139
3.5	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	↑
3	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	↑
2.5	0.5	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	139

model CTT02		Clamping force $F = (P - 1.16) / (2.46 + 0.0116 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		35	40	50	60	80	100	120	140	
7	2.4	2.0	2.0	1.9	1.9					78
6.5	2.2	1.9	1.8	1.8	1.7	1.6	Nonusable range			89
6	2.0	1.7	1.7	1.6	1.5	1.4	1.3			104
5.5	1.8	1.5	1.5	1.4	1.4	1.3	1.2	1.1		123
5	1.6	1.3	1.3	1.3	1.2	1.1	1.1	1.0	0.9	152
4.5	1.4	1.2	1.1	1.1	1.1	1.0	0.9	0.9	0.8	↑
4	1.2	1.0	1.0	0.9	0.9	0.8	0.8	0.7	0.7	↑
3.5	1.0	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.6	↑
3	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	↑
2.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	152

model CTT04		Clamping force $F = (P - 1.51) / (1.60 + 0.00664 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		40	50	60	80	100	120	140	160	
7	3.4	2.9	2.8	2.7	2.6	2.4	Nonusable range			116
6.5	3.1	2.7	2.6	2.5	2.3	2.2	2.1	Nonusable range		135
6	2.8	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.7	161
5.5	2.5	2.1	2.1	2.0	1.9	1.8	1.7	1.6	1.5	199
5	2.2	1.9	1.8	1.7	1.6	1.5	1.5	1.4	1.3	↑
4.5	1.9	1.6	1.5	1.5	1.4	1.3	1.2	1.2	1.1	↑
4	1.6	1.3	1.3	1.2	1.2	1.1	1.0	1.0	0.9	↑
3.5	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.7	↑
3	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	↑
2.5	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	199

model CTT06		Clamping force $F = (P - 1.25) / (1.12 + 0.00422 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		50	60	80	100	120	140	160	180	
7	5.1	4.3	4.2	3.9	3.7					111
6.5	4.7	3.9	3.8	3.6	3.4	3.2	Nonusable range			127
6	4.2	3.6	3.5	3.3	3.1	2.9	2.8			149
5.5	3.8	3.2	3.1	2.9	2.8	2.6	2.5	2.4	2.3	180
5	3.3	2.8	2.7	2.6	2.4	2.3	2.2	2.1	2.0	226
4.5	2.9	2.4	2.4	2.2	2.1	2.0	1.9	1.8	1.7	↑
4	2.5	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.5	↑
3.5	2.0	1.7	1.6	1.5	1.5	1.4	1.3	1.3	1.2	↑
3	1.6	1.3	1.3	1.2	1.1	1.1	1.0	1.0	0.9	↑
2.5	1.1	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	226

model CTT10		Clamping force $F = (P - 1.26) / (0.706 + 0.00228 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		60	80	100	120	140	160	180	200	
7	8.1	6.8	6.5	6.1	5.9					135
6.5	7.4	6.2	5.9	5.6	5.3	5.1	Nonusable range			155
6	6.7	5.6	5.3	5.1	4.8	4.6	4.4	4.2		182
5.5	6.0	5.0	4.8	4.5	4.3	4.1	4.0	3.8	3.6	221
5	5.3	4.4	4.2	4.0	3.8	3.6	3.5	3.4	3.2	↑
4.5	4.6	3.8	3.6	3.5	3.3	3.2	3.0	2.9	2.8	↑
4	3.9	3.3	3.1	2.9	2.8	2.7	2.6	2.5	2.4	↑
3.5	3.2	2.7	2.5	2.4	2.3	2.2	2.1	2.0	1.9	↑
3	2.5	2.1	2.0	1.9	1.8	1.7	1.6	1.6	1.5	↑
2.5	1.8	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	221

model CTT16		Clamping force $F = (P - 1.28) / (0.429 + 0.00128 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		70	80	100	120	140	160	180	200	
7	13.3	11.0	10.8	10.3	9.8					132
6.5	12.2	10.1	9.8	9.4	9.0	8.6	Nonusable range			151
6	11.0	9.1	8.9	8.5	8.1	7.8	7.4			176
5.5	9.8	8.1	7.9	7.6	7.2	6.9	6.7	6.4	6.2	212
5	8.7	7.2	7.0	6.7	6.4	6.1	5.9	5.6	5.4	264
4.5	7.5	6.2	6.1	5.8	5.5	5.3	5.1	4.9	4.7	↑
4	6.3	5.2	5.1	4.9	4.7	4.5	4.3	4.1	4.0	↑
3.5	5.2	4.3	4.2	4.0	3.8	3.7	3.5	3.4	3.2	↑
3	4.0	3.3	3.2	3.1	3.0	2.8	2.7	2.6	2.5	↑
2.5	2.8	2.4	2.3	2.2	2.1	2.0	1.9	1.9	1.8	264

model CTT25		Clamping force $F = (P - 1.44) / (0.271 + 0.000658 \times LH)$								
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Max. arm length Max. LH mm
		Clamp arm length LH mm								
		90	100	120	140	160	180	200	240	
7	20.5	16.8	16.5	15.9	15.3	14.8	14.3	Nonusable range		180
6.5	18.7	15.3	15.0	14.5	13.9	13.4	13.0	12.6		208
6	16.8	13.8	13.5	13.0	12.6	12.1	11.7	11.3	10.6	246
5.5	15.0	12.3	12.1	11.6	11.2	10.8	10.4	10.1	9.5	300
5	13.1	10.8	10.6	10.2	9.8	9.5	9.1	8.8	8.3	↑
4.5	11.3	9.3	9.1	8.7	8.4	8.1	7.9	7.6	7.1	↑
4	9.4	7.8	7.6	7.3	7.1	6.8	6.6	6.4	6.0	↑
3.5	7.6	6.2	6.1	5.9	5.7	5.5	5.3	5.1	4.8	↑
3	5.8	4.7	4.6	4.5	4.3	4.1	4.0	3.9	3.6	↑
2.5	3.9	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5	300

● See the formula shown on page →35 for clamping force calculation when pin rod type (CTT□-□P) is selected.



## Swing speed adjustment

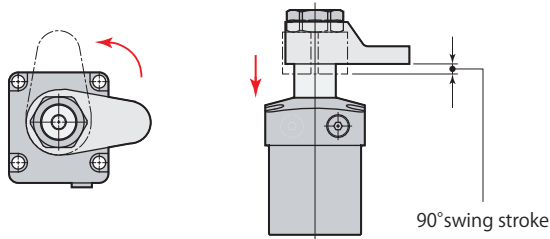
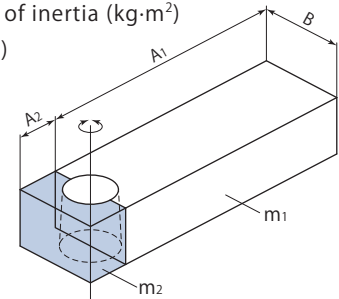
Swing time is restricted by the mass and length of the clamp arm (moment of inertia) since the 90° swing action impacts the cam shaft.

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

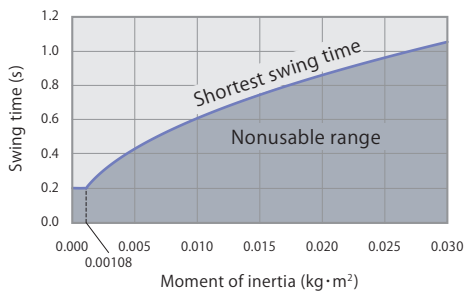
$$I = \frac{1}{12} m_1(4A_1^2 + B^2) + \frac{1}{12} m_2(4A_2^2 + B^2)$$

$I$  : Moment of inertia ( $\text{kg}\cdot\text{m}^2$ )  
 $m$  : Mass (kg)



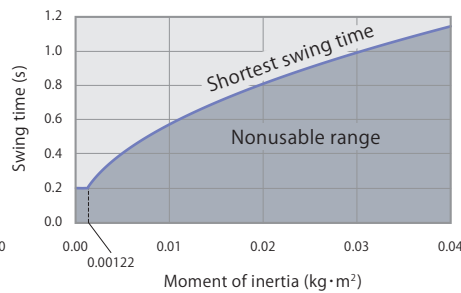
model **CTT01**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0270}}$



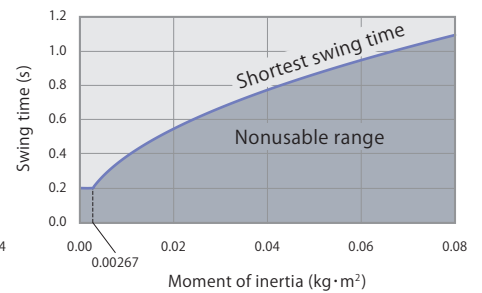
model **CTT02**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0305}}$



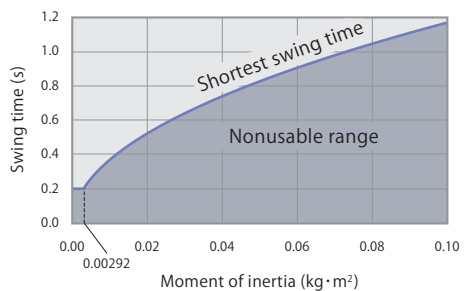
model **CTT04**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0668}}$



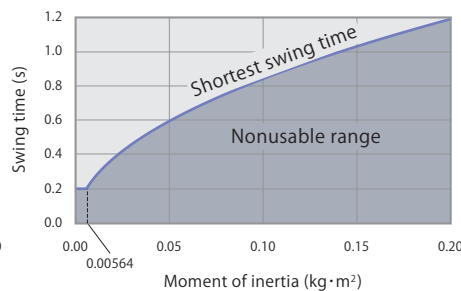
model **CTT06**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.0730}}$



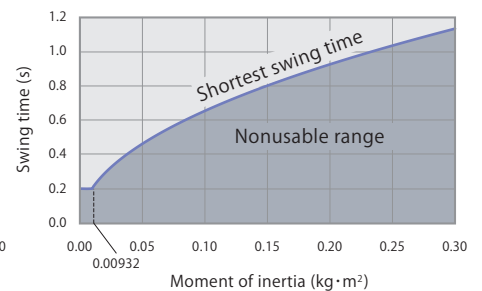
model **CTT10**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.141}}$



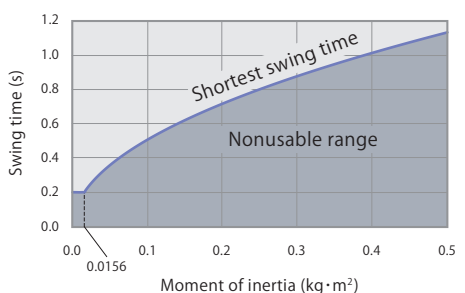
model **CTT16**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.233}}$

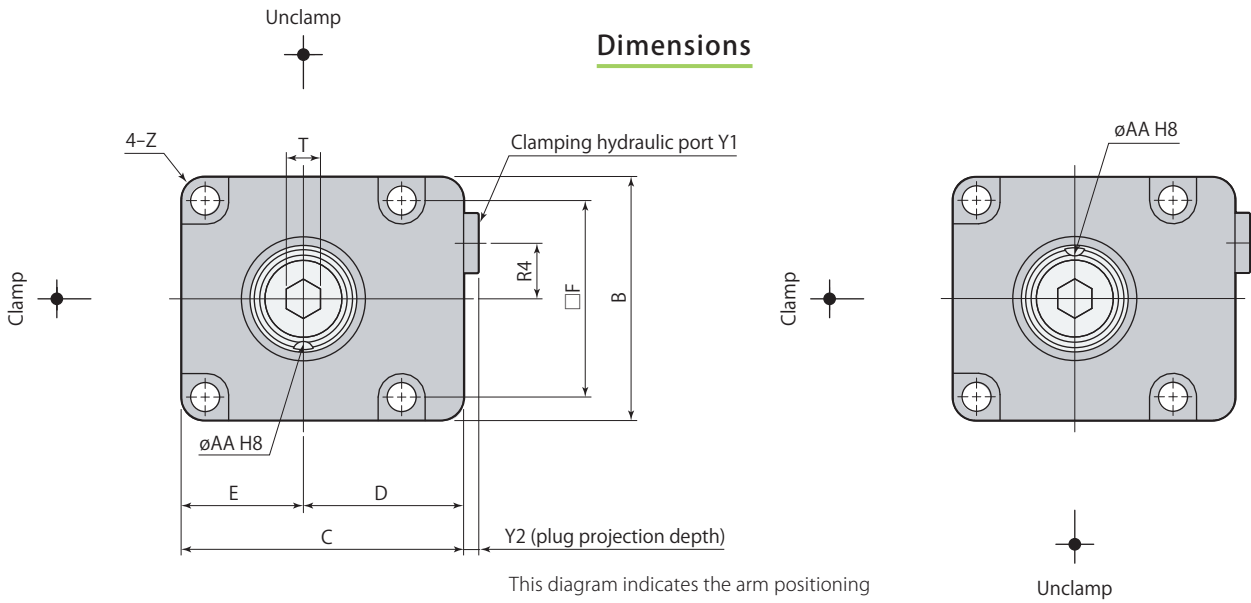


model **CTT25**

Shortest swing time calculation formula  $t = \sqrt{\frac{I}{0.389}}$



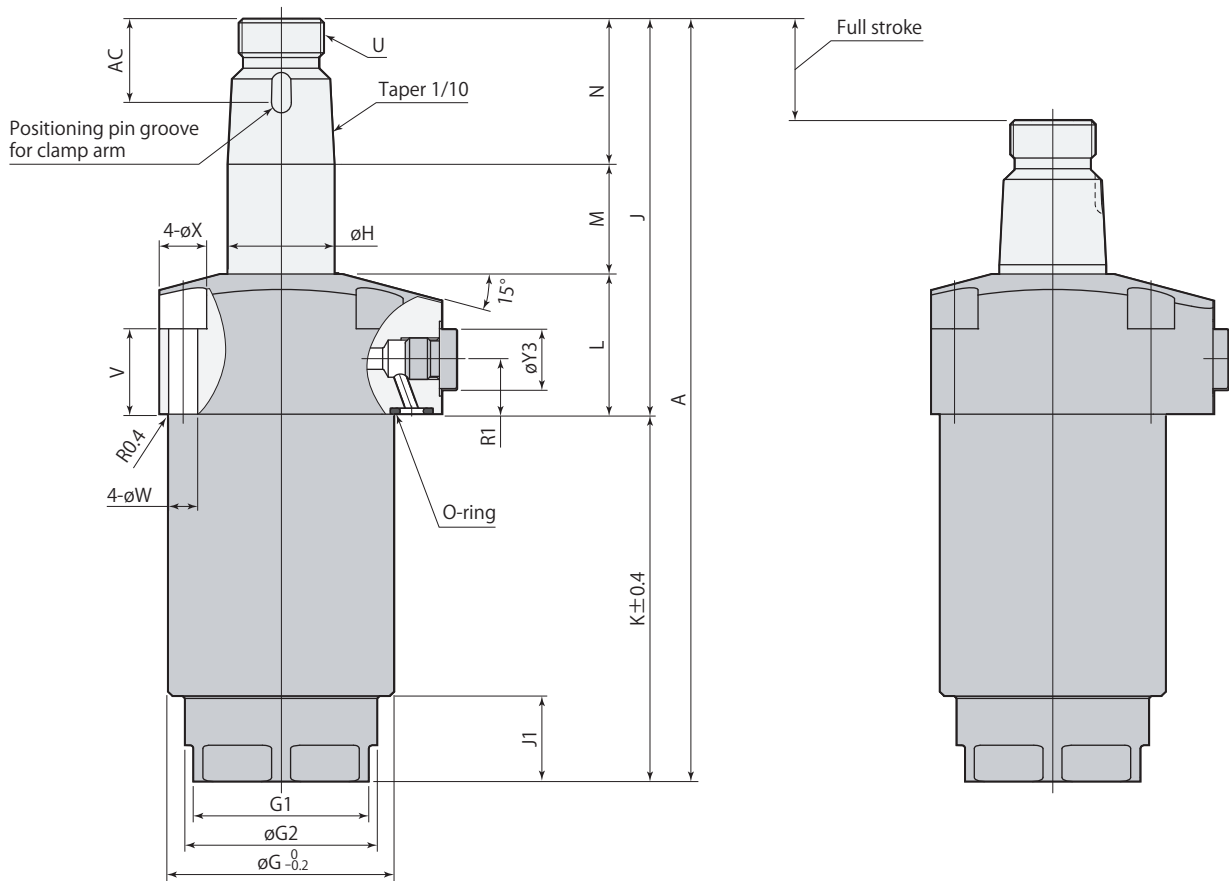
Dimensions



This diagram indicates the arm positioning pin groove at unclamped condition.

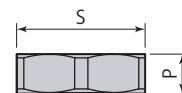
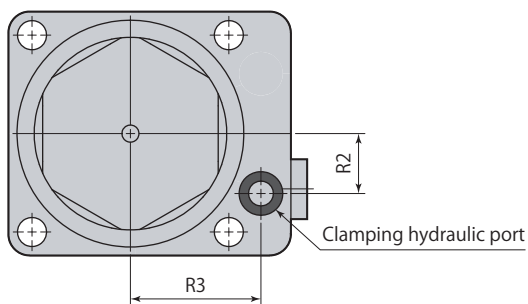
Swing direction L (counter-clockwise)

Swing direction R (clockwise)



Unclamp

Stroke end



Hex nut for arm mount

- Hex nut for arm mount is included.
- Refer to **page →40** for the details of perfect nut.
- Clamp arm, positioning pin and mounting screws are not included.

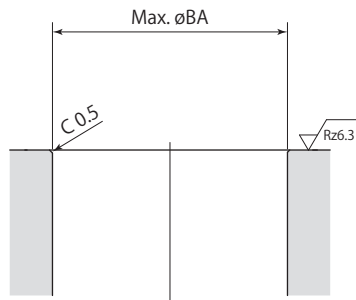
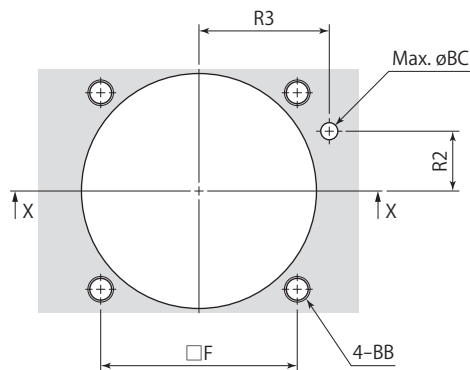
<b>CTT</b> □-□	<b>Single acting Swing clamp Standard model</b>	<b>7MPa</b>	<b>Single acting</b>
----------------	---	-------------	----------------------

Model	CTT01-□	CTT02-□	CTT04-□	CTT06-□	CTT10-□	CTT16-□	CTT25-□
A	129	136	161.5	178.5	203.5	231.5	284
B	38	45	50	57	70	86	108
C	48	55	60	66	82	96	120
D	29	32.5	35	37.5	47	53	66
E	19	22.5	25	28.5	35	43	54
F	30.5	35	40	46	56	68	88
øG	35	39	47	53	63	78	100
G1 (width across flats)	24	30	36	41	50	60	75
øG2	26	33	40	45	55	66	85
øH	14	18	22.4	25	30	35.5	45
J	68.5	77	87.5	92.5	101.5	117.5	147
J1	12	5	13	20	25	30	40
K	60.5	59	74	86	102	114	137
L	28.5	29	31	33	36	40.5	51.5
M	17.5	20	22.5	25.5	28.5	30	37.5
N	22.5	28	34	34	37	47	58
P	6.5	8	9	9	10	12	13
R1	12.5	12.5	12.5	12.5	14	14	21
R2	9	11	12	14	18	22.5	25
R3	22.5	25	28	30.5	36	42	57
R4	8.1	10	11	13	15	19	25
S (nut width across flats)	19	22	27	30	36	46	55
T (hex socket)	5	6	6	8	8	10	14
U	M12×1.5	M14×1.5	M18×1.5	M20×1.5	M24×1.5	M30×1.5	M39×1.5
V	20	19.5	20	20	19.5	20	26
øW	4.3	5.5	5.5	6.8	9	11	14
øX	8	9.5	9.5	11	14	17.5	20
Y1	G1/8	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8
Y2	3.8	3.8	3.8	3.8	4.8	4.8	4.8
øY3	14	14	14	14	19	19	22
Z	R3	R3	R3	R5	R6	R7	R10
øAA (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
AC	15.5	18.5	19.5	19.5	22.5	24.5	27.5
Positioning pin (dowel pin)	ø3(h8)×8	ø4(h8)×10	ø4(h8)×10	ø5(h8)×10	ø6(h8)×12	ø6(h8)×12	ø6(h8)×14
O-ring (fluorocarbon hardness Hs90)	P7	P7	P7	P7	P8	P8	P10
Taper sleeve	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS
Flow control valve (meter-in)*	VCF01	VCF01	VCF01	VCF01	VCF02	VCF02	VCF03
Air bleeding valve*	VCE01	VCE01	VCE01	VCE01	VCE02	VCE02	VCE03

\*: Select the right model of VCF and VCE according to the size of the clamp.

Refer to each page for the details of options.

● Taper sleeve **page →39** ● Flow control valve **page →52** ● Air bleeding valve **page →54**

Mounting details

X-X

Rz: ISO4287(1997)

Model	CTT01-□	CTT02-□	CTT04-□	CTT06-□	CTT10-□	CTT16-□	CTT25-□	mm
F	30.5	35	40	46	56	68	88	
R2	9	11	12	14	18	22.5	25	
R3	22.5	25	28	30.5	36	42	57	
øBA	36	40	48	54	64	79	101	
BB	M4	M5	M5	M6	M8	M10	M12	
øBC	4	4	4	4	6	6	8	

Size

01  
02  
04  
06  
10  
16  
25

CTT

—

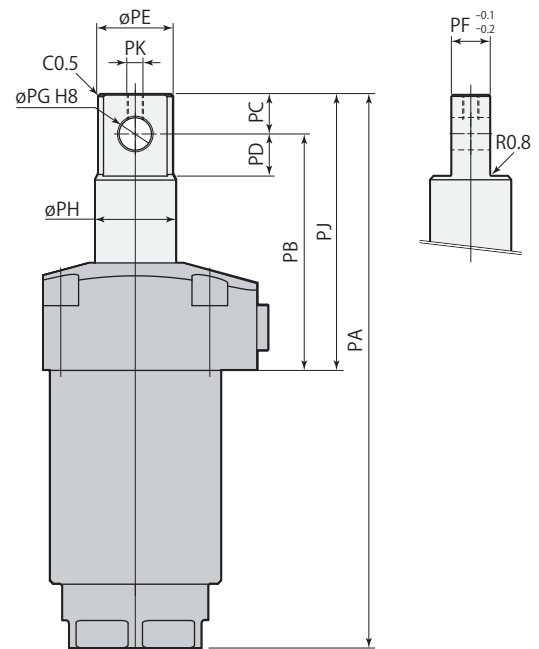
Swing direction (when clamping)

L : Counter-clockwise  
R : Clockwise

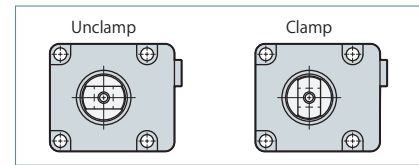
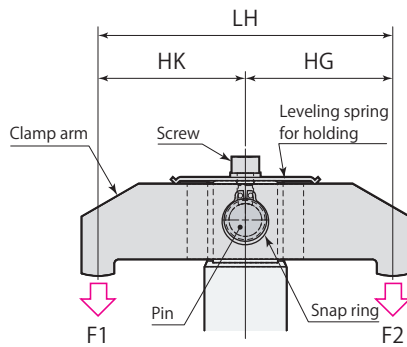
P : Pin rod

■ indicates made to order.

Dimensions



Usage example



Clamping performance

Clamping force calculation formula

$$F1 = \frac{HG}{LH} \times \frac{P \cdot n1}{n2}$$

$$F2 = \frac{HK}{LH} \times \frac{P \cdot n1}{n2}$$

F1, F2=Clamping force (kN),  
n1, n2=Coefficient (refer to right table),  
P= Hydraulic pressure (MPa),  
HG, HK=Distance from center of piston to clamping point (mm), LH=(mm)

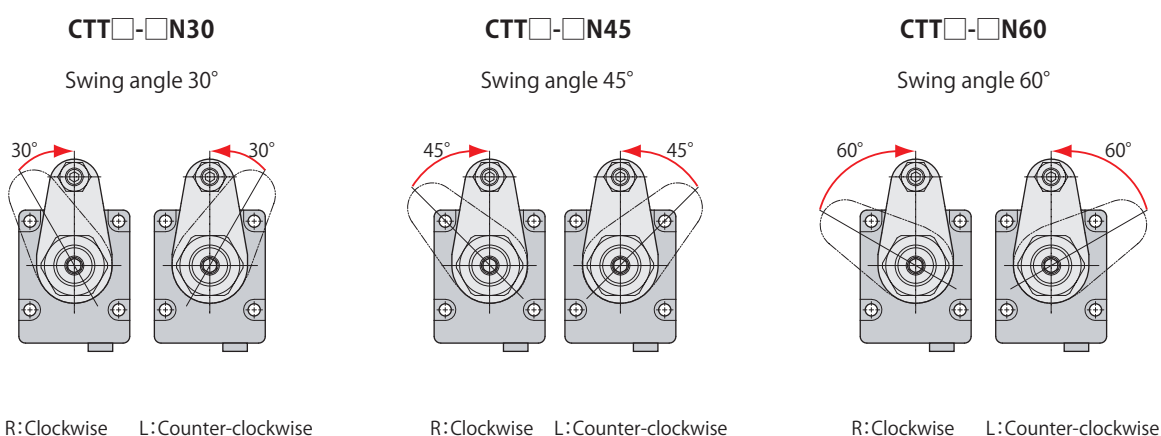
Model	Coefficient n1	Coefficient n2
CTT01-□P	1.10	2.97
CTT02-□P	1.16	2.46
CTT04-□P	1.51	1.60
CTT06-□P	1.25	1.12
CTT10-□P	1.26	0.706
CTT16-□P	1.28	0.429
CTT25-□P	1.44	0.271

- This diagram indicates unclamped condition. Direction of pin hole will be hydraulic port side at the time of clamping.
- Clamp arm, pin and snap ring are not included. Customers must arrange for them.
- Thread at top portion of the rod is for attaching a leveling spring. Screw and leveling spring are not included.
- Refer to specifications (page →29), dimensions (page →32) for other specifications and dimensions that are not shown in the diagram.

Model	CTT01-□P	CTT02-□P	CTT04-□P	CTT06-□P	CTT10-□P	CTT16-□P	CTT25-□P
PA	125	126.5	150	171	197	225	276.5
PB	56.5	59.5	66	73	81	92	115.5
PC	8	8	10	12	14	19	24
PD	9	9	11	13	15	20	25
øPE	12	16	20.4	23	28	33.5	43
PF	8	8	10	12	16	18	22
øPG	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	8 <sup>+0.022</sup> <sub>0</sub>	10 <sup>+0.022</sup> <sub>0</sub>	12 <sup>+0.027</sup> <sub>0</sub>	16 <sup>+0.027</sup> <sub>0</sub>	20 <sup>+0.033</sup> <sub>0</sub>
øPH	14	18	22.4	25	30	35.5	45
PJ	64.5	67.5	76	85	95	111	139.5
PK	M3×0.5	M3×0.5	M4×0.7	M5×0.8	M6×1	M6×1	M8×1.25
Mass	0.7 kg	0.8 kg	1.3 kg	1.8 kg	3.0 kg	4.9 kg	9.5 kg

<b>CTT</b>	Size		Swing direction (when clamping)	
	01	-		
	02			
	04		<b>L</b> : Counter-clockwise	<b>N30</b> : Swing angle 30°
	06			<b>N45</b> : Swing angle 45°
	10			<b>N60</b> : Swing angle 60°
	16		<b>R</b> : Clockwise	
25				

### Swing angle



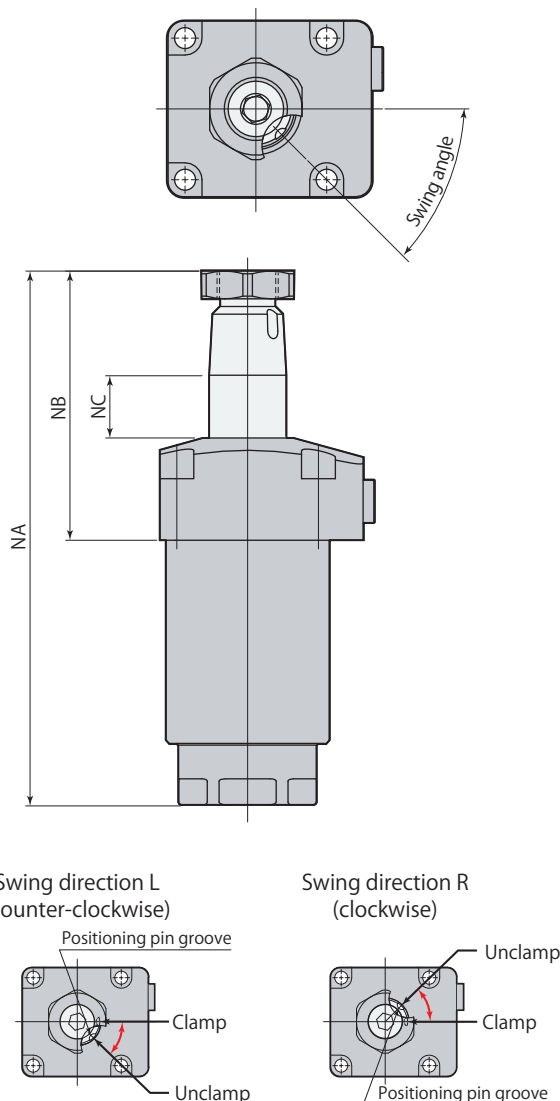
### Specifications

Model	CTT01-□N□			CTT02-□N□			CTT04-□N□			CTT06-□N□			
Swing angle	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	
Full stroke	mm	11.8	12.7	13.7	13.0	14.3	15.5	14.3	15.8	17.4	16.8	18.4	20.1
Swing stroke	mm	3.8	4.7	5.7	5.0	6.3	7.5	6.3	7.8	9.4	6.8	8.4	10.1
Clamp stroke	mm	8			8			8			10		
Cylinder capacity (clamp)	cm <sup>3</sup>	4.0	4.3	4.6	5.3	5.8	6.3	8.9	9.9	10.8	15.0	16.5	18.0
Return spring force (unclamp)	kN	0.28	0.27	0.26	0.36	0.34	0.32	0.66	0.62	0.58	0.88	0.85	0.81

Model	CTT10-□N□			CTT16-□N□			CTT25-□N□			
Swing angle	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	
Full stroke	mm	18.3	20.3	22.4	19.3	21.6	23.9	24.5	27.4	30.3
Swing stroke	mm	8.3	10.3	12.4	9.3	11.6	13.9	11.5	14.4	17.3
Clamp stroke	mm	10			10			13		
Cylinder capacity (clamp)	cm <sup>3</sup>	25.9	28.8	31.7	44.8	50.2	55.6	90.4	101.0	111.6
Return spring force (unclamp)	kN	1.38	1.32	1.25	2.26	2.15	2.03	3.86	3.62	3.39

● Refer to **page →29** for the specifications of products that are not listed on this page.

Dimensions



- This diagram indicates unclamped condition of swing direction L (L stands for counter-clockwise). Direction of positioning pin groove will be hydraulic port side at the time of clamping.
- Refer to **page →32** for the dimensions of products that are not listed on this page.

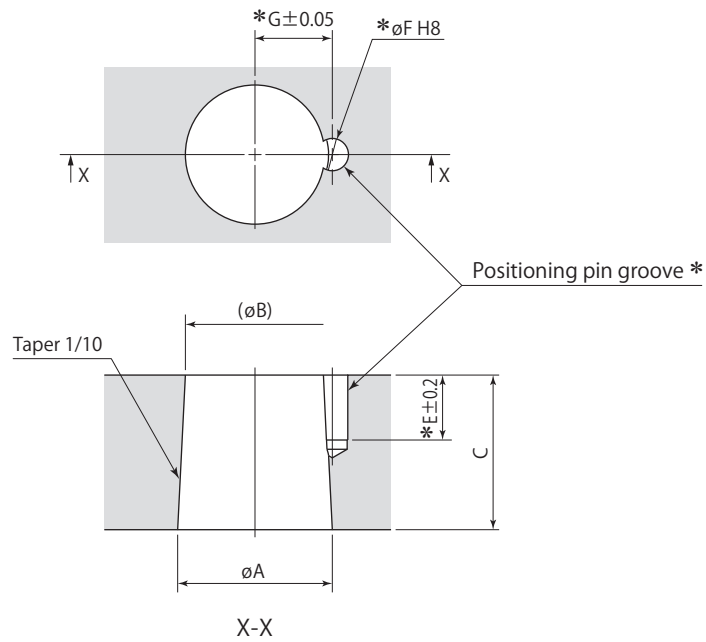
Model	CTT01-□N□			CTT02-□N□			CTT04-□N□			CTT06-□N□		
	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°
NA	124.8	125.7	126.7	131.0	132.3	133.5	155.3	156.8	158.4	171.8	173.4	175.1
NB	64.3	65.2	66.2	72.0	73.3	74.5	81.3	82.8	84.4	85.8	87.4	89.1
NC	13.3	14.2	15.2	15.0	16.3	17.5	16.3	17.8	19.4	18.8	20.4	22.1

Model	CTT10-□N□			CTT16-□N□			CTT25-□N□		
	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°	30°±3°	45°±3°	60°±3°
NA	195.3	197.3	199.4	222.3	224.6	226.9	272.5	275.4	278.3
NB	93.3	95.3	97.4	108.3	110.6	112.9	135.5	138.4	141.3
NC	20.3	22.3	24.4	20.8	23.1	25.4	26.0	28.9	31.8



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 (E,  $\phi F$ , G) unless positioning pin is used for the arm.  
The positioning pin enables a clamp arm to locate on the clamp firmly and easily.

Swing clamp	CTT01	CTT02	CTT04	CTT06	CTT10	CTT16	CTT25
$\phi A$	14 <sup>-0.016</sup> <sub>-0.034</sub>	18 <sup>-0.016</sup> <sub>-0.034</sub>	22.4 <sup>-0.020</sup> <sub>-0.041</sub>	25 <sup>-0.020</sup> <sub>-0.041</sub>	30 <sup>-0.020</sup> <sub>-0.041</sub>	35.5 <sup>-0.025</sup> <sub>-0.050</sub>	45 <sup>-0.025</sup> <sub>-0.050</sub>
$\phi B$	12.4	16	19.9	22.5	27.3	32	40.5
C	16	20	25	25	27	35	45
E	9	10.5	10.5	10.5	12.5	12.5	14.5
$\phi F$ (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
G	7.55	9.1	11.1	12.6	15.1	18.1	22.6

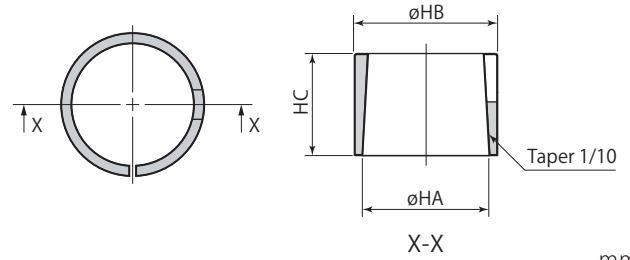
mm

### Taper sleeve

Size

01
02
04
06
10
16
25

**CTH** — **TS** : Taper sleeve

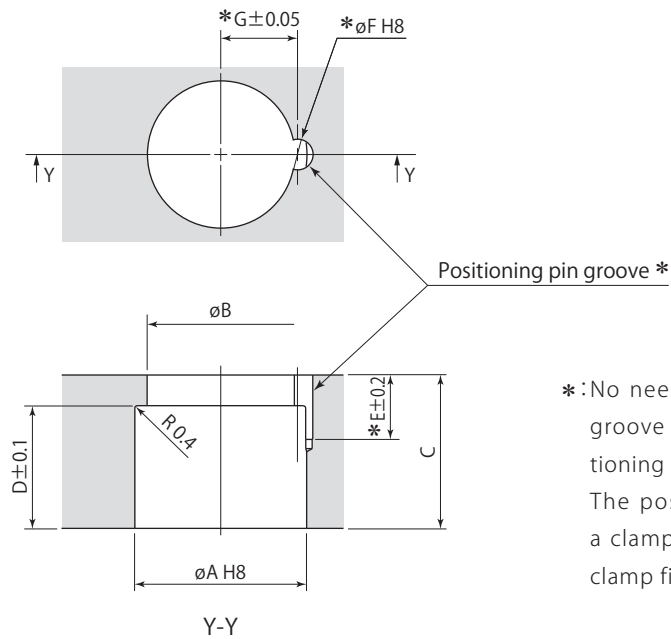


Taper sleeve	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS
Applicable swing clamp	CTT01	CTT02	CTT04	CTT06	CTT10	CTT16	CTT25
øHA	14	18	22.4	25	30	35.5	45
øHB	16	20	25	28	34	40	49
HC	13	16	21	20	22	29	38

### Clamp arm mounting details

(Using taper sleeve)

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

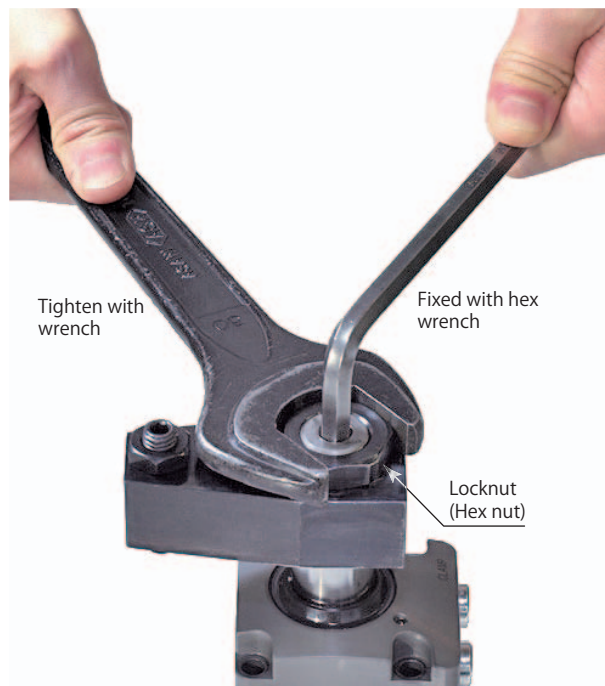


\*: No need to machine the pin groove (E, øF, G) unless positioning pin is used for the arm. The positioning pin enables a clamp arm to locate on the clamp firmly and easily.

Taper sleeve	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS
Applicable swing clamp	CTT01	CTT02	CTT04	CTT06	CTT10	CTT16	CTT25
øA	16 <sup>+0.027</sup> <sub>0</sub>	20 <sup>+0.033</sup> <sub>0</sub>	25 <sup>+0.033</sup> <sub>0</sub>	28 <sup>+0.033</sup> <sub>0</sub>	34 <sup>+0.039</sup> <sub>0</sub>	40 <sup>+0.039</sup> <sub>0</sub>	49 <sup>+0.039</sup> <sub>0</sub>
øB	13	17	21	24	28.5	34	42
C	16	20	25	25	27	35	45
D	13	16	21	20	22	29	38
E	9	10.5	10.5	10.5	12.5	12.5	14.5
øF (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
G	7.55	9.1	11.1	12.6	15.1	18.1	22.6

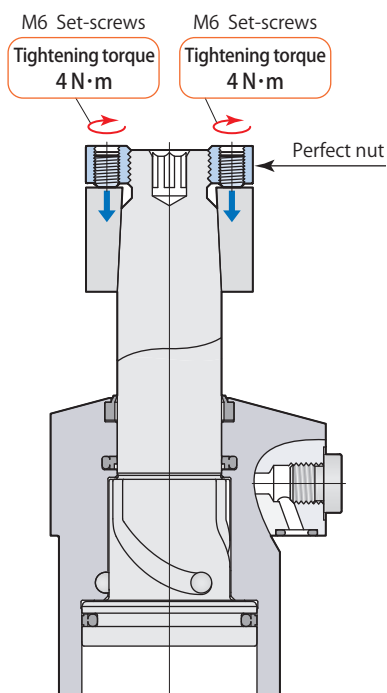
Mounting arm firmly and easily.

Less workability with conventional way of the mount.

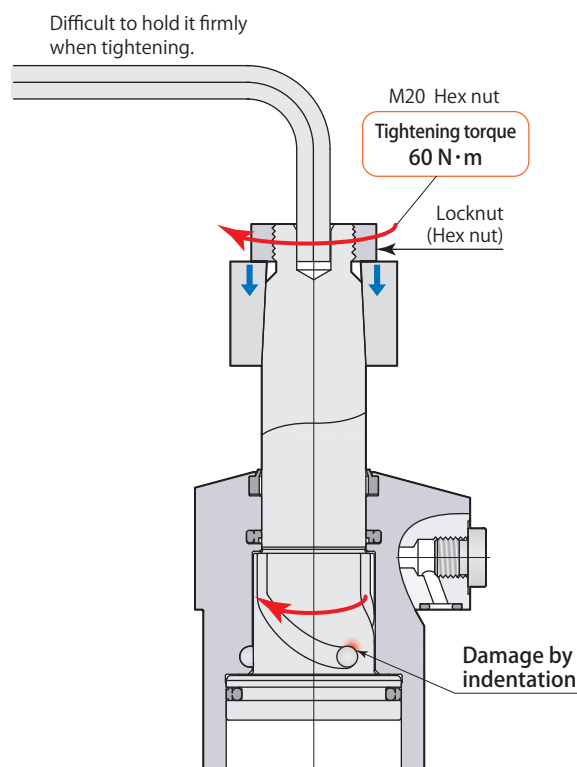


- Fastening or loosening the nut over the top of the clamp by an electric wrench helps to improve the workability on the machine table or the jig.

- To fasten or loosen the nut using the conventional way in a limited space makes the workability lower and may cause incomplete arm mounting.



Swing clamp model CTU06



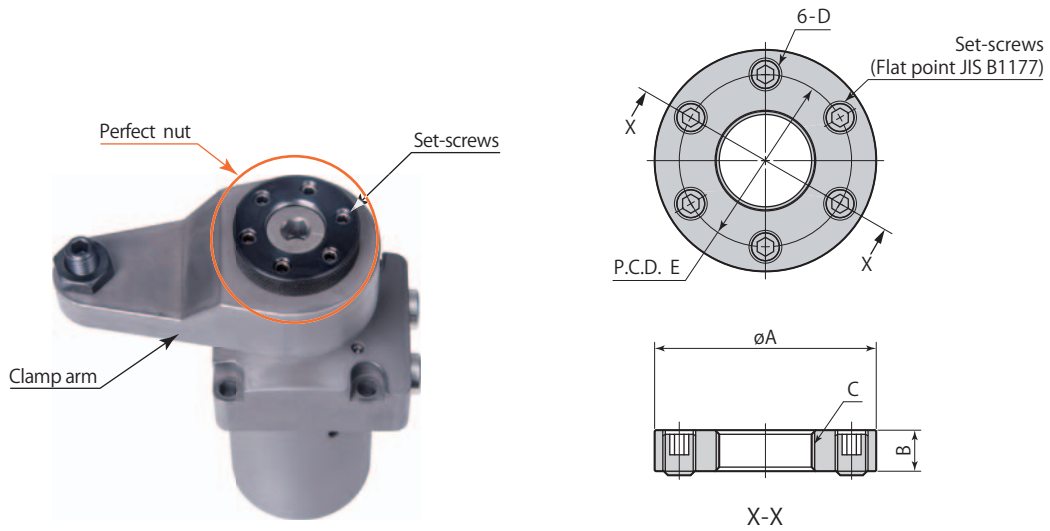
Swing clamp model CTU06

- The perfect nut needs minimum torque to tighten the set-screws and it can avoid giving the overload to the cam groove on the piston rod, which enables the arm to mount firmly and easily.

- The piston rod of the clamp must be fixed firmly to fasten the nut however it may cause damage on cam groove in case the rod is not fixed firmly.

Perfect nut

Size  
**01**  
**02**  
**04**  
**CTH 06** — **TN** : Perfect nut  
**10**  
**16**  
**25**

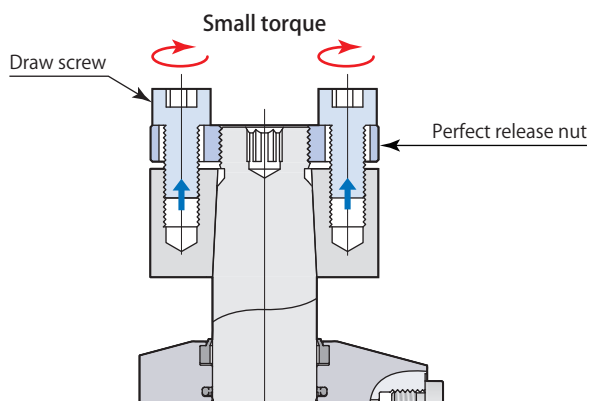


Perfect nut		CTH01-TN	CTH02-TN	CTH04-TN	CTH06-TN	CTH10-TN	CTH16-TN	CTH25-TN
Applicable swing clamp		CTU01 CTT01	CTU02 CTT02	CTU04 CTT04	CTU06 CTT06	CTU10 CTT10	CTU16 CTT16	CTU25 CTT25
Set-screws	Size	M4×0.7 length 6	M5×0.8 length 8	M6×1 length 8	M6×1 length 8	M8×1.25 length 10	M8×1.25 length 10	M10×1.5 length 10
	Recommended tightening torque	1 N·m	2 N·m	3 N·m	4 N·m	6 N·m	7 N·m	10 N·m
øA		24	30	36	40	50	56	74
B		6.5	8	9	9	10	12	13
C		M12×1.5	M14×1.5	M18×1.5	M20×1.5	M24×1.5	M30×1.5	M39×1.5
D		M4×0.7	M5×0.8	M6×1	M6×1	M8×1.25	M8×1.25	M10×1.5
E		18	22	26.5	30	38	43	55
Mass		0.02 kg	0.04 kg	0.06 kg	0.07 kg	0.12 kg	0.17 kg	0.33 kg

Dismounting arm easily.



- By simply fastening the draw screw the clamp arm can be easily removed, which does not need a specialized tool such as a gear puller.

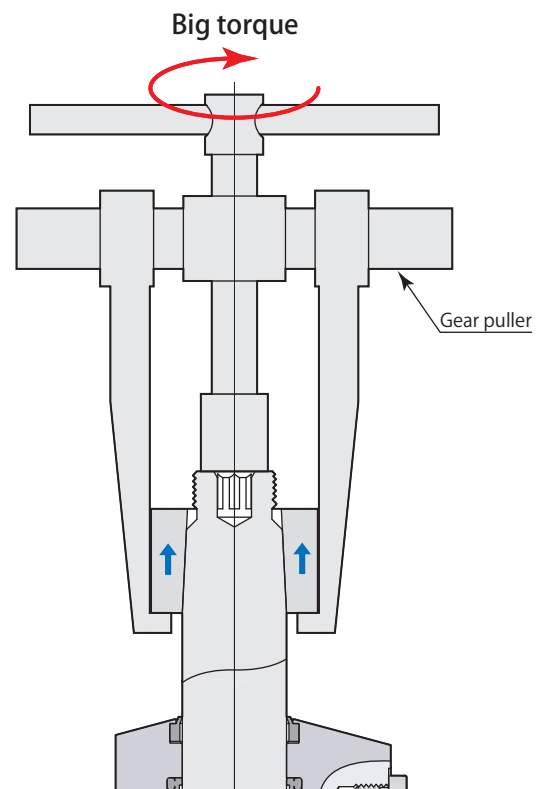


- The clamp arm can be dismantled easily and securely with a small torque.

Inferior dismounting workability using a gear puller.



- On the machine table top and the jig the working space is limited, it is difficult to pull up a clamp arm using a specialized tool such as a gear puller.



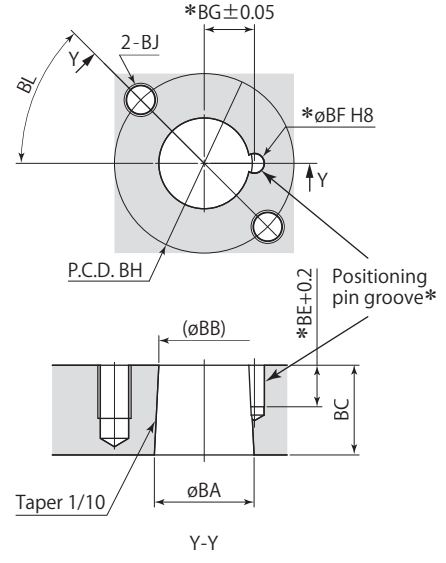
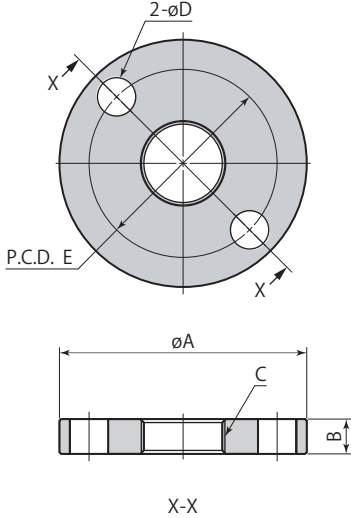
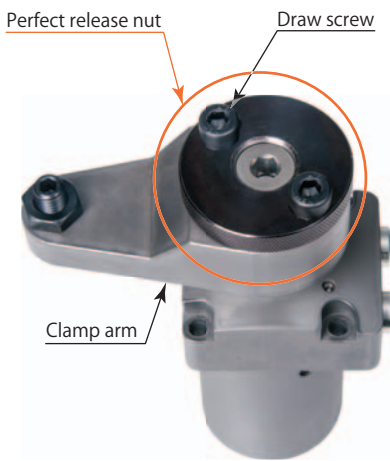
- A large torque is needed to pull the clamp arm off from the tapered area of the rod, which will be risky for a worker when the arm comes off suddenly.

Perfect release nut

- Size
- 01
  - 02
  - 04
  - 06
  - 10
  - 16
  - 25
- CTH — TNR : Perfect release nut

Clamp arm mounting details  
(Using perfect release nut)

Drill a 1/10 taper hole into the clamp arm, and provide the tap holes for draw screws to remove the clamp arm.



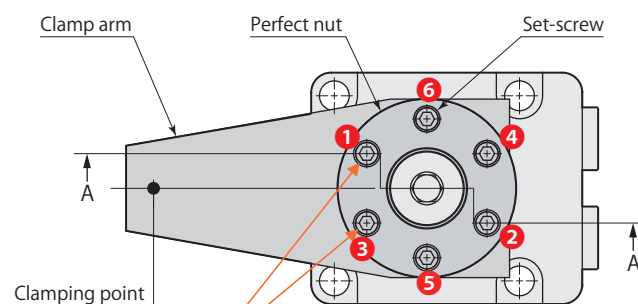
\*: No need to machine the pin groove (BE, øBF, BG) unless positioning pin is used for the arm.

Perfect release nut	CTH01-TNR	CTH02-TNR	CTH04-TNR	CTH06-TNR	CTH10-TNR	CTH16-TNR	CTH25-TNR
Applicable swing clamp	CTU01 CTT01	CTU02 CTT02	CTU04 CTT04	CTU06 CTT06	CTU10 CTT10	CTU16 CTT16	CTU25 CTT25
Recommended draw screw	M5×0.8	M6×1	M8×1.25	M8×1.25	M10×1.5	M10×1.5	M12×1.75
øA	34	40	50	54	67	70	90
B	6.5	8	9	9	10	12	13
C	M12×1.5	M14×1.5	M18×1.5	M20×1.5	M24×1.5	M30×1.5	M39×1.5
øD	5.5	6.8	9	9	11	11	14
E	24	29	36	39	50	53	70
Mass	0.04 kg	0.07 kg	0.12 kg	0.14 kg	0.24 kg	0.30 kg	0.53 kg
øBA	14 <sup>-0.016</sup> <sub>-0.034</sub>	18 <sup>-0.016</sup> <sub>-0.034</sub>	22.4 <sup>-0.020</sup> <sub>-0.041</sub>	25 <sup>-0.020</sup> <sub>-0.041</sub>	30 <sup>-0.020</sup> <sub>-0.041</sub>	35.5 <sup>-0.025</sup> <sub>-0.050</sub>	45 <sup>-0.025</sup> <sub>-0.050</sub>
øBB	12.4	16	19.9	22.5	27.3	32	40.5
BC	16	20	25	25	27	35	45
BE	9	10.5	10.5	10.5	12.5	12.5	14.5
øBF (pin groove diameter)	3 <sup>+0.014</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	4 <sup>+0.018</sup> <sub>0</sub>	5 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>	6 <sup>+0.018</sup> <sub>0</sub>
BG	7.55	9.1	11.1	12.6	15.1	18.1	22.6
BH	24	29	36	39	50	53	70
BJ	M5	M6	M8	M8	M10	M10	M12
BL	Standard 60° allowable range 45°-75° (within range that there is no interference with set-screws)						

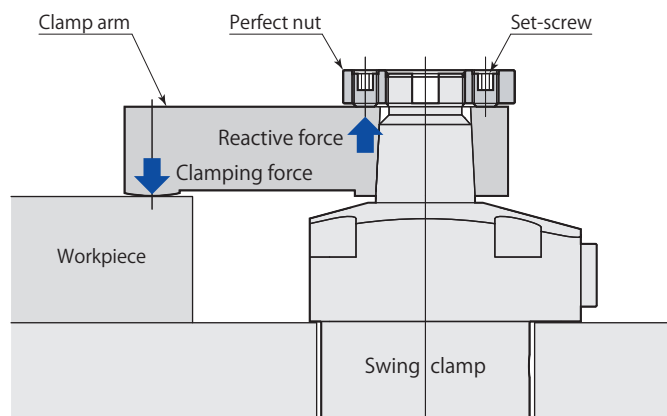
● Draw screws are not included with perfect release nut.

### Perfect nut (Arm mounting guide)

1. Set clamp arm and turn perfect nut as tight as it gets manually.
2. Turn back perfect nut to the position where two set-screws hold against reactive force of arm, as shown in diagram below.
3. Tighten set-screws with recommended torque in order of ① to ⑥ in diagram below.
4. Once set-screws are tightened to ⑥, ① becomes loose, so retighten in sequence of ① to ⑥ again.
5. Repeat tightening of set-screws ① to ⑥ six times.
6. Repeat clamping and unclamping of workpiece five times (this operation allows taper section to become accustomed to use).
7. Return to unclamped condition and then retighten set-screws in order of ① to ⑥.  
Once tightening in sequence of ① to ⑥ is repeated three times, all set-screws will be fixed and clamp arm is completely mounted.



Set a position which receives the arm reactive force at 2 pieces of set-screws.

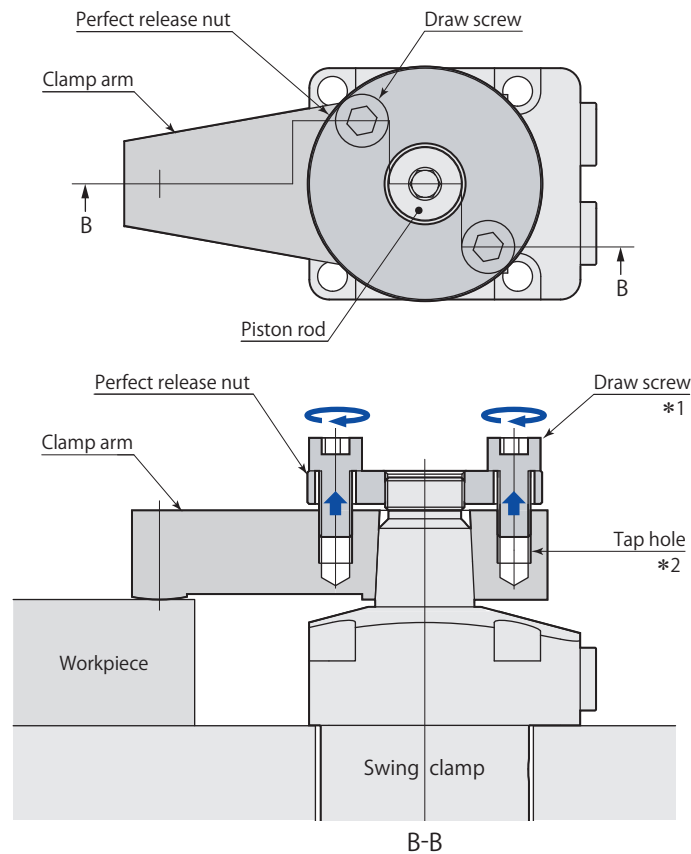


A-A

- The clamp arm may bite at the taper of the clamp rod and it will cause the demount failure if the set screw is tightened with excessive force. Be sure to use recommended torque when tightening.
- More secure tightening can be accomplished by applying some thread adhesive on set-screws. Recommended adhesive: LOCTITE 243 (medium strength type)

### Perfect release nut (Arm dismounting guide)

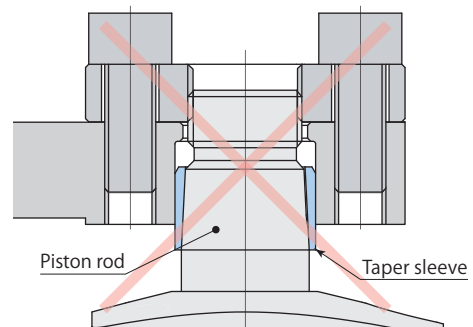
1. Loosen all set-screws of perfect nut and dismount perfect nut from piston rod.
2. Mount perfect release nut and turn it until clamp arm comes into contact.
3. Turn perfect release nut back one or two more times, align the nut hole with tap hole of clamp arm and then mount the draw screws.
4. Once draw screws are tightened, clamp arm can be pulled off piston rod.



- \*1: Turn draw screws as a pair, alternately turning 45° to 90° at a time to tighten them evenly. Some movement is felt in hand as clamp arm comes off, but there is no danger involved in this procedure.
- \*2: Tap holes for draw screws are needed on clamp arm in order to use perfect release nut. Refer to clamp arm mounting details on **page →43** for details on tap holes.

### Caution in use

In the event that a clamp arm is used with taper sleeve, the perfect release nut cannot remove the clamp arm due to the taper sleeve remaining on the piston rod. When using a taper sleeve, please use a gear puller (or similar) to remove clamp arm. To be able to easily remove clamp arms using the perfect release nut, drill a 1/10 taper hole into the clamp arm. (Clamp arm mounting details refer to **page →43**)



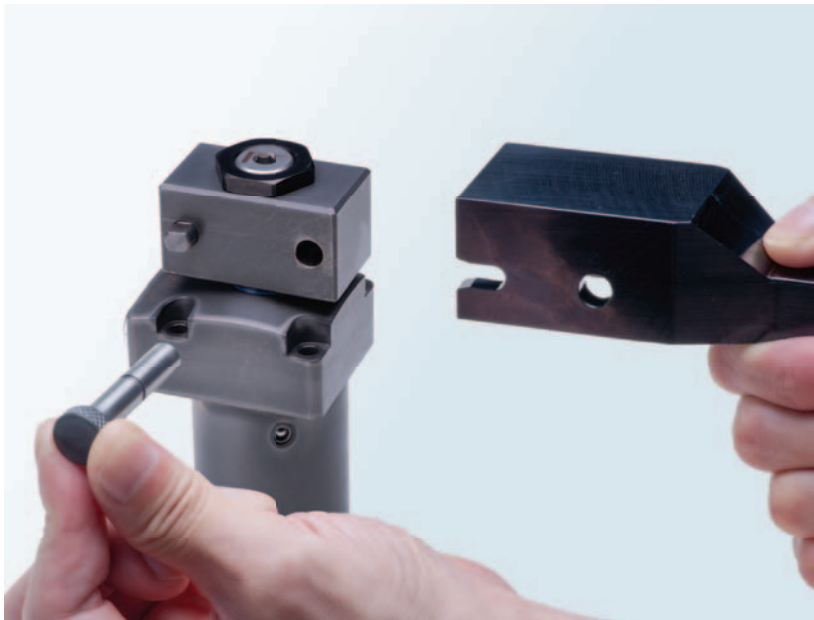


### Quick arm change



- Clamp arm is replaceable quickly.

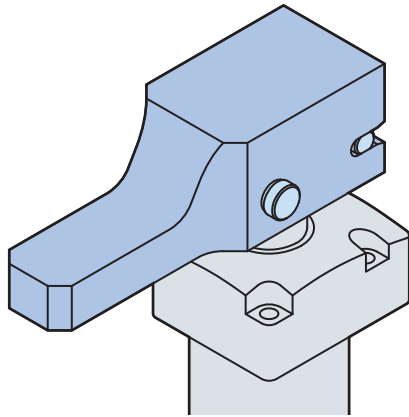
### Toolless



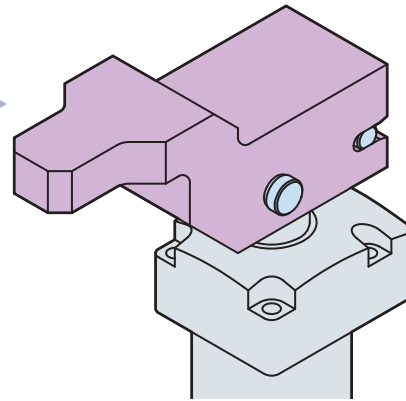
- No specific tools are required to replace, simply place the arm and put the pin in.

Jig cost is reduced

- The arm makes the clamp versatile for many kinds of the workpiece and overall Jig cost is reduced.

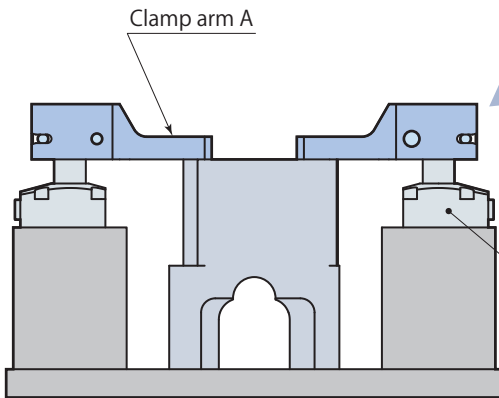


Replace clamp arm

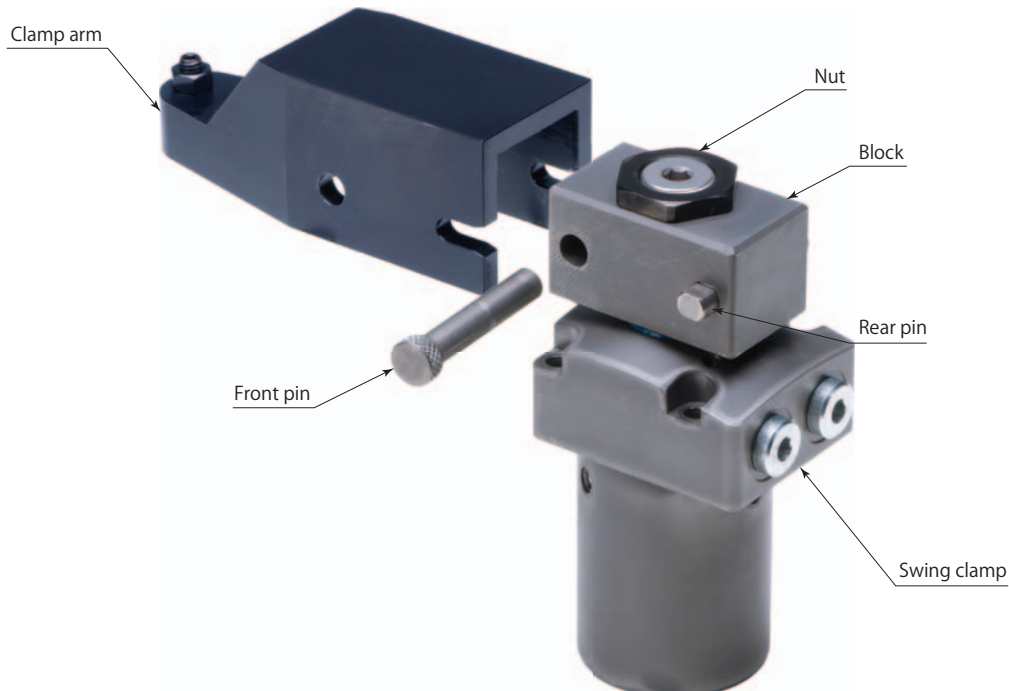
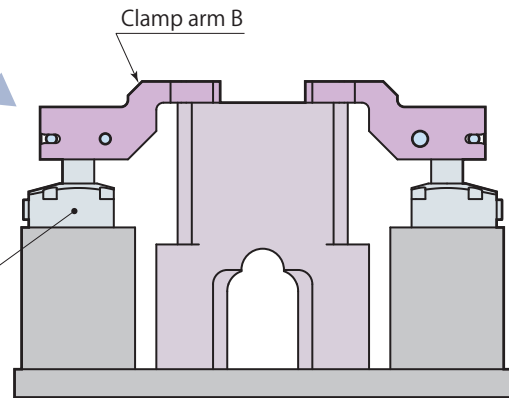


Productivity improved

- The introduction of the arm enable the jig to be exchanged very quick and to reduce the set-up time, which ends up the increase of productivity.

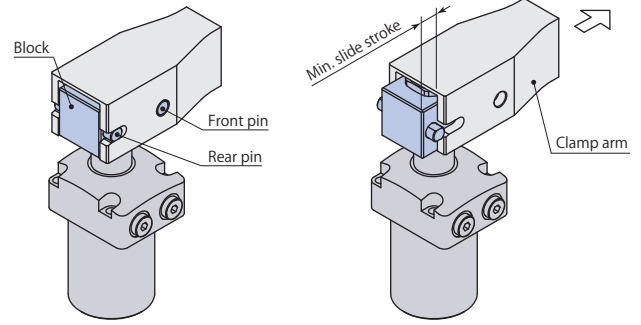


Replace clamp arm



Quick arm change

CTH	Size	
	02	
	04	
	06	- <b>CQ</b> : Quick arm change
	10	
	16	■ indicates made to order.

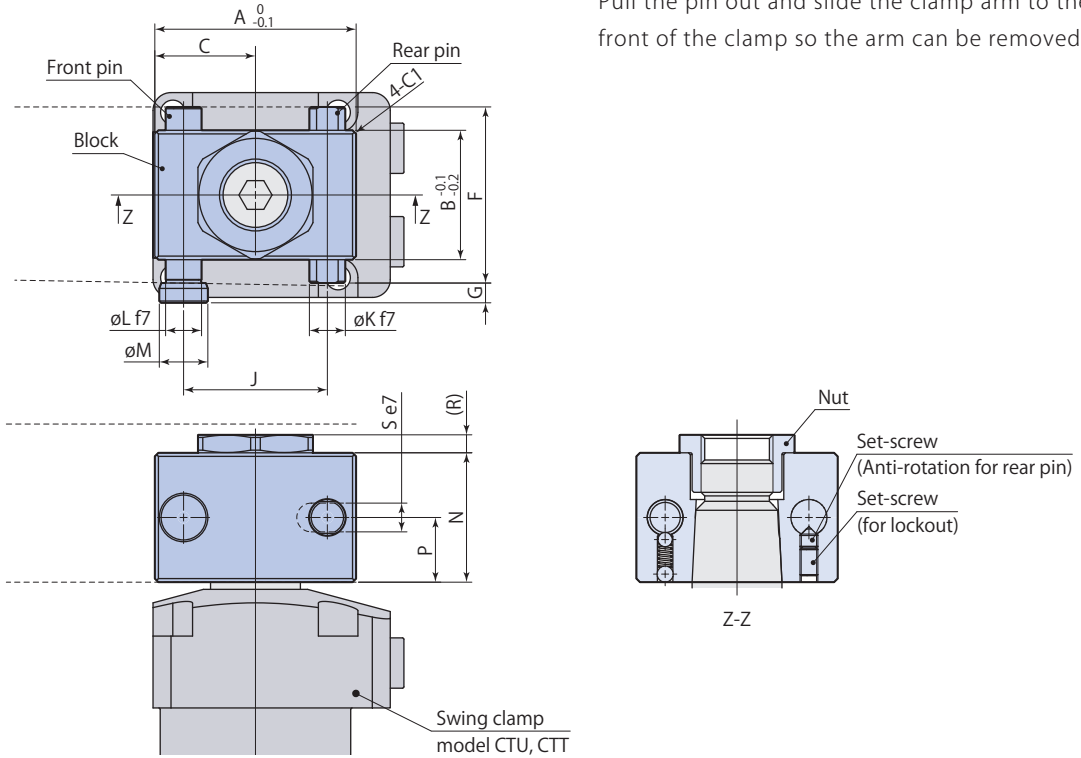


Clamp arm mounting

Clamp arm dismounting

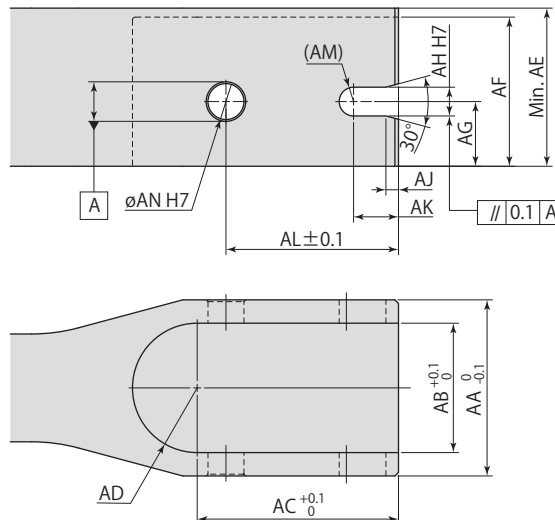
Pull the pin out and slide the clamp arm to the front of the clamp so the arm can be removed.

Dimensions



Clamp arm mounting details

Recommended material: S45C (HB201-269)



CTH□-CQ	Quick arm change	Option
---------	------------------	--------

Quick arm change	CTH02-CQ	CTH04-CQ	CTH06-CQ	CTH10-CQ	CTH16-CQ
Applicable swing clamp	CTU02 CTT02	CTU04 CTT04	CTU06 CTT06	CTU10 CTT10	CTU16 CTT16
A	45	54	57	66	76
B	25	30.5	33.5	40.5	51.5
C	22.5	27	28.5	33	38
F	35	42	46	55.5	70
G	5.5	5.5	5.5	7.5	9
J	32	38	38	46	56
∅K	6 <sup>-0.011 -0.022</sup>	8 <sup>-0.013 -0.028</sup>	10 <sup>-0.013 -0.028</sup>	12 <sup>-0.016 -0.034</sup>	14 <sup>-0.016 -0.034</sup>
∅L	6 <sup>-0.011 -0.022</sup>	8 <sup>-0.013 -0.028</sup>	10 <sup>-0.013 -0.028</sup>	12 <sup>-0.016 -0.034</sup>	14 <sup>-0.016 -0.034</sup>
∅M	9.5	11.5	13.5	16	18
N	22	29	32	36	40
P	11	14.5	16	18	20
R	6	5	5	7	7
S (width across flats)	5 <sup>-0.020 -0.032</sup>	6 <sup>-0.020 -0.032</sup>	8 <sup>-0.025 -0.040</sup>	10 <sup>-0.025 -0.040</sup>	12 <sup>-0.032 -0.050</sup>
Min. slide stroke	9.5	12	14.5	16	17

- Refer to **pages →7–23** for model CTU, **29–37** for model CTT for other specifications and dimensions that are not shown in the diagram.
- Refer to performance table (model CTU **page →8**, model CTT **page →30**) for the relation between hydraulic force and clamp arm length.
- A nut, block, front pin and a rear pin are included.
- Customers must arrange for the clamp arm.

Quick arm change	CTH02-CQ	CTH04-CQ	CTH06-CQ	CTH10-CQ	CTH16-CQ
Applicable swing clamp	CTU02 CTT02	CTU04 CTT04	CTU06 CTT06	CTU10 CTT10	CTU16 CTT16
AA	35	42	46	55.5	70
AB	25	30.5	33.5	40.5	51.5
AC	45	54	57	66	76
AD	R12.5	R15.25	R16.75	R20.25	R25.75
AE	33	39	42	48	52
AF	29	35	38	44	48
AG	11	14.5	16	18	20
AH	5 <sup>+0.012 0</sup>	6 <sup>+0.012 0</sup>	8 <sup>+0.015 0</sup>	10 <sup>+0.015 0</sup>	12 <sup>+0.018 0</sup>
AJ	2.5	3	3.5	5	5
AK	8.5	11	13	14	14
AL	38.5	46	47.5	56	66
AM	R2.5	R3	R4	R5	R6
∅AN	6 <sup>+0.012 0</sup>	8 <sup>+0.015 0</sup>	10 <sup>+0.015 0</sup>	12 <sup>+0.018 0</sup>	14 <sup>+0.018 0</sup>

### Mounting & dismounting of clamp arm

- Swing clamp may be damaged if excessive torque is applied to piston rod, since structure is intended for swinging using cam mechanism with lead grooves. Follow instructions shown below to prevent excessive torque from being applied on piston rod when mounting or dismounting clamp arm.
- Be sure to tighten locknut with recommended tightening torque. If the tightening torque is insufficient, clamp arm may slip during operation.

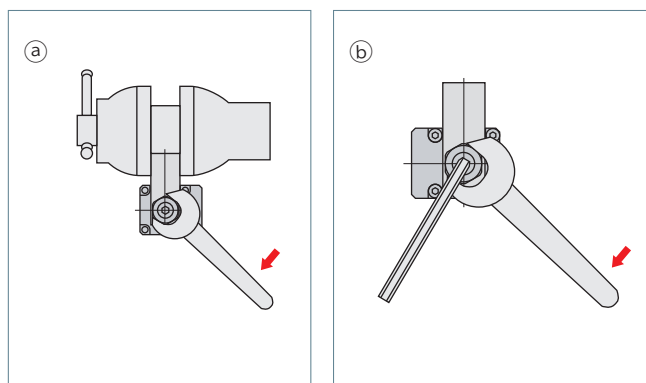
Model		CTM03	CTM04	CTM05	CTM06	CTM10	CTM16
Recommended tightening torque of locknut	N·m	22	35	60	100	155	260

Model		CTN02	CTN04	CTN05	CTN06	CTN10	CTN16
Recommended tightening torque of locknut	N·m	7.5	14	40	50	74	116

Model		CTU01 CTT01	CTU02 CTT02	CTU04 CTT04	CTU06 CTT06	CTU10 CTT10	CTU16 CTT16	CTU25 CTT25
Recommended tightening torque of locknut	N·m	12	26	51	60	86	120	180

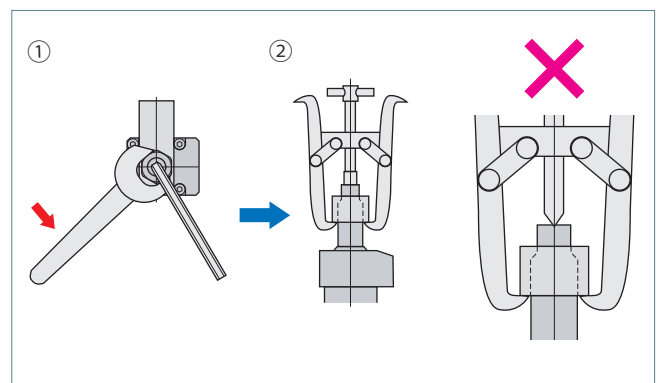
### Mounting of clamp arm

- Fix the clamp arm in a vise, then set the clamp body and clamp arm at the desired orientation, and tighten locknut with a wrench.
- For clamps that are mounted on jig, set clamp arm at desired orientation as shown in diagram below. Insert a hex wrench to hex socket at tip section of piston rod to hold it and tighten locknut with a wrench.



### Dismounting of clamp arm

- 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.
- 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 enlarge the hole on the tip of the piston rod. In addition, be careful not to rotate the rod when removing the arm.





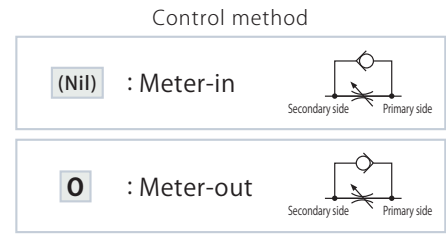
<b>VCF</b> □ - □	<b>Flow control valve</b>	<b>Option</b>
------------------	---------------------------	---------------

### Specifications



**VCF**

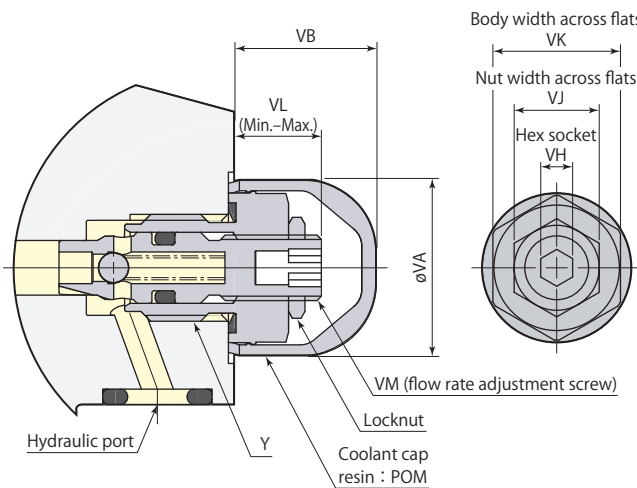
<b>01S</b>	: G1/8
<b>01</b>	: G1/8
<b>02</b>	: G1/4
<b>03</b>	: G3/8



Model	Meter-in				Meter-out				
	VCF01 <b>S</b>	VCF01	VCF02	VCF03	VCF01 <b>S</b> -O	VCF01-O	VCF02-O	VCF03-O	
G port size	G1/8	G1/8	G1/4	G3/8	G1/8	G1/8	G1/4	G3/8	
Cracking pressure	MPa	0.04	0.04	0.04	0.04	0.1	0.1	0.1	0.1
Orifice area	mm <sup>2</sup>	4.9	4.9	9.6	19.6	3.1	3.1	6.2	12.6
Recommended tightening torque	N·m	10	10	30	35	10	10	30	35
Mass	kg	0.011	0.013	0.024	0.038	0.011	0.013	0.024	0.038

- Pressure range : 0.5–7 MPa
- Proof pressure : 10.5 MPa
- Operating temperature : 0–70 °C
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)

### Dimensions



Model	VCF01 <b>S</b> VCF01 <b>S</b> -O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
Y	G1/8	G1/8	G1/4	G3/8
øVA	16	16	21	24
VB	13	13	13	14
VH	3	3	5	6
VJ	8	8	10	14
VK	12	12	17	19
VL	8–11	7–11	7.5–11.5	8.5–12.5
Adjustment screw number of turns	4 rotations	5.3 rotations	5.3 rotations	5.3 rotations
VM	M6×0.75	M6×0.75	M8×0.75	M10×0.75

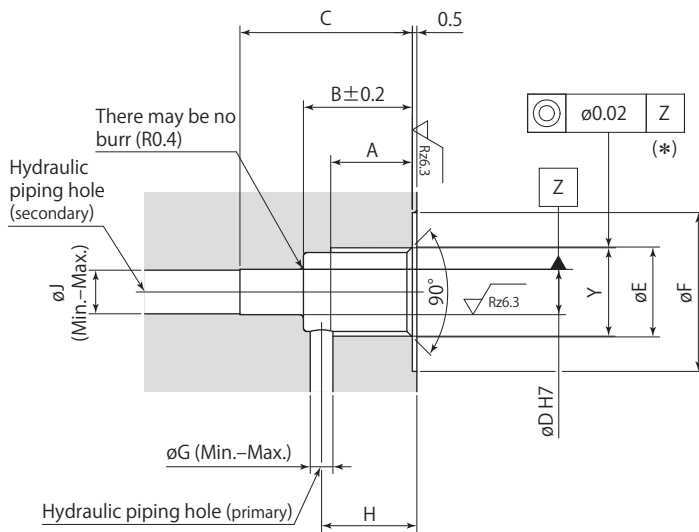
- Use a closed wrench or socket wrench for mounting and dismounting.
- Flow control valve can be mounted on hydraulic port (G port) when manifold piping.
- Adjust flow rate without hydraulic pressure. Conducting adjustments with hydraulic pressure may result in damaging seal.
- Diagram above indicates mounting for meter-in (VCF□).
- VCF is shipped with the valve fully open. Adjust the flow rate by loosening the screws after it is screwed in to close totally. Tighten the locknut after adjustment is completed.

### Applicable clamp and work support

Model	VCF01 <b>S</b>	VCF01	VCF02	VCF03
Swing clamp (double acting)	CTM03, 04, 05, 06 CTP04, 05, 06	CTM10 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)*	CTN02, 04, 05, 06	CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)*	CTS04	CTS06	CTS10, 16	–
Link clamp (double acting)	CLM03, 04 CLP04, 05, 06	CLM05, 06, 10 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)*	CLN04	CLN05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01	CNB02, 04	–	–
Push, pull cylinder	–	CNA02, 04, 06	CNA10, 16	CNA25
Work support*	CSU CSP-D(CSN, CSY)	–	–	–

\* : Single acting swing clamp, swivel clamp, single acting link clamp and work support are meter-in only.

### Mounting details



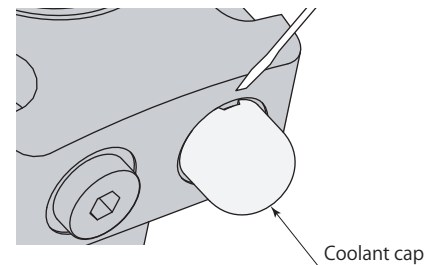
Rz: ISO4287(1997)

Model	mm			
	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
A	9	9	13	13
B	11	13	18	19
C	15.5	17.5	22.5	23.5
øD	5 <sup>+0.012</sup> <sub>0</sub>	5 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>
øE	9.9	9.9	13.3	16.8
øF	17.5	17.5	21.5	24.5
øG	1.5-2	2.5-3	3.5-5	5-6
H	9-10	9.5-11.5	14.5-15.5	15-16
øJ	2.5-5	2.5-5	3.5-6	5-8
Y	G1/8	G1/8	G1/4	G3/8

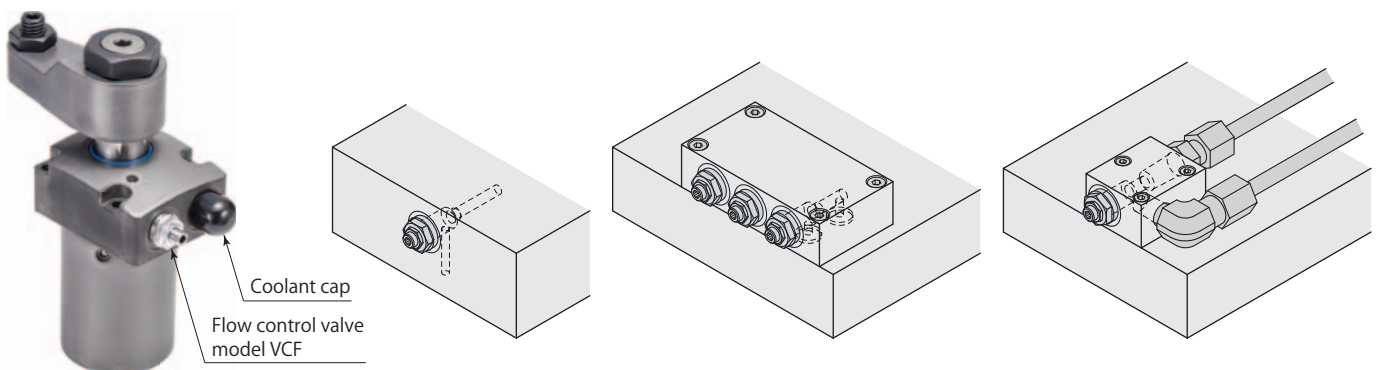
\*:Concentricity is required when machining øD and Y-portion thread. Misalignment or machining defect may cause the trouble of installation and adjusting flow rate.

### Mounting & dismounting of flow control valve, air bleeding valve

- When mounting or dismounting a flow control valve or air bleeding valve, be sure to set pressure within hydraulic circuit to 0 MPa before starting.
- When mounting a flow control valve or air bleeding valve, be sure to tighten it with the recommended tightening torque.
- When mounting a coolant cap (resin:POM), firmly press the body of cover. If it is not mounting properly, use a plastic mallet to tap it into place.
- When dismounting a coolant cap, use a sharp-pointed tool such as a precision screw driver by hooking the notched portion.



### Mounting example



Cylinder mounting

Pallet mounting

Block mounting ①

Block mounting ②



Specifications



G port size

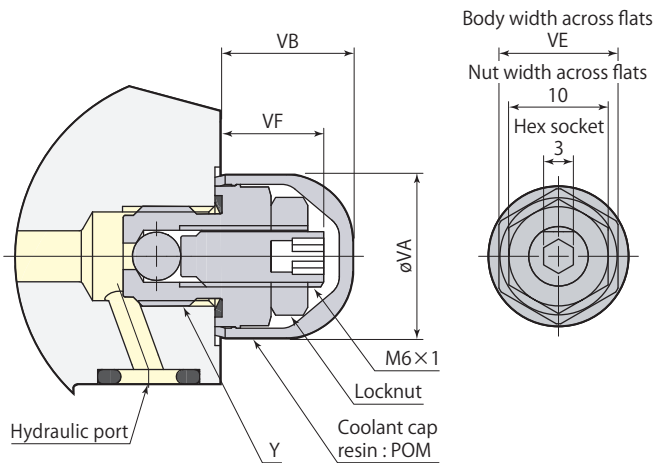
**01** : G1/8

**VCE 02** : G1/4

**03** : G3/8

Model	VCE01	VCE02	VCE03
G port size	G1/8	G1/4	G3/8
Recommended tightening torque N·m	10	30	35
Mass kg	0.017	0.029	0.044
Pressure range MPa	0-50		
Operating temperature °C	0-70		
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)		

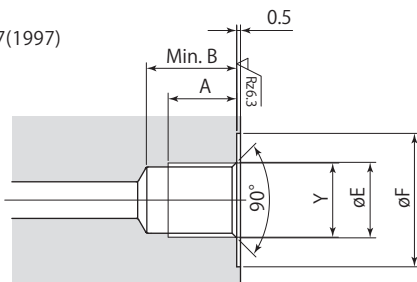
Dimensions



Model	VCE01	VCE02	VCE03
A	9	13	13
B	10	14	14
øE	9.9	13.3	16.8
øF	17.5	21.5	24.5
Y	G1/8	G1/4	G3/8
øVA	16	21	24
VB	13	13	14
VE	12	17	19
VF	10.5	10.5	11.5

Mounting details

Rz: ISO4287(1997)



- Use a closed wrench or socket wrench for mounting and dismounting.
- Air bleeding valve can be mounted on hydraulic port (G port) when manifold piping.

Applicable clamp and work support

Model	VCE01	VCE02	VCE03
Swing clamp (double acting)	CTM03, 04, 05, 06, 10 CTP04, 05, 06 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)	CTN02, 04, 05, 06 CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)	CTS04, 06	CTS10, 16	-
Link clamp (double acting)	CLM03, 04, 05, 06, 10 CLP04, 05, 06 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)	CLN04, 05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01, 02, 04	-	-
Push, pull cylinder	CNA02, 04, 06	CNA10, 16	CNA25
Work support	CSU CST CSP-D(CSN, CSY, CSK)	-	-





<b>Link clamp</b>		model <b>CLU</b> Page →58		model <b>CLT</b> Page →74		
						
Specifications		7MPa Double acting		7MPa Single acting		
Features		Standard model		Standard model		
Variations	Standard		CLU	<b>Page →64</b>	CLT	<b>Page →80</b>
	Dual rod		CLU-E	<b>Page →67</b>	—	—
	Air sensor		CLU-A	<b>Page →68</b>	—	—
Option	Flow control valve		VCF	<b>Page →86</b>		
	Air bleeding valve		VCE	<b>Page →88</b>		

Table of contents

Structure, Hydraulic circuit diagram ..... 60

Specifications, Piping ..... 61

Performance diagram, Performance table ..... 62

Dimensions

    Standard CLU ..... 64

    Dual rod CLU-E ..... 67

    Air sensor CLU-A ..... 68

Clamp arm mounting details ..... 71

Clamp arm allowable eccentricity ..... 72

Caution in use ..... 85

Flow control valve VCF ..... 86

Air bleeding valve VCE ..... 88

# Link clamp

Double acting 7 MPa

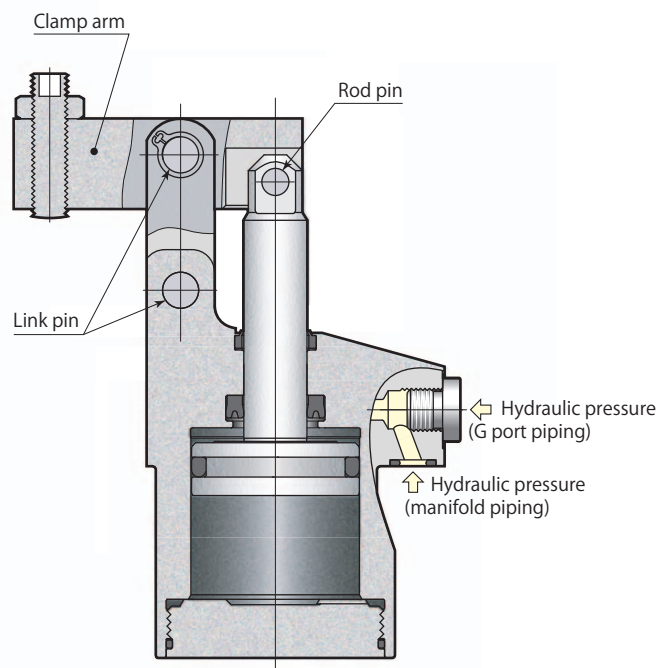
model **CLU**



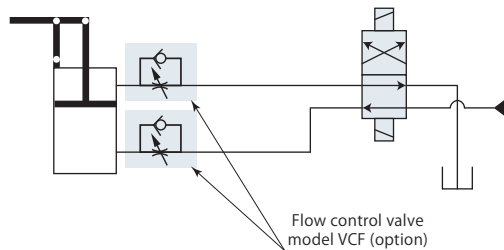
Standard model  
model CLU06-F

Standard model

model CLU□-□



Hydraulic circuit diagram



For flow control valve, we recommend the meter-in control. If meter-out control is used, due to the area difference, it will cause back pressure and become high pressure. This can lead to malfunction of the system. Please be aware when designing the circuit.

- Specifications page → 61
- Standard page → 64
- Dual rod page → 67
- Air sensor page → 68

Specifications

Size: 02, 04, 06, 10, 16, 25\*

Clamp arm mounting direction: L: Left side, F: Front side, R: Right side

Variation code: (Nil): Standard, E: Dual rod, A: Air sensor

\*: CLU25-LE and CLU25-RE are made to order.

■ indicates made to order.

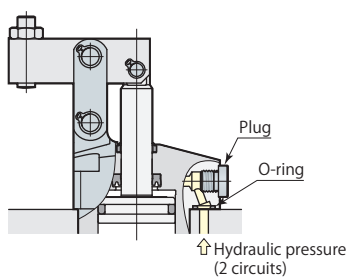
Model		CLU02	CLU04	CLU06	CLU10	CLU16	CLU25
Cylinder force (hydraulic pressure 7MPa)	kN	3.4	5.0	6.7	10.6	17.2	26.9
Cylinder inner diameter	mm	25	30	35	44	56	70
Rod diameter	mm	12	14	14	16	22.4	28
Effective area (clamp)	cm <sup>2</sup>	4.9	7.1	9.6	15.2	24.6	38.5
Full stroke	mm	20.5	23.5	26	29.5	36	45
Clamp stroke	mm	17.5	20.5	23	26.5	33	42
Safety stroke	mm	3	3	3	3	3	3
Max. oil flow rate	L/min	1.0	1.6	2.6	4.7	9.5	18.9
Cylinder capacity	Clamp	cm <sup>3</sup>	10.0	16.7	25.0	44.8	173.3
	Unclamp	cm <sup>3</sup>	7.7	13.0	21.0	38.9	145.5
Mass	kg	0.7	1.0	1.4	2.3	4.0	7.4
Recommended tightening torque of mounting screws*	N·m	7	7	12	29	57	100

- Pressure range: 1–7 MPa
  - Proof pressure: 10.5 MPa
  - Operating temperature: 0–70 °C
  - 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

Manifold piping and G port piping are available.

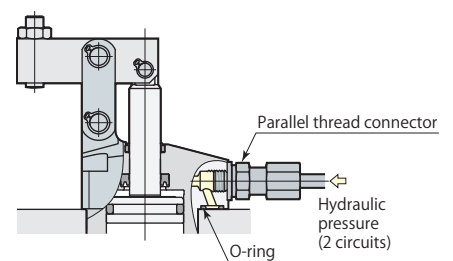
Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the clamp.



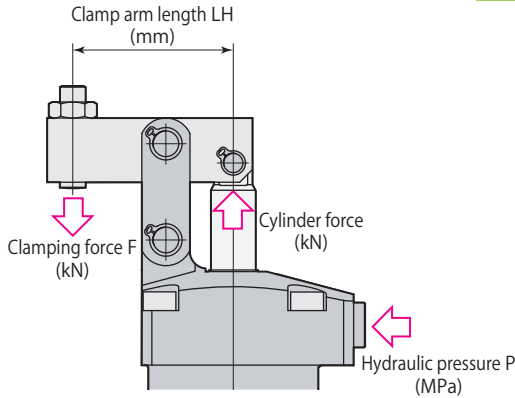
G port piping

Remove plugs when choosing G port piping. (O-ring must be used.) Refer to page →174 for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.





Performance diagram



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

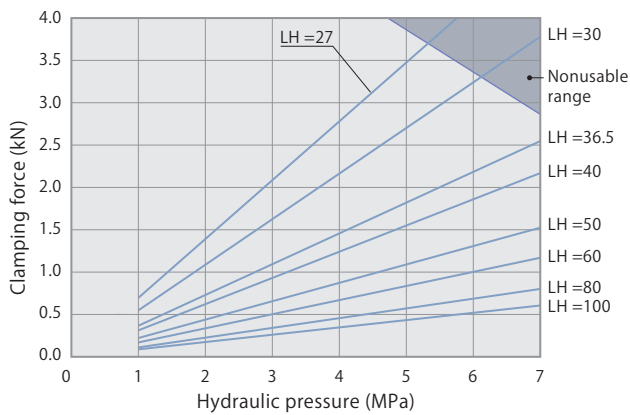
Clamping force calculation formula  
 $F = \text{Coefficient 1} \times P / (\text{LH} - \text{Coefficient 2})$

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

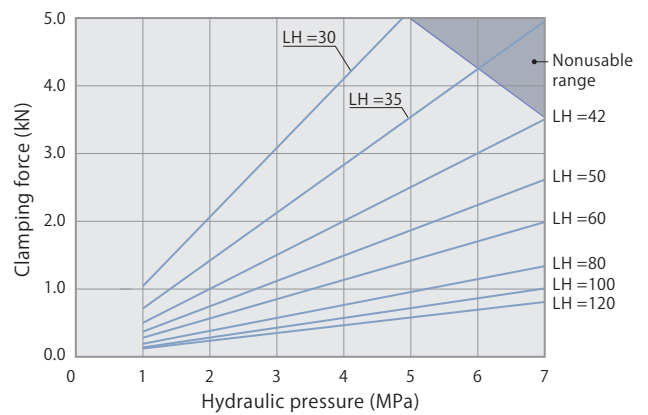
CLU06 with clamp arm length (LH) = 50 mm at hydraulic pressure of 7 MPa, Clamping force F is calculated by  $18.18 \times 7 / (50 - 21.0) = 4.4 \text{ kN}$

Do not use the clamp in the nonusable range. It may cause damage of link mechanism.

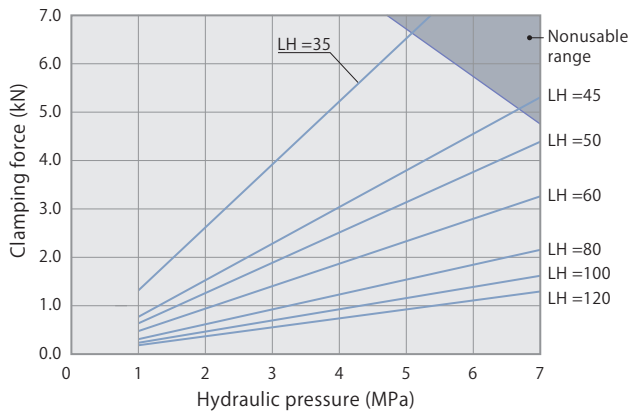
model CLU02



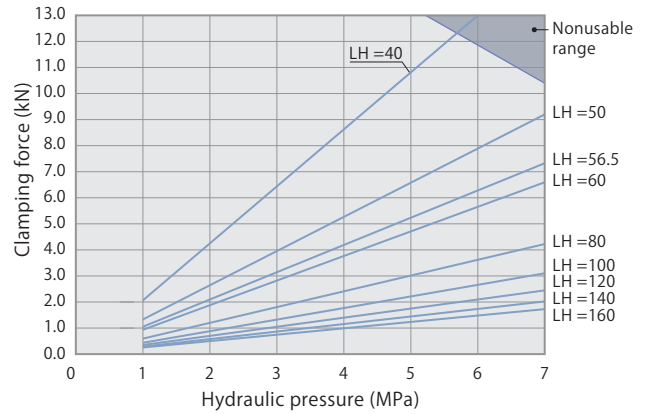
model CLU04



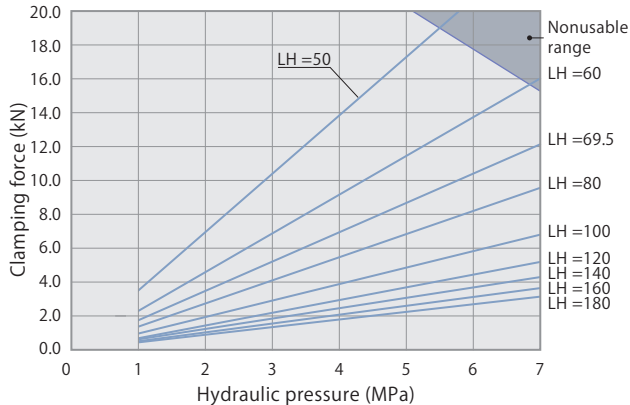
model CLU06



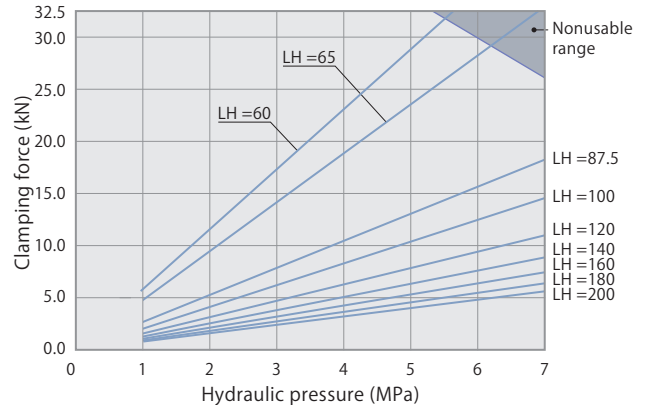
model CLU10



model CLU16



model CLU25



Performance table

model CLU02		Clamping force $F=7.29 \times P / (LH-16.5)$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm	
		Clamp arm length LH mm									
		27	30	36.5	40	50	60	80	100		
7	3.4			2.6	2.2	1.5	1.2	0.8	0.6	35	
6.5	3.2			2.4	2.0	1.4	1.1	0.7	0.6	32	
6	3.0		3.2	2.2	1.9	1.3	1.0	0.7	0.5	30	
5.5	2.7		3.0	2.0	1.7	1.2	0.9	0.6	0.5	28	
5	2.5	3.5	2.7	1.8	1.6	1.1	0.8	0.6	0.4	26	
4.5	2.2	3.1	2.4	1.6	1.4	1.0	0.8	0.5	0.4	25	
4	2.0	2.8	2.2	1.5	1.2	0.9	0.7	0.5	0.3	24	
3.5	1.7	2.4	1.9	1.3	1.1	0.8	0.6	0.4	0.3	↑	
3	1.5	2.1	1.6	1.1	0.9	0.7	0.5	0.3	0.3	↑	
2.5	1.2	1.7	1.4	0.9	0.8	0.5	0.4	0.3	0.2	↑	
2	1.0	1.4	1.1	0.7	0.6	0.4	0.3	0.2	0.2	↑	
1.5	0.7	1.0	0.8	0.5	0.5	0.3	0.3	0.2	0.1	↑	
1	0.5	0.7	0.5	0.4	0.3	0.2	0.2	0.1	0.1	24	
Max. pressure MPa		5.3	6.1	7.0	7.0	7.0	7.0	7.0	7.0		

indicates nonusable range

model CLU04		Clamping force $F=11.77 \times P / (LH-18.5)$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm	
		Clamp arm length LH mm									
		30	35	42	50	60	80	100	120		
7	5.0			3.5	2.6	2.0	1.3	1.0	0.8	42	
6.5	4.6			3.3	2.4	1.8	1.2	0.9	0.8	39	
6	4.2			3.0	2.2	1.7	1.1	0.9	0.7	36	
5.5	3.9		3.9	2.8	2.1	1.6	1.1	0.8	0.6	33	
5	3.5		3.6	2.5	1.9	1.4	1.0	0.7	0.6	31	
4.5	3.2	4.6	3.2	2.3	1.7	1.3	0.9	0.6	0.5	29	
4	2.8	4.1	2.9	2.0	1.5	1.1	0.8	0.6	0.5	27	
3.5	2.5	3.6	2.5	1.8	1.3	1.0	0.7	0.5	0.4	26	
3	2.1	3.1	2.1	1.5	1.1	0.9	0.6	0.4	0.3	↑	
2.5	1.8	2.6	1.8	1.3	0.9	0.7	0.5	0.4	0.3	↑	
2	1.4	2.0	1.4	1.0	0.7	0.6	0.4	0.3	0.2	↑	
1.5	1.1	1.5	1.1	0.8	0.6	0.4	0.3	0.2	0.2	↑	
1	0.7	1.0	0.7	0.5	0.4	0.3	0.2	0.1	0.1	26	
Max. pressure MPa		4.9	5.9	7.0	7.0	7.0	7.0	7.0	7.0		

indicates nonusable range

model CLU06		Clamping force $F=18.18 \times P / (LH-21.0)$							
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN						Min. arm length Min. LH mm	
		Clamp arm length LH mm							
		35	45	50	60	80	100		120
7	6.7			4.4	3.3	2.2	1.6	1.3	48
6.5	6.3		4.9	4.1	3.0	2.0	1.5	1.2	44
6	5.8		4.5	3.8	2.8	1.8	1.4	1.1	40
5.5	5.3		4.2	3.4	2.6	1.7	1.3	1.0	37
5	4.8	6.5	3.8	3.1	2.3	1.5	1.2	0.9	35
4.5	4.3	5.8	3.4	2.8	2.1	1.4	1.0	0.8	33
4	3.9	5.2	3.0	2.5	1.9	1.2	0.9	0.7	31
3.5	3.4	4.5	2.7	2.2	1.6	1.1	0.8	0.6	30
3	2.9	3.9	2.3	1.9	1.4	0.9	0.7	0.6	↑
2.5	2.4	3.2	1.9	1.6	1.2	0.8	0.6	0.5	↑
2	1.9	2.6	1.5	1.3	0.9	0.6	0.5	0.4	↑
1.5	1.4	1.9	1.1	0.9	0.7	0.5	0.3	0.3	↑
1	1.0	1.3	0.8	0.6	0.5	0.3	0.2	0.2	30
Max. pressure MPa		5.1	6.7	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

model CLU10		Clamping force $F=33.54 \times P / (LH-24.5)$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm	
		Clamp arm length LH mm									
		40	50	56.5	60	80	100	120	140		160
7	10.6		9.2	7.3	6.6	4.2	3.1	2.5	2.0	1.7	48
6.5	9.9		8.5	6.8	6.1	3.9	2.9	2.3	1.9	1.6	45
6	9.1		7.9	6.3	5.7	3.6	2.7	2.1	1.7	1.5	42
5.5	8.4	11.9	7.2	5.8	5.2	3.3	2.4	1.9	1.6	1.4	40
5	7.6	10.8	6.6	5.2	4.7	3.0	2.2	1.8	1.5	1.2	37
4.5	6.8	9.7	5.9	4.7	4.3	2.7	2.0	1.6	1.3	1.1	36
4	6.1	8.7	5.3	4.2	3.8	2.4	1.8	1.4	1.2	1.0	↑
3.5	5.3	7.6	4.6	3.7	3.3	2.1	1.6	1.2	1.0	0.9	↑
3	4.6	6.5	3.9	3.1	2.8	1.8	1.3	1.1	0.9	0.7	↑
2.5	3.8	5.4	3.3	2.6	2.4	1.5	1.1	0.9	0.7	0.6	↑
2	3.0	4.3	2.6	2.1	1.9	1.2	0.9	0.7	0.6	0.5	↑
1.5	2.3	3.2	2.0	1.6	1.4	0.9	0.7	0.5	0.4	0.4	↑
1	1.5	2.2	1.3	1.0	0.9	0.6	0.4	0.4	0.3	0.2	36
Max. pressure MPa		5.7	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

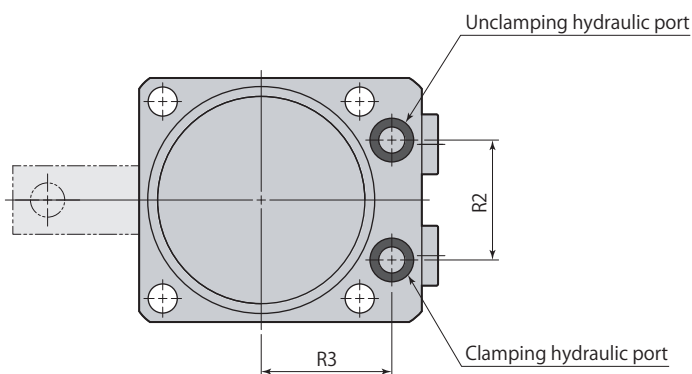
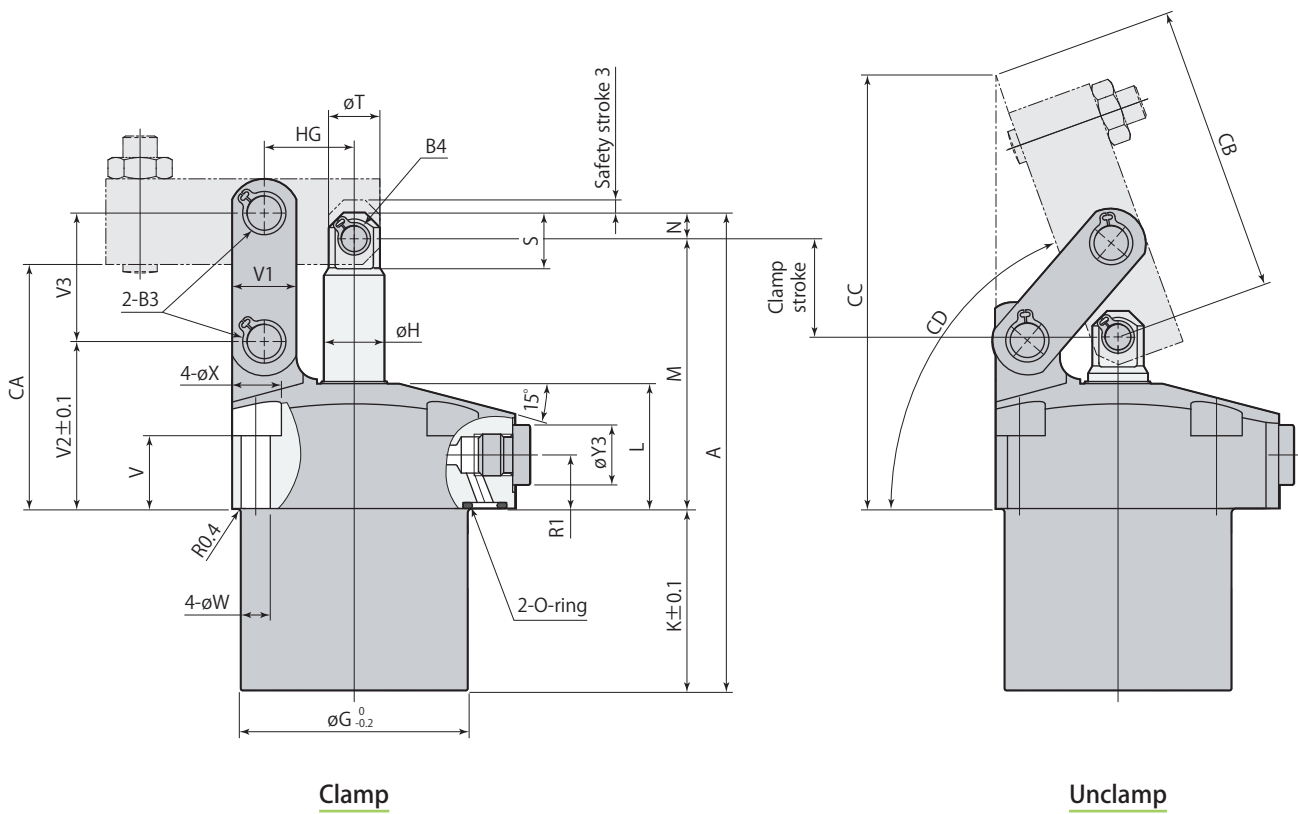
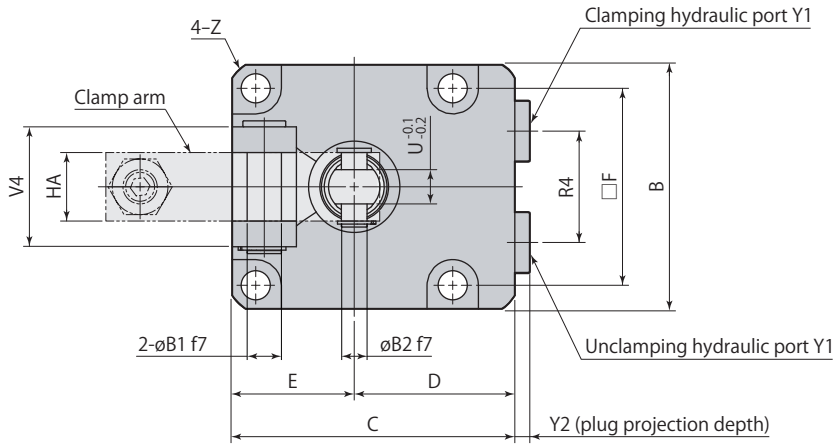
model CLU16		Clamping force $F=67.61 \times P / (LH-30.5)$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm	
		Clamp arm length LH mm									
		50	60	69.5	80	100	120	140	160		180
7	17.2			12.1	9.6	6.8	5.3	4.3	3.7	3.2	62
6.5	16.0		14.9	11.3	8.9	6.3	4.9	4.0	3.4	2.9	58
6	14.8		13.8	10.4	8.2	5.8	4.5	3.7	3.1	2.7	54
5.5	13.6		12.6	9.5	7.5	5.4	4.2	3.4	2.9	2.5	51
5	12.3	17.3	11.5	8.7	6.8	4.9	3.8	3.1	2.6	2.3	48
4.5	11.1	15.6	10.3	7.8	6.1	4.4	3.4	2.8	2.3	2.0	45
4	9.9	13.9	9.2	6.9	5.5	3.9	3.0	2.5	2.1	1.8	44
3.5	8.6	12.1	8.0	6.1	4.8	3.4	2.6	2.2	1.8	1.6	↑
3	7.4	10.4	6.9	5.2	4.1	2.9	2.3	1.9	1.6	1.4	↑
2.5	6.2	8.7	5.7	4.3	3.4	2.4	1.9	1.5	1.3	1.1	↑
2	4.9	6.9	4.6	3.5	2.7	1.9	1.5	1.2	1.0	0.9	↑
1.5	3.7	5.2	3.4	2.6	2.0	1.5	1.1	0.9	0.8	0.7	↑
1	2.5	3.5	2.3	1.7	1.4	1.0	0.8	0.6	0.5	0.5	44
Max. pressure MPa		5.4	6.8	7.0	7.0	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

model CLU25		Clamping force $F=129.87 \times P / (LH-37.5)$									
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm	
		Clamp arm length LH mm									
		60	65	87.5	100	120	140	160	180		200
7	26.9			18.2	14.5	11.0	8.9	7.4	6.4	5.6	73
6.5	25.0			16.9	13.5	10.2	8.2	6.9	5.9	5.2	68
6	23.1		28.3	15.6	12.5	9.4	7.6	6.4	5.5	4.8	64
5.5	21.2	31.7	26.0	14.3	11.4	8.7	7.0	5.8	5.0	4.4	60
5	19.2	28.9	23.6	13.0	10.4	7.9	6.3	5.3	4.6	4.0	57
4.5	17.3	26.0	21.3	11.7	9.4	7.1	5.7	4.8	4.1	3.6	55
4	15.4	23.1	18.9	10.4	8.3	6.3	5.1	4.2	3.6	3.2	↑
3.5	13.5	20.2	16.5	9.1	7.3	5.5	4.4	3.7	3.2	2.8	↑
3	11.6	17.3	14.2	7.8	6.2	4.7	3.8	3.2	2.7	2.4	↑
2.5	9.6	14.4	11.8	6.5	5.2	3.9	3.2	2.7	2.3	2.0	↑
2	7.7	11.5	9.4	5.2	4.2	3.1	2.5	2.1	1.8	1.6	↑
1.5	5.8	8.7	7.1	3.9	3.1	2.4	1.9	1.6	1.4	1.2	↑
1	3.9	5.8	4.7	2.6	2.1	1.6	1.3	1.1	0.9	0.8	55
Max. pressure MPa		5.5	6.2	7.0	7.0	7.0	7.0	7.0	7.0	7.0	

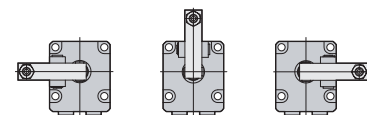
indicates nonusable range

Dimensions



● This diagram represents external contour of CLU □-F. CLU□-L and CLU□-R differ only in terms of mounting direction of clamp arm and otherwise all dimensions are identical to those of CLU□-F.

L: Left side F: Front side R: Right side



● Clamp arm and mounting screws are not included.

<b>CLU</b> □-□	<b>Link clamp Standard</b>					<b>7MPa</b>	<b>Double acting</b>
----------------	----------------------------	--	--	--	--	-------------	----------------------

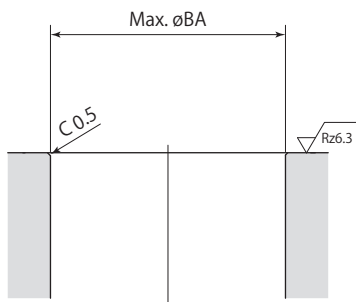
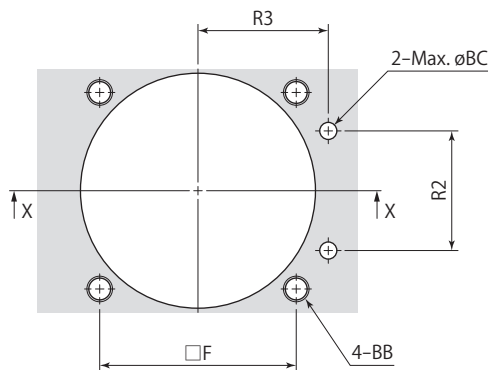
mm							
Model	CLU02-□	CLU04-□	CLU06-□	CLU10-□	CLU16-□	CLU25-□	
A	93.5	104	111.5	131	155	186.5	
B	45	50	57	70	86	108	
C	55	60	66	82	96	120	
D	32.5	35	37.5	47	53	66	
E	22.5	25	28.5	35	43	54	
F	35	40	46	56	68	88	
øG	39	47	53	63	78	100	
øH	12	14	14	16	22.4	28	
K	33.5	39.5	42.5	47	55	65	
L	27.5	27.7	29.3	36.3	41.5	47	
M	55	58.5	63	76	89	108.5	
N	5	6	6	8	11	13	
R1	12.5	12.5	12.5	14	14	21	
R2	22	24	28	36	45	50	
R3	25	28	30.5	36	42	57	
R4	20	22	26	30	38	50	
S	11.5	13	13	17	21.8	27.5	
øT	10	12	12	14	20	26	
U (width across flats)	6	6	8	10	11	16	
V	18	17	17	20	20	20	
V1	11	13	15	19	25	32	
V2	34	36	39	48	54.5	65	
V3	24	26	30	35.5	44	53	
V4	21	21	28	37	46	56	
øW	5.5	5.5	6.8	9	11	14	
øX	10	10	12	15	18.5	20	
Y1	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8	
Y2	3.8	3.8	3.8	4.8	4.8	4.8	
øY3	14	14	14	19	19	22	
Z	C1.5	C2.5	C2.5	C3	C3.5	C5.5	
øB1	6 <sup>-0.010</sup> <sub>-0.022</sub>	6 <sup>-0.010</sup> <sub>-0.022</sub>	8 <sup>-0.013</sup> <sub>-0.028</sub>	10 <sup>-0.013</sup> <sub>-0.028</sub>	14 <sup>-0.016</sup> <sub>-0.034</sub>	16 <sup>-0.016</sup> <sub>-0.034</sub>	
øB2	6 <sup>-0.010</sup> <sub>-0.022</sub>	6 <sup>-0.010</sup> <sub>-0.022</sub>	6 <sup>-0.010</sup> <sub>-0.022</sub>	8 <sup>-0.013</sup> <sub>-0.028</sub>	12 <sup>-0.016</sup> <sub>-0.034</sub>	14 <sup>-0.016</sup> <sub>-0.034</sub>	
B3 (snap ring)*1	STW-6	STW-6	STW-8	STW-10	STW-14	STW-16	
B4 (snap ring)*1	STW-6	STW-6	STW-6	STW-8	STW-12	STW-14	
CA	49.5	52.5	57	68	80	96	
CB	48	59.6	67.3	78.7	98.2	133.5	
CC	80.2	92.5	101.3	120.4	144.7	189.2	
CD	About 69°	About 71°	About 70°	About 70°	About 69°	About 72°	
HA	12	12	16	19	22	32	
HG	16.5	18.5	21	24.5	30.5	37.5	
O-ring (fluorocarbon hardness Hs90)	P7	P7	P7	P8	P8	P10	
Flow control valve*2	Meter-in	VCF01	VCF01	VCF01	VCF02	VCF02	VCF03
	Meter-out	VCF01-O	VCF01-O	VCF01-O	VCF02-O	VCF02-O	VCF03-O
Air bleeding valve*2	VCE01	VCE01	VCE01	VCE02	VCE02	VCE03	

\*1: Snap ring is made by Ochiai Corporation.

\*2: Select the right model of VCF and VCE according to the size of the clamp.

Refer to each page for the details of options. ● Flow control valve **page →86** ● Air bleeding valve **page →88**

Mounting details



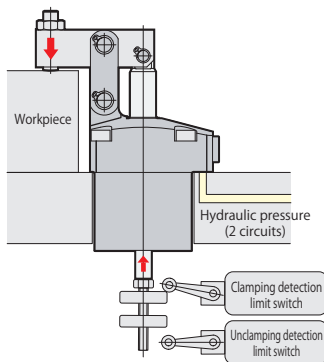
X-X

Rz: ISO4287(1997)

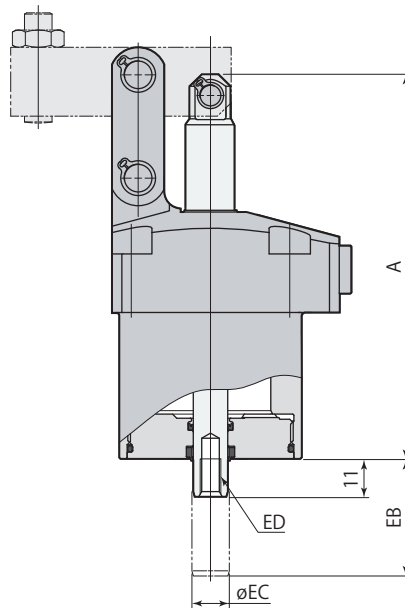
Model	CLU02-□	CLU04-□	CLU06-□	CLU10-□	CLU16-□	CLU25-□
F	35	40	46	56	68	88
R2	22	24	28	36	45	50
R3	25	28	30.5	36	42	57
øBA	40	48	54	64	79	101
BB	M5	M5	M6	M8	M10	M12
øBC	4	4	4	6	6	8

mm

Usage example



Dimensions



Link clamp

CLU-E Dual rod

mm

Model	CLU02-□E	CLU04-□E	CLU06-□E	CLU10-□E	CLU16-□E	CLU25-□E
Cylinder capacity (clamp)	9.0 cm <sup>3</sup>	14.8 cm <sup>3</sup>	22.9 cm <sup>3</sup>	41.6 cm <sup>3</sup>	84.6 cm <sup>3</sup>	164.3 cm <sup>3</sup>
A	93.5	104	111.5	131	155	186.5
EB	28.5	31.5	34	37.5	44	53
øEC	8	10	10	12	12	16
ED	M5×0.8 depth 8	M6×1 depth 11	M6×1 depth 11	M8×1.25 depth 15	M8×1.25 depth 15	M10×1.5 depth 18
Mass	0.7 kg	1.0 kg	1.4 kg	2.4 kg	4.0 kg	7.4 kg

- Refer to specifications (page →61), dimensions (page →64) for other specifications and dimensions that are not shown in the diagram.
- CLU25-LE and CLU25-RE are made to order.

Clamping performance

Dual rod and air sensor models have smaller effective area on clamping side, which slightly reduces clamping force. Obtain clamping force by multiplying standard clamping force obtained from performance diagram (page →62) or performance table (page →63) by coefficient shown in table below.

Calculation example

For models CLU10-FE or CLU10-FA, with hydraulic pressure of 7.0 MPa and clamp arm length of 60 mm:

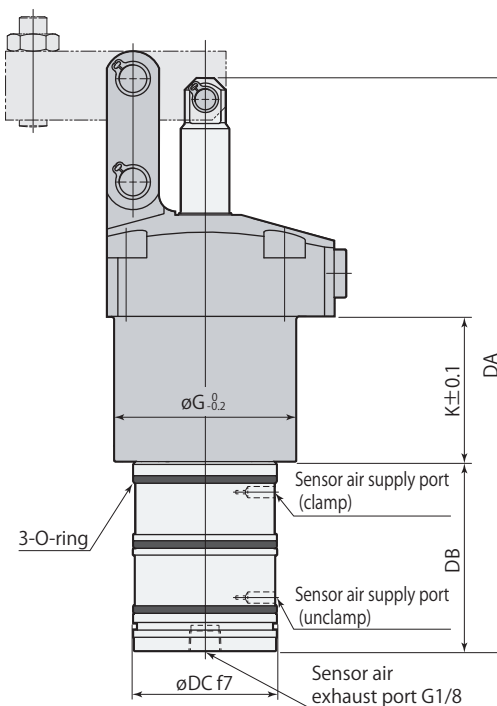
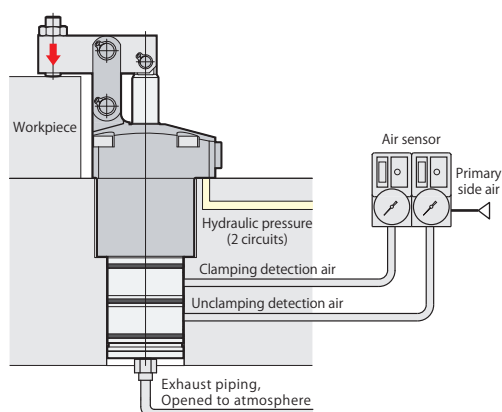
Clamping force of standard specification CLU10-F : 6.6 kN

Clamping force of CLU10-FE or CLU10-FA : 6.6 × 0.93 = 6.1 kN

Model	CLU02-□E CLU02-□A	CLU04-□E CLU04-□A	CLU06-□E CLU06-□A	CLU10-□E CLU10-□A	CLU16-□E CLU16-□A	CLU25-□E CLU25-□A
Clamping performance coefficient	0.90	0.89	0.92	0.93	0.95	0.95

Usage example

Dimensions

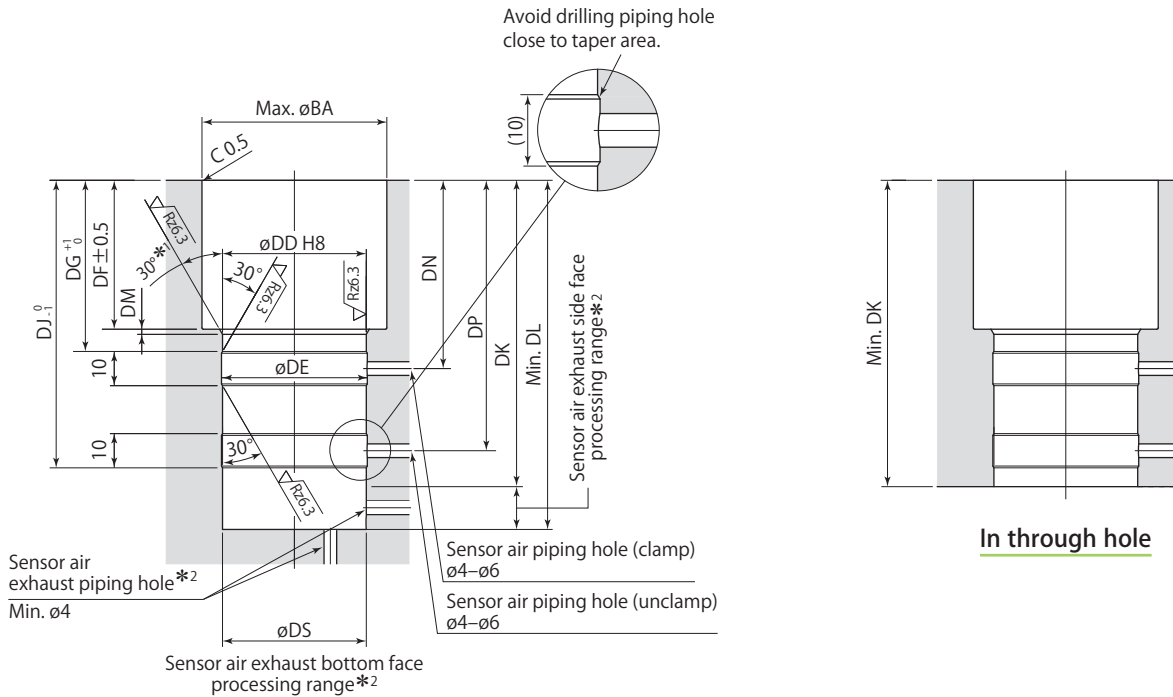


- Exhaust port must be opened to atmosphere.  
If sensor is embedded in a jig, prepare an exhaust piping hole.  
Furthermore, provide the piping if there is a risk of coolant or metal chips intrusion.  
Use one-touch fittings manufactured by SMC for G port piping. (See SMC catalog for the details of the fitting.)
- Refer to specifications (page →61), dimensions (page →64) for other specifications and dimensions that are not shown in the diagram. (Refer to page →67 for details on clamping performance.)

Model	CLU02-□A	CLU04-□A	CLU06-□A	CLU10-□A	CLU16-□A	CLU25-□A
Cylinder capacity (clamp)	9.0 cm <sup>3</sup>	14.8 cm <sup>3</sup>	22.9 cm <sup>3</sup>	41.6 cm <sup>3</sup>	84.6 cm <sup>3</sup>	164.3 cm <sup>3</sup>
DA	142.5	158	167.5	191	221.5	260
DB	49	54	56	60	66.5	73.5
øDC	38 <sup>-0.025 -0.050</sup>	42 <sup>-0.025 -0.050</sup>	42 <sup>-0.025 -0.050</sup>	45 <sup>-0.025 -0.050</sup>	45 <sup>-0.025 -0.050</sup>	52 <sup>-0.030 -0.060</sup>
øG	39	47	53	63	78	100
K	33.5	39.5	42.5	47	55	65
O-ring (fluorocarbon hardness Hs70)	AS568-028	AS568-029	AS568-029	AS568-030	AS568-030	AS568-032
Mass	0.9 kg	1.2 kg	1.6 kg	2.7 kg	4.3 kg	7.9 kg

- CLU□-□A (Air sensor) is made to order.

Mounting details



In blind hole

Rz: ISO4287(1997)

\*1: 15° only for CLU02-A

\*2: Sensor air exhaust piping hole must be made on either side or bottom face.

- Apply an appropriate amount of grease to the chamfer and the bore when mounting. Excessive grease may be a blockage in the air passage, causing malfunction of the sensor.
- The 30° taper machining must be provided to avoid the damage of the O-ring. Ensure that there are no interference on taper area when drilling the hole for sensor air.

mm

Model	CLU02-□A	CLU04-□A	CLU06-□A	CLU10-□A	CLU16-□A	CLU25-□A
øDD	38 <sup>+0.039</sup> <sub>0</sub>	42 <sup>+0.039</sup> <sub>0</sub>	42 <sup>+0.039</sup> <sub>0</sub>	45 <sup>+0.039</sup> <sub>0</sub>	45 <sup>+0.039</sup> <sub>0</sub>	52 <sup>+0.046</sup> <sub>0</sub>
øDE	38.6	42.6	42.6	45.6	45.6	52.6
DF	34.5	40.5	43.5	48	56	66
DG	41	47	50	54.5	62.5	72.5
DJ	70	79	84	92.5	107	123.5
DK	76	85	90	98.5	113	129.5
DL	86.5	97.5	102.5	111	125.5	142.5
DM	1	1.5	1.5	1.5	1.5	1.5
DN	46	52	55	59.5	67.5	77.5
DP	65	74	79	87.5	102	118.5
øDS	38	42	42	45	45	52
øBA	40	48	54	64	79	101



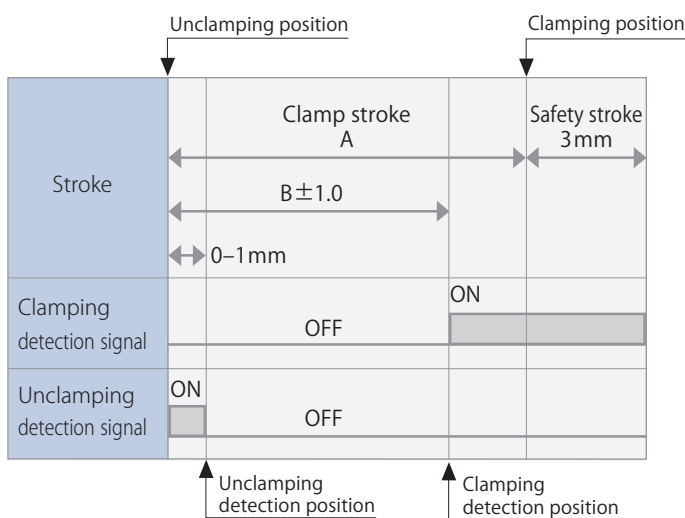
### Air sensor unit

Supplier and model	ISA3-G series manufactured by SMC
	GPS2-05 series manufactured by CKD
Air supply pressure	0.2 MPa
Inner diameter of piping	ø4 mm
Overall piping length	5 m or less

- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.

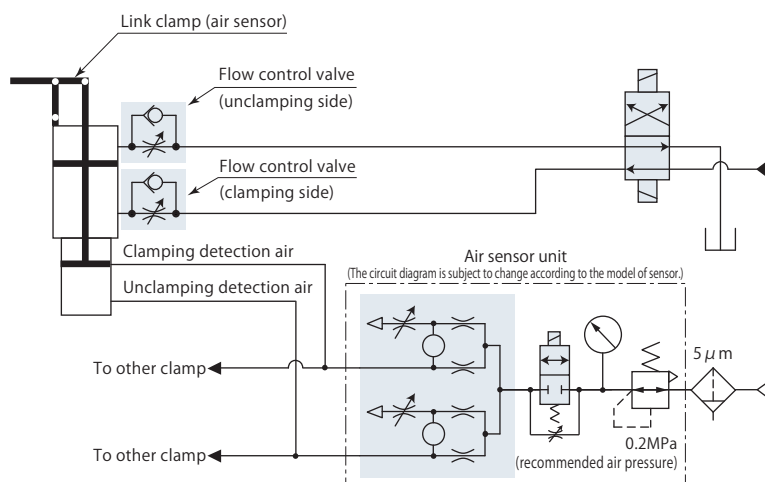
- There is a case that air sensing cannot be successfully made as designed when it is used out of the usage shown on the left. Contact Technical service center for more details.
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- Maximum 6 pieces of clamp can be detected at 0.2MPa air pressure by means of 1 piece of sensor. In case of 0.1MPa air pressure, maximum 3 pieces of clamp are detectable.

### Air sensor triggering point



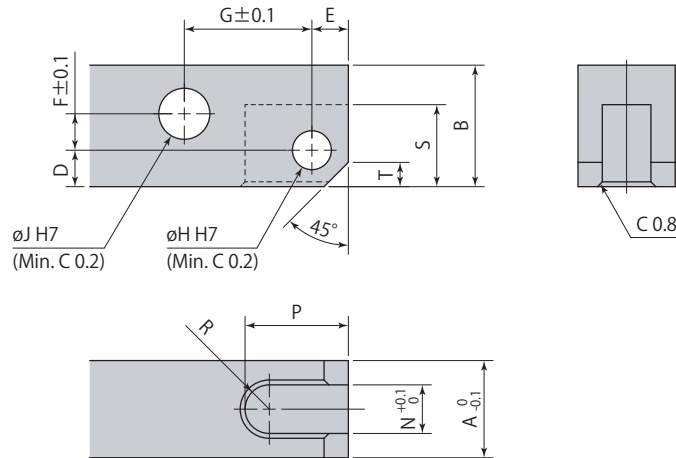
Model	Clamp stroke A	Clamping detection position B
CLU02-□A	17.5	15.5
CLU04-□A	20.5	18.5
CLU06-□A	23.0	21.0
CLU10-□A	26.5	24.5
CLU16-□A	33.0	31.0
CLU25-□A	42.0	40.0

### Hydraulic and pneumatic circuit diagram



Clamp arm mounting details

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



Recommended material: S45C (HB167–229)

Link clamp	CLU02	CLU04	CLU06	CLU10	CLU16	CLU25
A	12	12	16	19	22	32
B	14	16	20	25	31	38
D	5.5	6	6	8	9	12.5
E	5.5	6	6	7	10	13
F	3	3.5	6	7.5	9.5	9.5
G	16.5	18.5	21	24.5	30.5	37.5
$\varnothing H$	$6^{+0.012}_0$	$6^{+0.012}_0$	$6^{+0.012}_0$	$8^{+0.015}_0$	$12^{+0.018}_0$	$14^{+0.018}_0$
$\varnothing J$	$6^{+0.012}_0$	$6^{+0.012}_0$	$8^{+0.015}_0$	$10^{+0.015}_0$	$14^{+0.018}_0$	$16^{+0.018}_0$
N	6	6	8	10	11	16
P	14	17	17	20	26.5	36
R	R3	R3	R4	R5	R5.5	R8
S	12	13.5	13.5	17.5	22	28
T	3	4	4	5	7	8

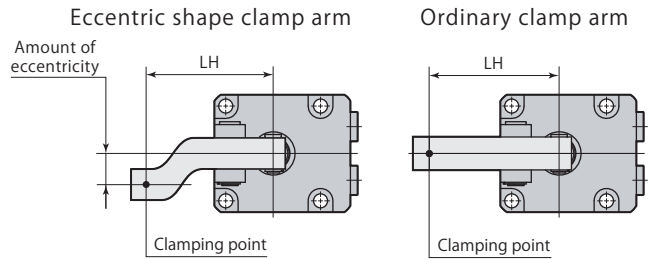
● When mounting the clamp arm, use included pins and snap rings.

Clamp arm allowable eccentricity

An eccentric shape clamp arm, as shown in diagram on right can be used with link clamp model CLU, if it is not possible to set clamping point at tip section of clamp arm in alignment with center line of piston rod and clamp arm.

Amount of eccentricity, however, must be within allowable eccentricity shown below.

Using a clamp arm that exceeds allowable eccentricity results in significant eccentric load on link mechanism and piston rod, leading to malfunction.



Link clamp

CLU

model CLU02		■ indicates nonusable range							
Hydraulic pressure MPa	Allowable eccentricity mm								
	Clamp arm length LH mm								
	27	30	36.5	40	50	60	80	100	
7			16	20	34	47	60	60	
6.5			18	23	38	52	↑	↑	
6		11	21	27	43	58	↑	↑	
5.5		13	24	30	48	60	↑	↑	
5	10	16	28	35	55	↑	↑	↑	
4.5	12	19	33	41	60	↑	↑	↑	
4	15	23	39	48	↑	↑	↑	↑	
3.5	20	28	47	57	↑	↑	↑	↑	
3	25	35	58	60	↑	↑	↑	↑	
2.5	33	45	60	↑	↑	↑	↑	↑	
2	44	60	↑	↑	↑	↑	↑	↑	
1.5	60	↑	↑	↑	↑	↑	↑	↑	
1	60	60	60	60	60	60	60	60	

model CLU04		■ indicates nonusable range							
Hydraulic pressure MPa	Allowable eccentricity mm								
	Clamp arm length LH mm								
	30	35	42	50	60	80	100	120	
7			7	13	21	36	51	60	
6.5			9	15	24	41	57	↑	
6			11	18	27	46	60	↑	
5.5		6	13	21	32	52	↑	↑	
5		8	16	25	37	60	↑	↑	
4.5	6	11	20	30	43	↑	↑	↑	
4	6	14	24	36	51	↑	↑	↑	
3.5	9	18	30	44	60	↑	↑	↑	
3	13	23	37	54	↑	↑	↑	↑	
2.5	18	30	48	60	↑	↑	↑	↑	
2	26	42	60	↑	↑	↑	↑	↑	
1.5	39	60	↑	↑	↑	↑	↑	↑	
1	60	60	60	60	60	60	60	60	

model CLU06		■ indicates nonusable range						
Hydraulic pressure MPa	Allowable eccentricity mm							
	Clamp arm length LH mm							
	35	45	50	60	80	100	120	
7			8	8	8	8	8	
6.5		8	8	8	8	8	8	
6		12	13	15	19	23	26	
5.5		18	20	24	32	41	49	
5	11	24	28	35	48	62	76	
4.5	15	32	37	48	68	80	80	
4	19	42	49	64	80	↑	↑	
3.5	24	51	65	80	↑	↑	↑	
3	31	63	79	↑	↑	↑	↑	
2.5	41	80	80	↑	↑	↑	↑	
2	55	↑	↑	↑	↑	↑	↑	
1.5	80	↑	↑	↑	↑	↑	↑	
1	80	80	80	80	80	80	80	

model CLU10		■ indicates nonusable range								
Hydraulic pressure MPa	Allowable eccentricity mm									
	Clamp arm length LH mm									
	40	50	56.5	60	80	100	120	140	160	
7		12	17	18	23	28	33	38	43	
6.5		15	24	26	35	45	54	64	73	
6		18	27	33	50	65	79	94	95	
5.5	9	22	32	38	67	88	95	95	↑	
5	9	27	38	45	80	95	↑	↑	↑	
4.5	12	32	46	53	93	↑	↑	↑	↑	
4	17	40	55	63	95	↑	↑	↑	↑	
3.5	22	49	66	76	↑	↑	↑	↑	↑	
3	30	61	82	93	↑	↑	↑	↑	↑	
2.5	40	79	95	95	↑	↑	↑	↑	↑	
2	56	95	↑	↑	↑	↑	↑	↑	↑	
1.5	82	↑	↑	↑	↑	↑	↑	↑	↑	
1	95	95	95	95	95	95	95	95	95	

model CLU16		■ indicates nonusable range								
Hydraulic pressure MPa	Allowable eccentricity mm									
	Clamp arm length LH mm									
	50	60	69.5	80	100	120	140	160	180	
7			16	26	46	66	86	107	110	
6.5		11	22	34	58	81	104	110	↑	
6		17	29	44	71	98	110	↑	↑	
5.5		23	38	55	87	110	↑	↑	↑	
5	13	31	49	68	105	↑	↑	↑	↑	
4.5	19	41	62	85	110	↑	↑	↑	↑	
4	27	53	78	105	↑	↑	↑	↑	↑	
3.5	37	69	98	110	↑	↑	↑	↑	↑	
3	51	90	110	↑	↑	↑	↑	↑	↑	
2.5	71	110	↑	↑	↑	↑	↑	↑	↑	
2	96	↑	↑	↑	↑	↑	↑	↑	↑	
1.5	110	↑	↑	↑	↑	↑	↑	↑	↑	
1	110	110	110	110	110	110	110	110	110	

model CLU25		■ indicates nonusable range								
Hydraulic pressure MPa	Allowable eccentricity mm									
	Clamp arm length LH mm									
	60	65	87.5	100	120	140	160	180	200	
7			41	59	87	115	142	160	160	
6.5			48	67	97	128	158	↑	↑	
6		18	55	76	110	143	160	↑	↑	
5.5	16	22	64	87	124	160	↑	↑	↑	
5	18	28	75	100	142	↑	↑	↑	↑	
4.5	24	35	88	117	160	↑	↑	↑	↑	
4	31	44	104	137	↑	↑	↑	↑	↑	
3.5	41	56	125	160	↑	↑	↑	↑	↑	
3	53	71	153	↑	↑	↑	↑	↑	↑	
2.5	71	93	160	↑	↑	↑	↑	↑	↑	
2	97	125	↑	↑	↑	↑	↑	↑	↑	
1.5	141	160	↑	↑	↑	↑	↑	↑	↑	
1	160	160	160	160	160	160	160	160	160	



Table of contents

Structure, Hydraulic circuit diagram .....	76
Specifications, Piping .....	77
Performance diagram, Performance table .....	78
CLT Dimensions .....	80
Mounting details .....	82
Clamp arm mounting details .....	83
Clamp arm allowable eccentricity .....	84
Caution in use .....	85
Flow control valve VCF .....	86
Air bleeding valve VCE .....	88

# Link clamp

Single acting 7 MPa

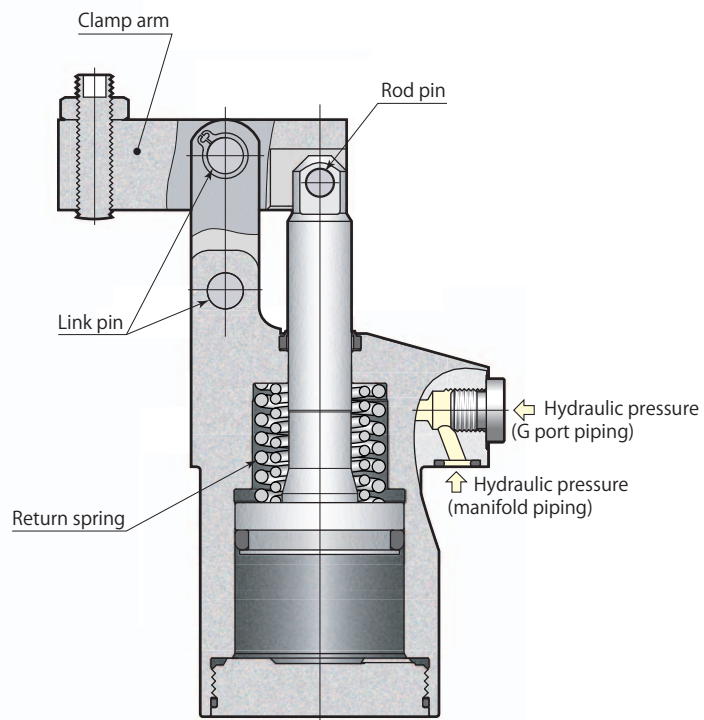
model **CLT**



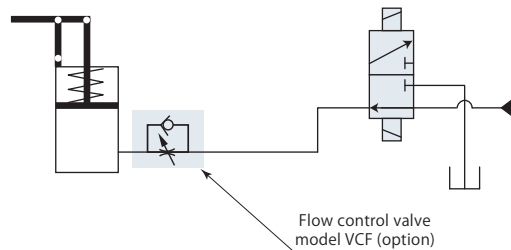
Single acting Link clamp  
model CLT06-F

Standard model

model CLT□-□



Hydraulic circuit diagram

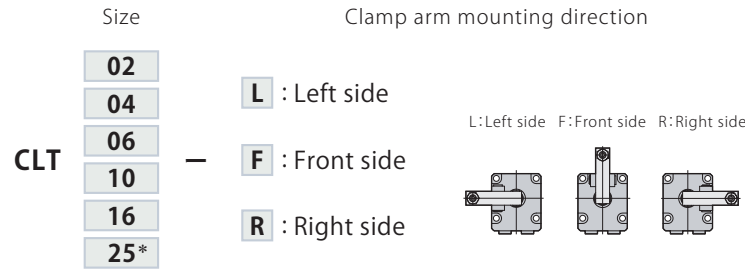


Use flow control valve for meter-in control.

Specifications page → 77

Standard page → 80

## Specifications



\*:CLT25-L and CLT25-R are made to order.

Model		CLT02	CLT04	CLT06	CLT10	CLT16	CLT25	
Cylinder force (hydraulic pressure 7MPa)*1	kN	3.2	4.5	6.1	9.8	15.7	25.4	
Cylinder inner diameter	mm	25	30	35	44	56	70	
Rod diameter	mm	12	14	14	16	22.4	28	
Effective area (clamp)	cm <sup>2</sup>	4.9	7.1	9.6	15.2	24.6	38.5	
Full stroke	mm	20.5	23.5	26	29.5	36	45	
Clamp stroke	mm	17.5	20.5	23	26.5	33	42	
Safety stroke	mm	3	3	3	3	3	3	
Max. oil flow rate	L/min	1.0	1.6	2.6	4.7	9.5	18.9	
Cylinder capacity	cm <sup>3</sup>	10.0	16.7	25.0	44.8	88.6	173.3	
Return spring force	Clamp	kN	0.25	0.40	0.63	0.81	1.52	1.58
	Unclamp	kN	0.13	0.19	0.33	0.44	0.81	0.83
Recommended piping inner diameter*2	mm	ø6	ø6	ø6	ø8	ø8	ø10	
Max. allowable mass of clamp arm*3	kg	0.2	0.3	0.5	1.0	1.5	3.0	
Mass	kg	0.7	1.0	1.5	2.4	4.3	8.1	
Recommended tightening torque of mounting screws*4	N·m	7	7	12	29	57	100	

● Pressure range: 2.5–7 MPa    ● Proof pressure: 10.5 MPa    ● Operating temperature: 0–70 °C

● Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)

● Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

\*1: This is value for clamping position.

\*2: Care must be taken when numerous clamps are used or when hydraulic piping is long.

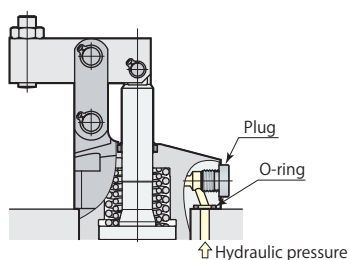
\*3: This is clamp arm mass when shape of clamp arm being described in Dimensions is retained but length only has been extended.

\*4: ISO R898 class 12.9

## Manifold piping and G port piping are available.

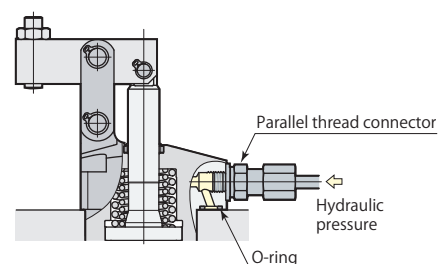
### Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the clamp.



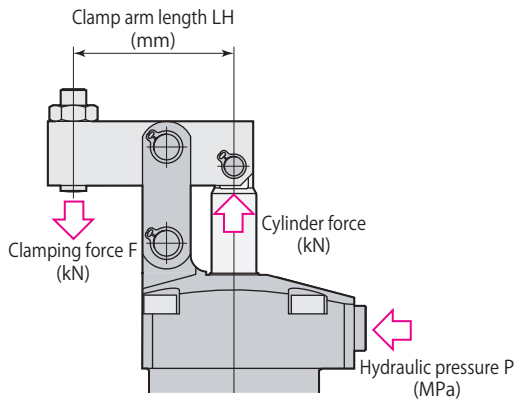
### G port piping

Remove plug when choosing G port piping. (O-ring must be used.) Refer to **page → 174** for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.





Performance diagram



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

Clamping force calculation formula

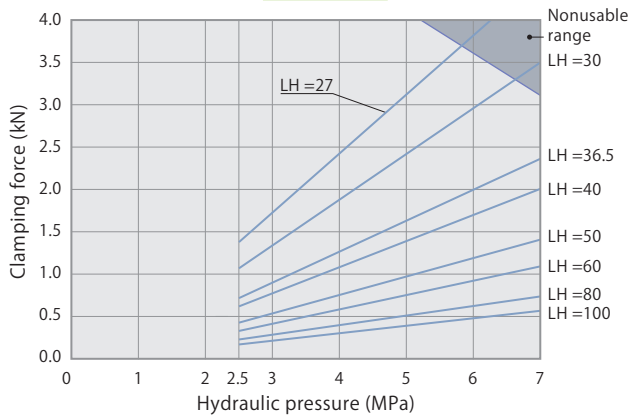
$$F = (\text{Coefficient 1} \times P - \text{Coefficient 2}) / (\text{LH} - \text{Coefficient 3})$$

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

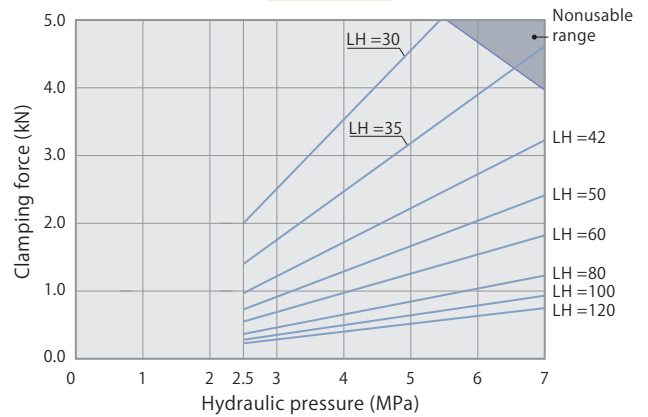
CLT06 with clamp arm length (LH) = 50 mm at hydraulic pressure of 7 MPa, Clamping force F is calculated by  $(18.18 \times 7 - 11.91) / (50 - 21.0) = 4.0 \text{ kN}$

Do not use the clamp in the nonusable range. It may cause damage of link mechanism.

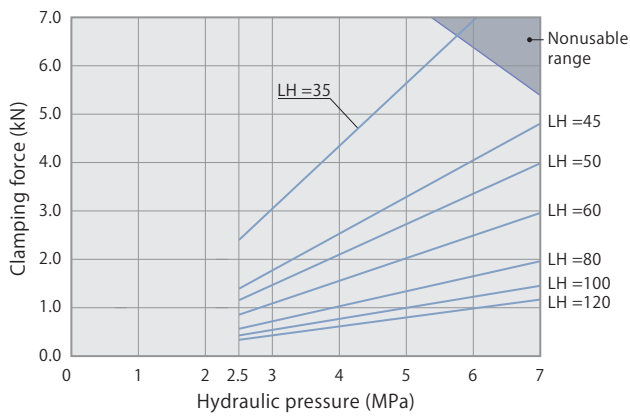
model CLT02



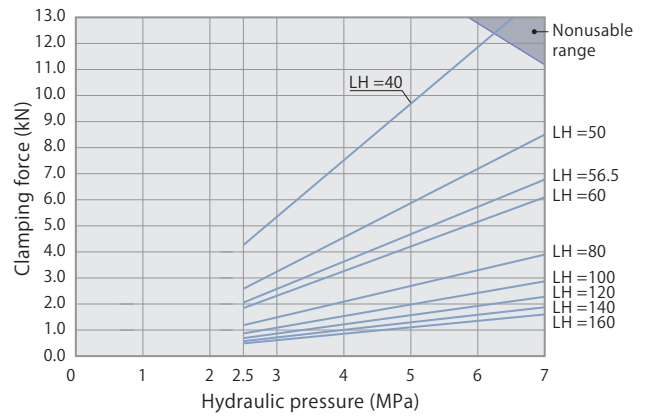
model CLT04



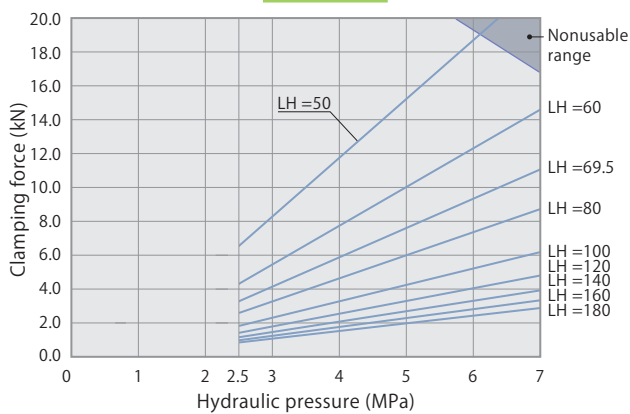
model CLT06



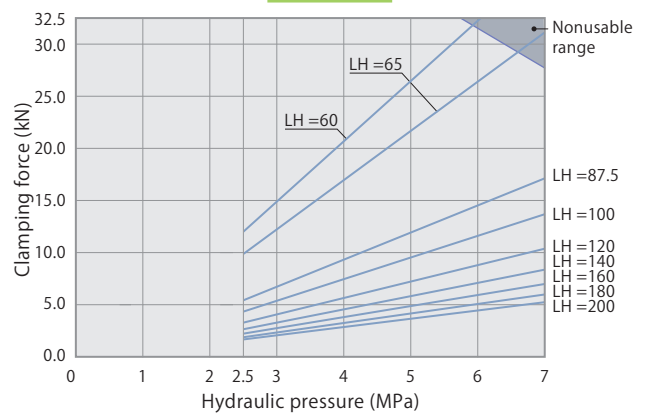
model CLT10



model CLT16



model CLT25



Performance table

**model CLT02** Clamping force  $F=(7.29 \times P-3.71)/(LH-16.5)$

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm
		Clamp arm length LH mm								
		27	30	36.5	40	50	60	80	100	
7	3.2			2.4	2.0	1.4	1.1	0.7	0.6	32
6.5	2.9		3.2	2.2	1.9	1.3	1.0	0.7	0.5	30
6	2.7		3.0	2.0	1.7	1.2	0.9	0.6	0.5	28
5.5	2.4	3.5	2.7	1.8	1.5	1.1	0.8	0.6	0.4	26
5	2.2	3.1	2.4	1.6	1.4	1.0	0.8	0.5	0.4	25
4.5	2.0	2.8	2.2	1.5	1.2	0.9	0.7	0.5	0.3	24
4	1.7	2.4	1.9	1.3	1.1	0.8	0.6	0.4	0.3	↑
3.5	1.5	2.1	1.6	1.1	0.9	0.7	0.5	0.3	0.3	↑
3	1.2	1.7	1.3	0.9	0.8	0.5	0.4	0.3	0.2	↑
2.5	1.0	1.4	1.1	0.7	0.6	0.4	0.3	0.2	0.2	24
Max. pressure MPa		5.8	6.6	7.0	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

**model CLT04** Clamping force  $F=(11.77 \times P-6.66)/(LH-18.5)$

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN								Min. arm length Min. LH mm
		Clamp arm length LH mm								
		30	35	42	50	60	80	100	120	
7	4.5			3.2	2.4	1.8	1.2	0.9	0.7	38
6.5	4.2		4.2	3.0	2.2	1.7	1.1	0.9	0.7	35
6	3.8		3.9	2.7	2.0	1.5	1.0	0.8	0.6	33
5.5	3.5		3.5	2.5	1.8	1.4	0.9	0.7	0.6	31
5	3.1	4.5	3.2	2.2	1.7	1.3	0.8	0.6	0.5	29
4.5	2.8	4.0	2.8	2.0	1.5	1.1	0.8	0.6	0.5	27
4	2.4	3.5	2.4	1.7	1.3	1.0	0.7	0.5	0.4	26
3.5	2.1	3.0	2.1	1.5	1.1	0.8	0.6	0.4	0.3	↑
3	1.7	2.5	1.7	1.2	0.9	0.7	0.5	0.4	0.3	↑
2.5	1.4	2.0	1.4	1.0	0.7	0.5	0.4	0.3	0.2	26
Max. pressure MPa		5.4	6.5	7.0	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

**model CLT06** Clamping force  $F=(18.18 \times P-11.91)/(LH-21.0)$

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN							Min. arm length Min. LH mm
		Clamp arm length LH mm							
		35	45	50	60	80	100	120	
7	6.1		4.8	4.0	3.0	2.0	1.5	1.2	43
6.5	5.6		4.4	3.7	2.7	1.8	1.3	1.1	39
6	5.1		4.0	3.4	2.5	1.6	1.2	1.0	37
5.5	4.7	6.3	3.7	3.0	2.3	1.5	1.1	0.9	34
5	4.2	5.6	3.3	2.7	2.0	1.3	1.0	0.8	32
4.5	3.7	5.0	2.9	2.4	1.8	1.2	0.9	0.7	30
4	3.2	4.3	2.5	2.1	1.6	1.0	0.8	0.6	↑
3.5	2.7	3.7	2.2	1.8	1.3	0.9	0.7	0.5	↑
3	2.3	3.0	1.8	1.5	1.1	0.7	0.5	0.4	↑
2.5	1.8	2.4	1.4	1.2	0.9	0.6	0.4	0.3	30
Max. pressure MPa		5.7	7.0	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

**model CLT10** Clamping force  $F=(33.54 \times P-17.86)/(LH-24.5)$

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN									Min. arm length Min. LH mm
		Clamp arm length LH mm									
		40	50	56.5	60	80	100	120	140	160	
7	9.8		8.5	6.8	6.1	3.9	2.9	2.3	1.9	1.6	44
6.5	9.1		7.8	6.3	5.6	3.6	2.7	2.1	1.7	1.5	42
6	8.3	11.8	7.2	5.7	5.2	3.3	2.4	1.9	1.6	1.4	39
5.5	7.6	10.7	6.5	5.2	4.7	3.0	2.2	1.7	1.4	1.2	37
5	6.8	9.7	5.9	4.7	4.2	2.7	2.0	1.6	1.3	1.1	36
4.5	6.0	8.6	5.2	4.2	3.7	2.4	1.8	1.4	1.2	1.0	↑
4	5.3	7.5	4.6	3.6	3.3	2.1	1.5	1.2	1.0	0.9	↑
3.5	4.5	6.4	3.9	3.1	2.8	1.8	1.3	1.0	0.9	0.7	↑
3	3.8	5.3	3.2	2.6	2.3	1.5	1.1	0.9	0.7	0.6	↑
2.5	3.0	4.3	2.6	2.1	1.9	1.2	0.9	0.7	0.6	0.5	36
Max. pressure MPa		6.2	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	

indicates nonusable range

**model CLT16** Clamping force  $F=(67.61 \times P-41.72)/(LH-30.5)$

Hydraulic pressure MPa	Cylinder force kN	Clamping force kN									Min. arm length Min. LH mm
		Clamp arm length LH mm									
		50	60	69.5	80	100	120	140	160	180	
7	15.7		14.6	11.1	8.7	6.2	4.8	3.9	3.3	2.9	57
6.5	14.5		13.5	10.2	8.0	5.7	4.4	3.6	3.1	2.7	53
6	13.3	18.7	12.3	9.3	7.4	5.2	4.1	3.3	2.8	2.4	50
5.5	12.0	16.9	11.2	8.5	6.7	4.8	3.7	3.0	2.5	2.2	47
5	10.8	15.2	10.0	7.6	6.0	4.3	3.3	2.7	2.3	2.0	45
4.5	9.6	13.5	8.9	6.7	5.3	3.8	2.9	2.4	2.0	1.8	44
4	8.3	11.7	7.8	5.9	4.6	3.3	2.6	2.1	1.8	1.5	↑
3.5	7.1	10.0	6.6	5.0	3.9	2.8	2.2	1.8	1.5	1.3	↑
3	5.9	8.3	5.5	4.1	3.3	2.3	1.8	1.5	1.2	1.1	↑
2.5	4.6	6.5	4.3	3.3	2.6	1.8	1.4	1.2	1.0	0.9	44
Max. pressure MPa		6.1	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	

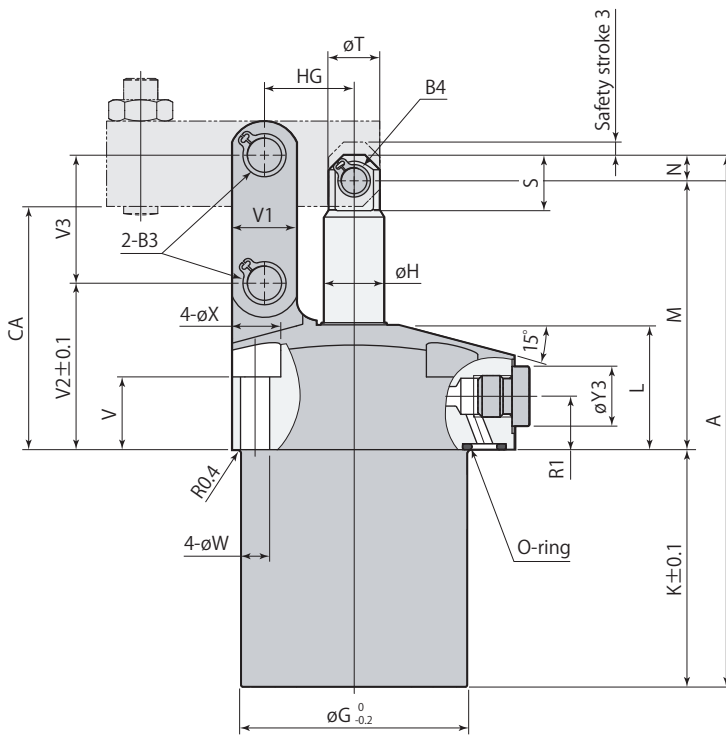
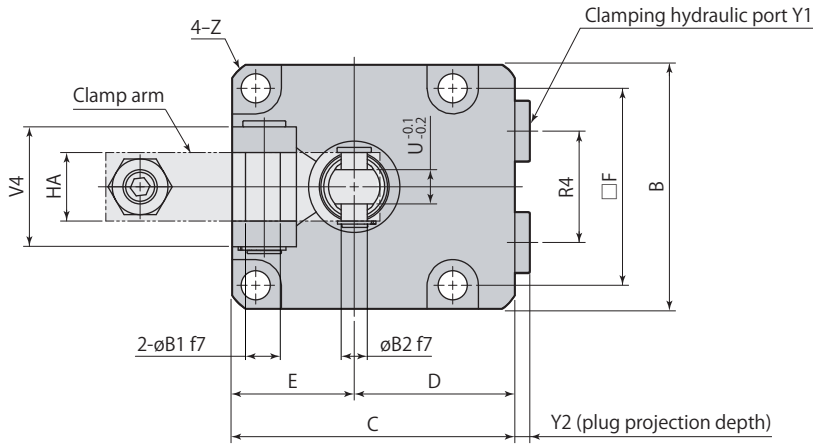
indicates nonusable range

**model CLT25** Clamping force  $F=(129.87 \times P-53.33)/(LH-37.5)$

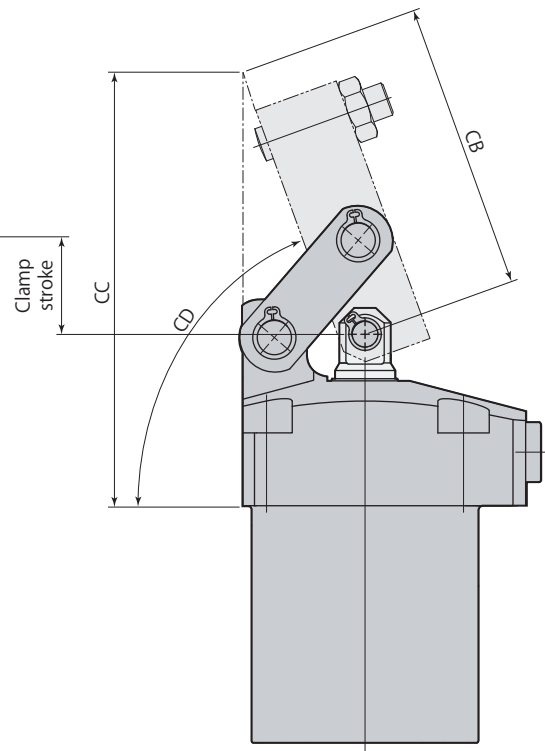
Hydraulic pressure MPa	Cylinder force kN	Clamping force kN										Min. arm length Min. LH mm
		Clamp arm length LH mm										
		60	65	87.5	100	120	140	160	180	200		
7	25.4			17.1	13.7	10.4	8.3	7.0	6.0	5.3	69	
6.5	23.4		28.8	15.8	12.7	9.6	7.7	6.5	5.5	4.9	65	
6	21.5		26.4	14.5	11.6	8.8	7.1	5.9	5.1	4.5	61	
5.5	19.6	29.4	24.0	13.2	10.6	8.0	6.4	5.4	4.6	4.1	58	
5	17.7	26.5	21.7	11.9	9.5	7.2	5.8	4.9	4.2	3.7	55	
4.5	15.7	23.6	19.3	10.6	8.5	6.4	5.2	4.3	3.7	3.3	↑	
4	13.8	20.7	17.0	9.3	7.5	5.7	4.5	3.8	3.3	2.9	↑	
3.5	11.9	17.8	14.6	8.0	6.4	4.9	3.9	3.3	2.8	2.5	↑	
3	10.0	14.9	12.2	6.7	5.4	4.1	3.3	2.7	2.4	2.1	↑	
2.5	8.0	12.1	9.9	5.4	4.3	3.3	2.6	2.2	1.9	1.7	55	
Max. pressure MPa		5.9	6.6	7.0	7.0	7.0	7.0	7.0	7.0	7.0		

indicates nonusable range

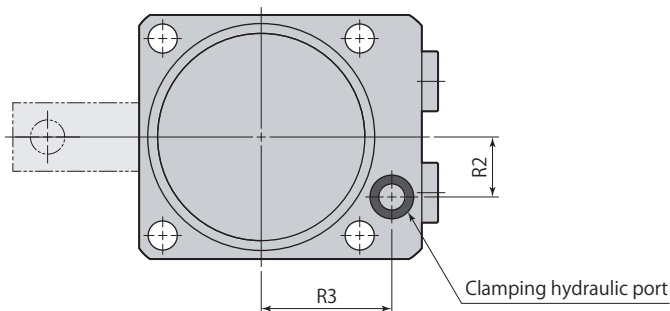
Dimensions



Clamp

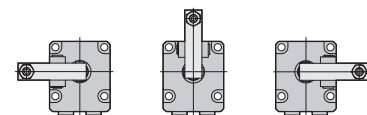


Unclamp



● This diagram represents external contour of CLT □-F. CLT□-L and CLT□-R differ only in terms of mounting direction of clamp arm and otherwise all dimensions are identical to those of CLT□-F.

L: Left side F: Front side R: Right side



● Clamp arm and mounting screws are not included.

Model	CLT02-□	CLT04-□	CLT06-□	CLT10-□	CLT16-□	CLT25-□
A	97.5	110	124.5	138	169	201.5
B	45	50	57	70	86	108
C	55	60	66	82	96	120
D	32.5	35	37.5	47	53	66
E	22.5	25	28.5	35	43	54
F	35	40	46	56	68	88
øG	39	47	53	63	78	100
øH	12	14	14	16	22.4	28
K	37.5	45.5	55.5	54	69	80
L	27.5	27.7	29.3	36.3	41.5	47
M	55	58.5	63	76	89	108.5
N	5	6	6	8	11	13
R1	12.5	12.5	12.5	14	14	21
R2	11	12	14	18	22.5	25
R3	25	28	30.5	36	42	57
R4	20	22	26	30	38	50
S	11.5	13	13	17	21.8	27.5
T	10	12	12	14	20	26
U (width across flats)	6	6	8	10	11	16
V	18	17	17	20	20	20
V1	11	13	15	19	25	32
V2	34	36	39	48	54.5	65
V3	24	26	30	35.5	44	53
V4	21	21	28	37	46	56
øW	5.5	5.5	6.8	9	11	14
øX	10	10	12	15	18.5	20
Y1	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8
Y2	3.8	3.8	3.8	4.8	4.8	4.8
øY3	14	14	14	19	19	22
Z	C1.5	C2.5	C2.5	C3	C3.5	C5.5
øB1	6 <sup>-0.010</sup> <sub>-0.022</sub>	6 <sup>-0.010</sup> <sub>-0.022</sub>	8 <sup>-0.013</sup> <sub>-0.028</sub>	10 <sup>-0.013</sup> <sub>-0.028</sub>	14 <sup>-0.016</sup> <sub>-0.034</sub>	16 <sup>-0.016</sup> <sub>-0.034</sub>
øB2	6 <sup>-0.010</sup> <sub>-0.022</sub>	6 <sup>-0.010</sup> <sub>-0.022</sub>	6 <sup>-0.010</sup> <sub>-0.022</sub>	8 <sup>-0.013</sup> <sub>-0.028</sub>	12 <sup>-0.016</sup> <sub>-0.034</sub>	14 <sup>-0.016</sup> <sub>-0.034</sub>
B3 (snap ring)*1	STW-6	STW-6	STW-8	STW-10	STW-14	STW-16
B4 (snap ring)*1	STW-6	STW-6	STW-6	STW-8	STW-12	STW-14
CA	49.5	52.5	57	68	80	96
CB	48	59.6	67.3	78.7	98.2	133.5
CC	80.2	92.5	101.3	120.4	144.7	189.2
CD	About 69°	About 71°	About 70°	About 70°	About 69°	About 72°
HA	12	12	16	19	22	32
HG	16.5	18.5	21	24.5	30.5	37.5
O-ring (fluorocarbon hardness Hs90)	P7	P7	P7	P8	P8	P10
Flow control valve (meter-in)*2	VCF01	VCF01	VCF01	VCF02	VCF02	VCF03
Air bleeding valve*2	VCE01	VCE01	VCE01	VCE02	VCE02	VCE03

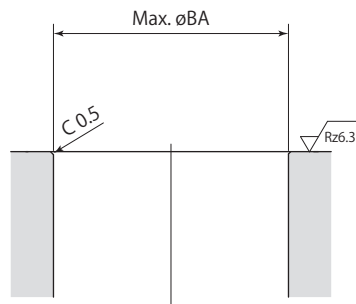
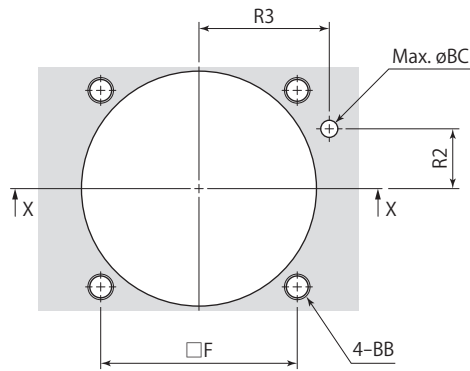
\*1: Snap ring is made by Ochiai Corporation.

\*2: Select the right model of VCF and VCE according to the size of the clamp.

Refer to each page for the details of options.

● Flow control valve **page →86**

● Air bleeding valve **page →88**

Mounting details

X-X

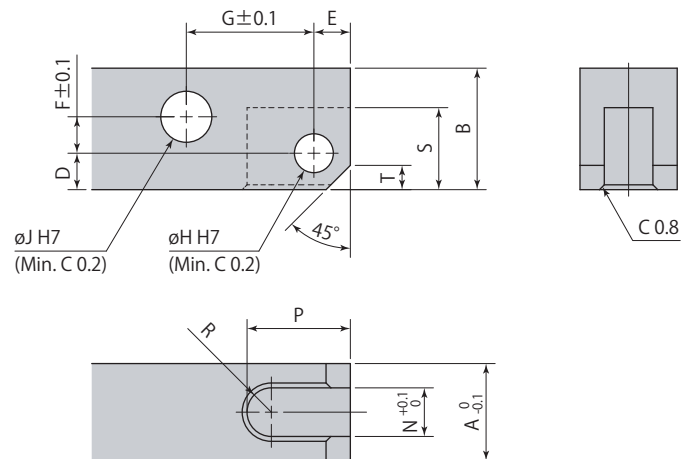
Rz: ISO4287(1997)

Model	CLT02-□	CLT04-□	CLT06-□	CLT10-□	CLT16-□	CLT25-□
F	35	40	46	56	68	88
R2	11	12	14	18	22.5	25
R3	25	28	30.5	36	42	57
øBA	40	48	54	64	79	101
BB	M5	M5	M6	M8	M10	M12
øBC	4	4	4	6	6	8

mm

Clamp arm mounting details

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



Recommended material: S45C (HB167–229)

Link clamp	mm					
	CLT02	CLT04	CLT06	CLT10	CLT16	CLT25
A	12	12	16	19	22	32
B	14	16	20	25	31	38
D	5.5	6	6	8	9	12.5
E	5.5	6	6	7	10	13
F	3	3.5	6	7.5	9.5	9.5
G	16.5	18.5	21	24.5	30.5	37.5
$\varnothing H$	6 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>	12 <sup>+0.018</sup> <sub>0</sub>	14 <sup>+0.018</sup> <sub>0</sub>
$\varnothing J$	6 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>	10 <sup>+0.015</sup> <sub>0</sub>	14 <sup>+0.018</sup> <sub>0</sub>	16 <sup>+0.018</sup> <sub>0</sub>
N	6	6	8	10	11	16
P	14	17	17	20	26.5	36
R	R3	R3	R4	R5	R5.5	R8
S	12	13.5	13.5	17.5	22	28
T	3	4	4	5	7	8

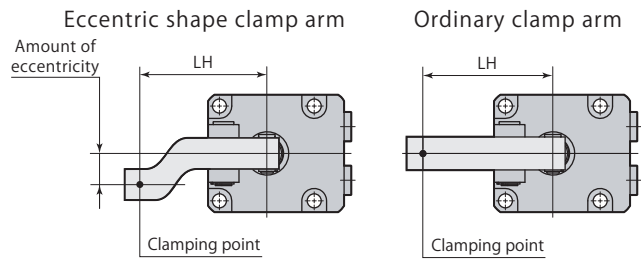
● When mounting the clamp arm, use included pins and snap rings.

### Clamp arm allowable eccentricity

An eccentric shape clamp arm, as shown in diagram on right can be used with link clamp model CLT, if it is not possible to set clamping point at tip section of clamp arm in alignment with center line of piston rod and clamp arm.

Amount of eccentricity, however, must be within allowable eccentricity shown below.

Using a clamp arm that exceeds allowable eccentricity results in significant eccentric load on link mechanism and piston rod, leading to malfunction.



model CLT02		indicates nonusable range							
Hydraulic pressure MPa	Allowable eccentricity mm								
	Clamp arm length LH mm								
	27	30	36.5	40	50	60	80	100	
7			18	23	38	52	60	60	
6.5		11	21	27	43	58	↑	↑	
6		13	24	30	48	60	↑	↑	
5.5	10	16	28	35	55	↑	↑	↑	
5	12	19	33	41	60	↑	↑	↑	
4.5	15	23	39	48	↑	↑	↑	↑	
4	20	28	47	57	↑	↑	↑	↑	
3.5	25	35	58	60	↑	↑	↑	↑	
3	33	45	60	↑	↑	↑	↑	↑	
2.5	44	60	60	60	60	60	60	60	

model CLT04		indicates nonusable range							
Hydraulic pressure MPa	Allowable eccentricity mm								
	Clamp arm length LH mm								
	30	35	42	50	60	80	100	120	
7			9	16	24	41	58	60	
6.5		6	11	19	28	47	60	↑	
6		6	14	22	32	53	↑	↑	
5.5		8	16	26	38	60	↑	↑	
5	6	11	20	31	44	↑	↑	↑	
4.5	6	14	25	37	52	↑	↑	↑	
4	9	18	31	45	60	↑	↑	↑	
3.5	13	24	39	55	↑	↑	↑	↑	
3	19	32	50	60	↑	↑	↑	↑	
2.5	27	44	60	60	60	60	60	60	

model CLT06		indicates nonusable range							
Hydraulic pressure MPa	Allowable eccentricity mm								
	Clamp arm length LH mm								
	35	45	50	60	80	100	120		
7		9	9	10	11	12	13		
6.5		14	15	18	23	28	25		
6		19	22	27	37	47	33		
5.5	12	26	30	38	54	70	57		
5	16	35	41	52	75	80	80		
4.5	20	45	54	70	80	↑	↑		
4	26	55	69	80	↑	↑	↑		
3.5	33	68	80	↑	↑	↑	↑		
3	44	80	↑	↑	↑	↑	↑		
2.5	61	80	80	80	80	80	80		

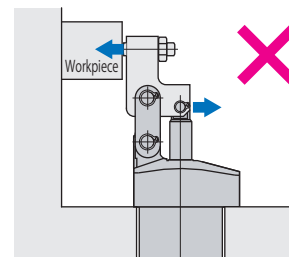
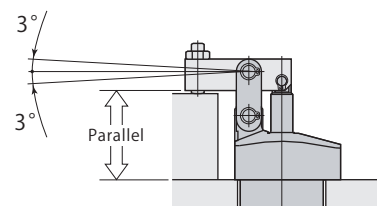
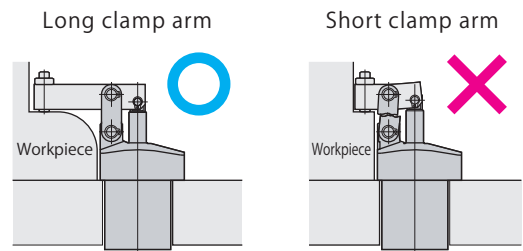
model CLT10		indicates nonusable range									
Hydraulic pressure MPa	Allowable eccentricity mm										
	Clamp arm length LH mm										
	40	50	56.5	60	80	100	120	140	160		
7		15	24	26	36	46	56	65	75		
6.5		18	28	33	51	66	81	95	95		
6	9	22	33	38	68	90	95	↑	↑		
5.5	9	27	39	45	81	95	↑	↑	↑		
5	13	33	46	53	94	↑	↑	↑	↑		
4.5	17	40	55	63	95	↑	↑	↑	↑		
4	23	50	67	76	↑	↑	↑	↑	↑		
3.5	30	62	83	94	↑	↑	↑	↑	↑		
3	41	80	95	95	↑	↑	↑	↑	↑		
2.5	57	95	95	95	95	95	95	95	95		

model CLT16		indicates nonusable range									
Hydraulic pressure MPa	Allowable eccentricity mm										
	Clamp arm length LH mm										
	50	60	69.5	80	100	120	140	160	180		
7		13	24	37	61	85	110	110	110		
6.5		18	32	47	75	103	↑	↑	↑		
6	11	25	41	58	91	110	↑	↑	↑		
5.5	14	34	52	72	110	↑	↑	↑	↑		
5	21	44	66	90	↑	↑	↑	↑	↑		
4.5	30	57	83	110	↑	↑	↑	↑	↑		
4	41	74	105	↑	↑	↑	↑	↑	↑		
3.5	56	96	110	↑	↑	↑	↑	↑	↑		
3	77	110	↑	↑	↑	↑	↑	↑	↑		
2.5	109	110	110	110	110	110	110	110	110		

model CLT25		indicates nonusable range											
Hydraulic pressure MPa	Allowable eccentricity mm												
	Clamp arm length LH mm												
	60	65	87.5	100	120	140	160	180	200				
7			46	65	95	125	155	160	160				
6.5		17	54	74	107	140	160	↑	↑				
6		21	62	85	121	158	↑	↑	↑				
5.5	17	27	73	98	138	160	↑	↑	↑				
5	23	34	85	113	159	↑	↑	↑	↑				
4.5	30	43	101	133	160	↑	↑	↑	↑				
4	39	54	121	158	↑	↑	↑	↑	↑				
3.5	50	68	147	160	↑	↑	↑	↑	↑				
3	67	88	160	↑	↑	↑	↑	↑	↑				
2.5	91	118	160	160	160	160	160	160	160				

Caution in use

- With link clamps, force acting on link mechanism becomes larger as clamp arm becomes shorter. Exceeding maximum allowable load for link mechanism will lead to malfunction. Depending on clamp arm length, it would be necessary to lower clamping force (hydraulic pressure). Use a clamp at appropriate clamping force that is suitable for clamp arm length, referring to performance diagram and table.
- Determine height and mount clamp, ensuring that clamp arm becomes parallel to clamping surface and mounting surface when workpiece is clamped (allowable angle  $\pm 3^\circ$ ).
- Using a method such as that shown in the diagram on the right will apply a transverse force on the piston rod and cause the piston rod to break. Please avoid the usage that may apply a non-axial force to the piston rod.





Specifications

(Nil) : Meter-in

O : Meter-out



Body color : Silver



Body color : Black

G port size

01S : G1/8

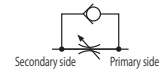
01 : G1/8

02 : G1/4

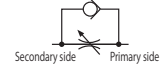
03 : G3/8

Control method

(Nil) : Meter-in



O : Meter-out

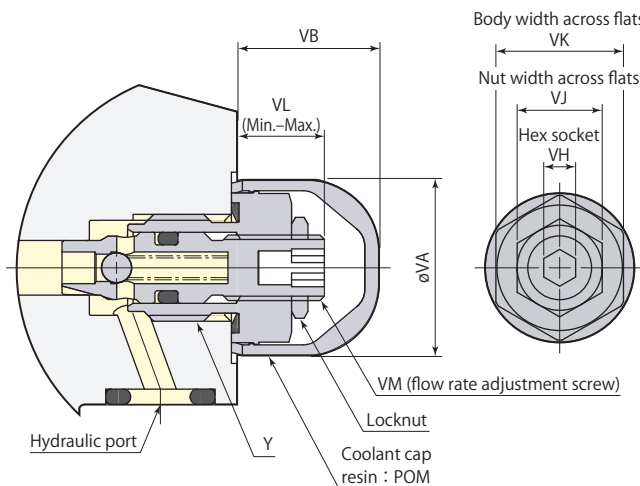


VCF

Model	Meter-in				Meter-out			
	VCF01S	VCF01	VCF02	VCF03	VCF01S-O	VCF01-O	VCF02-O	VCF03-O
G port size	G1/8	G1/8	G1/4	G3/8	G1/8	G1/8	G1/4	G3/8
Cracking pressure MPa	0.04	0.04	0.04	0.04	0.1	0.1	0.1	0.1
Orifice area mm <sup>2</sup>	4.9	4.9	9.6	19.6	3.1	3.1	6.2	12.6
Recommended tightening torque N·m	10	10	30	35	10	10	30	35
Mass kg	0.011	0.013	0.024	0.038	0.011	0.013	0.024	0.038

- Pressure range : 0.5–7 MPa
- Proof pressure : 10.5 MPa
- Operating temperature : 0–70 °C
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)

Dimensions



Model	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
Y	G1/8	G1/8	G1/4	G3/8
øVA	16	16	21	24
VB	13	13	13	14
VH	3	3	5	6
VJ	8	8	10	14
VK	12	12	17	19
VL	8–11	7–11	7.5–11.5	8.5–12.5
Adjustment screw number of turns	4 rotations	5.3 rotations	5.3 rotations	5.3 rotations
VM	M6×0.75	M6×0.75	M8×0.75	M10×0.75

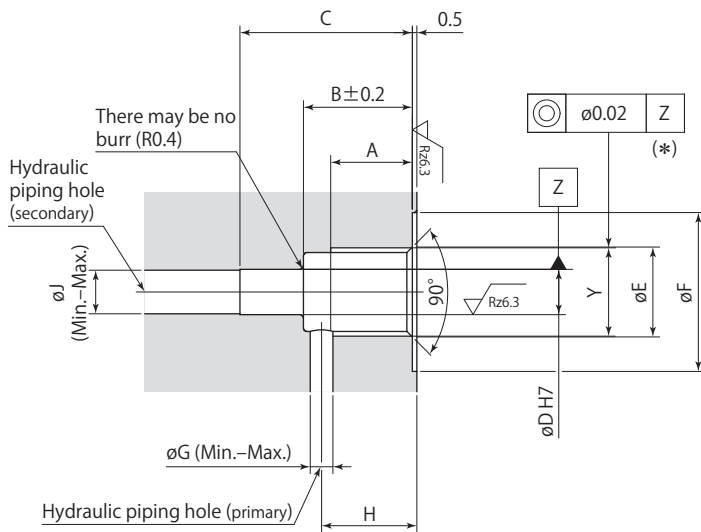
- Use a closed wrench or socket wrench for mounting and dismounting.
- Flow control valve can be mounted on hydraulic port (G port) when manifold piping.
- Adjust flow rate without hydraulic pressure. Conducting adjustments with hydraulic pressure may result in damaging seal.
- Diagram above indicates mounting for meter-in (VCF□).
- VCF is shipped with the valve fully open. Adjust the flow rate by loosening the screws after it is screwed in to close totally. Tighten the locknut after adjustment is completed.

Applicable clamp and work support

Model	VCF01S	VCF01	VCF02	VCF03
Swing clamp (double acting)	CTM03, 04, 05, 06 CTP04, 05, 06	CTM10 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)*	CTN02, 04, 05, 06	CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)*	CTS04	CTS06	CTS10, 16	-
Link clamp (double acting)	CLM03, 04 CLP04, 05, 06	CLM05, 06, 10 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)*	CLN04	CLN05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01	CNB02, 04	-	-
Push, pull cylinder	-	CNA02, 04, 06	CNA10, 16	CNA25
Work support*	CSU CSP-D(CSN, CSY)	-	-	-

\* : Single acting swing clamp, swivel clamp, single acting link clamp and work support are meter-in only.

Mounting details



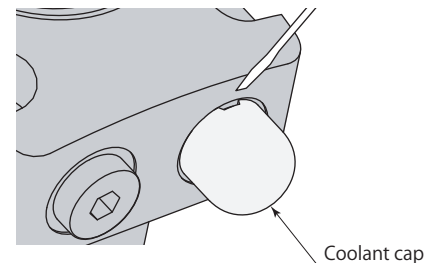
Rz: ISO4287(1997)

Model	mm			
	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
A	9	9	13	13
B	11	13	18	19
C	15.5	17.5	22.5	23.5
øD	5 <sup>+0.012</sup> <sub>0</sub>	5 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>
øE	9.9	9.9	13.3	16.8
øF	17.5	17.5	21.5	24.5
øG	1.5-2	2.5-3	3.5-5	5-6
H	9-10	9.5-11.5	14.5-15.5	15-16
øJ	2.5-5	2.5-5	3.5-6	5-8
Y	G1/8	G1/8	G1/4	G3/8

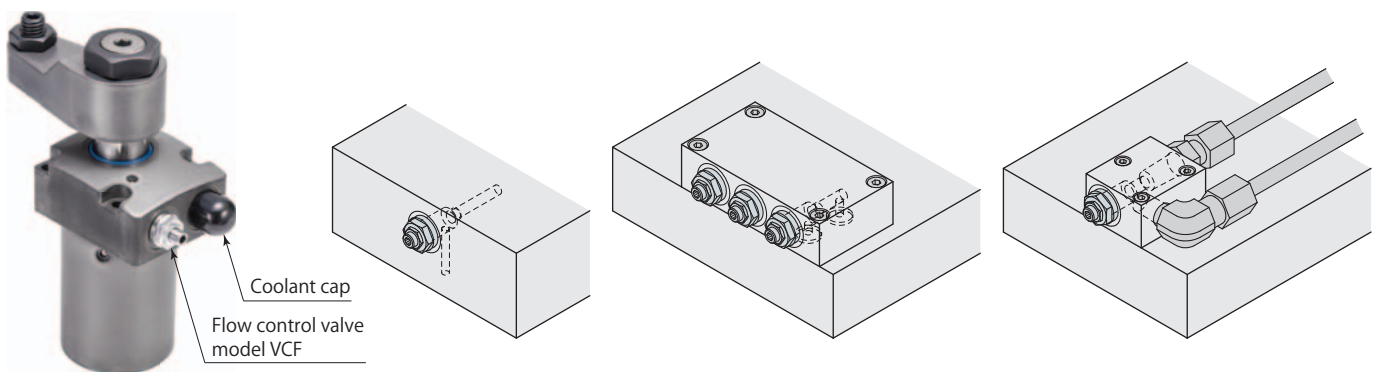
\*:Concentricity is required when machining øD and Y-portion thread. Misalignment or machining defect may cause the trouble of installation and adjusting flow rate.

Mounting & dismounting of flow control valve, air bleeding valve

- When mounting or dismounting a flow control valve or air bleeding valve, be sure to set pressure within hydraulic circuit to 0 MPa before starting.
- When mounting a flow control valve or air bleeding valve, be sure to tighten it with the recommended tightening torque.
- When mounting a coolant cap (resin:POM), firmly press the body of cover. If it is not mounting properly, use a plastic mallet to tap it into place.
- When dismounting a coolant cap, use a sharp-pointed tool such as a precision screw driver by hooking the notched portion.



Mounting example



Cylinder mounting

Pallet mounting

Block mounting ①

Block mounting ②

### Specifications

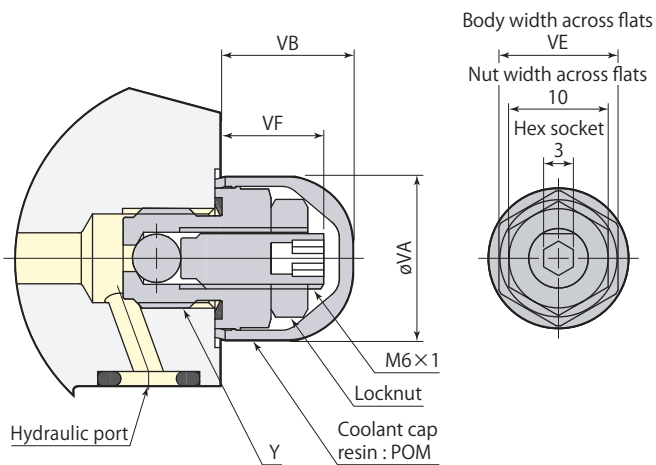


G port size

**01** : G1/8**VCE 02** : G1/4**03** : G3/8

Model	VCE01	VCE02	VCE03
G port size	G1/8	G1/4	G3/8
Recommended tightening torque N·m	10	30	35
Mass kg	0.017	0.029	0.044
Pressure range MPa	0–50		
Operating temperature °C	0–70		
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)		

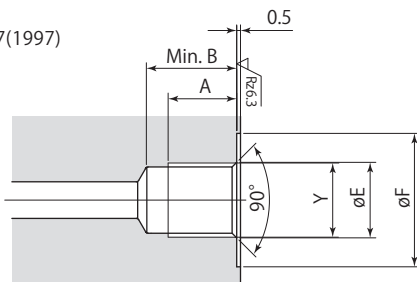
### Dimensions



Model	VCE01	VCE02	VCE03
A	9	13	13
B	10	14	14
øE	9.9	13.3	16.8
øF	17.5	21.5	24.5
Y	G1/8	G1/4	G3/8
øVA	16	21	24
VB	13	13	14
VE	12	17	19
VF	10.5	10.5	11.5

### Mounting details

Rz: ISO4287(1997)



- Use a closed wrench or socket wrench for mounting and dismantling.
- Air bleeding valve can be mounted on hydraulic port (G port) when manifold piping.

### Applicable clamp and work support

Model	VCE01	VCE02	VCE03
Swing clamp (double acting)	CTM03, 04, 05, 06, 10 CTP04, 05, 06 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)	CTN02, 04, 05, 06 CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)	CTS04, 06	CTS10, 16	–
Link clamp (double acting)	CLM03, 04, 05, 06, 10 CLP04, 05, 06 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)	CLN04, 05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01, 02, 04	–	–
Push, pull cylinder	CNA02, 04, 06	CNA10, 16	CNA25
Work support	CSU CST CSP-D(CSN, CSY, CSK)	–	–



## Clamp cylinder

**Push, pull cylinder**  
 model **CNA** Page →92



Female thread rod Pin rod Male thread rod

Specifications

7MPa Double acting

Features

Standard model

Variations

Standard



CNA Page →96

Dual rod



CNA-E Page →104

Air sensor



CNA-A Page →106

Option

Flow control valve



VCF Page →122

Air bleeding valve



VCE Page →124

<b>Clamp cylinder</b>		<b>Push cylinder</b> model <b>CMC</b> Page →112		<b>Pull cylinder</b> model <b>CMD</b> Page →112	
		 Threaded top type    Round top type			
Specifications		35MPa    Single acting		35MPa    Single acting	
Features		Threaded body		Threaded body	
Option	Flange	 CSP-F <b>Page →120</b>			
	Piping block	 CMH-C <b>Page →121</b>		CMH-D <b>Page →121</b>	

Table of contents

Structure, Hydraulic circuit diagram .....	94
Specifications, Piping .....	95
Dimensions	
Female thread rod CNA-T .....	96
Pin rod CNA-P .....	100
Male thread rod CNA-M .....	102
Dual rod CNA-E .....	104
Air sensor CNA-A .....	106
Caution in use .....	110
Flow control valve VCF .....	122
Air bleeding valve VCE .....	124

# Push, pull cylinder

Double acting 7 MPa

model **CNA**



Female thread rod  
model CNA06-30T



Pin rod  
model CNA06-30P

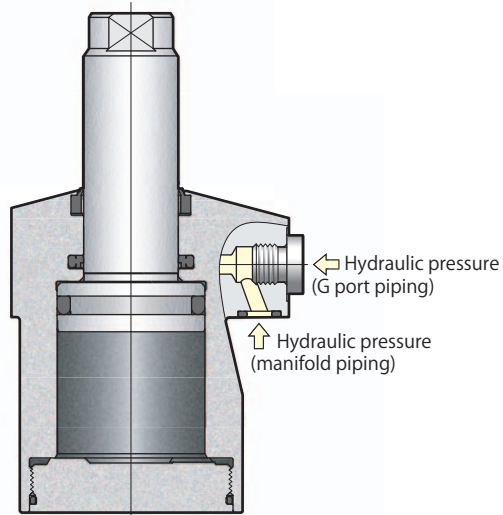


Male thread rod  
model CNA06-30M

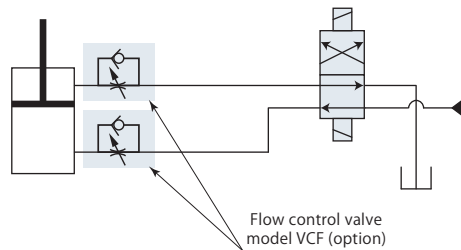


Standard model

model CNA□-□□



Hydraulic circuit diagram



For flow control valve, we recommend the meter-in control. If meter-out control is used, due to the area difference, it will cause back pressure and become high pressure. This can lead to malfunction of the system. Please be aware when designing the circuit.

- Specifications page → 95
- Piping page → 95
- Standard page → 96
- Dual rod page → 104
- Air sensor page → 106

Specifications

Size	Stroke	Rod tip section shapes	Variation code
<b>02</b>	<b>10 15 20 30 40 50 (60) (70)</b>		(Nil) : Standard
<b>04</b>	<b>10 15 20 30 40 50 60 70</b>	<b>T</b> : Female thread rod	<b>E</b> : Dual rod
<b>06</b>	<b>10 15 20 30 40 50 60 70 (80) (90)</b>	<b>P</b> : Pin rod	<b>A1</b> : Air sensor Detection 1mm before push end
<b>10</b>	<b>10 20 30 40 50 60 70 80 (90) (100)</b>	<b>M</b> : Male thread rod	<b>A3</b> : Air sensor Detection 3mm before push end
<b>16</b>	<b>10 20 30 40 50 60 70 80 (90) (100)</b>		<b>A5</b> : Air sensor Detection 5mm before push end
<b>25</b>	<b>20 30 40 50 60 70 80 90 (100) (110)</b>		

■ indicates made to order. Dual rod, air sensor model for the stroke with ( ) are unavailable.

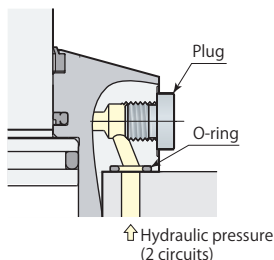
Model			CNA02	CNA04	CNA06	CNA10	CNA16	CNA25
Cylinder force (hydraulic pressure 7MPa)	Push	kN	3.4	4.9	6.7	10.6	17.2	26.9
	Pull	kN	2.0	3.2	4.0	7.2	12.3	20.0
Cylinder force calculation formula*1	Push		$F=0.49 \times P$	$F=0.71 \times P$	$F=0.96 \times P$	$F=1.52 \times P$	$F=2.46 \times P$	$F=3.85 \times P$
	Pull		$F=0.29 \times P$	$F=0.45 \times P$	$F=0.57 \times P$	$F=1.03 \times P$	$F=1.76 \times P$	$F=2.86 \times P$
Cylinder inner diameter		mm	25	30	35	44	56	70
Rod diameter		mm	16	18	22.4	25	30	35.5
Effective area	Push	cm <sup>2</sup>	4.9	7.1	9.6	15.2	24.6	38.5
	Pull	cm <sup>2</sup>	2.9	4.5	5.7	10.3	17.6	28.6
Max. oil flow rate		L/min	1.0	1.6	2.1	5.0	8.4	10.5
Recommended tightening torque of mounting screws*2		N·m	7	7	12	29	57	77

- Pressure range : 1–7 MPa
  - Proof pressure : 10.5 MPa
  - Operating temperature : 0–70 °C
  - Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)
  - Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)
- \*1 : F=Cylinder force (kN), P=Hydraulic pressure (MPa)    \*2 : ISO R898 class 12.9

Manifold piping and G port piping are available.

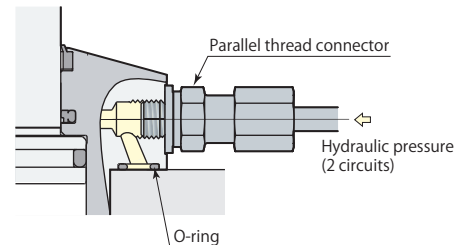
Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the cylinder.



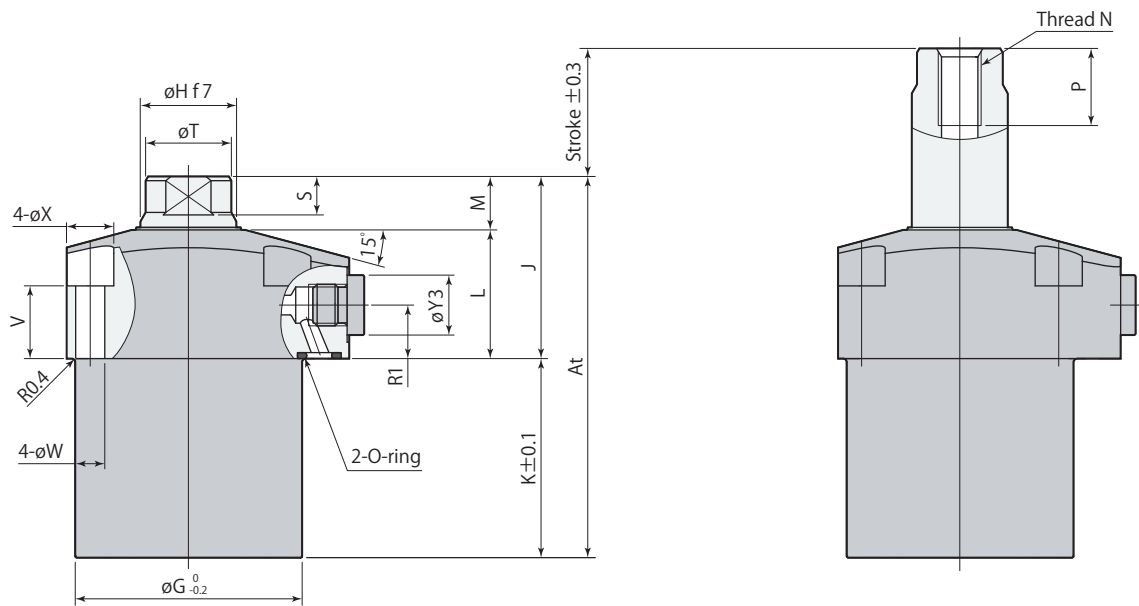
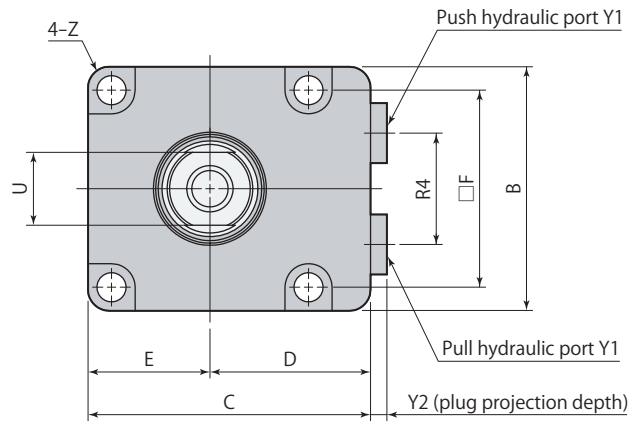
G port piping

Remove plugs when choosing G port piping. (O-ring must be used.) Refer to **page →174** for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.



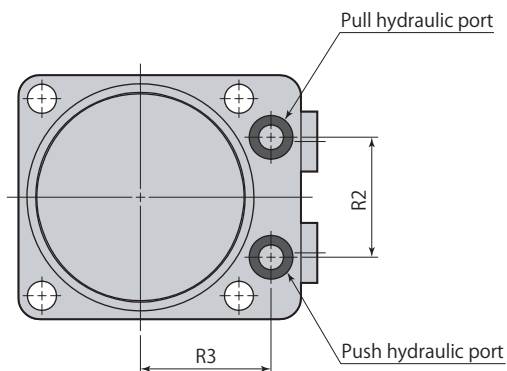
Dimensions

(Female thread rod)



Pull end

Push end



- Mounting screws are not included.
- Refer to **pages → 104–109** for specifications of dual rod and air sensor models.

							mm
Model	CNA02-□T	CNA04-□T	CNA06-□T	CNA10-□T	CNA16-□T	CNA25-□T	
B	45	50	57	70	86	108	
C	55	60	66	82	96	120	
D	32.5	35	37.5	47	53	66	
E	22.5	25	28.5	35	43	54	
F	35	40	46	56	68	88	
øG	39	47	53	63	78	100	
øH	16 <sup>-0.016 -0.034</sup>	18 <sup>-0.016 -0.034</sup>	22.4 <sup>-0.020 -0.041</sup>	25 <sup>-0.020 -0.041</sup>	30 <sup>-0.020 -0.041</sup>	35.5 <sup>-0.025 -0.050</sup>	
J	38	39.5	42.5	51	57	65.5	
L	27.5	28	30	37.5	41.5	48.5	
M	10.5	11.5	12.5	13.5	15.5	17	
N	M8×1.25	M8×1.25	M10×1.5	M12×1.75	M16×2	M20×2.5	
P	14	14	18	21	27	33	
R1	12.5	12.5	12.5	14	14	21	
R2	22	24	28	36	45	50	
R3	25	28	30.5	36	42	57	
R4	20	22	26	30	38	50	
S (width across flats height)	7	8	9	10	12	14	
øT	14±0.2	16±0.2	20±0.2	23±0.2	28±0.2	33.5±0.3	
U (width across flats)	12	14	17	19	24	30	
V	18	17	17	20	20	20	
øW	5.5	5.5	6.8	9	11	14	
øX	9.5	9.5	11	14	17.5	20	
Y1	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8	
Y2	3.8	3.8	3.8	4.8	4.8	4.8	
øY3	14	14	14	19	19	22	
Z	R3	R5	R5	R6	R7	R10	
O-ring (fluorocarbon hardness Hs90)	P7	P7	P7	P8	P8	P10	
Flow control valve*	Meter-in	VCF01	VCF01	VCF01	VCF02	VCF02	VCF03
	Meter-out	VCF01-O	VCF01-O	VCF01-O	VCF02-O	VCF02-O	VCF03-O
Air bleeding valve*	VCE01	VCE01	VCE01	VCE02	VCE02	VCE03	

\*: Select the right model of VCF and VCE according to the size of the cylinder.

Refer to each page for the details of options. ● Flow control valve **page →122** ● Air bleeding valve **page →124**

● CNA□-□T (Female thread rod) size 02, 04, 16, 25 or more than 60 mm stroke are made to order.

CNA02-Stroke			10	15	20	30	40	50	60	70
Cylinder capacity	Push	cm <sup>3</sup>	4.9	7.4	9.8	14.7	19.6	24.5	29.4	34.3
	Pull	cm <sup>3</sup>	2.9	4.3	5.8	8.7	11.6	14.5	17.4	20.3
	At	mm	66		81		101		121	
	K	mm	28		43		63		83	
	Mass	kg	0.7		0.8		1.0	0.9	1.1	

● Stroke 10, 20, 40, and 60 use spacers.

CNA04-Stroke			10	15	20	30	40	50	60	70
Cylinder capacity	Push	cm <sup>3</sup>	7.1	10.6	14.1	21.2	28.3	35.3	42.4	49.5
	Pull	cm <sup>3</sup>	4.5	6.8	9.0	13.6	18.1	22.6	27.1	31.7
	At	mm	70.5		85.5		105.5		125.5	
	K	mm	31		46		66		86	
	Mass	kg	0.9		1.1		1.3		1.5	

● Stroke 10, 20, 40, and 60 use spacers.

CNA06-Stroke			10	15	20	30	40	50	60	70	80	90
Cylinder capacity	Push	cm <sup>3</sup>	9.6	14.4	19.2	28.9	38.5	48.1	57.7	67.3	77.0	86.6
	Pull	cm <sup>3</sup>	5.7	8.5	11.4	17.0	22.7	28.4	34.1	39.8	45.4	51.1
	At	mm	74		89		109		129		149	
	K	mm	31.5		46.5		66.5		86.5		106.5	
	Mass	kg	1.2		1.4		1.7		1.9		2.2	

● Stroke 10, 20, 40, 60 and 80 use spacers.

CNA10-Stroke			10	20	30	40	50	60	70	80	90	100
Cylinder capacity	Push	cm <sup>3</sup>	15.2	30.4	45.6	60.8	76.0	91.2	106.4	121.6	136.8	152.1
	Pull	cm <sup>3</sup>	10.3	20.6	30.9	41.2	51.5	61.8	72.1	82.4	92.7	103.0
	At	mm	88.5		108.5		128.5		148.5		168.5	
	K	mm	37.5		57.5		77.5		97.5		117.5	
	Mass	kg	2.1		2.4		2.7		3.1		3.4	

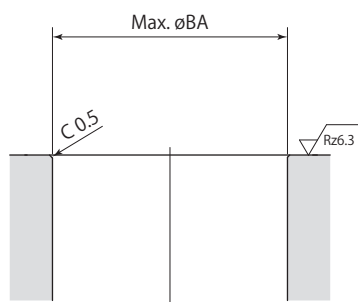
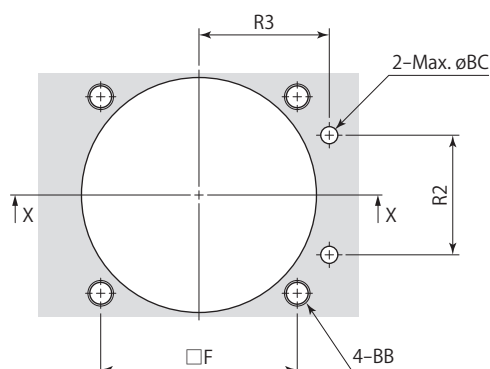
● Stroke 10, 30, 50, 70 and 90 use spacers.

CNA16-Stroke			10	20	30	40	50	60	70	80	90	100
Cylinder capacity	Push	cm <sup>3</sup>	24.6	49.3	73.9	98.5	123.2	147.8	172.4	197.0	221.7	246.3
	Pull	cm <sup>3</sup>	17.6	35.1	52.7	70.2	87.8	105.4	122.9	140.5	158.1	175.6
	At	mm	96		116		136		156		176	
	K	mm	39		59		79		99		119	
	Mass	kg	3.3		3.8		4.3		4.7		5.2	

● Stroke 10, 30, 50, 70 and 90 use spacers.

CNA25-Stroke			20	30	40	50	60	70	80	90	100	110
Cylinder capacity	Push	cm <sup>3</sup>	77.0	115.5	153.9	192.4	230.9	269.4	307.9	346.4	384.8	423.3
	Pull	cm <sup>3</sup>	57.2	85.8	114.3	142.9	171.5	200.1	228.7	257.3	285.9	314.5
	At	mm	115.5		135.5		155.5		175.5		195.5	
	K	mm	50		70		90		110		130	
	Mass	kg	6.3		7.1		7.8		8.6		9.4	

● Stroke 20, 40, 60, 80 and 100 use spacers.

Mounting details

X-X

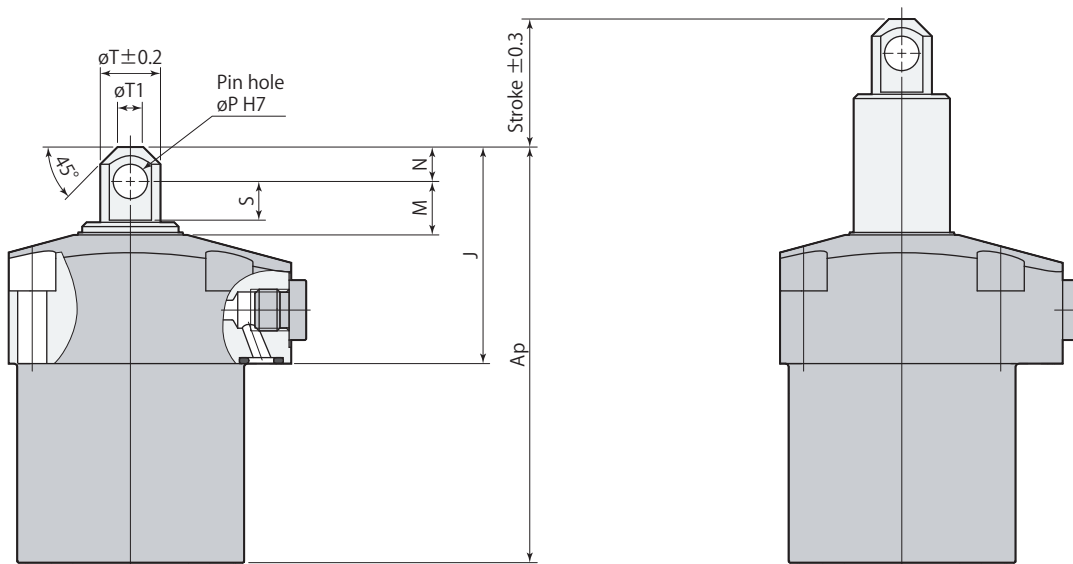
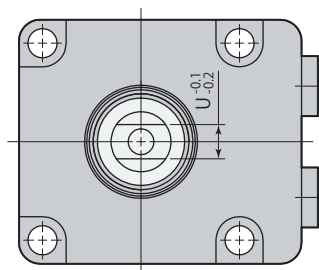
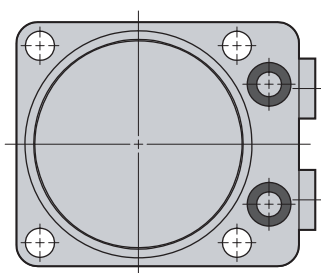
Rz: ISO4287(1997)

Model	CNA02-□T	CNA04-□T	CNA06-□T	CNA10-□T	CNA16-□T	CNA25-□T
F	35	40	46	56	68	88
R2	22	24	28	36	45	50
R3	25	28	30.5	36	42	57
øBA	40	48	54	64	79	101
BB	M5	M5	M6	M8	M10	M12
øBC	4	4	4	6	6	8

mm

Dimensions

(Pin rod)

Pull endPush end

- Mounting screws are not included.
- Recommended material for pin: SCM435-H (HB269–331)
- Refer to **pages →96–99** for specifications and dimensions that are not shown in the diagram.
- Refer to **pages →104–109** for specifications of dual rod and air sensor models.

Model	CNA02-□P	CNA04-□P	CNA06-□P	CNA10-□P	CNA16-□P	CNA25-□P
J	42.5	44.5	50.5	60	67	79.5
M	10	10.5	12.5	13.5	14.5	18
N	5	6	8	9	11	13
øP	6 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>	10 <sup>+0.015</sup> <sub>0</sub>	12 <sup>+0.018</sup> <sub>0</sub>	14 <sup>+0.018</sup> <sub>0</sub>
S	6.5	7	9	10	10.8	14.5
øT	10	12	14	16	20	26
øT1	5	5	6	8	10	14
U	6	6	8	11	14	16

mm

● CNA□-□P (Pin rod) is made to order.

CNA02-Stroke		10	15	20	30	40	50	60	70
Ap	mm	70.5		85.5		105.5		125.5	
Mass	kg	0.7		0.8		1.0	0.9	1.1	

CNA04-Stroke		10	15	20	30	40	50	60	70
Ap	mm	75.5		90.5		110.5		130.5	
Mass	kg	0.9		1.1		1.3		1.5	

CNA06-Stroke		10	15	20	30	40	50	60	70	80	90
Ap	mm	82	97		117		137		157		
Mass	kg	1.2	1.4		1.7		1.9		2.2		

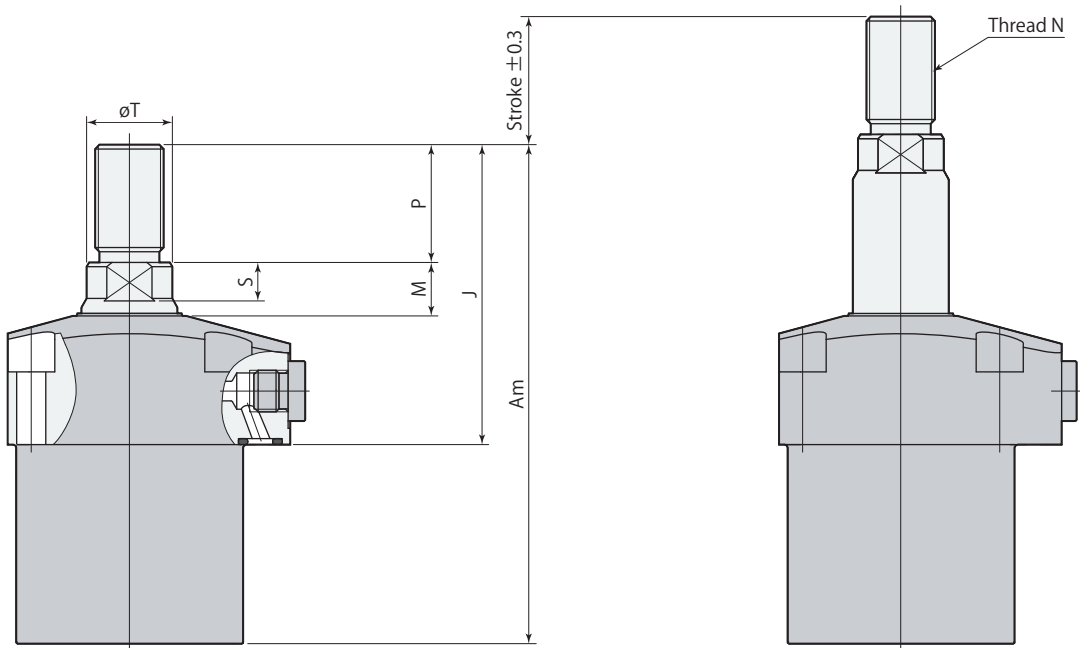
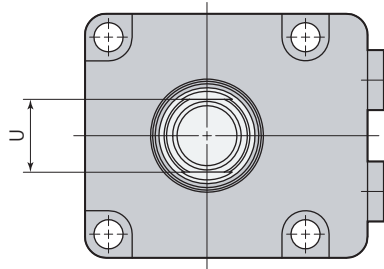
CNA10-Stroke		10	20	30	40	50	60	70	80	90	100
Ap	mm	97.5	117.5		137.5		157.5		177.5		
Mass	kg	2.1	2.4		2.7		3.1		3.4		

CNA16-Stroke		10	20	30	40	50	60	70	80	90	100
Ap	mm	106	126		146		166		186		
Mass	kg	3.3	3.8		4.3		4.7		5.2		

CNA25-Stroke		20	30	40	50	60	70	80	90	100	110
Ap	mm	129.5	149.5		169.5		189.5		209.5		
Mass	kg	6.3	7.1		7.9		8.6		9.5	9.4	

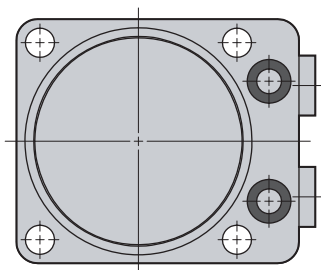


Dimensions  
(Male thread rod)



Pull end

Push end



- Mounting screws are not included.
- Refer to **pages →96–99** for specifications and dimensions that are not shown in the diagram.
- Refer to **pages →104–109** for specifications of dual rod and air sensor models.

CNA-M Male thread rod

Push, pull cylinder

Model	CNA02-□M	CNA04-□M	CNA06-□M	CNA10-□M	CNA16-□M	CNA25-□M
J	58	64.5	70	81	92	110.5
M	10.5	11.5	12.5	13.5	15.5	17
N	M12×1.25	M14×1.5	M16×1.5	M20×1.5	M24×1.5	M30×1.5
P	20	25	27.5	30	35	45
S (width across flats height)	7	8	9	10	12	14
øT	14±0.2	16±0.2	20±0.2	23±0.2	28±0.2	33.5±0.3
U (width across flats)	12	14	17	19	24	30

mm

● CNA□-□M (Male thread rod) is made to order.

CNA02-Stroke		10	15	20	30	40	50	60	70
Am	mm	86		101		121		141	
Mass	kg	0.7		0.8		1.0		1.1	

CNA04-Stroke		10	15	20	30	40	50	60	70
Am	mm	95.5		110.5		130.5		150.5	
Mass	kg	1.0		1.1		1.3		1.5	

CNA06-Stroke		10	15	20	30	40	50	60	70	80	90
Am	mm	101.5		116.5		136.5		156.5		176.5	
Mass	kg	1.3		1.5		1.7		2.0		2.3	

CNA10-Stroke		10	20	30	40	50	60	70	80	90	100
Am	mm	118.5		138.5		158.5		178.5		198.5	
Mass	kg	2.2		2.5		2.8		3.2		3.5	

CNA16-Stroke		10	20	30	40	50	60	70	80	90	100
Am	mm	131		151		171		191		211	
Mass	kg	3.5		4.0		4.4		4.9		5.4	

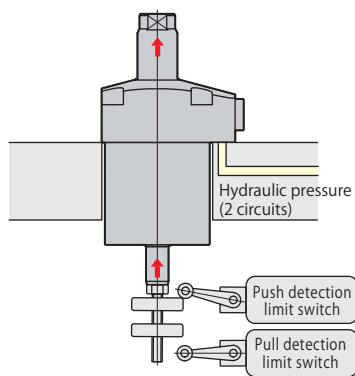
CNA25-Stroke		20	30	40	50	60	70	80	90	100	110
Am	mm	160.5		180.5		200.5		220.5		240.5	
Mass	kg	6.6		7.4		8.2		9.0		9.7	

Specifications

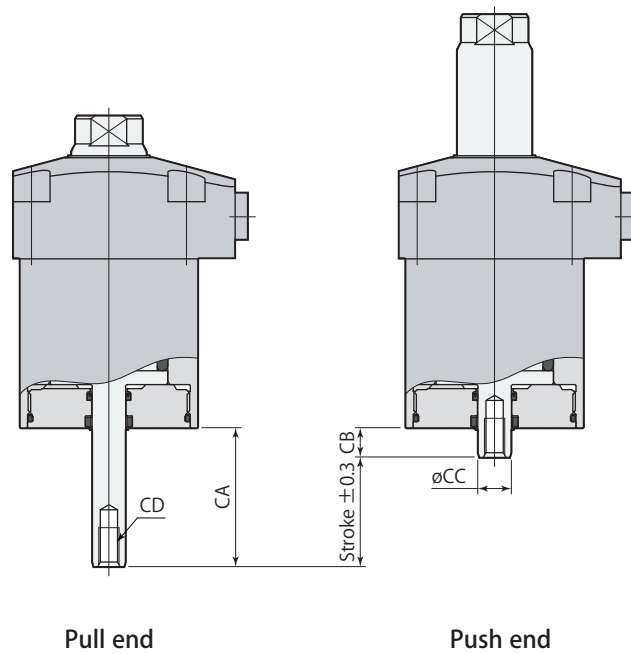
Model			CNA02-□□E	CNA04-□□E	CNA06-□□E	CNA10-□□E	CNA16-□□E	CNA25-□□E
Cylinder force (hydraulic pressure 7MPa)	Push	kN	3.1	4.4	6.2	9.9	16.4	25.5
	Pull	kN	2.0	3.2	4.0	7.2	12.3	20.0
Cylinder inner diameter		mm	25	30	35	44	56	70
Rod diameter		mm	16	18	22.4	25	30	35.5
Sensor rod diameter		mm	8	10	10	12	12	16
Effective area	Push	cm <sup>2</sup>	4.4	6.3	8.8	14.1	23.5	36.5
	Pull	cm <sup>2</sup>	2.9	4.5	5.7	10.3	17.6	28.6

● CNA□-□□E (Dual rod) is made to order.

Usage example



Dimensions



- This diagram depicts shape of female thread rod.
- Mounting screws are not included.
- Refer to specifications (page →95), dimensions (pages →96–103) for specifications and dimensions that are not shown in the diagram.

CNA02-Stroke			10	15	20	30	40	50
Cylinder capacity	Push	cm <sup>3</sup>	4.4	6.6	8.8	13.2	17.6	22.0
	Pull	cm <sup>3</sup>	2.9	4.3	5.8	8.7	11.6	14.5
CA		mm	23	23	38	38	58	58
CB		mm	13	8	18	8	18	8
øCC		mm	8					
CD		mm	M5×0.8 depth 8					
Mass	TE : Female thread rod	kg	0.7	0.7	0.8	0.8	0.9	0.9
	PE : Pin rod	kg	0.7	0.7	0.8	0.8	0.9	0.9
	ME : Male thread rod	kg	0.7	0.7	0.8	0.8	1.0	1.0

● Stroke 10, 20, and 40 use spacers.

Push, pull cylinder  
CNA-E  
Dual rod

CNA04-Stroke			10	15	20	30	40	50	60	70
Cylinder capacity	Push	cm <sup>3</sup>	6.3	9.4	12.6	18.8	25.1	31.4	37.7	44.0
	Pull	cm <sup>3</sup>	4.5	6.8	9.0	13.6	18.1	22.6	27.1	31.7
CA		mm	23	23	38	38	58	58	78	78
CB		mm	13	8	18	8	18	8	18	8
øCC		mm	10							
CD		mm	M6×1 depth 11							
Mass	TE : Female thread rod	kg	0.9		1.1		1.3		1.5	
	PE : Pin rod	kg	0.9		1.1		1.3		1.5	
	ME : Male thread rod	kg	0.9		1.1		1.3		1.5	

● Stroke 10, 20, 40, and 60 use spacers.

CNA06-Stroke			10	15	20	30	40	50	60	70
Cylinder capacity	Push	cm <sup>3</sup>	8.8	13.3	17.7	26.5	35.3	44.2	53.0	61.9
	Pull	cm <sup>3</sup>	5.7	8.5	11.4	17.0	22.7	28.4	34.1	39.8
CA		mm	23	23	38	38	58	58	78	78
CB		mm	13	8	18	8	18	8	18	8
øCC		mm	10							
CD		mm	M6×1 depth 11							
Mass	TE : Female thread rod	kg	1.2	1.2	1.4	1.4	1.7	1.7	1.9	1.9
	PE : Pin rod	kg	1.2	1.2	1.4	1.4	1.7	1.7	1.9	1.9
	ME : Male thread rod	kg	1.3	1.3	1.5	1.4	1.7	1.7	2.0	2.0

● Stroke 10, 20, 40, and 60 use spacers.

CNA10-Stroke			10	20	30	40	50	60	70	80
Cylinder capacity	Push	cm <sup>3</sup>	14.1	28.1	42.2	56.3	70.4	84.4	98.5	112.6
	Pull	cm <sup>3</sup>	10.3	20.6	30.9	41.2	51.5	61.8	72.1	82.4
CA		mm	28	28	48	48	68	68	88	88
CB		mm	18	8	18	8	18	8	18	8
øCC		mm	12							
CD		mm	M8×1.25 depth 15							
Mass	TE : Female thread rod	kg	2.2	2.1	2.5	2.5	2.8	2.8	3.2	3.1
	PE : Pin rod	kg	2.2	2.1	2.5	2.5	2.8	2.8	3.2	3.1
	ME : Male thread rod	kg	2.2	2.2	2.6	2.5	2.9	2.9	3.2	3.2

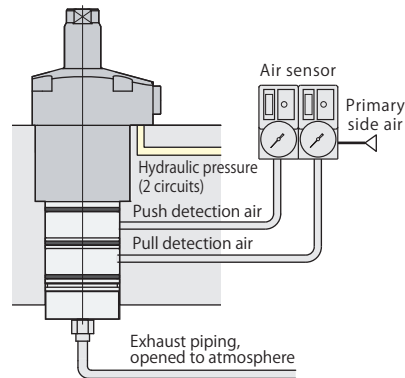
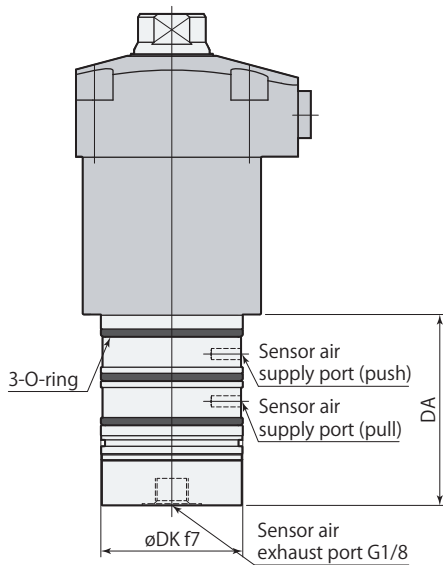
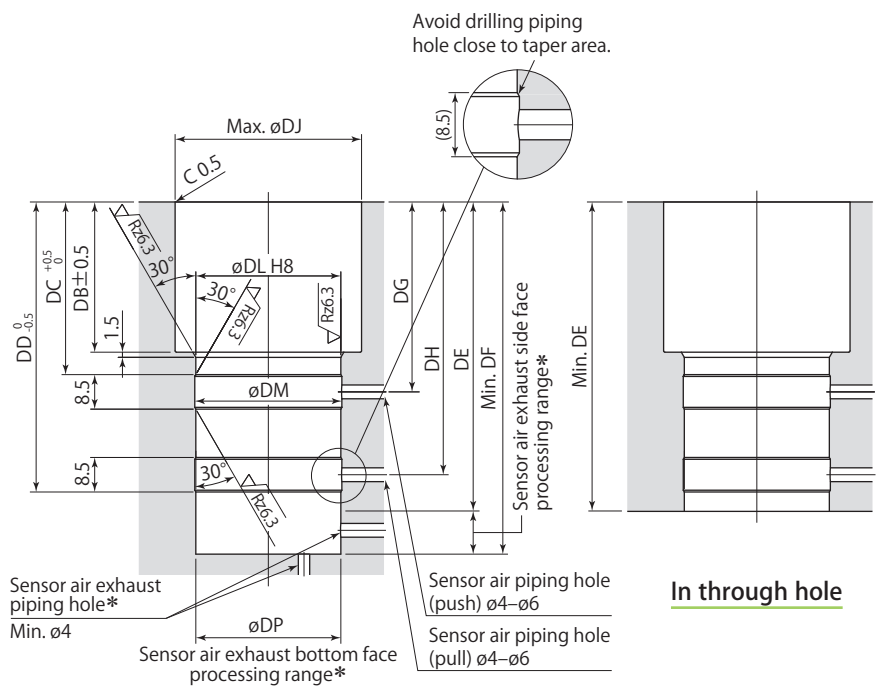
● Stroke 10, 30, 50 and 70 use spacers.

CNA16-Stroke			10	20	30	40	50	60	70	80
Cylinder capacity	Push	cm <sup>3</sup>	23.5	47.0	70.5	94.0	117.5	141.0	164.5	188.0
	Pull	cm <sup>3</sup>	17.6	35.1	52.7	70.2	87.8	105.4	122.9	140.5
CA		mm	28	28	48	48	68	68	88	88
CB		mm	18	8	18	8	18	8	18	8
øCC		mm	12							
CD		mm	M8×1.25 depth 15							
Mass	TE : Female thread rod	kg	3.4	3.3	3.9	3.8	4.3	4.3	4.8	4.8
	PE : Pin rod	kg	3.4	3.3	3.9	3.8	4.4	4.3	4.9	4.8
	ME : Male thread rod	kg	3.5	3.4	3.9	3.9	4.4	4.4	4.9	4.9

● Stroke 10, 30, 50 and 70 use spacers.

CNA25-Stroke			20	30	40	50	60	70	80	90
Cylinder capacity	Push	cm <sup>3</sup>	72.9	109.4	145.9	182.4	218.8	255.3	291.8	328.3
	Pull	cm <sup>3</sup>	57.2	85.8	114.3	142.9	171.5	200.1	228.7	257.3
CA		mm	38	38	58	58	78	78	98	98
CB		mm	18	8	18	8	18	8	18	8
øCC		mm	16							
CD		mm	M10×1.5 depth 18							
Mass	TE : Female thread rod	kg	6.3	6.2	7.2	7.0	7.9	7.8	8.7	8.7
	PE : Pin rod	kg	6.4	6.3	7.2	7.1	8.0	7.9	8.8	8.7
	ME : Male thread rod	kg	6.6	6.6	7.4	7.4	8.3	8.2	9.1	9.0

● Stroke 20, 40, 60, and 80 use spacers.

Usage exampleDimensionsMounting detailsIn through holeIn blind hole

\* : Sensor air exhaust piping hole must be made on either side or bottom face.

Rz: ISO4287(1997)

- This diagram depicts shape of female thread rod.
- Exhaust port must be opened to atmosphere. If sensor is embedded in a jig, prepare an exhaust piping hole. Furthermore, provide the piping if there is a risk of coolant or metal chips intrusion. Use one-touch fittings manufactured by SMC for G port piping. (See SMC catalog for the details of the fitting.)
- Apply an appropriate amount of grease to the chamfer and the bore when mounting. Excessive grease may be a blockage in the air passage, causing malfunction of the sensor.
- The 30° taper machining must be provided to avoid the damage of the O-ring. Ensure that there are no interference on taper area when drilling the hole for sensor air.
- Refer to specifications (page →104), dimensions (pages →96–103) for specifications and dimensions that are not shown in the diagram.
- CNA□-□□A (Air sensor) is made to order.

CNA02-Stroke		10	15	20	30	40	50
DA	mm	41		56		76	
DB	mm	29		44		64	
DC	mm	35.5		50.5		70.5	
DD	mm	58		73		93	
DE	mm	64.5		79.5		99.5	
DF	mm	73		103		143	
DG	mm	40		55		75	
DH	mm	53.5		68.5		88.5	
øDJ	mm			40			
øDK	mm			38 <sup>-0.025</sup> <sub>-0.050</sub>			
øDL	mm			38 <sup>+0.039</sup> <sub>0</sub>			
øDM	mm			38.6			
øDP	mm			38			
O-ring		AS568-028 (fluorocarbon hardness Hs70)					
Mass	TA :Female thread rod	kg	0.8		1.0		1.2
	PA :Pin rod	kg	0.8		1.0		1.2
	MA :Male thread rod	kg	0.9		1.0		1.2

CNA04-Stroke		10	15	20	30	40	50	60	70	
DA	mm	43.5		56.5		76.5		96.5		
DB	mm	32		47		67		87		
DC	mm	38.5		53.5		73.5		93.5		
DD	mm	61		76		96		116		
DE	mm	67.5		82.5		102.5		122.5		
DF	mm	78.5		106.5		146.5		186.5		
DG	mm	43		58		78		98		
DH	mm	56.5		71.5		91.5		111.5		
øDJ	mm					48				
øDK	mm					42 <sup>-0.025</sup> <sub>-0.050</sub>				
øDL	mm					42 <sup>+0.039</sup> <sub>0</sub>				
øDM	mm					42.6				
øDP	mm					42				
O-ring		AS568-029 (fluorocarbon hardness Hs70)								
Mass	TA :Female thread rod	kg	1.1	1.1	1.4	1.3	1.6	1.6	1.9	1.9
	PA :Pin rod	kg	1.1	1.1	1.4	1.3	1.6	1.6	1.9	1.9
	MA :Male thread rod	kg	1.2	1.2	1.4	1.4	1.7	1.6	1.9	1.9

CNA06-Stroke		10	15	20	30	40	50	60	70	
DA	mm	43.5		56.5		76.5		96.5		
DB	mm	32.5		47.5		67.5		87.5		
DC	mm	39		54		74		94		
DD	mm	61.5		76.5		96.5		116.5		
DE	mm	68		83		103		123		
DF	mm	79		107		147		187		
DG	mm	43.5		58.5		78.5		98.5		
DH	mm	57		72		92		112		
øDJ	mm					54				
øDK	mm					42 <sup>-0.025</sup> <sub>-0.050</sub>				
øDL	mm					42 <sup>+0.039</sup> <sub>0</sub>				
øDM	mm					42.6				
øDP	mm					42				
O-ring		AS568-029 (fluorocarbon hardness Hs70)								
Mass	TA :Female thread rod	kg	1.4	1.3	1.6	1.6	1.9	1.9	2.2	2.2
	PA :Pin rod	kg	1.4	1.3	1.6	1.6	1.9	1.9	2.2	2.2
	MA :Male thread rod	kg	1.4	1.4	1.7	1.6	2.0	2.0	2.3	2.3

CNA10-Stroke		10	20	30	40	50	60	70	80	
DA	mm	47.5		67.5		87.5		107.5		
DB	mm	38.5		58.5		78.5		98.5		
DC	mm	45		65		85		105		
DD	mm	67.5		87.5		107.5		127.5		
DE	mm	74		94		114		134		
DF	mm	89		129		169		209		
DG	mm	49.5		69.5		89.5		109.5		
DH	mm	63		83		103		123		
øDJ	mm	64								
øDK	mm	45 <sup>-0.025</sup> <sub>-0.050</sub>								
øDL	mm	45 <sup>+0.039</sup> <sub>0</sub>								
øDM	mm	45.6								
øDP	mm	45								
O-ring		AS568-030 (fluorocarbon hardness Hs70)								
Mass	TA :Female thread rod	kg	2.6	2.5	3.0	2.9	3.4	3.3	3.8	3.7
	PA :Pin rod	kg	2.6	2.5	3.0	2.9	3.4	3.3	3.8	3.7
	MA :Male thread rod	kg	2.6	2.6	3.1	3.0	3.5	3.4	3.9	3.8

CNA16-Stroke		10	20	30	40	50	60	70	80	
DA	mm	47.5		67.5		87.5		107.5		
DB	mm	40		60		80		100		
DC	mm	46.5		66.5		86.5		106.5		
DD	mm	69		89		109		129		
DE	mm	75.5		95.5		115.5		135.5		
DF	mm	90.5		130.5		170.5		210.5		
DG	mm	51		71		91		111		
DH	mm	64.5		84.5		104.5		124.5		
øDJ	mm	79								
øDK	mm	45 <sup>-0.025</sup> <sub>-0.050</sub>								
øDL	mm	45 <sup>+0.039</sup> <sub>0</sub>								
øDM	mm	45.6								
øDP	mm	45								
O-ring		AS568-030 (fluorocarbon hardness Hs70)								
Mass	TA :Female thread rod	kg	4.0	3.9	4.5	4.4	5.1	5.0	5.6	5.5
	PA :Pin rod	kg	4.0	3.9	4.5	4.5	5.1	5.0	5.6	5.6
	MA :Male thread rod	kg	4.1	4.1	4.7	4.6	5.2	5.2	5.8	5.7

CNA25-Stroke		20	30	40	50	60	70	80	90	
DA	mm	58.5		78.5		98.5		118.5		
DB	mm	51		71		91		111		
DC	mm	57.5		77.5		97.5		117.5		
DD	mm	80		100		120		140		
DE	mm	86.5		106.5		126.5		146.5		
DF	mm	112.5		152.5		192.5		232.5		
DG	mm	62		82		102		122		
DH	mm	75.5		95.5		115.5		135.5		
øDJ	mm	101								
øDK	mm	52 <sup>-0.030</sup> <sub>-0.060</sub>								
øDL	mm	52 <sup>+0.039</sup> <sub>0</sub>								
øDM	mm	52.6								
øDP	mm	52								
O-ring		AS568-032 (fluorocarbon hardness Hs70)								
Mass	TA :Female thread rod	kg	6.6	6.5	7.5	7.4	8.3	8.3	9.2	9.1
	PA :Pin rod	kg	6.6	6.5	7.5	7.4	8.4	8.3	9.3	9.2
	MA :Male thread rod	kg	6.9	6.8	7.8	7.7	8.7	8.6	9.6	9.5

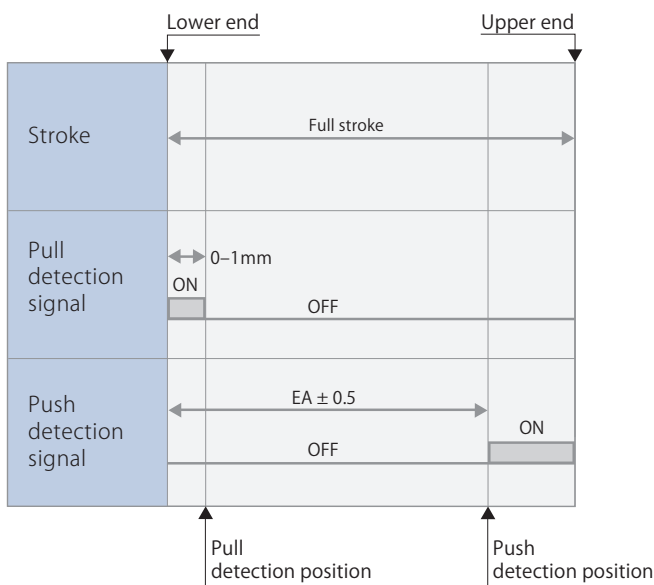
**Air sensor unit**

Supplier and model	ISA3-G series manufactured by SMC GPS2-05 series manufactured by CKD
Air supply pressure	0.2 MPa
Inner diameter of piping	ø4 mm
Overall piping length	5 m or less

- Supply the dry and filtered air. Particulate size 5 μm or less is recommended.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.

- There is a case that air sensing cannot be successfully made as designed when it is used out of the usage shown on the left. Contact Technical service center for more details.
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- Maximum 6 pieces of cylinder can be detected at 0.2MPa air pressure by means of 1 piece of sensor. In case of 0.1MPa air pressure, maximum 3 pieces of cylinder are detectable.

**Air sensor triggering point**



CNA02-Stroke		10	15	20	30	40	50	mm
Push detection position	EA(A1)	9	14	19	29	39	49	
	EA(A3)	7	12	17	27	37	47	
	EA(A5)	5	10	15	25	35	45	

CNA04-CNA06-Stroke		10	15	20	30	40	50	60	70	mm
Push detection position	EA(A1)	9	14	19	29	39	49	59	69	
	EA(A3)	7	12	17	27	37	47	57	67	
	EA(A5)	5	10	15	25	35	45	55	65	

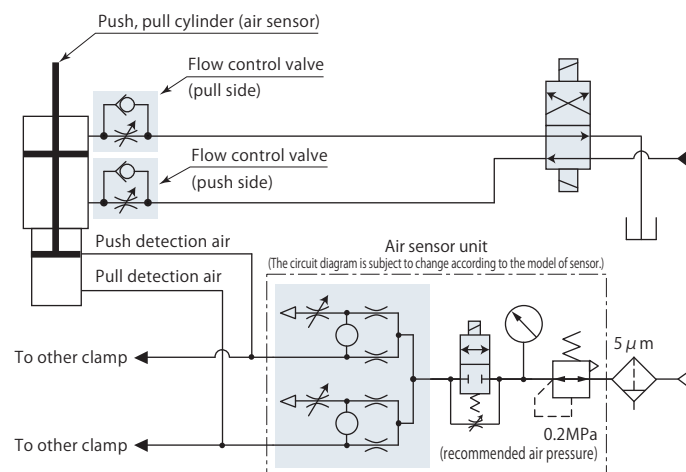
  

CNA10-CNA16-Stroke		10	20	30	40	50	60	70	80	mm
Push detection position	EA(A1)	9	19	29	39	49	59	69	79	
	EA(A3)	7	17	27	37	47	57	67	77	
	EA(A5)	5	15	25	35	45	55	65	75	

CNA25-Stroke		20	30	40	50	60	70	80	90	mm
Push detection position	EA(A1)	19	29	39	49	59	69	79	89	
	EA(A3)	17	27	37	47	57	67	77	87	
	EA(A5)	15	25	35	45	55	65	75	85	

**Hydraulic and pneumatic circuit diagram**

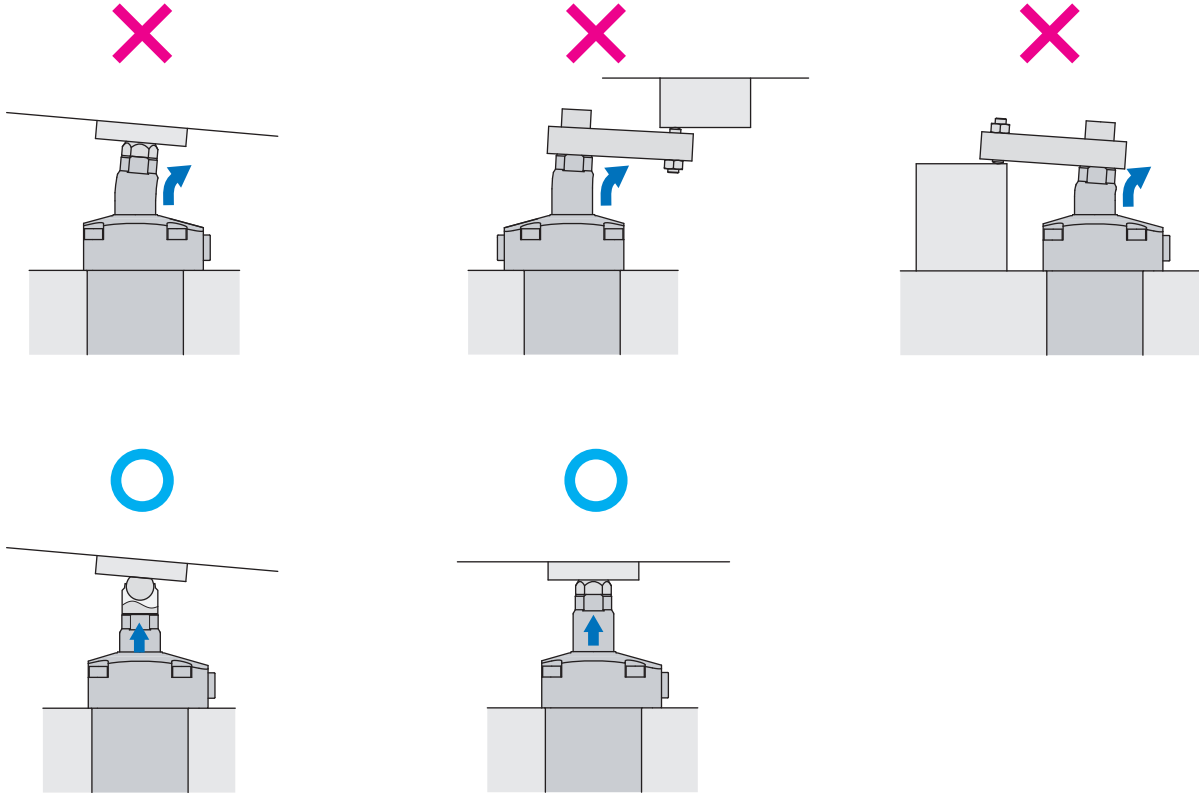




Caution in use

Please avoid the usage that may apply eccentric load and non-axial force to the piston rod.  
This may break the piston rod.

Female thread rod and male thread rod CNA□-□T, □M



Pin rod CNA□-□P

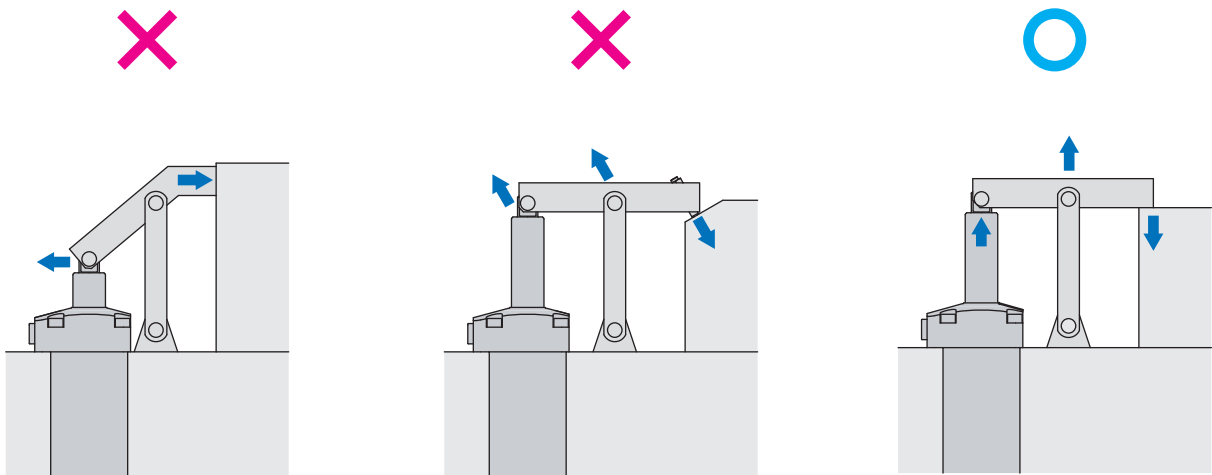




Table of contents

Push cylinder CMC Specifications .....	114
Push cylinder CMC Dimensions .....	116
Pull cylinder CMD Specifications .....	118
Pull cylinder CMD Dimensions .....	119
Option	
Flange CSP-F .....	120
Piping block CMH-C, CMH-D .....	121

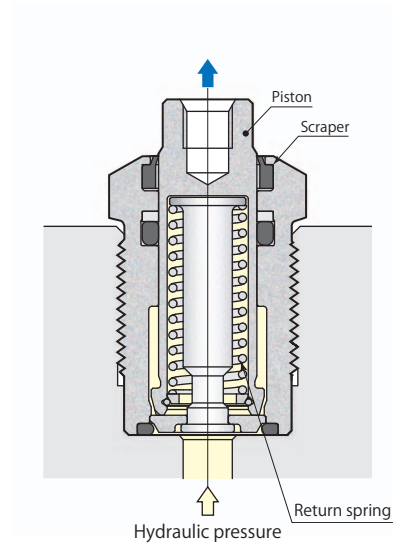
# Clamp cylinder

Single acting 35 MPa

model **CMC**

model **CMD**





- This is a push-type cylinder with threaded body.
- Air vent hole was eliminated to solve problems of coolant intrusion.
- Scraper is placed for moving parts to prevent adhesion of foreign substance.

Specifications

Model		CMC01			CMC03			CMC04				CMC06			
Stroke	mm	5	10	15	5	10	15	5	10	15	20	5	10	15	20
Cylinder force*1 kN	Hydraulic pressure 3.5MPa	0.2			0.4			0.5				0.8			
	Hydraulic pressure 7MPa	0.3			0.8			1.0				1.7			
	Hydraulic pressure 25MPa	1.2			2.8			3.8				6.3			
	Hydraulic pressure 35MPa	1.7			3.9			5.3				8.8			
Cylinder force calculation formula*2		F=0.050×P-0.016			F=0.113×P-0.035			F=0.154×P-0.049				F=0.255×P-0.081			
Rod diameter	mm	8			12			14				18			
Effective area	cm <sup>2</sup>	0.50			1.13			1.54				2.55			
Max. oil flow rate	L/min	0.15			0.34			0.46				0.76			
Cylinder capacity	cm <sup>3</sup>	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
Return spring force*3	N	13-19			28-42			38-59				62-100			
Mass	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
Recommended tightening torque of body	N·m	10			30			40				60			
Pressure range	MPa	1-35													
Proof pressure	MPa	52.5													
Operating temperature	°C	0-70													
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent)													

\*1: This is value for central position of stroke.  
 \*2: F=Cylinder force (kN), P= Hydraulic pressure (MPa)  
 \*3: Figures are for "lower end to upper end" of piston action.

Model designation

Size	Stroke	Rod tip section shapes	Scraper, seal material
01	5 10 15	(Nil) : Threaded top type (standard)	(Nil) : NBR (standard)
03	5 10 15		
04	5 10 15 20		
06	5 10 15 20		
CMC 10	5 10 15 25	R*1 : Round top type	V*2 : Fluorocarbon (except model CMC10, 40 and 60)
20	10 15 20 32		
25	12 20 32		
40	16 25 40		
60	16 25 40		

\*1: CMC04/06/10/20/25/40/60 are made to order.

\*2: Fluorocarbon has been adopted as a measure for the use of chlorine-based cutting fluid and also for thermal resistance (max. 150°C) specifications.

■ indicates made to order.

Specifications

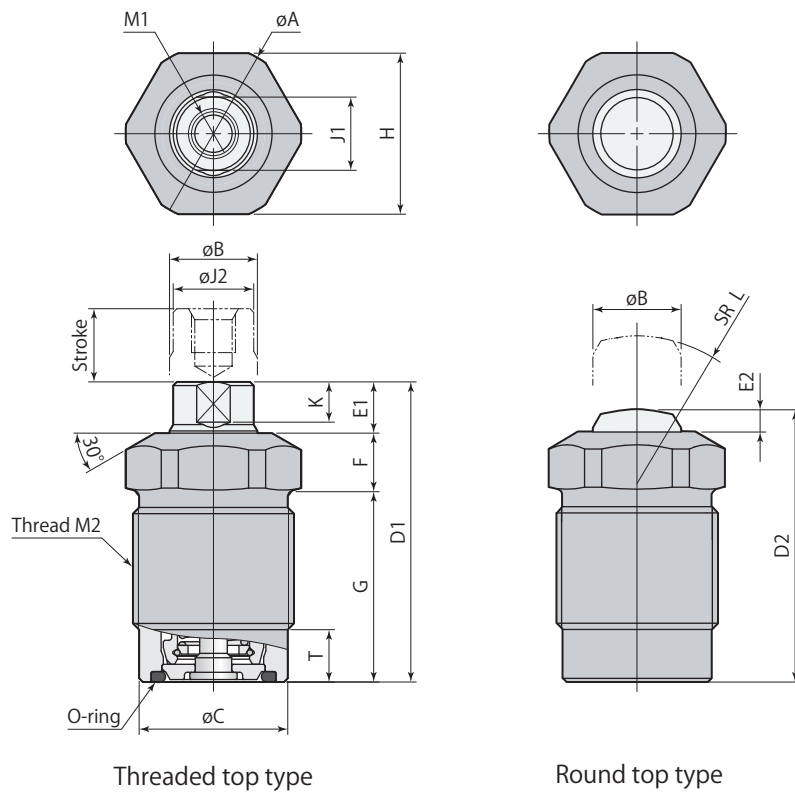
Model		CMC10				CMC20				CMC25			CMC40			CMC60		
Stroke	mm	5	10	15	25	10	15	20	32	12	20	32	16	25	40	16	25	40
Cylinder force*1 kN	Hydraulic pressure 3.5MPa	1.3				2.6				3.1			5.1			7.5		
	Hydraulic pressure 7MPa	2.6				5.4				6.6			10.6			15.8		
	Hydraulic pressure 25MPa	9.7				19.8				24.4			39.3			58.6		
	Hydraulic pressure 35MPa	13.7				27.9				34.3			55.2			82.4		
Cylinder force calculation formula*2		F=0.394×P-0.129				F=0.804×P-0.255				F=0.990×P-0.323			F=1.590×P-0.485			F=2.376×P-0.790		
Rod diameter	mm	22.4				32				35.5			45			55		
Effective area	cm <sup>2</sup>	3.94				8.04				9.90			15.90			23.76		
Max. oil flow rate	L/min	1.18				2.41				2.97			4.77			7.13		
Cylinder capacity	cm <sup>3</sup>	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*3	N	97-160				200-310				240-405			370-600			570-1010		
Mass	kg	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
Recommended tightening torque of body	N·m	110				270				360			620			1160		
Pressure range	MPa	1-35																
Proof pressure	MPa	52.5																
Operating temperature	°C	0-70																
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent)																

\*1: This is value for central position of stroke.

\*2: F=Cylinder force (kN), P= Hydraulic pressure (MPa)

\*3: Figures are for "lower end to upper end" of piston action.

Dimensions

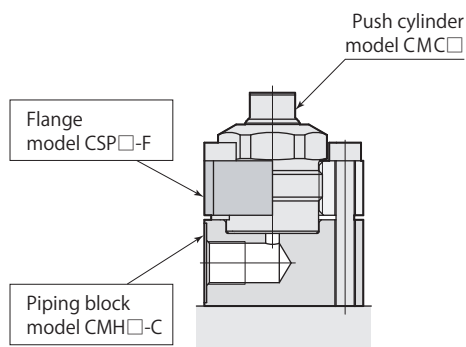
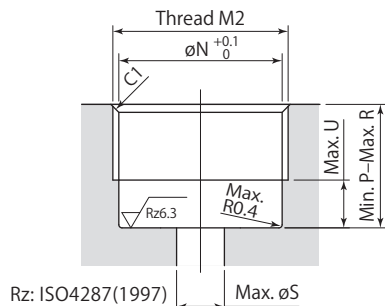


mm

Model	CMC01			CMC03			CMC04				CMC06			
Stroke	5	10	15	5	10	15	5	10	15	20	5	10	15	20
øA	15.5			24			26				33			
øB	8			12			14				18			
øC	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 (hex width across flats)	14			22			24				30			
J1 (width across flats)	7			10			12				14			
øJ2	7.5			11			13				17			
K (width across flats height)	4.5			5.5			6.5				7.5			
L	16			20			25				32			
M1	M5×0.8 depth 8			M6×1 depth 6			M6×1 depth 11				M8×1.25 depth 13			
M2	M16×1.5			M22×1.5			M25×1.5				M30×1.5			
øN	14.5			20.5			23.5				28.5			
P	12			13			14				15			
R	19	29	38	15.5	25.5	36	18	29	40	50	19.5	30.5	41.5	51.5
øS	5			8			10				14			
T	7			7			7				7			
U	6			6			6				6			
O-ring (hardness Hs90)	AS568-012			AS568-015			AS568-016				AS568-019			

Dimensions

Mounting details

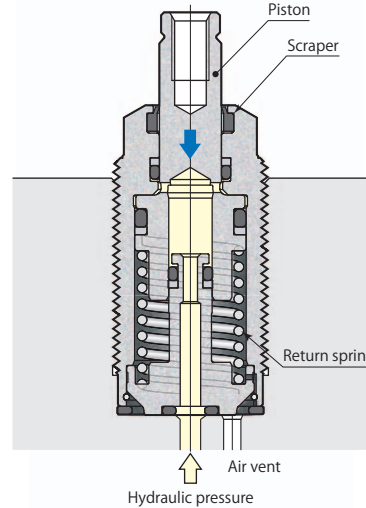


- Hardness at top of round type piston is HRC54.
- When mounting an attachment, be sure to hold the width across flats at the tip section by a spanner, etc., to prevent the piston from rotating before tightening the screw. Do not attempt to tighten it with a hydraulic-powered resistance against rotation.
- Flange and piping block (left diagram) are available as options. Refer to **pages →120, 121** for details.
- Please avoid the usage that may apply eccentric load and non-axial force to the piston. This may break the piston.
- When assembling or installing, during the first operation after changing the oil, air is trapped in the piping and increases the flow rate. Perform complete air bleeding and use at a flow rate within tolerance.

mm

Model	CMC10				CMC20				CMC25			CMC40			CMC60		
Stroke	5	10	15	25	10	15	20	32	12	20	32	16	25	40	16	25	40
$\phi A$	40				50				55			66			80		
$\phi B$	22.4				32				35.5			45			55		
$\phi C$	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 (hex width across flats)	36				46				50			60			75		
J1 (width across flats)	19				27				30			36			41		
$\phi J2$	21.4				30				32.5			43			52		
K (width across flats height)	9.5				12.5				13.5			15.5			17		
L	40				50				60			70			80		
M1	M8×1.25 depth 13				M12×1.75 depth 18				M12×1.75 depth 18			M16×2.0 depth 18			M20×2.5 depth 22		
M2	M36×1.5				M48×1.5				M55×2.0			M65×2.0			M80×2.0		
$\phi N$	34.5				46.5				53			63			78		
P	17				20				24			27			29		
R	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
$\phi S$	19				26				34			44			56		
T	7				7				10			10			10		
U	6				6				9			9			9		
O-ring (hardness Hs90)	AS568-022				AS568-126				AS568-129			AS568-135			AS568-143		





- Suitable for small or irregular-shaped workpiece.
- This is a pull-type cylinder with threaded body.

**Specifications**

CMD	Size		Stroke	
	02	04	05	10
			05	10
			05	10
	06		10	20
	10		10	20
	20		10	20
	40		10	20
	50		15	25
	80		15	25

■ indicates made to order.

Model		CMD02		CMD04		CMD06		CMD10		CMD20		CMD40		CMD50		CMD80	
Stroke	mm	5	10	5	10	10	20	10	20	10	20	10	20	15	25	15	25
Cylinder force*1 kN	Hydraulic pressure 3.5MPa	0.3		0.4		0.7		1.2		2.0		3.5		4.6		7.0	
	Hydraulic pressure 7MPa	0.5		0.9		1.5		2.5		4.3		7.4		9.9		14.9	
	Hydraulic pressure 25MPa	2.1		3.4		5.6		9.3		15.8		27.3		37.0		55.4	
	Hydraulic pressure 35MPa	2.9		4.7		7.9		13.0		22.2		38.4		52.1		77.9	
Cylinder force calculation formula*2		F=0.084×P-0.043		F=0.137×P-0.060		F=0.229×P-0.093		F=0.376×P-0.147		F=0.640×P-0.219		F=1.107×P-0.377		F=1.505×P-0.620		F=2.250×P-0.835	
Cylinder inner diameter	mm	16		18		22		28		36		46		54		65	
Rod diameter	mm	10		10		12		16		20		25		30		35.5	
Effective area	cm <sup>2</sup>	0.84		1.37		2.29		3.76		6.40		11.07		15.05		22.50	
Max. oil flow rate	L/min	0.25		0.41		0.69		1.13		1.92		3.32		4.51		6.75	
Cylinder capacity	cm <sup>3</sup>	0.5	0.9	0.7	1.4	2.3	4.6	3.8	7.5	6.4	12.8	11.1	22.2	22.6	37.6	33.8	56.3
Return spring force*3	N	30-56		43-77		65-120		100-193		170-267		283-470		400-840		560-1110	
Mass	kg	0.10	0.12	0.12	0.15	0.23	0.30	0.35	0.46	0.69	0.89	1.1	1.4	1.9	2.2	2.7	3.2
Recommended tightening torque of body	N·m	8		9		10		14		30		40		200		300	

● Pressure range: 1.5-35 MPa    ● Proof pressure: 52.5 MPa    ● Operating temperature: 0-70 °C

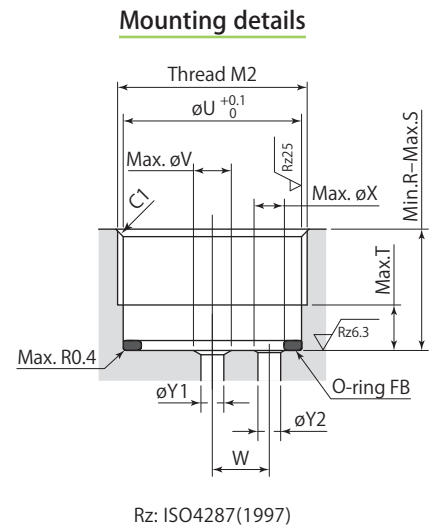
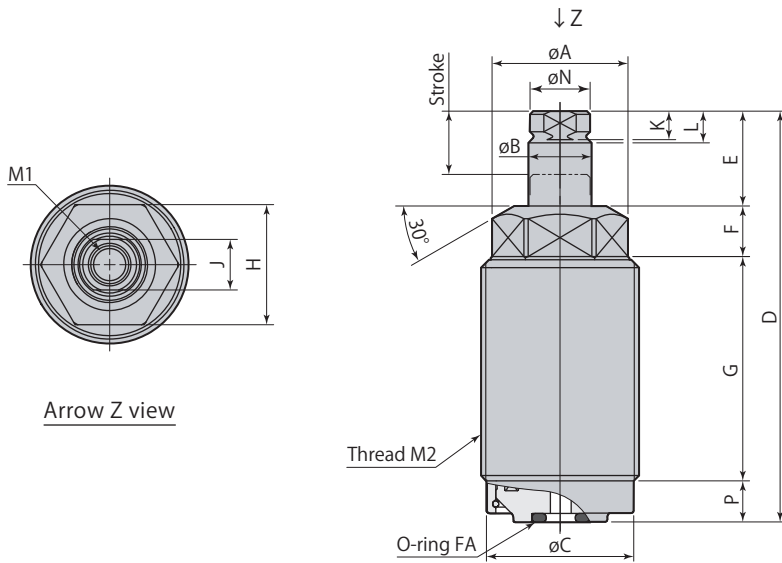
● Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)

● Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

\*1: This is value for central position of stroke.    \*2: F=Cylinder force (kN), P= Hydraulic pressure (MPa)

\*3: Figures are for "upper end to lower end" of piston action.

Dimensions



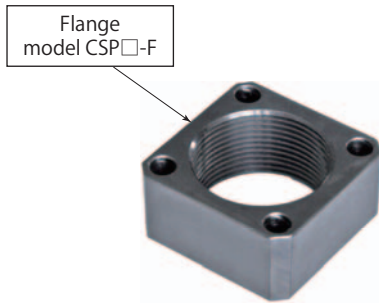
Rz: ISO4287(1997)

Model	CMD02		CMD04		CMD06		CMD10		CMD20		CMD40		CMD50		CMD80	
Stroke	5	10	5	10	10	20	10	20	10	20	10	20	15	25	15	25
$\phi A$	19		21.5		27		33		45		55		67		77	
$\phi B$	10		10		12		16		20		25		30		35.5	
$\phi C$	20.3		23.3		28.3		34.3		46.3		56.3		67.6		77.6	
D	51	65	51	65	69	96	73	101	80	109	88	116	108	136	119	145
E	10	15	10	15	16	26	17	27	19	29	20.5	30.5	27.5	37.5	28.5	38.5
F	7.5		8		9.5		11.5		13.5		16.5		22.5		24.5	
G	27	36	26.5	35.5	35.5	52.5	35.5	53.5	35.5	54.5	38	56	45	63	53	69
H (hex width across flats)	17		19		24		30		41		50		60		70	
J (width across flats)	8		8		10		14		17		22		27		30	
K (width across flats height)	4.5		4.5		5.5		6.5		8.5		10		12		13	
L	5		5		6		7		9		10.5		12.5		13.5	
M1	M6×1 depth 11		M6×1 depth 11		M8×1.25 depth 18		M10×1.5 depth 20		M12×1.75 depth 22		M16×2 depth 27		M18×2.5 depth 31		M22×2.5 depth 33	
M2	M22×1.5		M25×1.5		M30×1.5		M36×1.5		M48×1.5		M58×1.5		M70×2.0		M80×2.0	
$\phi N$	9.5		9.5		11.5		15.5		19.5		24.5		29.5		35	
P	6.5		6.5		8		9		12		13		13		13	
R	13		14		15		17		20		20		25		25	
S	32.5	41.5	32	41	42.5	59.5	43.5	61.5	46.5	65.5	50	68	57	75	65	81
T	5.5		5.5		7		8		11		12		12		12	
$\phi U$	20.5		23.5		28.5		34.5		46.5		56.5		68		78	
$\phi V$	5		5		5		5		7		7		8		8	
W	7		7.5		9.5		12		15		18		19-21		19.5-26.5	
$\phi X$	4		4		4		4		4		4		8		8	
$\phi Y1$ (hydraulic port)	3		3		3		4		6		6		6		6	
$\phi Y2$ (air vent)	3		3		3		3		3		3		6		6	
O-ring FA (hardness Hs90)	P6		P6		P6		P6		P8		P8		P9		P9	
O-ring FB (hardness Hs90)	AS568-017		AS568-019		AS568-022		AS568-026		AS568-031		AS568-034		AS568-144		AS568-150	

- Install O-ring FB at the bottom of the hole. The O-ring FB is packed pull cylinder.
- When mounting an attachment, be sure to hold the width across flats at the tip section by a spanner, etc., to prevent the piston from rotating before tightening the screw. Do not attempt to tighten it with a hydraulic-powered resistance against rotation.
- Flange and piping block are available as options. Refer to **pages →120, 121** for details.
- Please avoid the usage that may apply eccentric load and non-axial force to the piston. This may break the piston.
- Air vent must be opened to atmosphere. Provide the piping if there is a risk of coolant or metal chips intrusion.

CSP□-F	Flange	Option
--------	--------	--------

### Flange

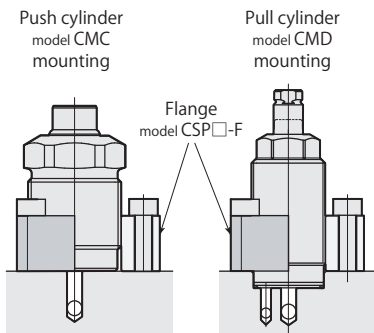


CSP	Size			- <b>F</b> : Flange
	016	036	065	
	022	048	070	
	025	055	080	
	030	058		

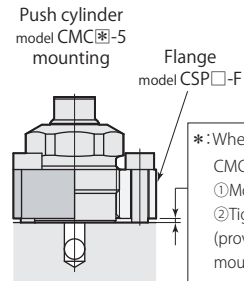
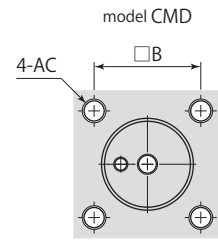
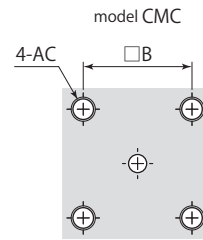
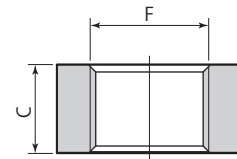
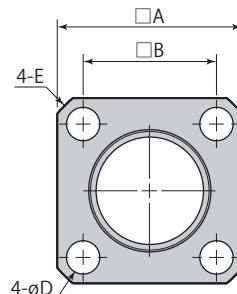
■ indicates made to order.

Model	CSP016-F	CSP022-F	CSP025-F	CSP030-F	CSP036-F	CSP048-F	CSP055-F	CSP058-F	CSP065-F	CSP070-F	CSP080-F
Push cylinder	CMC01	CMC03	CMC04	CMC06	CMC10	CMC20	CMC25		CMC40		CMC60
Pull cylinder		CMD02	CMD04	CMD06	CMD10	CMD20		CMD40		CMD50	CMD80

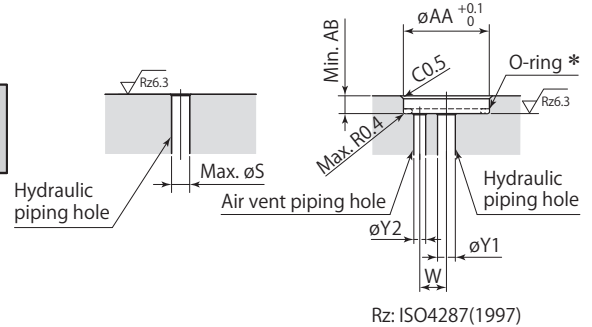
### Mounting details



①Mount a flange with screws. ②Screw the cylinder in the flange.



\*: When using the flange with model CMC03-5, CMC04-5, CMC06-5 or CMC10-5.  
 ①Mount model CMC onto the flange.  
 ②Tighten the mounting screws.  
 (providing a clearance between the flange and the mounting surface)



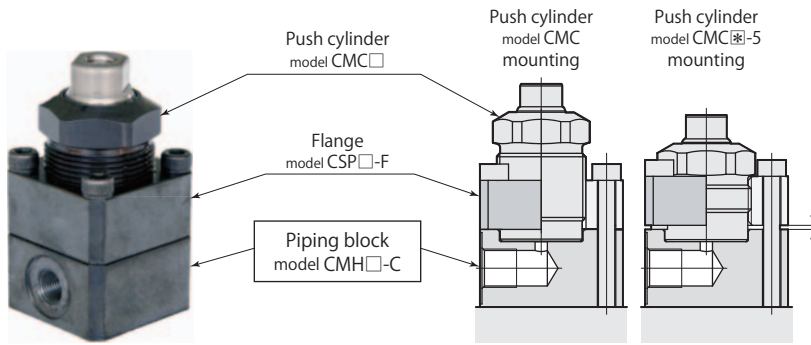
\*: Install O-ring in the same way even when a flange is used for mounting. The O-ring is included in the package of the pull cylinder.

mm

Model	CSP016-F	CSP022-F	CSP025-F	CSP030-F	CSP036-F	CSP048-F	CSP055-F	CSP058-F	CSP065-F	CSP070-F	CSP080-F
A	25	30	35	40	50	65	70	70	80	85	90
B	18	23	26	31	40	48	54	54	62	65	72
C	12	12	14	16	16	20	24	20	25	25	25
øD	4.5	4.5	5.5	5.5	6.8	11	11	11	14	14	14
E	C2	C2	C3	C3	C3	C5	C5	C5	C5	C5	C5
F	M16×1.5	M22×1.5	M25×1.5	M30×1.5	M36×1.5	M48×1.5	M55×2.0	M58×1.5	M65×2.0	M70×2.0	M80×2.0
øS	5	8	10	14	19	26	34	-	44	-	56
W	-	7	7.5	9.5	12	15	-	18	-	19-21	19.5-26.5
øY1	-	3	3	3	4	6	-	6	-	6	6
øY2	-	3	3	3	3	3	-	3	-	6	6
øAA	-	20.5	23.5	28.5	34.5	46.5	-	56.5	-	68	78
AB	-	3	3	3	3	3	-	4	-	4	4
AC	M4	M4	M5	M5	M6	M10	M10	M10	M12	M12	M12
Mass	0.04 kg	0.05 kg	0.08 kg	0.11 kg	0.18 kg	0.33 kg	0.43 kg	0.31 kg	0.52 kg	0.58 kg	0.53 kg

- Mounting screws are not included.
- Refer to dimension of individual products for dimensions that are not listed in the diagram.

Piping block



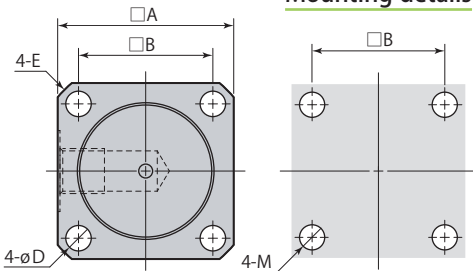
Size

- 016** : CMC01
- 022** : CMC03
- 025** : CMC04
- 030** : CMC06
- 036** : CMC10
- 048** : CMC20
- 055** : CMC25
- 065** : CMC40
- 080** : CMC60

CMH **036** — **C** : Piping block

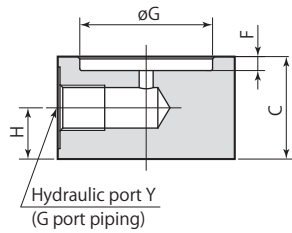
■ indicates made to order.

Mounting details

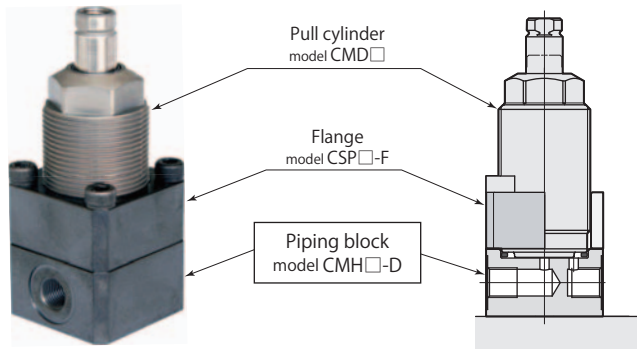


- ①Mount a piping block and a flange with screws.
- ②Screw the cylinder model CMC in the flange.

\*: When using the flange with model CMC03-5, CMC04-5, CMC06-5 or CMC10-5.  
 ①Mount model CMC onto the flange. ②Tighten the mounting screws. (providing a clearance between the flange and the piping block)



Model	CMH016-C	CMH022-C	CMH025-C	CMH030-C	CMH036-C	CMH048-C	CMH055-C	CMH065-C	CMH080-C
A	25	30	35	40	50	65	70	80	90
B	18	23	26	31	40	48	54	62	72
C	19	19	19	22	22	25	25	25	28
øD	4.5	4.5	5.5	5.5	6.8	11	11	14	14
E	C2	C2	C3	C3	C3	C5	C5	C5	C5
F	1.5	3	3	3	3	4	4	4	4
øG	14.5	20.5	23.5	28.5	34.5	46.5	53	63	78
H	9.5	9.5	9.5	11	11	12.5	12.5	12.5	14
M	M4	M4	M5	M5	M6	M10	M10	M12	M12
Y	G1/8	G1/8	G1/8	G1/8	G1/8	G1/4	G1/4	G1/4	G1/4
Mass	0.07 kg	0.11 kg	0.15 kg	0.23 kg	0.38 kg	0.67 kg	0.79 kg	1.01 kg	1.47 kg



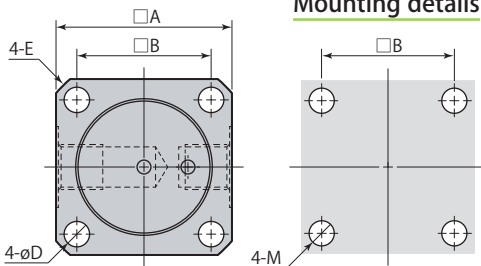
Size

- 022** : CMD02
- 025** : CMD04
- 030** : CMD06
- 036** : CMD10
- 048** : CMD20
- 058** : CMD40
- 070** : CMD50
- 080** : CMD80

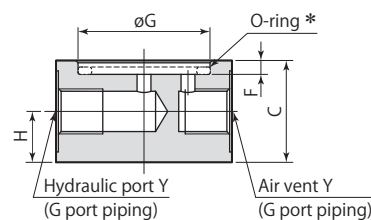
CMH **036** — **D** : Piping block

■ indicates made to order.

Mounting details



- ①Mount a piping block and a flange with screws.
- ②Screw the cylinder model CMD in the flange.



Model	CMH022-D	CMH025-D	CMH030-D	CMH036-D	CMH048-D	CMH058-D	CMH070-D	CMH080-D
A	30	35	40	50	65	70	85	90
B	23	26	31	40	48	54	65	72
C	19	19	22	22	25	25	28	28
øD	4.5	5.5	5.5	6.8	11	11	14	14
E	C2	C3	C3	C3	C5	C5	C5	C5
F	3	3	3	3	4	4	4	4
øG	20.5	23.5	28.5	34.5	46.5	56.5	68	78
H	9.5	9.5	11	11	12.5	12.5	14	14
M	M4	M5	M5	M6	M10	M10	M12	M12
Y	G1/8	G1/8	G1/8	G1/8	G1/4	G1/4	G1/4	G1/4
Mass	0.1 kg	0.14 kg	0.23 kg	0.37 kg	0.65 kg	0.76 kg	1.28 kg	1.44 kg

\*: Install O-ring in the same way even when a piping block is used for mounting. The O-ring is included in the package of the pull cylinder.

<b>VCF</b> □-□	<b>Flow control valve</b>	<b>Option</b>
----------------	---------------------------	---------------

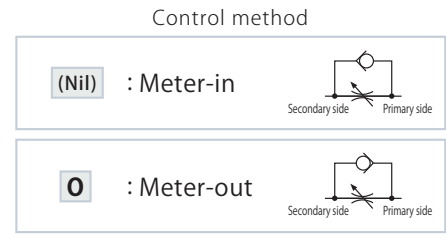
### Specifications



G port size

**VCF**

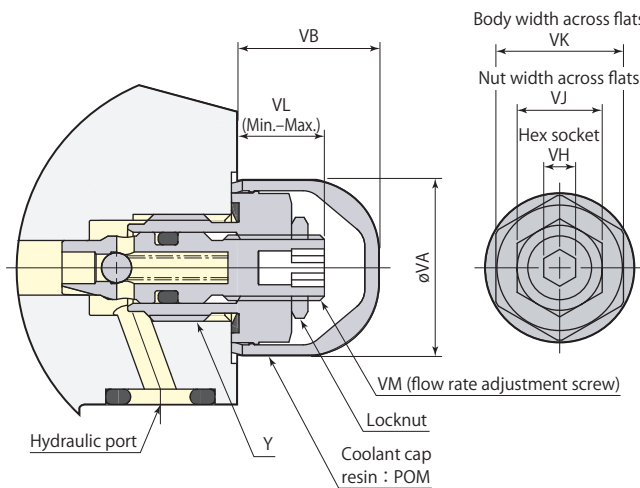
<b>01S</b>	: G1/8
<b>01</b>	: G1/8
<b>02</b>	: G1/4
<b>03</b>	: G3/8



Model	Meter-in				Meter-out				
	VCF01S	VCF01	VCF02	VCF03	VCF01S-O	VCF01-O	VCF02-O	VCF03-O	
G port size	G1/8	G1/8	G1/4	G3/8	G1/8	G1/8	G1/4	G3/8	
Cracking pressure	MPa	0.04	0.04	0.04	0.04	0.1	0.1	0.1	0.1
Orifice area	mm <sup>2</sup>	4.9	4.9	9.6	19.6	3.1	3.1	6.2	12.6
Recommended tightening torque	N·m	10	10	30	35	10	10	30	35
Mass	kg	0.011	0.013	0.024	0.038	0.011	0.013	0.024	0.038

- Pressure range : 0.5–7 MPa
- Proof pressure : 10.5 MPa
- Operating temperature : 0–70 °C
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)

### Dimensions



Model	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
Y	G1/8	G1/8	G1/4	G3/8
øVA	16	16	21	24
VB	13	13	13	14
VH	3	3	5	6
VJ	8	8	10	14
VK	12	12	17	19
VL	8–11	7–11	7.5–11.5	8.5–12.5
Adjustment screw number of turns	4 rotations	5.3 rotations	5.3 rotations	5.3 rotations
VM	M6×0.75	M6×0.75	M8×0.75	M10×0.75

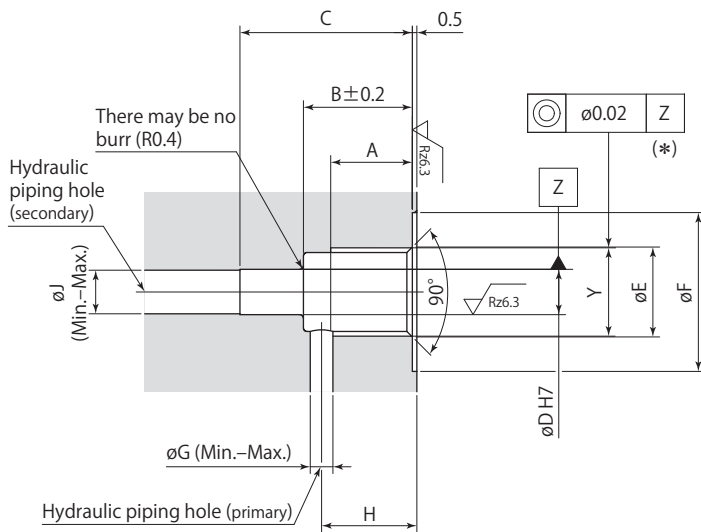
- Use a closed wrench or socket wrench for mounting and dismounting.
- Flow control valve can be mounted on hydraulic port (G port) when manifold piping.
- Adjust flow rate without hydraulic pressure. Conducting adjustments with hydraulic pressure may result in damaging seal.
- Diagram above indicates mounting for meter-in (VCF□).
- VCF is shipped with the valve fully open. Adjust the flow rate by loosening the screws after it is screwed in to close totally. Tighten the locknut after adjustment is completed.

### Applicable clamp and work support

Model	VCF01S	VCF01	VCF02	VCF03
Swing clamp (double acting)	CTM03, 04, 05, 06 CTP04, 05, 06	CTM10 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)*	CTN02, 04, 05, 06	CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)*	CTS04	CTS06	CTS10, 16	–
Link clamp (double acting)	CLM03, 04 CLP04, 05, 06	CLM05, 06, 10 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)*	CLN04	CLN05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01	CNB02, 04	–	–
Push, pull cylinder	–	CNA02, 04, 06	CNA10, 16	CNA25
Work support*	CSU CSP-D(CSN, CSY)	–	–	–

\*: Single acting swing clamp, swivel clamp, single acting link clamp and work support are meter-in only.

Mounting details



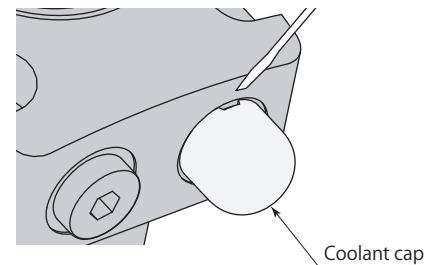
Rz: ISO4287(1997)

Model	mm			
	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
A	9	9	13	13
B	11	13	18	19
C	15.5	17.5	22.5	23.5
øD	5 <sup>+0.012</sup> <sub>0</sub>	5 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>
øE	9.9	9.9	13.3	16.8
øF	17.5	17.5	21.5	24.5
øG	1.5-2	2.5-3	3.5-5	5-6
H	9-10	9.5-11.5	14.5-15.5	15-16
øJ	2.5-5	2.5-5	3.5-6	5-8
Y	G1/8	G1/8	G1/4	G3/8

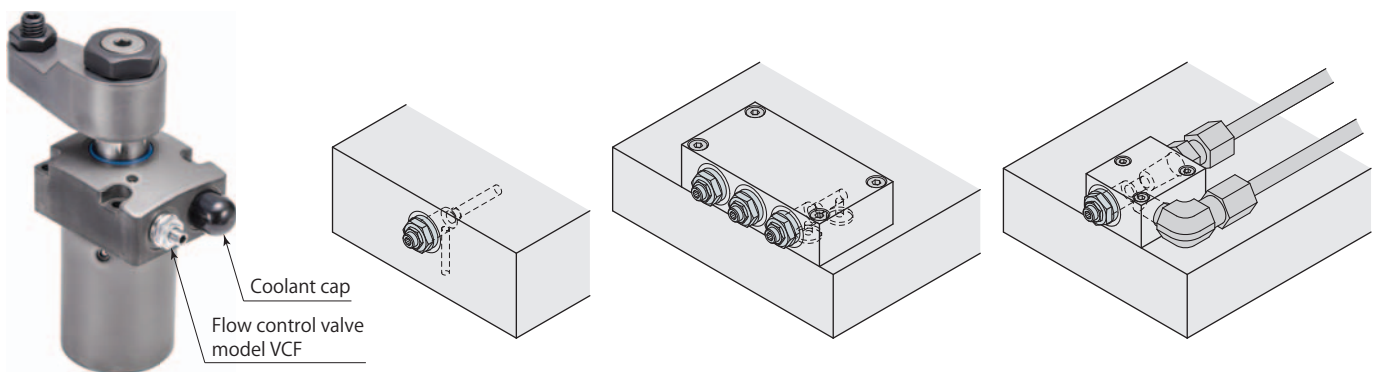
\*:Concentricity is required when machining øD and Y-portion thread. Misalignment or machining defect may cause the trouble of installation and adjusting flow rate.

Mounting & dismounting of flow control valve, air bleeding valve

- When mounting or dismounting a flow control valve or air bleeding valve, be sure to set pressure within hydraulic circuit to 0 MPa before starting.
- When mounting a flow control valve or air bleeding valve, be sure to tighten it with the recommended tightening torque.
- When mounting a coolant cap (resin:POM), firmly press the body of cover. If it is not mounting properly, use a plastic mallet to tap it into place.
- When dismounting a coolant cap, use a sharp-pointed tool such as a precision screw driver by hooking the notched portion.



Mounting example



Cylinder mounting

Pallet mounting

Block mounting ①

Block mounting ②

### Specifications

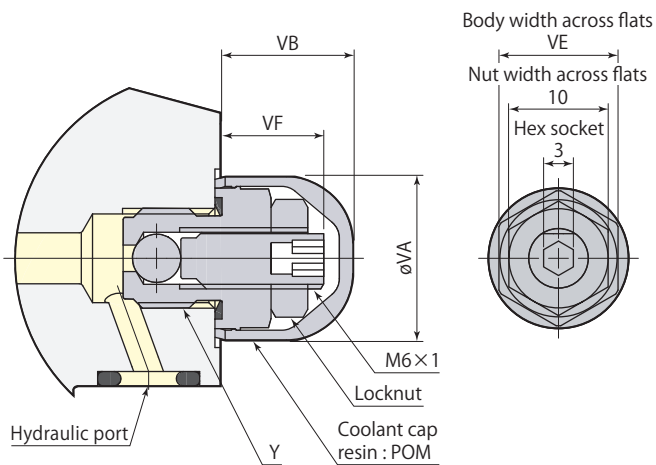


G port size

**01** : G1/8**VCE 02** : G1/4**03** : G3/8

Model	VCE01	VCE02	VCE03	
G port size	G1/8	G1/4	G3/8	
Recommended tightening torque	N·m	10	30	35
Mass	kg	0.017	0.029	0.044
Pressure range	MPa	0–50		
Operating temperature	°C	0–70		
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)			

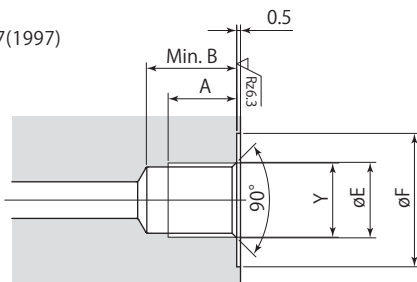
### Dimensions



Model	VCE01	VCE02	VCE03
A	9	13	13
B	10	14	14
øE	9.9	13.3	16.8
øF	17.5	21.5	24.5
Y	G1/8	G1/4	G3/8
øVA	16	21	24
VB	13	13	14
VE	12	17	19
VF	10.5	10.5	11.5

### Mounting details

Rz: ISO4287(1997)






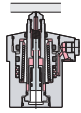


- Use a closed wrench or socket wrench for mounting and dismantling.
- Air bleeding valve can be mounted on hydraulic port (G port) when manifold piping.

### Applicable clamp and work support

Model	VCE01	VCE02	VCE03
Swing clamp (double acting)	CTM03, 04, 05, 06, 10 CTP04, 05, 06 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)	CTN02, 04, 05, 06 CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)	CTS04, 06	CTS10, 16	–
Link clamp (double acting)	CLM03, 04, 05, 06, 10 CLP04, 05, 06 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)	CLN04, 05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01, 02, 04	–	–
Push, pull cylinder	CNA02, 04, 06	CNA10, 16	CNA25
Work support	CSU CST CSP-D(CSN, CSY, CSK)	–	–





<b>Work support</b>		model <b>CSU</b> Page →128	model <b>CSU-H</b> Page →128	model <b>CST</b> Page →128
				
Specifications		7MPa Hydraulic lift		7MPa Spring lift
Features		Flange mount type Standard model	Flange mount type Support force enhanced model	Flange mount type Standard model
Variations	Standard (without sensor)	CSU Page →136	CSU-H Page →136	CST Page →142
	Air sensor 	CSU-B Page →138	—	—
Option	Flow control valve 	VCF Page →170		—
	Air bleeding valve 	VCE Page →172		

Refer to **page →163** for the details of the work supports that are not described in the catalog.

<b>Work support</b>		model <b>CSN</b> Page →128	model <b>CSY</b> Page →128	model <b>CSK</b> Page →128
				
Specifications		7MPa Hydraulic lift		7MPa Spring lift
Features		Threaded body Standard model	Threaded body Support force enhanced model	Threaded body Standard model
Variations	Standard (without sensor)	CSN Page →152	CSY Page →154	CSK Page →160
	Air sensor 	CSN-B Page →156	CSY-B Page →156	—
Option	Chip cover 	CSP-A Page →164		
	Piping cap 	CSP-C Page →164		
	Piping block 	CSP-D Page →166		
	Flange 	CSP-F Page →168		
	Flow control valve 	VCF Page →170 (Using piping block CSP-D)		—
	Air bleeding valve 	VCE Page →172 (Using piping block CSP-D)		

Refer to **page →163** for the details of the work supports that are not described in the catalog.

## Table of contents

Hydraulic lift <b>CSU</b> , Spring lift <b>CST</b> Flange mount type	
Structure, Hydraulic and pneumatic circuit diagram .....	130
Operation .....	132
Specifications, Piping .....	134
Hydraulic pressure & support force, Applied load & deformation .....	135
Hydraulic lift <b>CSU</b> Dimensions	
Standard <b>CSU</b> , Support force enhanced <b>CSU-H</b> .....	136
Air sensor <b>CSU-B</b> .....	138
Caution in use .....	140
Spring lift <b>CST</b> Dimensions	
Standard <b>CST</b> .....	142
Caution in use .....	144
Hydraulic lift <b>CSN/CSY</b> , Spring lift <b>CSK</b> Threaded body	
Structure, Hydraulic and pneumatic circuit diagram .....	146
Operation .....	148
Specifications .....	150
Hydraulic pressure & support force, Applied load & deformation .....	151
Hydraulic lift <b>CSN/CSY</b> Dimensions	
Standard <b>CSN</b> .....	152
Support force enhanced <b>CSY</b> .....	154
Air sensor <b>CSN-B/CSY-B</b> .....	156
Caution in use .....	158
Spring lift <b>CSK</b> Dimensions	
Standard <b>CSK</b> .....	160
Caution in use .....	162
Option	
Chip cover <b>CSP-A</b> .....	164
Piping cap <b>CSP-C</b> .....	164
Piping block <b>CSP-D</b> .....	166
Flange <b>CSP-F</b> .....	168
Flow control valve <b>VCF</b> .....	170
Air bleeding valve <b>VCE</b> .....	172

Refer to **page →163** for the details of the work supports that are not described in the catalog.

# Work support

7 MPa

Hydraulic lift,  
support force enhanced model  
model CSU-H10-L



Hydraulic lift,  
standard model  
model CSU10-L



Spring lift  
model CST10-L



Hydraulic lift,  
support force enhanced model  
model CSY03-L



Hydraulic lift,  
standard model  
model CSN03-L



Spring lift  
model CSK03-L



Hydraulic lift

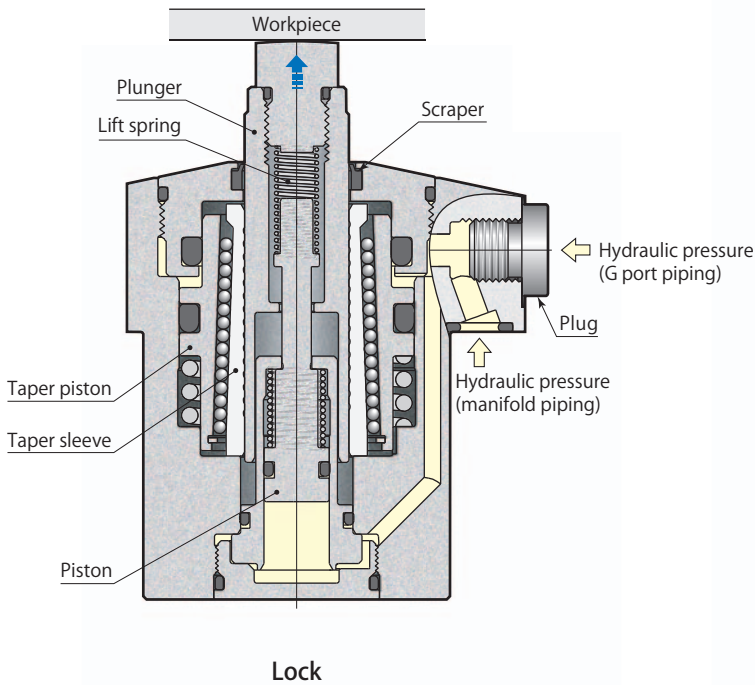
Standard model **CSU**□-□□

Support force enhanced model **CSU-H**□-□□

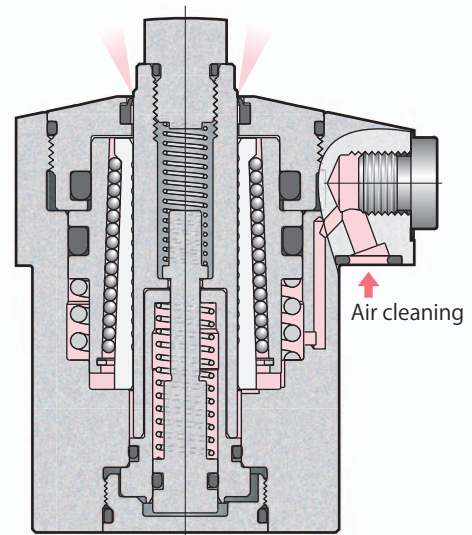


Work support

CSU Hydraulic lift

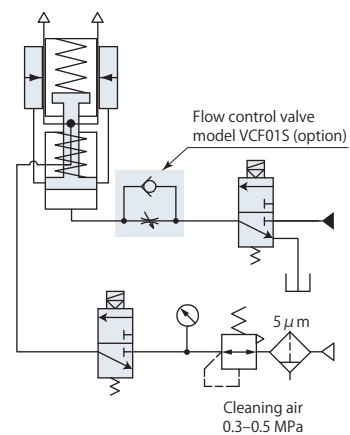


Lock



Unlock

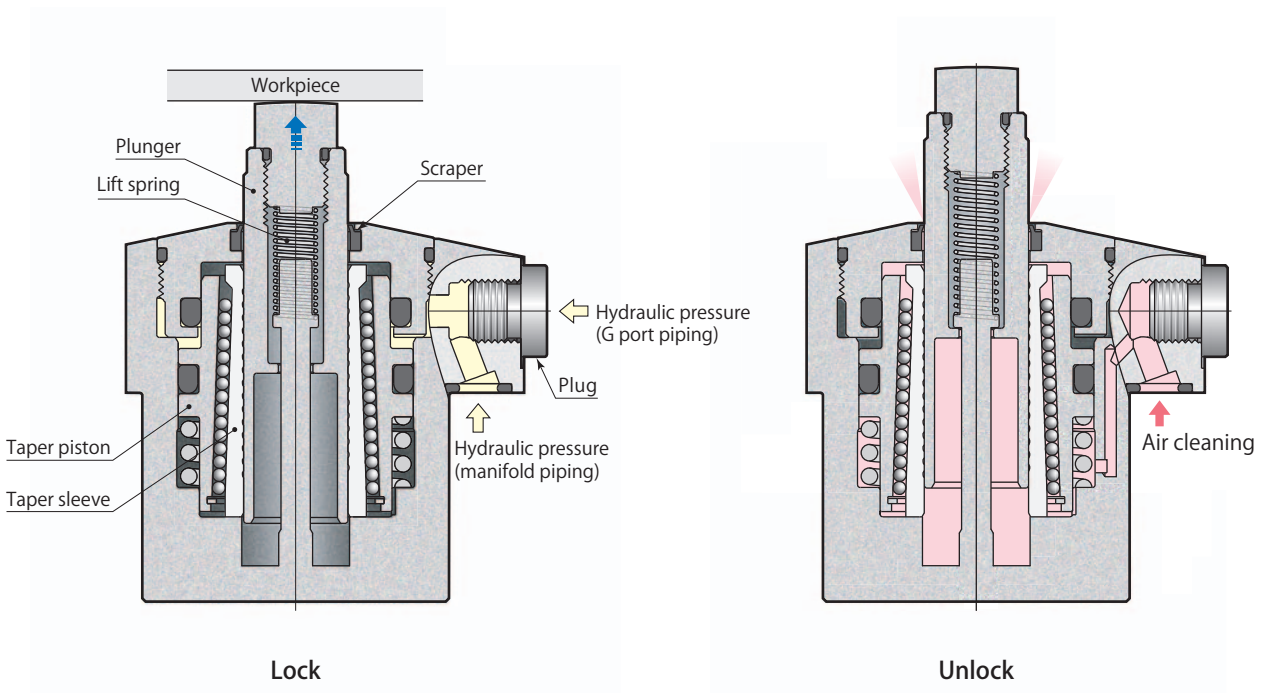
Hydraulic and pneumatic circuit diagram



- Specifications page → 134
- Hydraulic pressure & support force page → 135
- Applied load & deformation page → 135
- Dimensions page → 136
- Mounting details page → 136
- Air sensor page → 138

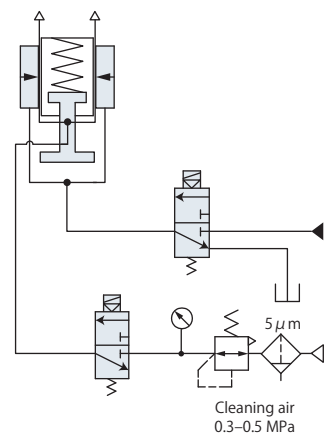
Spring lift

model CST □-□



Work support  
CST Spring lift

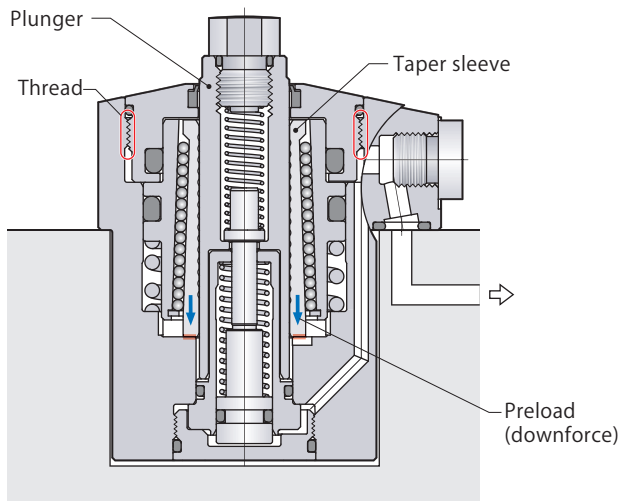
Hydraulic and pneumatic circuit diagram



- Specifications page → 134
- Hydraulic pressure & support force page → 135
- Applied load & deformation page → 135
- Dimensions page → 142
- Mounting details page → 142

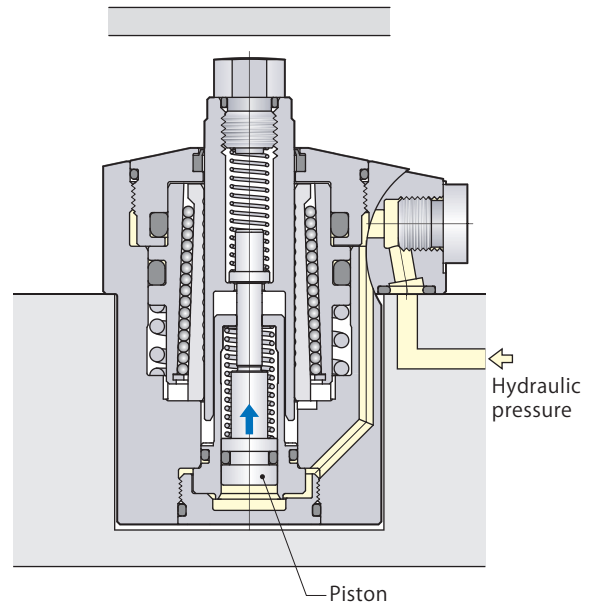
### Hydraulic lift (model CSU)

Plunger is locked after it stroked by the structure containing sequential movement, which enables a workpiece to hold securely.



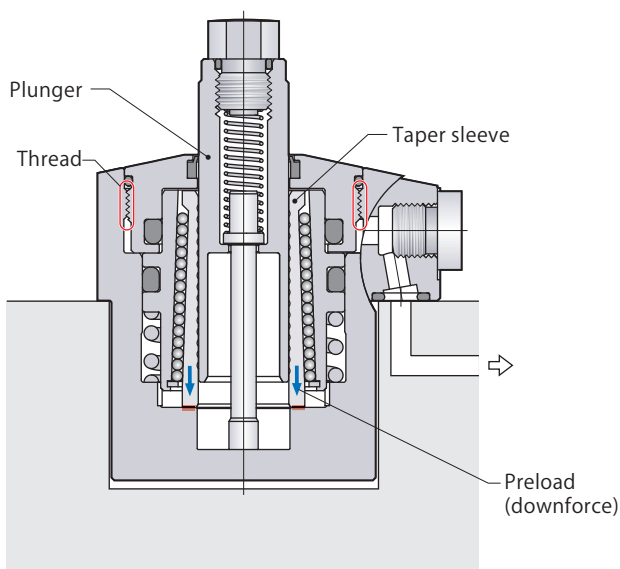
- The taper sleeve is preloaded by the thread and is kept the position lower.

#### ① The piston moves upward



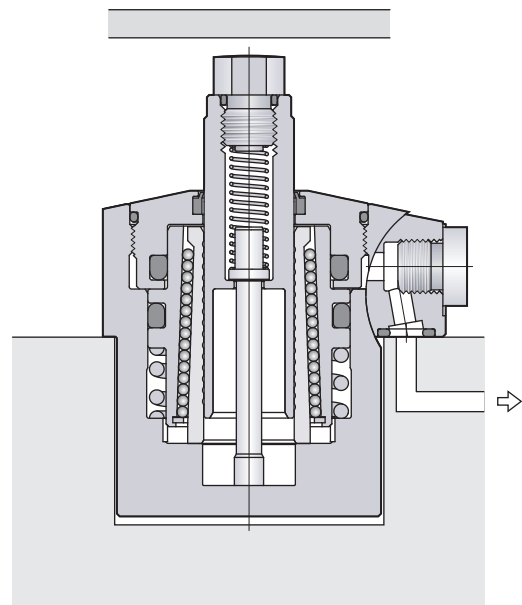
- Piston moves upward by the hydraulic force.

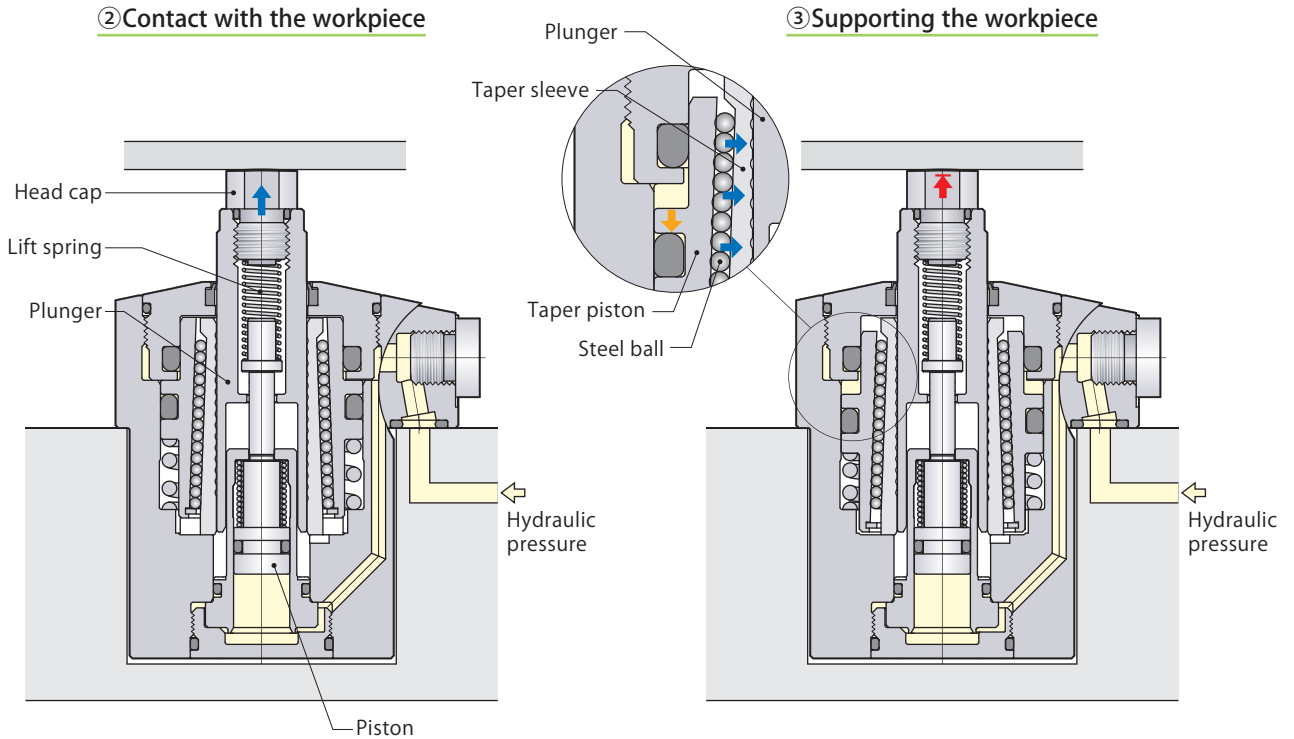
### Spring lift (model CST)



- The taper sleeve is preloaded by the thread and is kept the position lower.

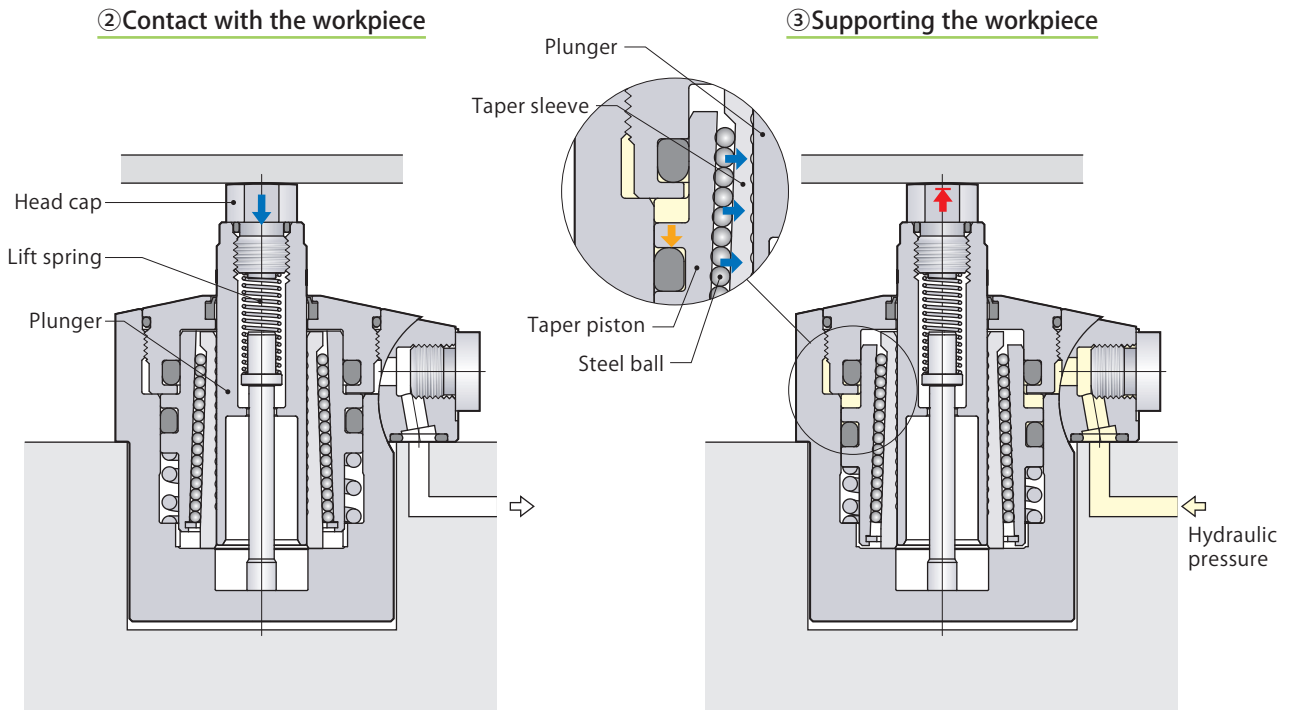
#### ① Before the workpiece approaches





- The plunger with a head cap strokes upward by the lift spring to contact the workpiece. The plunger puts a load on the workpiece since the piston continues to move upward to the end of its stroke.

- After piston stroking, the taper piston moves down by the hydraulic force to depress the taper sleeve by means of the steel balls. Then the taper sleeve locks the plunger firmly.



- The workpiece touches head cap then depresses the plunger until it reaches to the seating surface. The lift spring puts a load onto the workpiece.

- The taper piston is pushed down by the hydraulic force to depress the taper sleeve by means of the steel balls. Then the taper sleeve locks the plunger firmly.



## Specifications

	Size	Lift spring force
<b>CSU</b> : Hydraulic lift, standard	<b>04</b>	
	<b>06</b>	<b>L</b> : Standard
<b>CSU-H</b> : Hydraulic lift, support force enhanced	<b>10</b> —	<b>(Nil)</b> : Standard
	<b>16</b>	<b>B</b> : Air sensor
<b>CST</b> : Spring lift	<b>25</b>	

■ indicates made to order.

Air sensor is not applicable for CSU-H (support force enhanced model) and CST.

Model		CSU□04	CSU□06	CSU□10	CSU□16	CSU□25		
		CST04	CST06	CST10	CST16	CST25		
Support force (hydraulic pressure 7MPa)*1	Standard	kN	5	7	10	16	25	
	Support force enhanced	kN	7	10	14	23	36	
Cylinder capacity	CSU	cm <sup>3</sup>	1.2	1.8	2.6	3.9	5.7	
	CST	cm <sup>3</sup>	0.7	0.9	1.2	2.1	3.3	
Lift spring force*2	L:Standard	Standard	N	3.0–4.1	4.3–8.1	5.3–10.8	5.5–10.8	6.9–13.2
		Support force enhanced	N	4.5–6.0	5.0–11.0	8.0–17.0	9.0–17.0	11.0–20.0
	H:Strong	Standard	N	4.8–7.5	6.6–11.1	7.8–13.3	11.2–19.8	13.5–22.4
		Support force enhanced	N	6.0–9.5	8.0–14.0	11.0–20.0	11.0–21.0	20.0–25.0
Plunger stroke		mm	8	12	12	16	16	
Max. allowable mass of head cap		kg	0.15	0.2	0.2	0.3	0.3	
Mass	CSU	kg	0.6	1.0	1.2	2.0	3.3	
	CST	kg	0.5	0.9	1.1	1.8	3.1	
Recommended tightening torque of mounting screws*3		N·m	7	7	7	12	29	

- Pressure range: 2.5–7 MPa    ● Proof pressure: 10.5 MPa    ● Operating temperature: 0–70 °C
- Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)
- Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

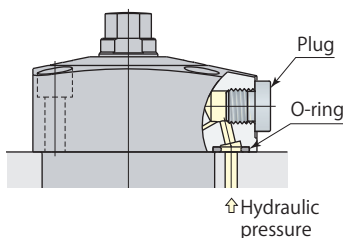
\*1: When work support and clamp are used facing each other, work support and clamp must be selected in such a way that the support force is 1.5 times the applied load (clamping force + machining force).

\*2: Figures are for “upper end to lower end” of plunger action.    \*3: ISO R898 class 12.9

## Manifold piping and G port piping are available.

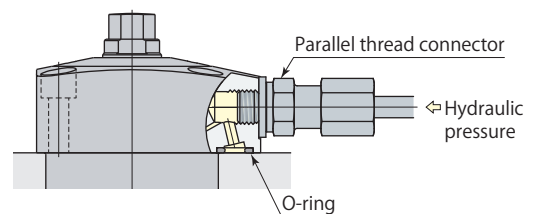
### Manifold piping

When choosing manifold piping, a flow control valve (model VCF) and an air bleeding valve (model VCE) are mountable on the G ports of the clamp.

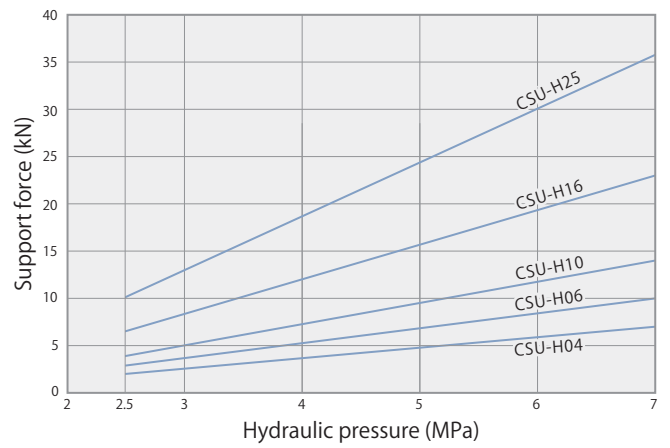
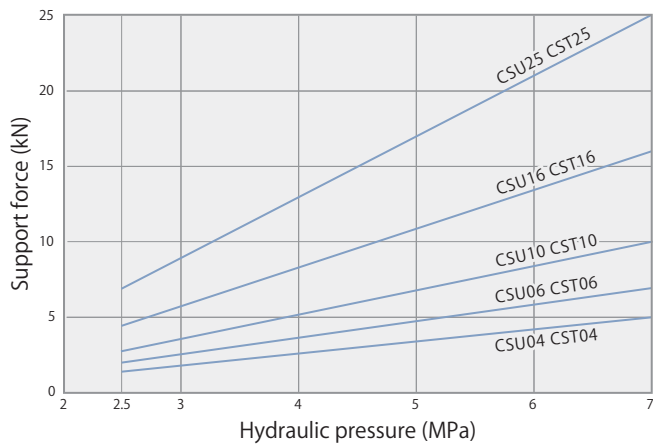


### G port piping

Remove plugs when choosing G port piping. (O-ring must be used.) Refer to [page →372](#) for details on G port piping flareless fitting. The flow control valve and the air bleeding valve should be installed in the middle of oil path.



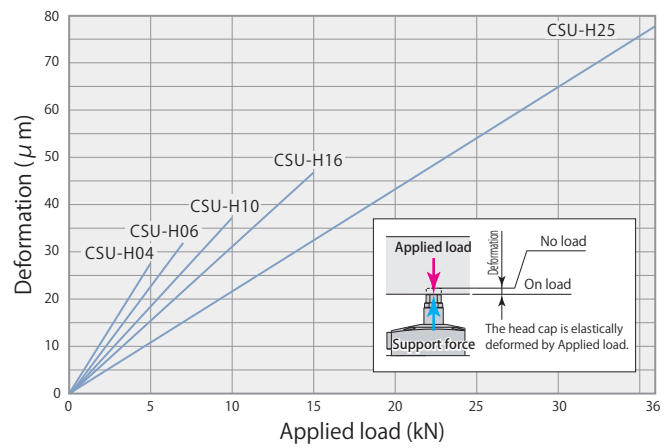
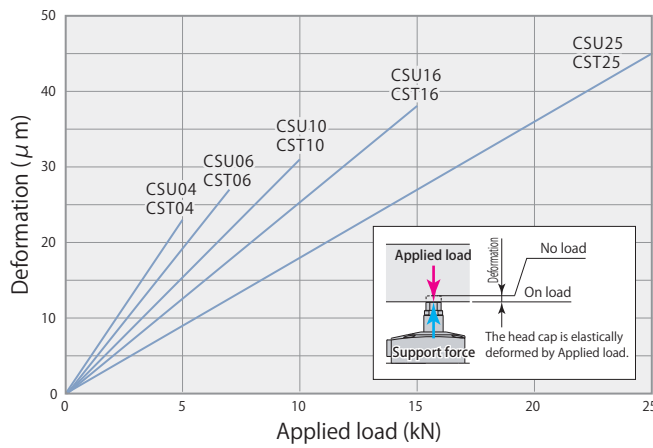
Hydraulic pressure & support force



Hydraulic pressure MPa	Support force kN				
	CSU04 CST04	CSU06 CST06	CSU10 CST10	CSU16 CST16	CSU25 CST25
2.5	1.4	2.0	2.8	4.5	7.0
3.0	1.8	2.6	3.6	5.8	9.0
3.5	2.2	3.1	4.4	7.1	11.0
4.0	2.6	3.7	5.2	8.3	13.0
4.5	3.0	4.2	6.0	9.6	15.0
5.0	3.4	4.8	6.8	10.9	17.0
5.5	3.8	5.3	7.6	12.2	19.0
6.0	4.2	5.9	8.4	13.4	21.0
6.5	4.6	6.4	9.2	14.7	23.0
7.0	5.0	7.0	10.0	16.0	25.0

Hydraulic pressure MPa	Support force kN				
	CSU-H04	CSU-H06	CSU-H10	CSU-H16	CSU-H25
2.5	2.0	2.9	3.9	6.5	10.1
3.0	2.6	3.7	5.0	8.3	13.0
3.5	3.1	4.5	6.1	10.2	15.9
4.0	3.7	5.3	7.3	12.0	18.7
4.5	4.2	6.1	8.4	13.8	21.6
5.0	4.8	6.9	9.5	15.7	24.5
5.5	5.3	7.6	10.6	17.5	27.4
6.0	5.9	8.4	11.7	19.3	30.2
6.5	6.4	9.2	12.9	21.2	33.1
7.0	7.0	10.0	14.0	23.0	36.0

Applied load & deformation



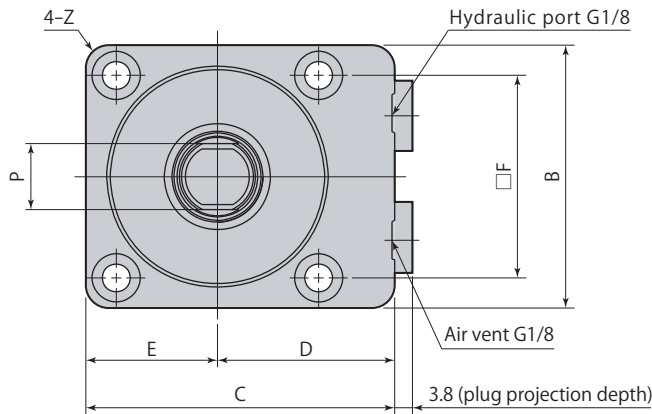
Applied load kN	Deformation μm				
	CSU04 CST04	CSU06 CST06	CSU10 CST10	CSU16 CST16	CSU25 CST25
0	0	0	0	0	0
5	23	19	16	13	9
7		27	22	18	13
10			31	26	18
15				38	27
20			Nonusable range		36
25					45

Applied load kN	Deformation μm				
	CSU-H04	CSU-H06	CSU-H10	CSU-H16	CSU-H25
0	0	0	0	0	0
5	27.6	22.8	18.6	15.6	10.8
7		31.9	26	21.8	15.1
10			37.2	31.2	21.6
15				46.8	32.4
20			Nonusable range		43.2
25					54
36					77.8

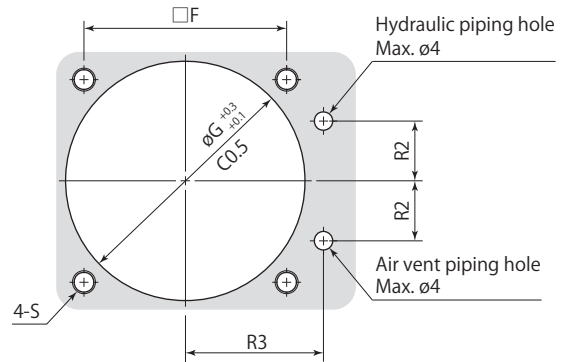
Held with hydraulic pressure of 7 MPa.

Held with hydraulic pressure of 7 MPa.

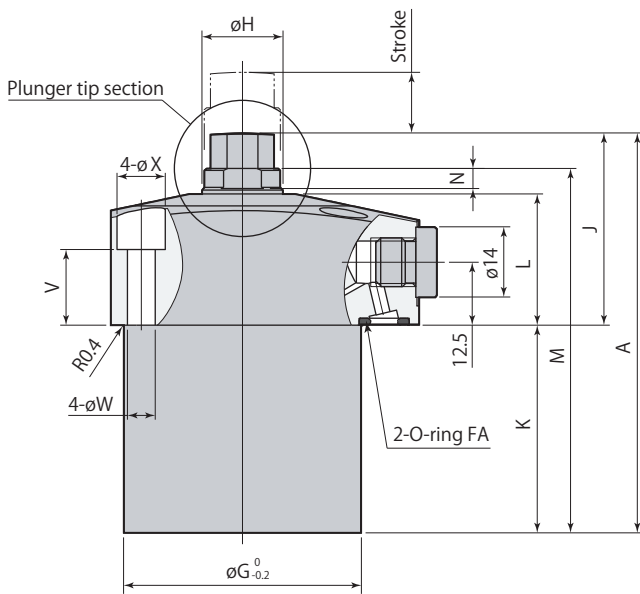
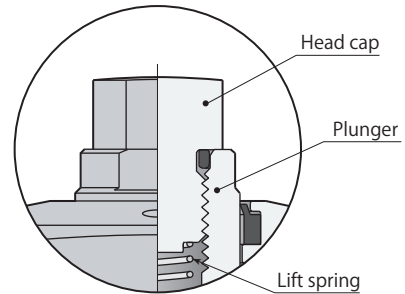
Dimensions



Mounting details

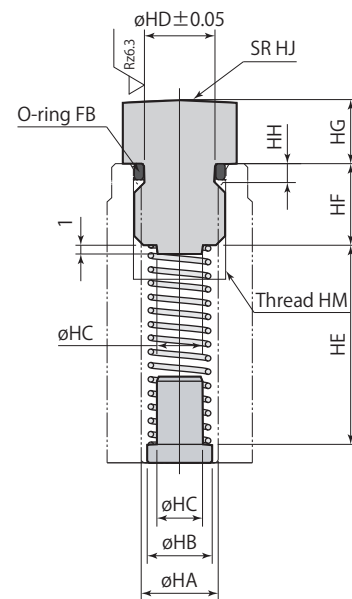
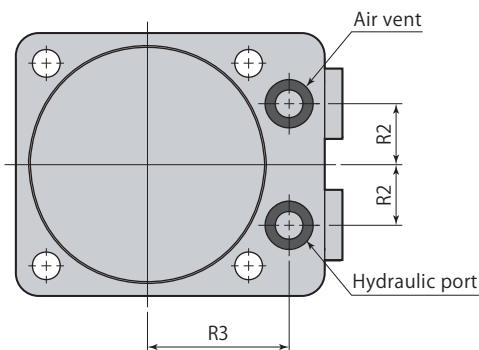
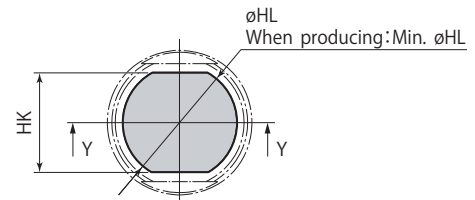


Plunger tip section details



Head cap details

Hardness: HRC52



Y-Y

Model	CSU□04-□	CSU□06-□	CSU□10-□	CSU□16-□	CSU□25-□
A	68	79	82	102	122
B	45	52	56	65	78
C	55	61	65	73	85
D	32.5	35	37	40.5	46
E	22.5	26	28	32.5	39
F	34	40	44	52	62
øG	40	47	52	60	72
øH	15	16	20	22	25
J	38	38	40	45	46
K	30	41	42	57	76
L	26	26	28	30	30
M	61	72	75	93	113
N (width across flats height)	4	4	4.5	5	6
P (width across flats)	13	13	17	19	22
R2	10	12	13	15	18
R3	25.5	28	30	33.5	39
S	M5	M5	M5	M6	M8
V	15	15	16.5	15.9	12
W	5.5	5.5	5.5	6.8	9
X	9.5	9.5	9.5	11	14
Z	R3	R5	R5	R6	R7
O-ring FA (fluorocarbon hardness Hs90)	P7	P7	P7	P7	P7
Flow control valve (meter-in)	VCF01S	VCF01S	VCF01S	VCF01S	VCF01S
Air bleeding valve	VCE01	VCE01	VCE01	VCE01	VCE01

- The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).
- Always attach head cap (lift spring cannot be retained).
- Mounting screws are not included.

### Head cap details

Model	CSU□04-□	CSU□06-□	CSU□10-□	CSU□16-□	CSU□25-□
øHA	8.5	8.5	10.3	10.3	14
øHB	7.2	7.2	9.2	9.2	11.2
øHC	5	5	6	6	7.5
øHD	7.8	7.8	9.2	9.2	13.5
HE	17.6	22	22.5	32.5	39
HF	9	9	11	11	15
HG	7	7	7	9	9
HH	1.9	1.9	2.3	2.3	3.5
HJ	70	70	90	110	140
HK	11	11	14	14	18
øHL	12.6	12.6	16.5	16.5	21.5
Min. øHL	12.5	12.5	16.5	16.5	21.5
HM (recommended tightening torque)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)	M12×1.75 depth 13 (50 N·m)	M12×1.75 depth 13 (50 N·m)	M16×2 depth 20 (80 N·m)
O-ring FB (fluorocarbon hardness Hs70)	S8	S8	P9	P9	AS568-014

- When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use included O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

Air sensor unit

Supplier and model	ISA3-G series manufactured by SMC GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.1 MPa
Inner diameter of piping	ø4 mm
Overall piping length	5 m or less

- Air supply to air sensor unit should be provided to the air vent port. Supplied air should be dried and filtered with particulate size 5 μm or less.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.
- There is a case that air sensing cannot be successfully made as designed when it is used out of the above usage. Contact Technical service center for more details.
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- When performing workpiece contact detection for multiple workpieces (in parallel fittings) using one air sensor, consider detection range of air sensor before determining the number of workpiece contacts to be detected.
- Setting air pressure that exceeds air pressure range results in leaking of air from scraper and accurate detection will not be possible.
- If the lowering operation slows down due to air pressure, stop air supply during lowering operation.

Workpiece contact force

Workpiece contact force (lift spring + air pressure lift) is exerted onto workpiece during workpiece setting. Lift spring force varies according to the stroke used. Use following formula to obtain lift spring force:

**Lift spring force calculation formula**  $P_s = P_1 - (P_1 - P_2) \times D_2 / D_1$

Example: model CSU06-LB using stroke of 5 mm:  
Lift spring force = 8.1 - (8.1 - 4.3) × 5 / 12 = 6.5 (N)

Workpiece contact force varies according to the air pressure used. Use following formula to obtain workpiece contact force:

**Workpiece contact force calculation formula**  $P = P_s + \eta \times P_a$

Example: model CSU06-LB using stroke of 5 mm and air pressure of 0.05 MPa,  
Workpiece contact force = 6.5 + 200 × 0.05 = 16.5 (N)

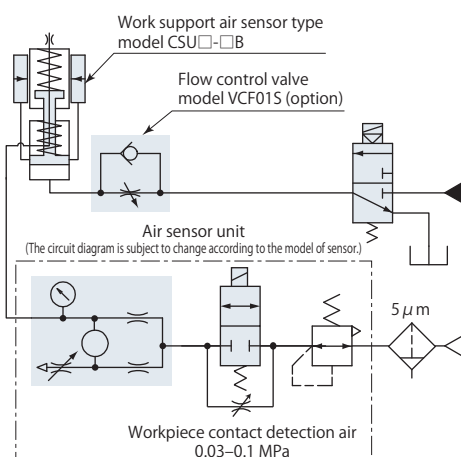
**P1**: Lift spring force at lower end (N) Lower end of plunger Upper end of plunger  
**P2**: Lift spring force at upper end (N)  
**D1**: Full stroke (mm)  
**D2**: Used stroke (mm)  
**P<sub>s</sub>**: Lift spring force (N)  
**η**: Push up coefficient (refer to table below)  
**P<sub>a</sub>**: Air pressure (MPa)  
**P**: Workpiece contact force (N)

The workpiece contact force varies depending on sliding resistance of scraper. Use calculated figures only as reference.

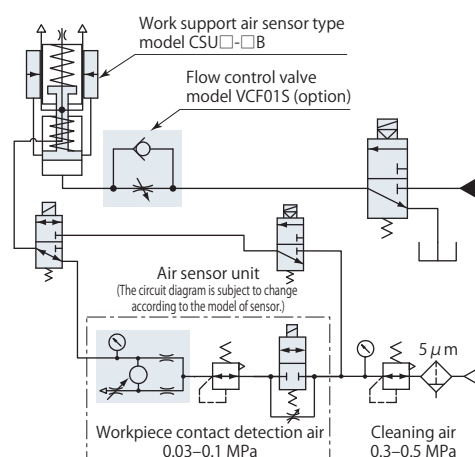
Model		CSU04-□B	CSU06-□B	CSU10-□B
Lift spring force N	L: Standard	3.0-4.1	4.3-8.1	5.3-10.8
	H: Strong	4.8-7.5	6.6-11.1	7.8-13.3
Air pressure range	MPa	0.03-0.1		
Plunger stroke	mm	8	12	12
Push up coefficient η		180	200	310

Lift spring force is shown as spring force for "upper end to lower end" of plunger action.

Air sensor & hydraulic circuit diagram

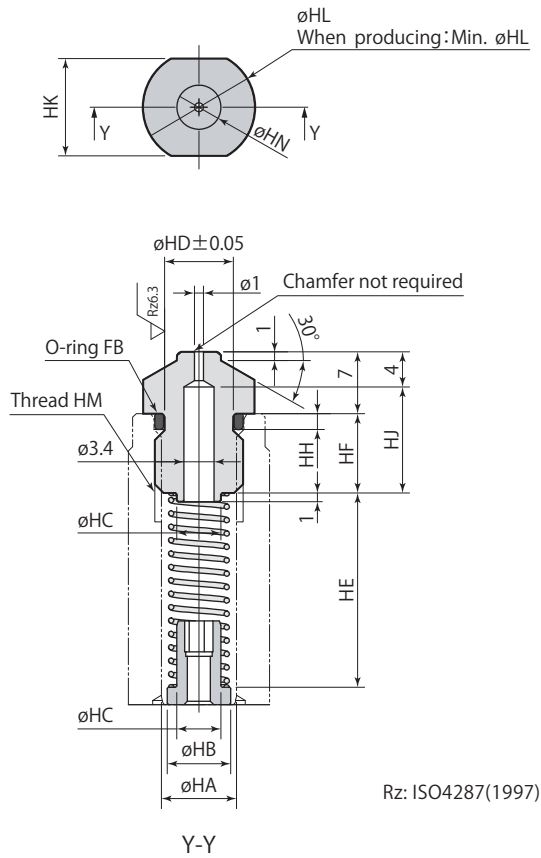


Air sensor & air cleaning & hydraulic circuit diagram



Air sensor head cap details

Hardness: HRC52



Work support  
Air sensor  
CSU-B  
Hydraulic lift

- Workpiece contact detection is not possible merely by replacing head cap of standard work support.
- There is no air sensor available for model CSU16 or CSU25.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

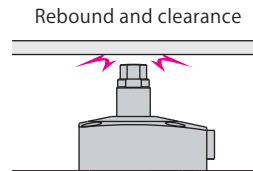
Model	CSU04-□B	CSU06-□B	CSU10-□B
$\phi HA$	8.5	8.5	10.3
$\phi HB$	7.2	7.2	9.2
$\phi HC$	5	5	6
$\phi HD$	7.8	7.8	9.2
HE	17.6	22	22.5
HF	9	9	11
HH	1.9	1.9	2.3
HJ	12	12	14
HK (width across flats)	11	11	14
$\phi HL$	12.6	12.6	16.5
Min. $\phi HL$	12.5	12.5	16.5
HM (recommended tightening torque)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)	M12×1.75 depth 13 (50 N·m)
$\phi HN$	5	5	8
O-ring FB (fluorocarbon hardness Hs70)	S8	S8	P9

- CSU□-□B (Air sensor) is made to order.

Caution in use

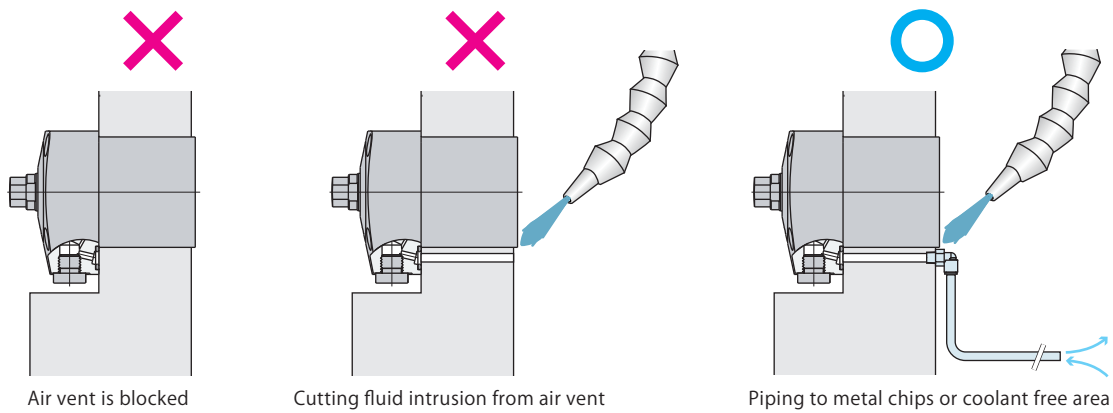
- The lift spring in the plunger may push the workpiece upward if it is light weight and seating detection cannot be complete. Review the weight of workpiece or lift spring force and make it appropriate to seat the workpiece perfectly and acutate the work support.
- Set the plunger lifting time to 0.5 seconds or longer by adjusting the flow control valve with check valve (meter-in). Reasonable plunger ascending speed can prevent the parts from breakage also curbs plunger contact false. Use a flow control valve with cracking pressure of 0.05MPa or less, in order to shorten plunger descending speed. (Cracking pressure of optional flow control valve model VCF01S is 0.04 MPa.)

If the plunger ascends to reach a workpiece too fast, it rebounds after hitting the workpice and will create a small clearance between the two. The clearance may cause a supporting fault of the workpiece.

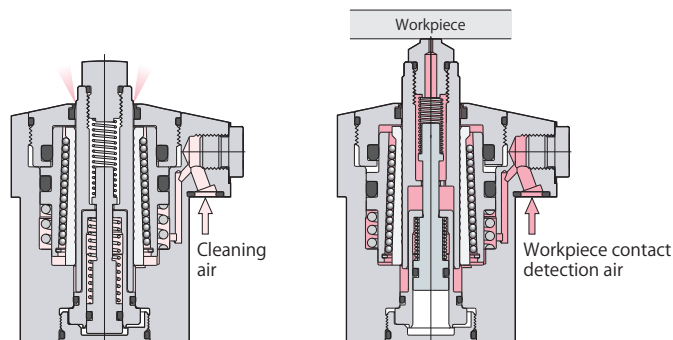


- Avoid following usages. These may cause sleeve deformation that could lead to malfunction of plunger or decreased support force.
  - ✗ Applying eccentric load on plunger.
  - ✗ Applying load that exceeds rated support force.
  - ✗ Rotating plunger when locked.

- Air vent must be opened to atmosphere. Any blockage on the vent results in malfunction. Provide the piping if there is a risk of coolant or metal chips intrusion. Allowing intrusion of cutting fluid may cause rusting and other problems.



- Air (oil free) must be fed through a 5 μm filter that is connected to an air vent port for air cleaning or workpiece contact detection (air sensor). Perform air cleaning only when replacing workpiece. Plunger will rise during air cleaning.



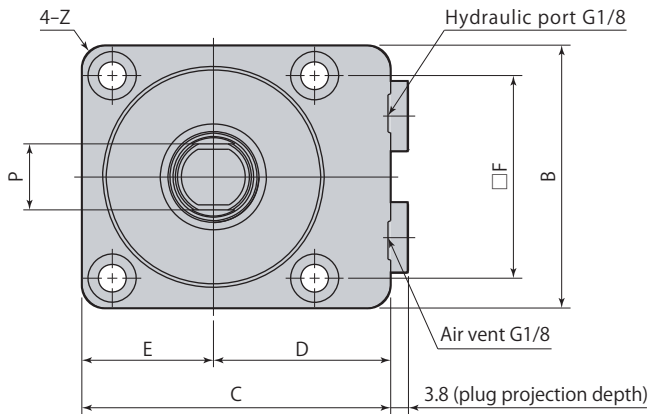
Work support

CSU Hydraulic lift

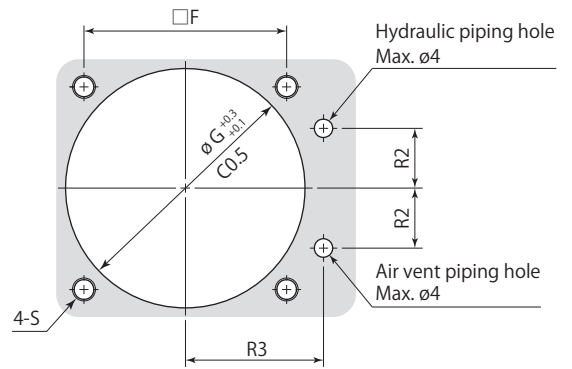




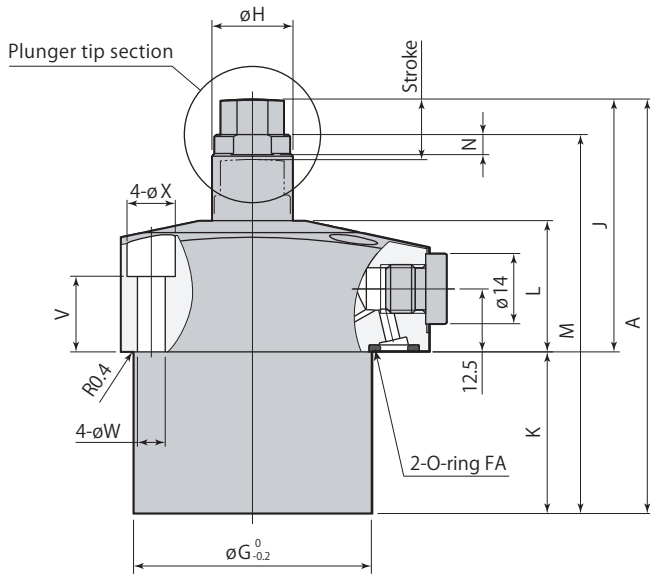
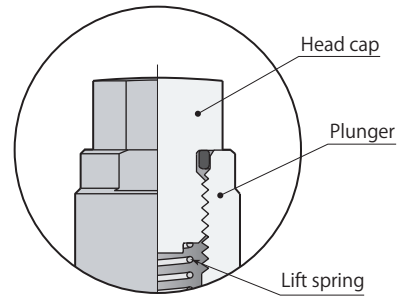
Dimensions



Mounting details

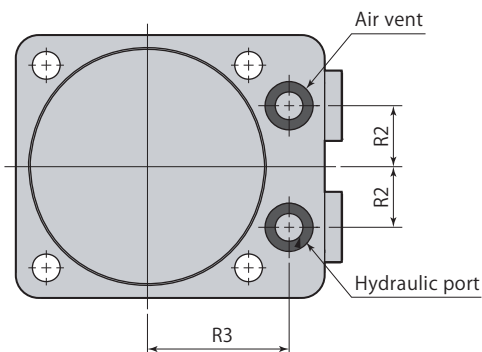
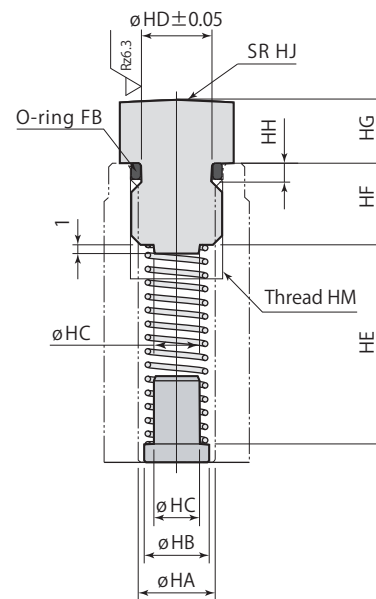
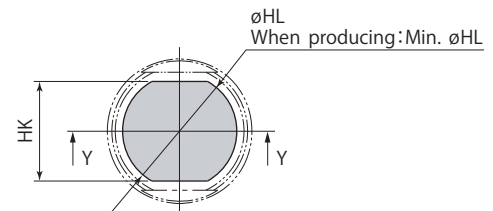


Plunger tip section details



Head cap details

Hardness: HRC52



mm

Model	CST04-□	CST06-□	CST10-□	CST16-□	CST25-□
A	67	82	85	108	129
B	45	52	56	65	78
C	55	61	65	73	85
D	32.5	35	37	40.5	46
E	22.5	26	28	32.5	39
F	34	40	44	52	62
øG	40	47	52	60	72
øH	15	16	20	22	25
J	46	50	52	61	62
K	21	32	33	47	67
L	26	26	28	30	30
M	60	75	78	99	120
N (width across flats height)	4	4	4.5	5	6
P (width across flats)	13	13	17	19	22
R2	10	12	13	15	18
R3	25.5	28	30	33.5	39
S	M5	M5	M5	M6	M8
V	15	15	16.5	15.9	12
W	5.5	5.5	5.5	6.8	9
X	9.5	9.5	9.5	11	14
Z	R3	R5	R5	R6	R7
O-ring FA (fluorocarbon hardness Hs90)	P7	P7	P7	P7	P7
Air bleeding valve	VCE01	VCE01	VCE01	VCE01	VCE01

- The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).
- Always attach head cap (lift spring cannot be retained).
- Mounting screws are not included.

### Head cap details

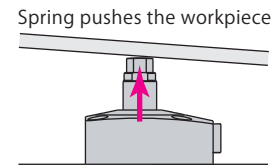
mm

Model	CST04-□	CST06-□	CST10-□	CST16-□	CST25-□
øHA	8.5	8.5	10.3	10.3	14
øHB	7.2	7.2	9.2	9.2	11.2
øHC	5	5	6	6	7.5
øHD	7.8	7.8	9.2	9.2	13.5
HE	17.6	22	22.5	32.5	39
HF	9	9	11	11	15
HG	7	7	7	9	9
HH	1.9	1.9	2.3	2.3	3.5
HJ	70	70	90	110	140
HK	11	11	14	14	18
øHL	12.6	12.6	16.5	16.5	21.5
Min. øHL	12.5	12.5	16.5	16.5	21.5
HM (recommended tightening torque)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)	M12×1.75 depth 13 (50 N·m)	M12×1.75 depth 13 (50 N·m)	M16×2 depth 20 (80 N·m)
O-ring FB (fluorocarbon hardness Hs70)	S8	S8	P9	P9	AS568-014

- When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use included O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

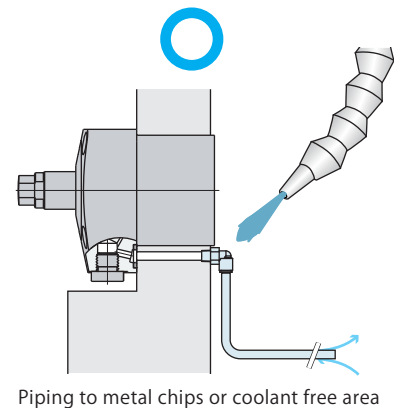
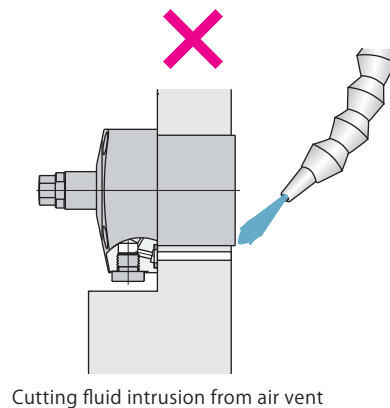
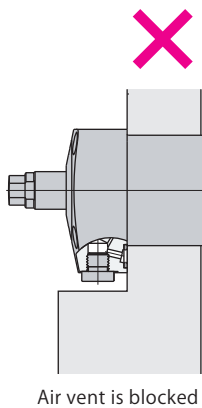
Caution in use

- If the workpiece is light weight, the plunger cannot be pressed down by the weight of workpiece and seating detection cannot be complete. Review the weight of workpiece or lift spring force to make the workpiece seat perfectly, and lock the work support.



- Avoid following usages. These may cause sleeve deformation that could lead to malfunction of plunger or decreased support force.
  - ✗ Applying eccentric load on plunger.
  - ✗ Applying load that exceeds rated support force.
  - ✗ Rotating plunger when locked.

- Air vent must be opened to atmosphere. Any blockage on the vent results in malfunction. Provide the piping if there is a risk of coolant or metal chips intrusion. Allowing intrusion of cutting fluid may cause rusting and other problems.



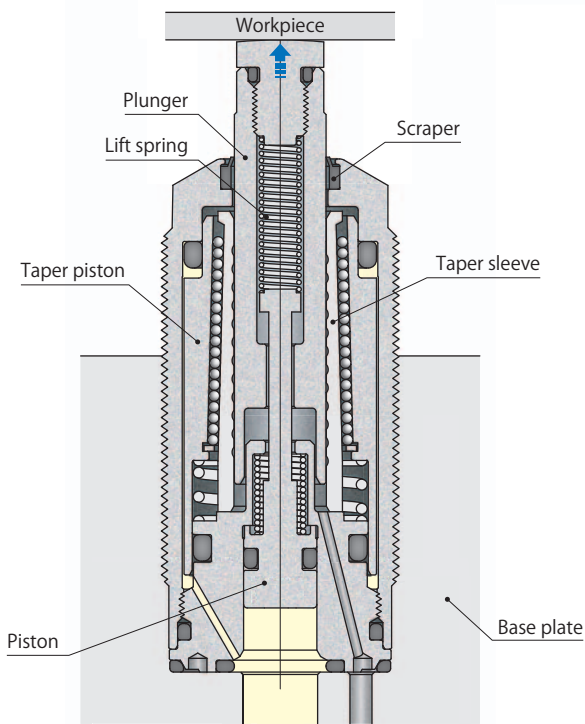
- Air (oil free) must be fed through a  $5\ \mu\text{m}$  filter that is connected to an air vent port for air cleaning. Perform air cleaning only when replacing workpiece.



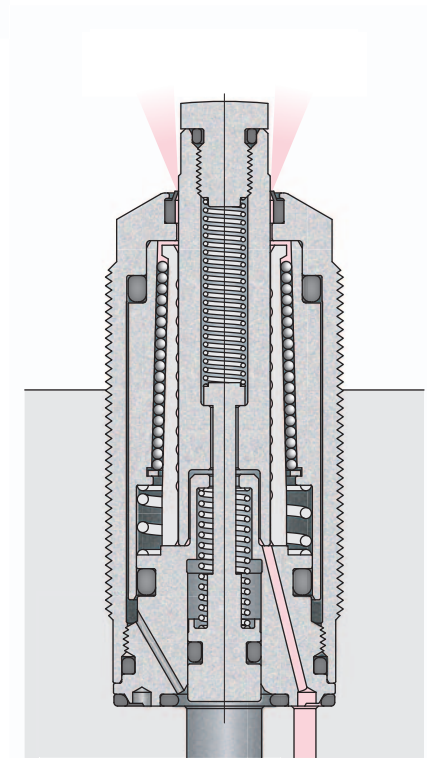
Hydraulic lift

Standard model **CSN**□-□□

Support force enhanced model **CSY**□-□□

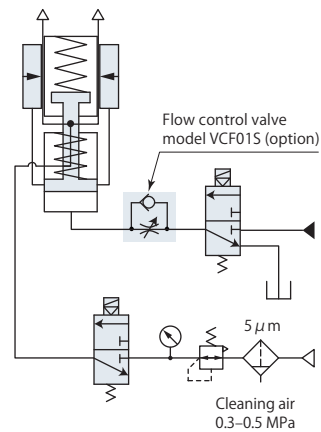


Lock



Unlock

Hydraulic and pneumatic circuit diagram



Specifications

page → 150

Hydraulic pressure & support force

page → 151

Applied load & deformation

page → 151

Dimensions

pages → 152, 154

Mounting details

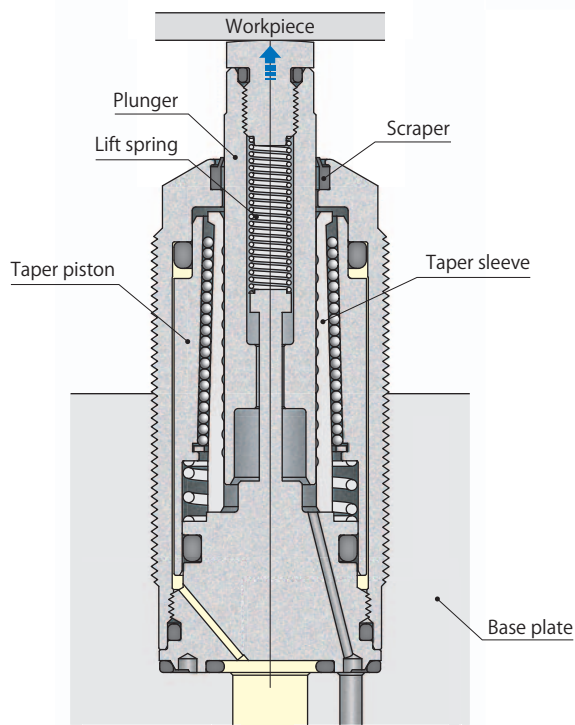
pages → 152, 154

Air sensor

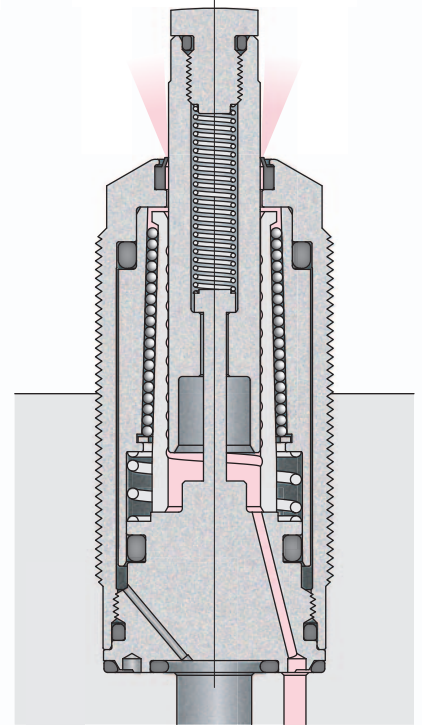
page → 156

Spring lift

model CSK□-□



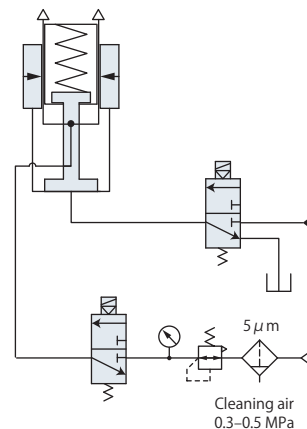
Lock



Unlock

↑ Air cleaning

Hydraulic and pneumatic circuit diagram

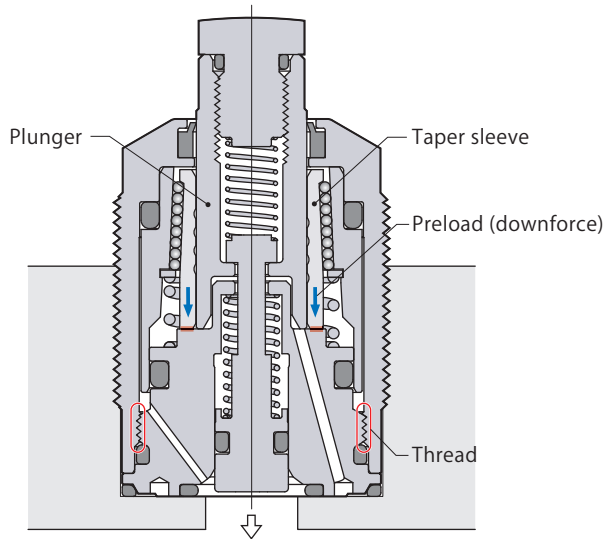


- Specifications page → 150
- Hydraulic pressure & support force page → 151
- Applied load & deformation page → 151
- Dimensions page → 160
- Mounting details page → 160

Work support  
CSK  
Spring lift

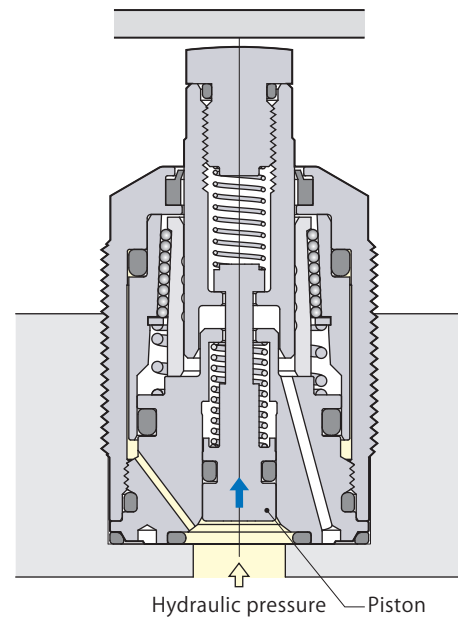
### Hydraulic lift (model CSN, CSY)

Plunger is locked after it stroked by the structure containing sequential movement, which enables a workpiece to hold securely.



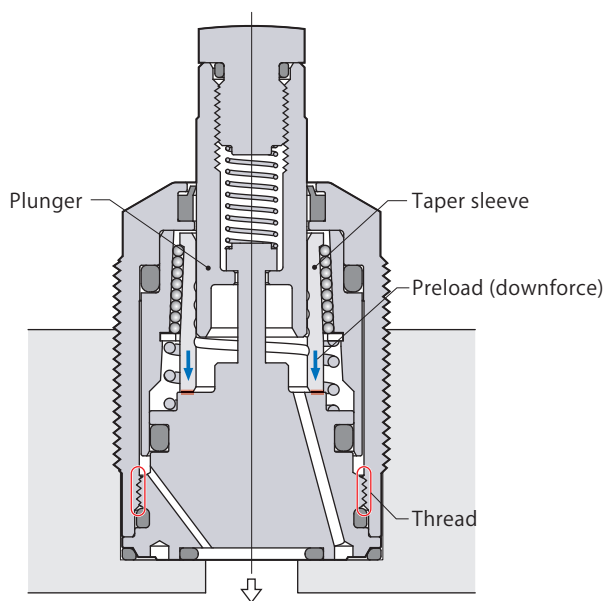
- The taper sleeve is preloaded by the thread and is kept the position lower.

#### ① The piston moves upward



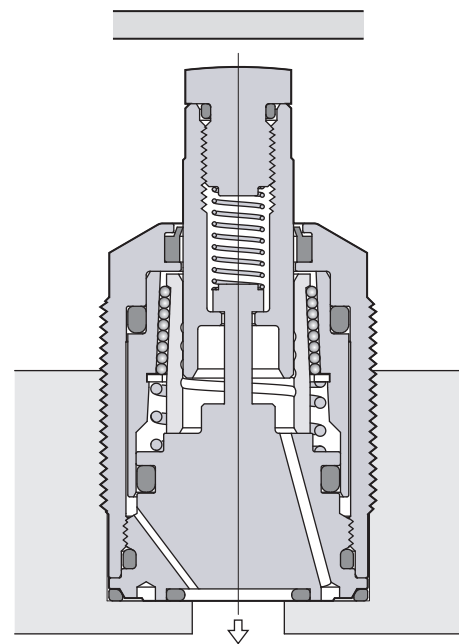
- Piston moves upward by the hydraulic force.

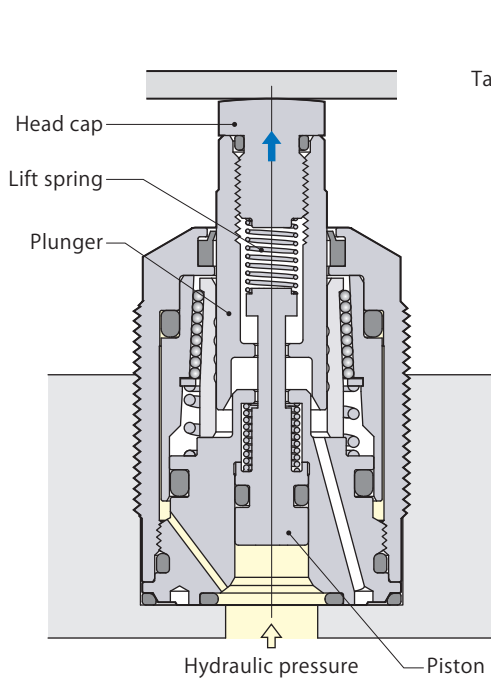
### Spring lift (model CSK)



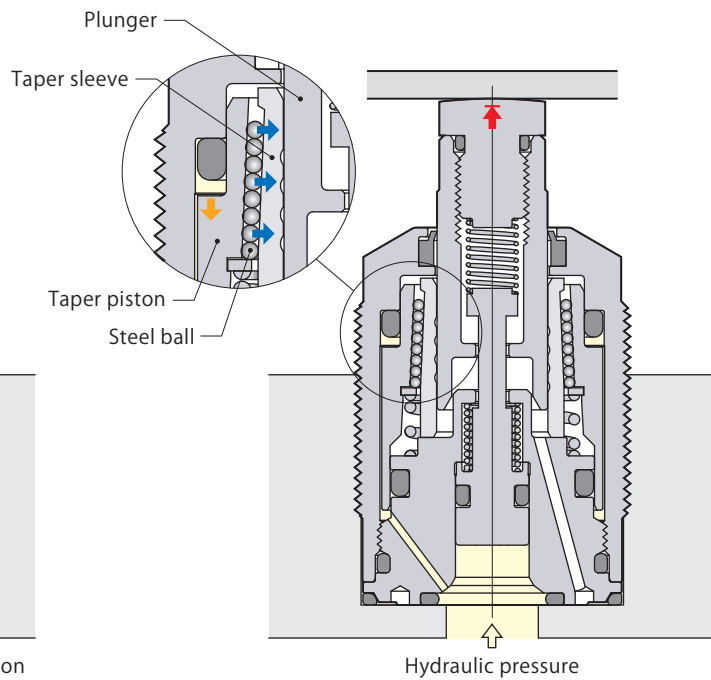
- The taper sleeve is preloaded by the thread and is kept the position lower.

#### ① Before the workpiece approaches

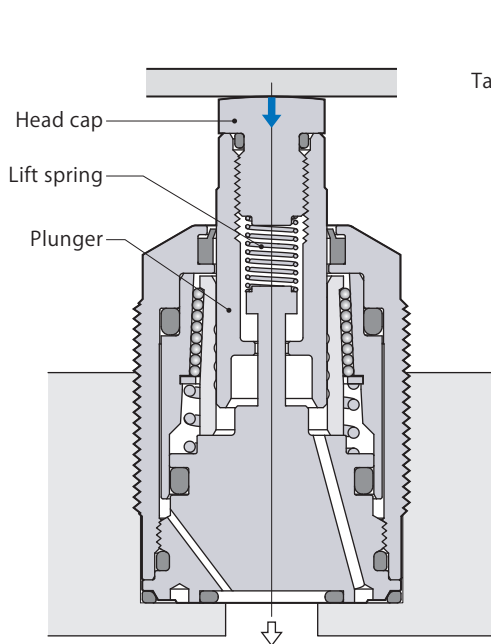


**② Contact with the workpiece**

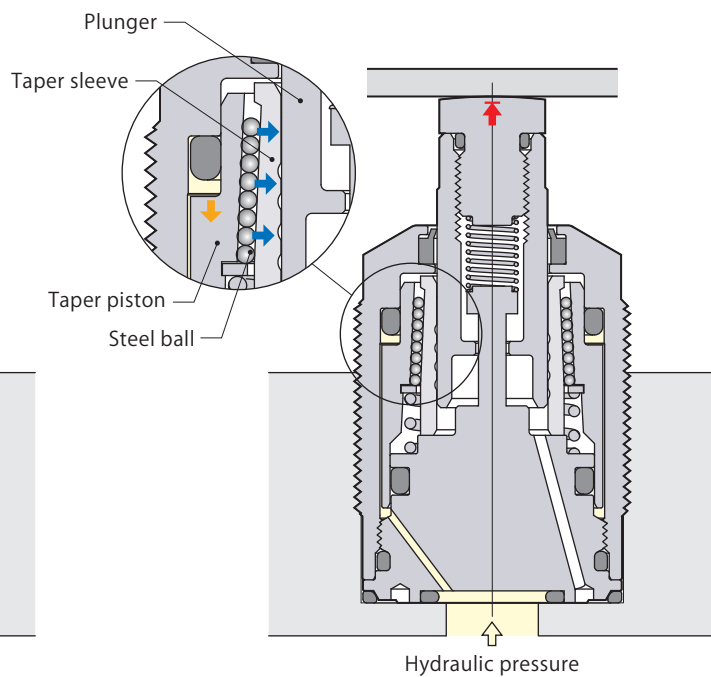
- The plunger with a head cap strokes upward by the lift spring to contact the workpiece. The plunger puts a load on the workpiece since the piston continues to move upward to the end of its stroke.

**③ Supporting the workpiece**

- After piston stroking, the taper piston moves down by the hydraulic force to depress the taper sleeve by means of the steel balls. Then the taper sleeve locks the plunger firmly.

**② Contact with the workpiece**

- The workpiece touches head cap then depresses the plunger until it reaches to the seating surface. The lift spring puts a load onto the workpiece.

**③ Supporting the workpiece**

- The taper piston is pushed down by the hydraulic force to depress the taper sleeve by means of the steel balls. Then the taper sleeve locks the plunger firmly.



### Specifications

	Size	Lift spring force	
<b>CSN</b> : Hydraulic lift, standard	<b>00</b>		
	<b>01</b>	<b>L</b> : Standard	<b>(Nil)</b> : Standard
<b>CSY</b> : Hydraulic lift, support force enhanced	<b>03</b>	—	<b>B</b> : Air sensor
	<b>04</b>	<b>H</b> : Strong	
<b>CSK</b> : Spring lift	<b>06</b>		

Air sensor is not applicable for model CSK.

Model		CSN00-□	CSN01-□	CSN03-□	CSN04-□	CSN06-□	
		CSY00-□	CSY01-□	CSY03-□	CSY04-□	CSY06-□	
		CSK00-□	CSK01-□	CSK03-□	CSK04-□	CSK06-□	
Support force (hydraulic pressure 7MPa)*1	CSN, CSK kN	2.5	1	3	4	7	
	CSY kN	3	1.2	4	5.5	10	
Cylinder capacity	CSN, CSY cm <sup>3</sup>	0.6	0.4	0.8	1.2	2.0	
	CSK cm <sup>3</sup>	0.3	0.1	0.7	0.7	1.2	
Lift spring force*2	L:Standard	CSN, CSK N	2-4			3-6	
		CSY N	2-4	2-4	4-6	5-8	
	H:Strong	CSN, CSK N	3-6			5-8	
		CSY N	3-6	3-6	5-8	6-11	8-14
Plunger stroke	mm	6.5	6	8	8	10	
Max. allowable mass of head cap	kg	0.05			0.1		
Mass	kg	0.2	0.2	0.3	0.4	0.7	
Recommended tightening torque of body	N·m	35-45	40-50	40-50	45-55	55-65	

● Pressure range: 2.5-7 MPa    ● Proof pressure: 10.5 MPa    ● Operating temperature: 0-70 °C

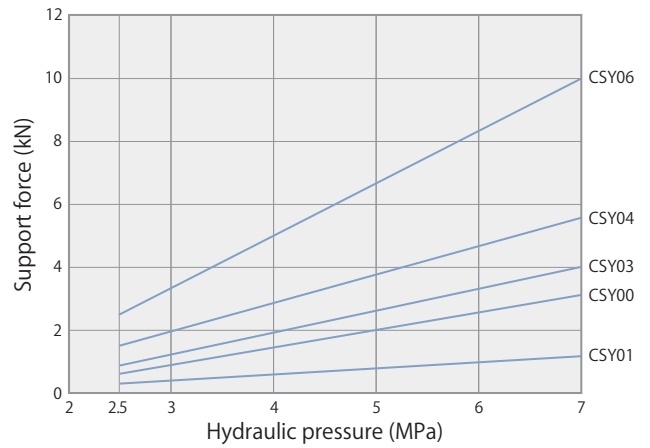
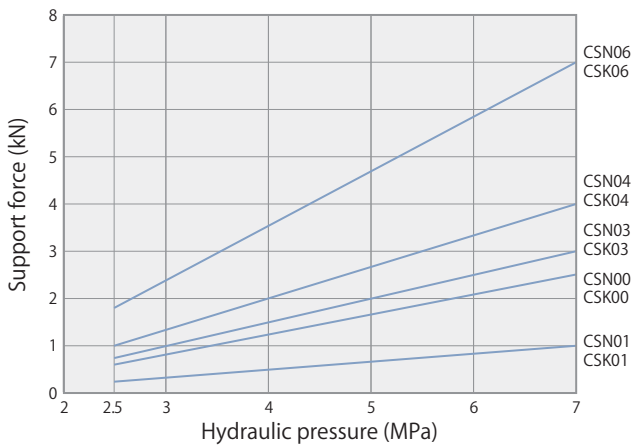
● Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)

● Seals are resistant to chlorine-based cutting fluid. (not thermal resistant specification)

\*1: When work support and clamp are used facing each other, work support and clamp must be selected in such a way that the support force is 1.5 times the applied load (clamping force + machining force).

\*2: Figures are for "upper end to lower end" of plunger action.

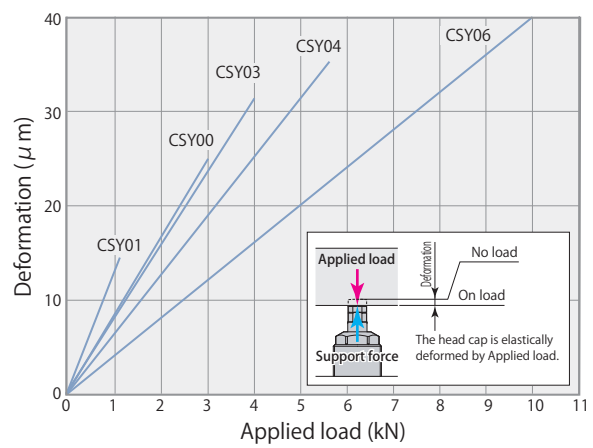
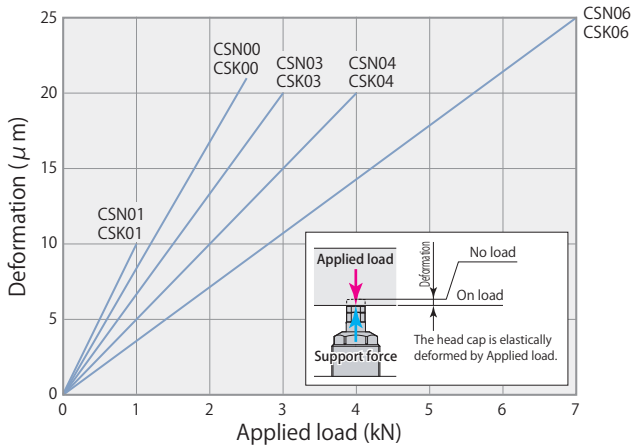
Hydraulic pressure & support force



Hydraulic pressure MPa	CSN, CSK support force kN				
	CS□00	CS□01	CS□03	CS□04	CS□06
2.5	0.6	0.3	0.8	1.0	1.8
3.0	0.8	0.3	1.0	1.3	2.3
3.5	1.0	0.4	1.3	1.7	3.0
4.0	1.2	0.5	1.5	2.0	3.5
4.5	1.4	0.6	1.8	2.3	4.1
5.0	1.7	0.7	2.0	2.7	4.7
5.5	1.9	0.8	2.3	3.0	5.3
6.0	2.1	0.8	2.5	3.3	5.9
6.5	2.3	0.9	2.8	3.6	6.4
7.0	2.5	1.0	3.0	4.0	7.0

Hydraulic pressure MPa	CSY support force kN				
	CSY00	CSY01	CSY03	CSY04	CSY06
2.5	0.8	0.3	1.0	1.4	2.5
3.0	1.0	0.4	1.3	1.8	3.3
3.5	1.3	0.5	1.7	2.3	4.2
4.0	1.5	0.6	2.0	2.8	5.0
4.5	1.8	0.7	2.3	3.2	5.8
5.0	2.0	0.8	2.7	3.7	6.7
5.5	2.3	0.9	3.0	4.1	7.5
6.0	2.5	1.0	3.3	4.6	8.3
6.5	2.8	1.1	3.7	5.0	9.2
7.0	3.0	1.2	4.0	5.5	10.0

Applied load & deformation



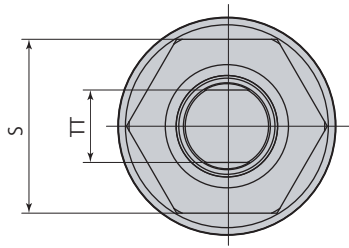
Applied load kN	CSN, CSK deformation μm				
	CS□00	CS□01	CS□03	CS□04	CS□06
0	0	0	0	0	0
1	8.4	10	6.7	5	3.6
2	16.8		13.3	10	7.1
3			20	15	10.7
4				20	14.3
5		Nonusable range			17.9
6					21.4
7					25

Applied load kN	CSY deformation μm				
	CSY00	CSY01	CSY03	CSY04	CSY06
0	0	0	0	0	0
1	8	12	8	6	4
2	17		16	13	8
3	25		24	19	12
4			32	26	16
5				32	20
6					24
7		Nonusable range			28
8					32
9					36
10					40

Held with hydraulic pressure of 7 MPa.

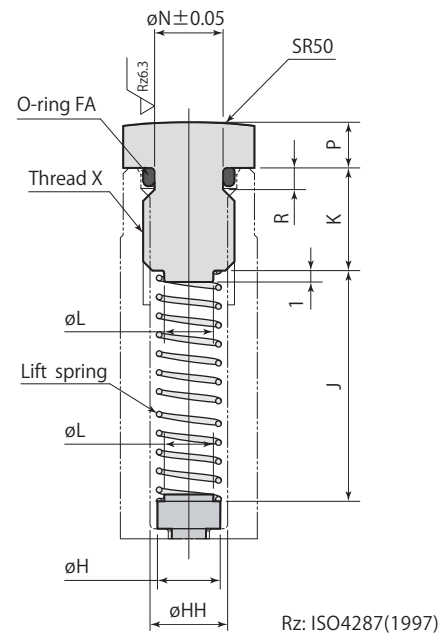
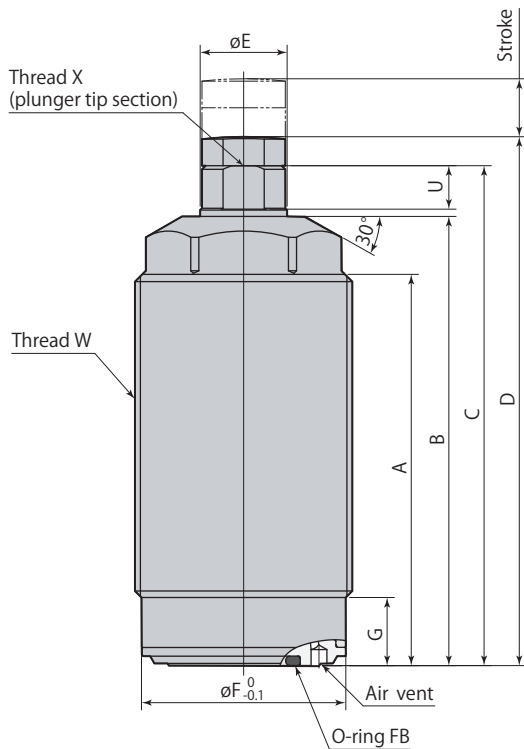
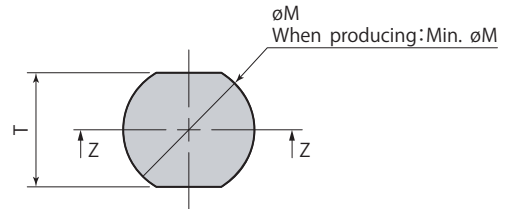
Held with hydraulic pressure of 7 MPa.

Dimensions

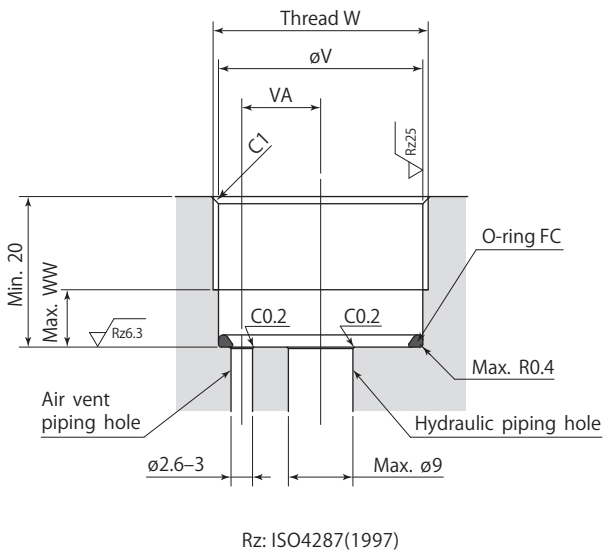


**Head cap details**

Hardness: HRC52



Mounting details

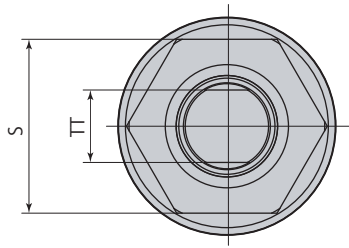


- When fixing the hexagon part of body with a vise, etc., make sure the tightening force is 2.5 kN or less.
- Always attach head cap (lift spring cannot be retained). When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- Install O-ring FC at the bottom of the hole. The O-ring FC is packed with a work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

Model	CSN00-□	CSN01-□	CSN03-□	CSN04-□	CSN06-□
A	49	33	54	48	60
B	57	41	62	58	71
C	63	48	69	65	78
D	66	52	73	69	82
øE	10	12	12	15	16
øF	24.3	28.2	28.2	34.2	43.2
G	8.4	9.4	9.4	9.4	9.4
øH	4.5	5.5	5.5	7.2	7.2
øHH	5.1	6.8	6.8	8.5	8.5
J	20.6	11.2	23.2	24.1	32.5
K	7.5	9	9	9	9
øL	3.5	4.3	4.3	5	5
øM	9.5	11.5	11.5	12.5	12.5
Min. øM	8.5	10	10	12.5	12.5
øN	4.5	6	6	7.8	7.8
P	3	4	4	4	4
R	1.5	1.9	1.9	1.9	1.9
S	22	24	24	30	36
T (width across flats)	8	10	10	11	11
TT (plunger width across flats)	8	10	10	13	13
U	5	6	6	6	6
øV	24.5	28.5	28.5	34.5	43.5
VA	9	11	11	13	16
W	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	9	9	9	9
X (recommended tightening torque)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)	M8×1.25 depth 12 (20 N·m)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)
O-ring FA (fluorocarbon hardness Hs70)	S5	S6	S6	S8	S8
O-ring FB (fluorocarbon hardness Hs90)	AS568-013	AS568-014	AS568-014	AS568-014	AS568-015
O-ring FC (fluorocarbon hardness Hs90)	AS568-020	AS568-022	AS568-022	AS568-026	AS568-030

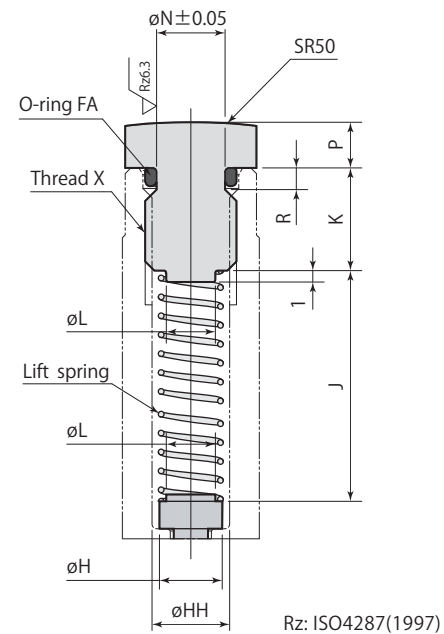
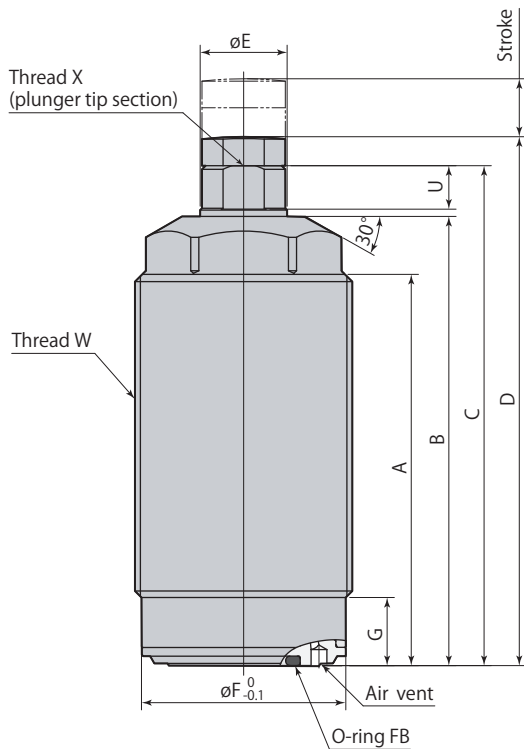
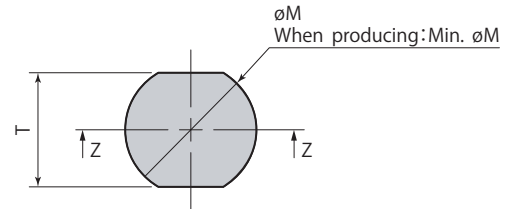
mm

Dimensions



Head cap details

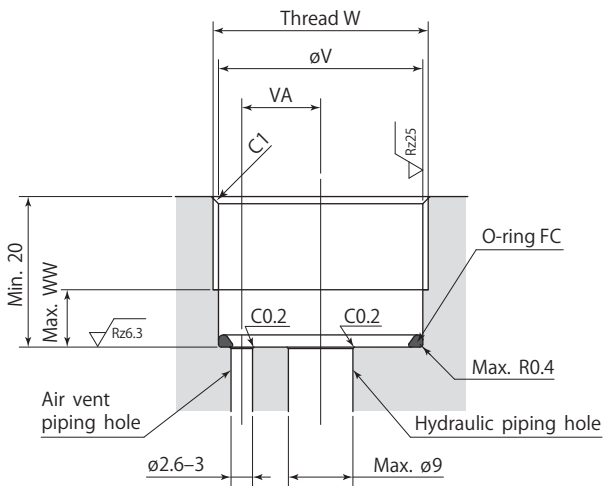
Hardness : HRC52



Rz: ISO4287(1997)

Z-Z

Mounting details



Rz: ISO4287(1997)

- When fixing the hexagon part of body with a vise, etc., make sure the tightening force is 2.5 kN or less.
- Always attach head cap (lift spring cannot be retained). When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- Install O-ring FC at the bottom of the hole. The O-ring FC is packed with a work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

Model	CSY00-□	CSY01-□	CSY03-□	CSY04-□	CSY06-□
A	49	33	54	48	60
B	57	41	62	58	71
C	63	48	69	65	78
D	66	52	73	69	82
øE	10	12	12	15	16
øF	24.3	28.2	28.2	34.2	43.2
G	8.4	9.4	9.4	9.4	9.4
øH	4.5	5.5	5.5	7.2	7.2
øHH	5.1	6.8	6.8	8.5	8.5
J	20.6	11.2	23.2	24.1	32.5
K	7.5	9	9	9	9
øL	3.5	4.3	4.3	5	5
øM	9.5	11.5	11.5	12.5	12.5
Min. øM	8.5	10	10	12.5	12.5
øN	4.5	6	6	7.8	7.8
P	3	4	4	4	4
R	1.5	1.9	1.9	1.9	1.9
S	22	24	24	30	36
T (width across flats)	8	10	10	11	11
TT (plunger width across flats)	8	10	10	13	13
U	5	6	6	6	6
øV	24.5	28.5	28.5	34.5	43.5
VA	9	11	11	13	16
W	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	9	9	9	9
X (recommended tightening torque)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)	M8×1.25 depth 12 (20 N·m)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)
O-ring FA (fluorocarbon hardness Hs70)	S5	S6	S6	S8	S8
O-ring FB (fluorocarbon hardness Hs90)	AS568-013	AS568-014	AS568-014	AS568-014	AS568-015
O-ring FC (fluorocarbon hardness Hs90)	AS568-020	AS568-022	AS568-022	AS568-026	AS568-030

mm

Work support  
Support force enhancedCSY  
Hydraulic lift

**Air sensor unit**

Supplier and model	ISA3-G series manufactured by SMC GPS2-05, GPS3-E series manufactured by CKD
Air supply pressure	0.1 MPa
Inner diameter of piping	ø4 mm
Overall piping length	5 m or less

- Air supply to air sensor unit should be provided to the air vent port. Supplied air should be dried and filtered with particulate size 5 μm or less.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.
- There is a case that air sensing cannot be successfully made as designed when it is used out of the above usage. Contact Technical service center for more details.
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- When performing workpiece contact detection for multiple workpieces (in parallel fittings) using one air sensor, consider detection range of air sensor before determining the number of workpiece contacts to be detected.
- Setting air pressure that exceeds air pressure range results in leaking of air from scraper and accurate detection will not be possible.
- If the lowering operation slows down due to air pressure, stop air supply during lowering operation.

**Workpiece contact force**

Workpiece contact force (lift spring + air pressure lift) is exerted onto workpiece during workpiece setting. Lift spring force varies according to the stroke used. Use following formula to obtain lift spring force:

**Lift spring force calculation formula**  $P_s = P_1 - (P_1 - P_2) \times D_2 / D_1$

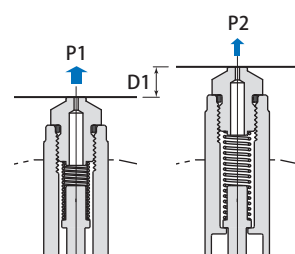
Example: model CSN03-LB using stroke of 5 mm:  
Lift spring force = 4 - (4 - 2) × 5 / 8 = 2.75 (N)

Workpiece contact force varies according to the air pressure used. Use following formula to obtain workpiece contact force:

**Workpiece contact force calculation formula**  $P = P_s + \eta \times P_a$

Example: model CSN03-LB using stroke of 5 mm and air pressure of 0.05 MPa,  
Workpiece contact force = 2.75 + 110 × 0.05 = 8.25 (N)

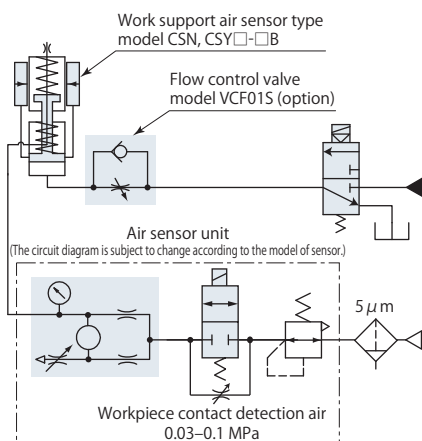
- P1** : Lift spring force at lower end (N) Lower end of plunger
- P2** : Lift spring force at upper end (N) Upper end of plunger
- D1** : Full stroke (mm)
- D2** : Used stroke (mm)
- P<sub>s</sub>** : Lift spring force (N)
- η** : Push up coefficient (refer to table below)
- P<sub>a</sub>** : Air pressure (MPa)
- P** : Workpiece contact force (N)



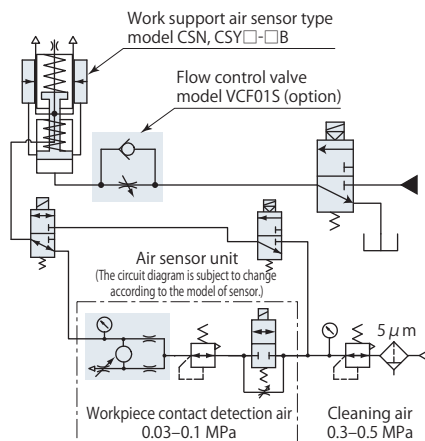
The workpiece contact force varies depending on sliding resistance of scraper. Use calculated figures only as reference. Refer to **page → 150** for specification list for details on lift spring force.

Model	CSN00	CSN01	CSN03	CSN04	CSN06
	-□B	-□B	-□B	-□B	-□B
Model	CSY00	CSY01	CSY03	CSY04	CSY06
	-□B	-□B	-□B	-□B	-□B
Air pressure range MPa	0.03-0.1				
Plunger stroke mm	6.5	6	8	8	10
Push up coefficient η	80	110	180	180	200

**Air sensor & hydraulic circuit diagram**

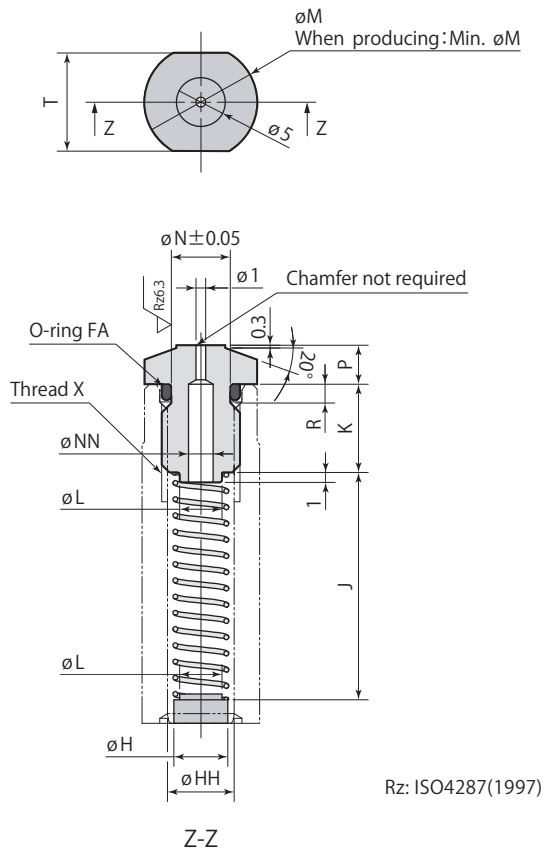


**Air sensor & air cleaning & hydraulic circuit diagram**



### Air sensor head cap details

Hardness: HRC52



Rz: ISO4287(1997)

- Workpiece contact detection is not possible merely by replacing head cap of standard work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

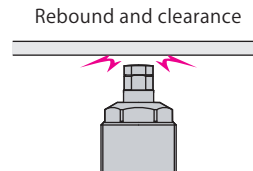
Model	mm				
	CSN00-□B	CSN01-□B	CSN03-□B	CSN04-□B	CSN06-□B
	CSY00-□B	CSY01-□B	CSY03-□B	CSY04-□B	CSY06-□B
øH	4.5	5.5		7.2	
øHH	5.1	6.8		8.5	
J	20.6	11.2	23.2	24.1	32.5
K	7.5	9		9	
øL	3.5	4.3		5	
øM	9.5	11.5		12.5	
Min. øM	8.5	10		12.5	
øN	4.5	6		7.8	
øNN	2.5	2.5		3.4	
P	3	4		4	
R	1.5	1.9		1.9	
T (width across flats)	8	10		11	
X (recommended tightening torque)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)		M10×1.5 depth 11 (30 N·m)	
O-ring FA (fluorocarbon hardness Hs70)	S5	S6		S8	



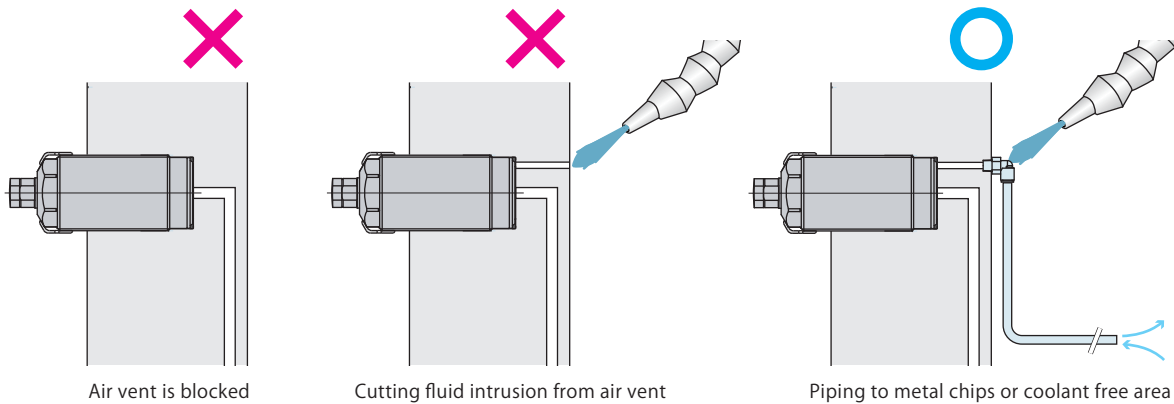
### Caution in use

- The lift spring in the plunger may push the workpiece upward if it is light weight and seating detection cannot be complete. Review the weight of workpiece or lift spring force and make it appropriate to seat the workpiece perfectly and accurate the work support.
- Set the plunger lifting time to 0.5 seconds or longer by adjusting the flow control valve with check valve (meter-in). Reasonable plunger ascending speed can prevent the parts from breakage also curbs plunger contact false. Use a flow control valve with cracking pressure of 0.05MPa or less, in order to shorten plunger descending speed. (Cracking pressure of optional flow control valve model VCF01S is 0.04 MPa.)

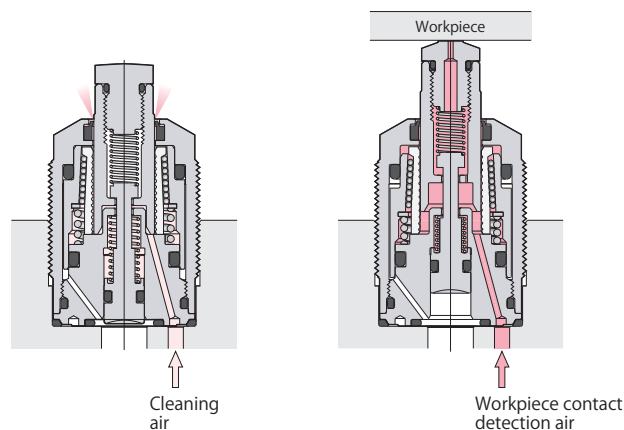
If the plunger ascends to reach a workpiece too fast, it rebounds after hitting the workpiece and will create a small clearance between the two. The clearance may cause a supporting fault of the workpiece.



- Avoid following usages. These may cause sleeve deformation that could lead to malfunction of plunger or decreased support force.
  - ✗ Applying eccentric load on plunger.
  - ✗ Applying load that exceeds rated support force.
  - ✗ Rotating plunger when locked.
- Air vent must be opened to atmosphere. Any blockage on the vent results in malfunction. Provide the piping if there is a risk of coolant or metal chips intrusion. Allowing intrusion of cutting fluid may cause rusting and other problems.

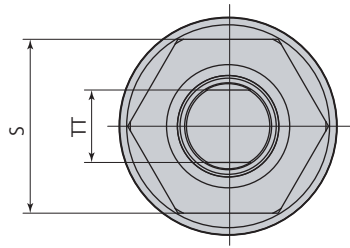


- Air (oil free) must be fed through a  $5\mu\text{m}$  filter that is connected to an air vent port for air cleaning or workpiece contact detection (air sensor). Perform air cleaning only when replacing workpiece. Plunger will rise during air cleaning.



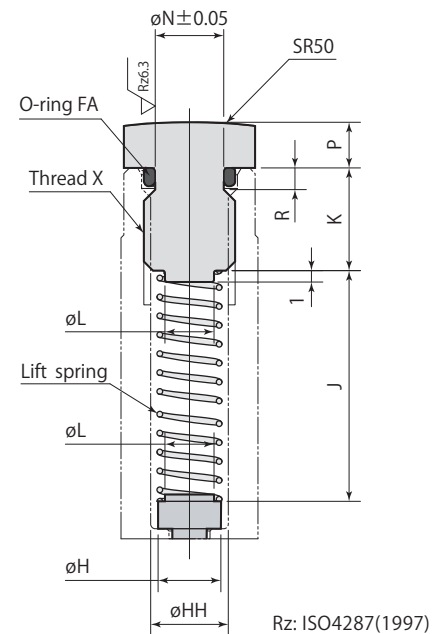
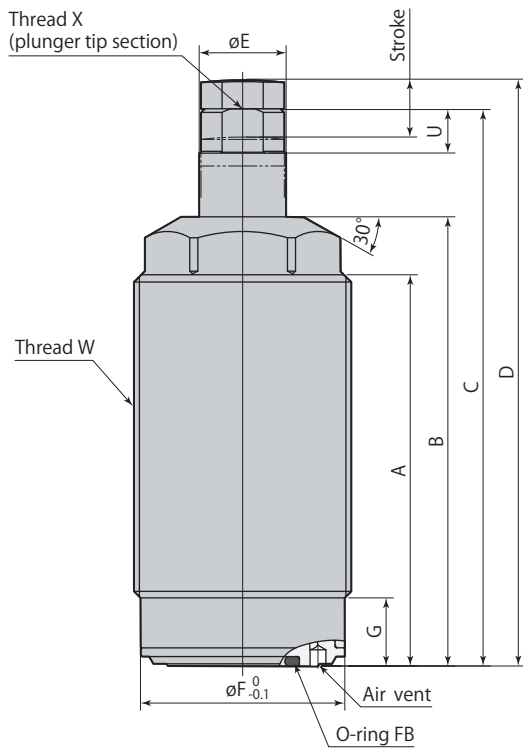
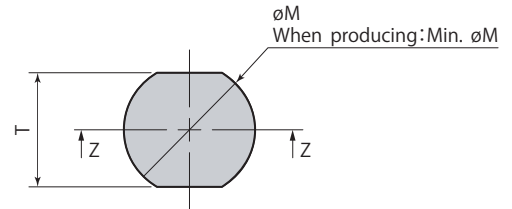


Dimensions

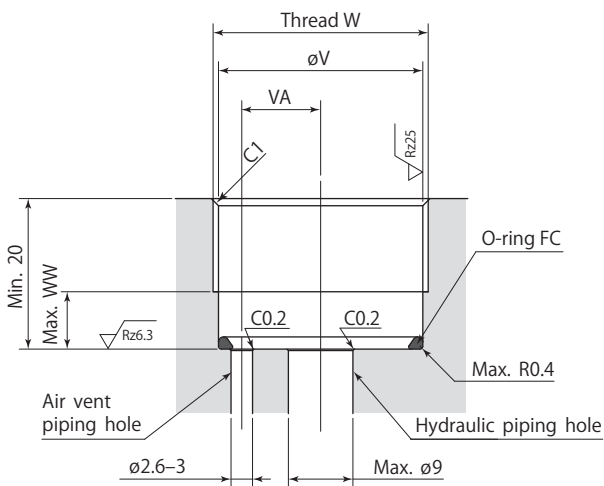


Head cap details

Hardness : HRC52



Mounting details



Rz: ISO4287(1997)

- When fixing the hexagon part of body with a vise, etc., make sure the tightening force is 2.5 kN or less.
- Always attach head cap (lift spring cannot be retained). When fabricating head cap, ensure that O-ring slot, spring spot facing and guide are made by referring to head cap details. Be sure to always use O-ring.
- When fabricating a lift spring, determine dimensions by referring to head cap details. Furthermore, rustproofing must be implemented (however, there is no guarantee for operation).
- Install O-ring FC at the bottom of the hole. The O-ring FC is packed with a work support.
- This diagram indicates a situation where head cap has been fitted into plunger with no pressure applied.

Work support

CSK Spring lift

<b>CSK</b> □-□	<b>Work support Spring lift</b>	<b>7MPa</b>
----------------	---------------------------------	-------------

Model	CSK00-□	CSK01-□	CSK03-□	CSK04-□	CSK06-□
A	49	33	54	48	60
B	57	41	62	58	71
C	69.5	54	77	73	88
D	72.5	58	81	77	92
øE	10	12	12	15	16
øF	24.3	28.2	28.2	34.2	43.2
G	8.4	9.4	9.4	9.4	9.4
øH	4.5	5.5	5.5	7.2	7.2
øHH	5.1	6.8	6.8	8.5	8.5
J	20.6	11.2	23.2	24.1	32.5
K	7.5	9	9	9	9
øL	3.5	4.3	4.3	5	5
øM	9.5	11.5	11.5	12.5	12.5
Min. øM	8.5	10	10	12.5	12.5
øN	4.5	6	6	7.8	7.8
P	3	4	4	4	4
R	1.5	1.9	1.9	1.9	1.9
S	22	24	24	30	36
T (width across flats)	8	10	10	11	11
TT (plunger width across flats)	8	10	10	13	13
U	5	6	6	6	6
øV	24.5	28.5	28.5	34.5	43.5
VA	9	11	11	13	16
W	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
WW	8	9	9	9	9
X (recommended tightening torque)	M6×1 depth 9 (10 N·m)	M8×1.25 depth 12 (20 N·m)	M8×1.25 depth 12 (20 N·m)	M10×1.5 depth 11 (30 N·m)	M10×1.5 depth 11 (30 N·m)
O-ring FA (fluorocarbon hardness Hs70)	S5	S6	S6	S8	S8
O-ring FB (fluorocarbon hardness Hs90)	AS568-013	AS568-014	AS568-014	AS568-014	AS568-015
O-ring FC (fluorocarbon hardness Hs90)	AS568-020	AS568-022	AS568-022	AS568-026	AS568-030

mm

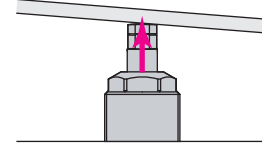
Work support

CSK  
Spring lift

Caution in use

- If the workpiece is light weight, the plunger cannot be pressed down by the weight of workpiece and seating detection cannot be complete. Review the weight of workpiece or lift spring force to make the workpiece seat perfectly, and lock the work support.

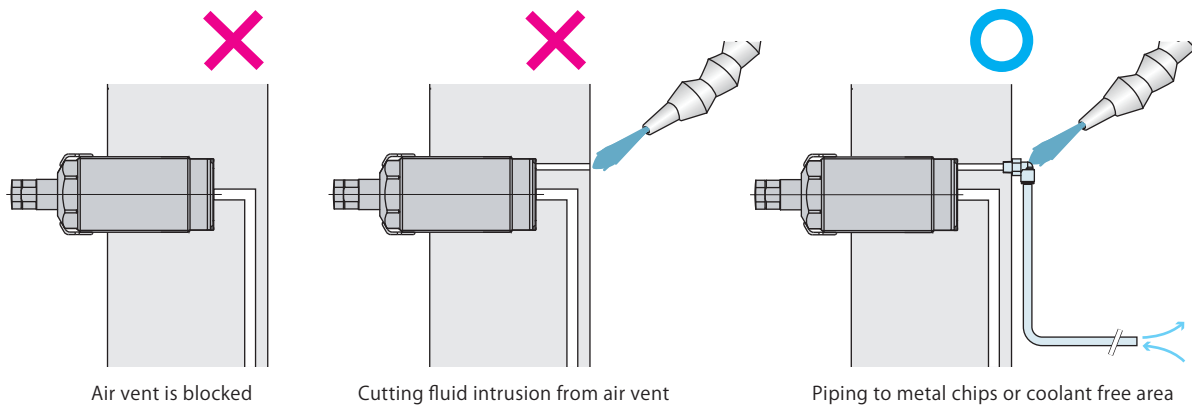
Spring pushes the workpiece



- Avoid following usages. These may cause sleeve deformation that could lead to malfunction of plunger or decreased support force.

- ✗ Applying eccentric load on plunger.
- ✗ Applying load that exceeds rated support force.
- ✗ Rotating plunger when locked.

- Air vent must be opened to atmosphere. Any blockage on the vent results in malfunction. Provide the piping if there is a risk of coolant or metal chips intrusion. Allowing intrusion of cutting fluid may cause rusting and other problems.



- Air (oil free) must be fed through a  $5\ \mu\text{m}$  filter that is connected to an air vent port for air cleaning. Perform air cleaning only when replacing workpiece.

## 7MPa Hydraulic lift (flange)

model  
**CSU**Plunger operation  
Hydraulic liftMounting  
Upper flange  
Lock mechanism  
Taper sleeve  
Air sensor  
CapableSupport force  
**5, 7, 10, 16, 25 kN**

Page →130

## 7MPa Support force enhanced (flange)

model  
**CSU-H**Plunger operation  
Hydraulic liftMounting  
Upper flange  
Lock mechanism  
Taper sleeve  
Air sensor  
IncapableSupport force  
**7, 10, 14, 23, 36 kN**

Page →130

## 7MPa Spring lift (flange)

model  
**CST**Plunger operation  
Spring liftMounting  
Upper flange  
Lock mechanism  
Taper sleeve  
Air sensor  
IncapableSupport force  
**5, 7, 10, 16, 25 kN**

Page →131

## 7MPa Hollow type

model  
**CST-C**Plunger operation  
Customers rangeMounting  
Upper flange  
Lock mechanism  
Taper sleeve  
Air sensor  
IncapableSupport force  
**4, 5.6, 8, 12.8, 20 kN**

Refer to separate materials for details.

## 7MPa Support force enhanced (thread)

model  
**CSY**Plunger operation  
Hydraulic liftMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
CapableSupport force  
**1.2, 3, 4, 5.5, 10 kN**

Page →146

## 7MPa Long stroke

model  
**CSY-S**Plunger operation  
Hydraulic liftMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
CapableSupport force  
**3, 4, 5.5, 10 kN**

Refer to separate materials for details.

## 7MPa Hydraulic lift (thread)

model  
**CSN**Plunger operation  
Hydraulic liftMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
CapableSupport force  
**1, 2.5, 3, 4, 7 kN**

Page →146

## 7MPa Double acting

model  
**CSN-D**Plunger operation  
Double actingMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
CapableSupport force  
**1, 3, 4, 7 kN**

Refer to separate materials for details.

## 7MPa Spring lift (thread)

model  
**CSK**Plunger operation  
Spring liftMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
IncapableSupport force  
**1, 2.5, 3, 4, 7 kN**

Page →147

## 7MPa Straight sleeve

model  
**CSM**Plunger operation  
Hydraulic liftMounting  
Threaded body  
Lock mechanism  
Straight sleeve  
Air sensor  
Contact usSupport force  
**2, 3, 4, 6 kN**

Refer to separate materials for details.

## Air 1MPa Air lift

model  
**CSS**Plunger operation  
Air liftMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
IncapableSupport force  
**0.8, 1.3, 1.9, 3.5, 5.0 kN**

Refer to separate materials for details.

## Air 1MPa Spring lift

model  
**CSX**Plunger operation  
Spring liftMounting  
Threaded body  
Lock mechanism  
Taper sleeve  
Air sensor  
IncapableSupport force  
**0.8, 1.3, 1.9, 3.5, 5.0 kN**

Refer to separate materials for details.

## 35MPa Hydraulic lift

model  
**CSW**Plunger operation  
Hydraulic liftMounting  
Threaded body  
Lock mechanism  
Straight sleeve  
Air sensor  
IncapableSupport force  
**7.1, 11.1, 17.8, 26.7 kN**

Refer to separate materials for details.

## 35MPa Double acting

model  
**CSW-D**Plunger operation  
Double actingMounting  
Threaded body  
Lock mechanism  
Straight sleeve  
Air sensor  
CapableSupport force  
**7.1, 11.1, 17.8, 26.7 kN**

Refer to separate materials for details.

## 35MPa Spring lift

model  
**CSV**Plunger operation  
Spring liftMounting  
Threaded body  
Lock mechanism  
Straight sleeve  
Air sensor  
IncapableSupport force  
**7.1, 11.1, 17.8, 26.7 kN**

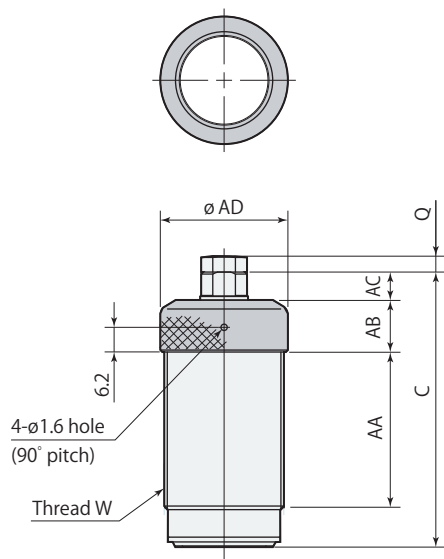
Refer to separate materials for details.

Specifications

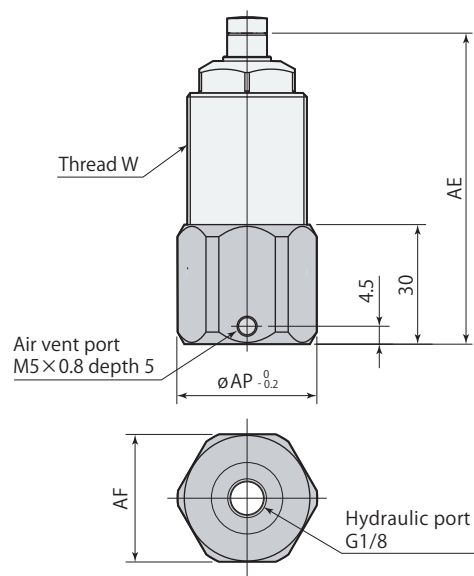
	Size		
<b>CSP</b>	<b>00</b>	: CS □ 00	—
	<b>(Nil)</b>	: CS □ 01, 03	
	<b>02</b>	: CS □ 04	
	<b>06</b>	: CS □ 06	
		<b>A</b>	: Chip cover*
		<b>C</b>	: Piping cap

\*: To be used as a protection cover for hexagonal part of upper part against accumulation of metal chips.

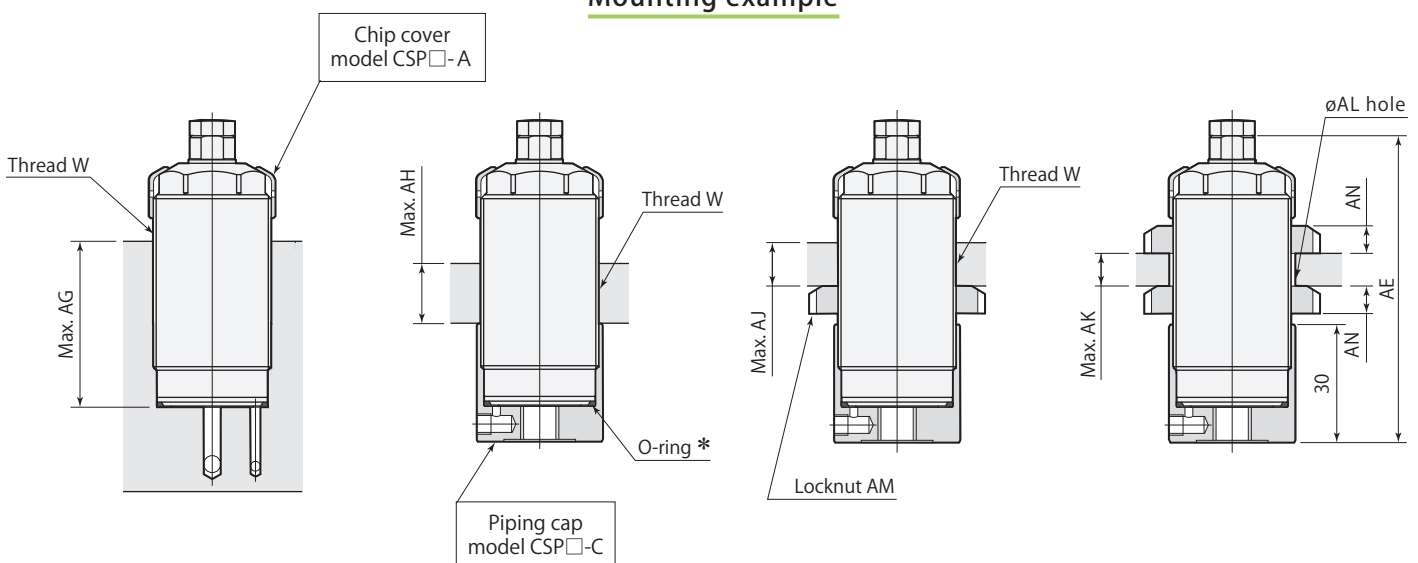
Chip cover



Piping cap



Mounting example



\*: Install O-ring in the same way even when a piping cap is used for mounting. The O-ring is included in the package of the work support.

<b>CSP</b> □-□	<b>Chip cover, Piping cap</b>	<b>Option</b>
----------------	-------------------------------	---------------

mm

Chip cover	CSP00-A	CSP-A		CSP02-A	CSP06-A
Work support	CS□00-□	CS□01-□	CS□03-□	CS□04-□	CS□06-□
C*	63	48	69	65	78
Q	3	4	4	4	4
W	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
AA	33.7	16.7	37.7	31.7	42.4
AB	13	13	13	15	16
AC	7	8	8	8	9.3
∅AD	28	32	32	38	47

\*: Stroke length to be added on C dimension when mounting on model CSK.

mm

Piping cap	CSP00-C	CSP-C		CSP02-C	CSP06-C
Work support	CS□00-□	CS□01-□	CS□03-□	CS□04-□	CS□06-□
W	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
AE*	72	57	78	74	87
AF (width across flats)	29	32	32	41	50
∅AP	32	35	35	45	54

\*: Stroke length to be added on AE dimension when mounting on model CSK.

mm

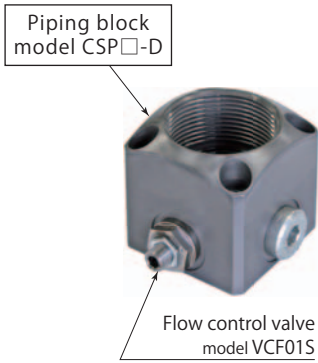
Chip cover	CSP00-A	CSP-A		CSP02-A	CSP06-A
Piping cap	CSP00-C	CSP-C		CSP02-C	CSP06-C
Work support	CS□00-□	CS□01-□	CS□03-□	CS□04-□	CS□06-□
W	M26×1.5	M30×1.5	M30×1.5	M36×1.5	M45×1.5
AE*	72	57	78	74	87
AG	48	32	53	47	58
AH	26	11	31	25	36
AJ	-	-	24	-	26
AK	-	-	17	-	16
∅AL	-	-	30.5	-	45.5
AM	-	-	AN06	-	AN09
AN	-	-	7	-	10

\*: Stroke length to be added on AE dimension when mounting on model CSK.

● The dimensions of AG, AH, AJ and AK are reduced by 6 mm when chip cover is used.

● Locknut AM is not included.



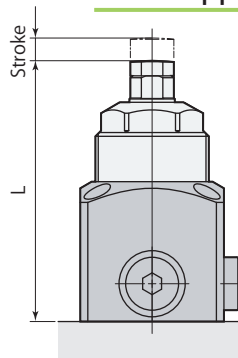
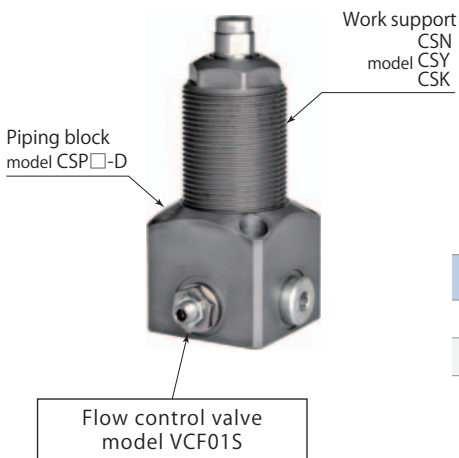


Piping block

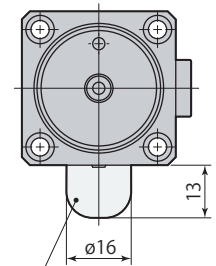
	Size		
	<b>00</b>	: CS □ 00	
	<b>(Nil)</b>	: CS □ 01, 03	
<b>CSP</b>	<b>04</b>	: CS □ 04	<b>- D</b> : Piping block
	<b>06</b>	: CS □ 06	

Plunger lifting operation time can be individually adjusted for work support model CSN & CSY, by using optional piping block model CSP-D and flow control valve model VCF01S.

Work support mounting dimensions



Flow control valve mounting dimensions



Model	CSP00-D	CSP-D	CSP04-D	CSP06-D
L*	83	69	90	99
Stroke	6.5	6	8	10
Work support models	CSN00 CSY00 CSK00	CSN01 CSY01 CSK01	CSN03 CSY03 CSK03	CSN04 CSY04 CSK04

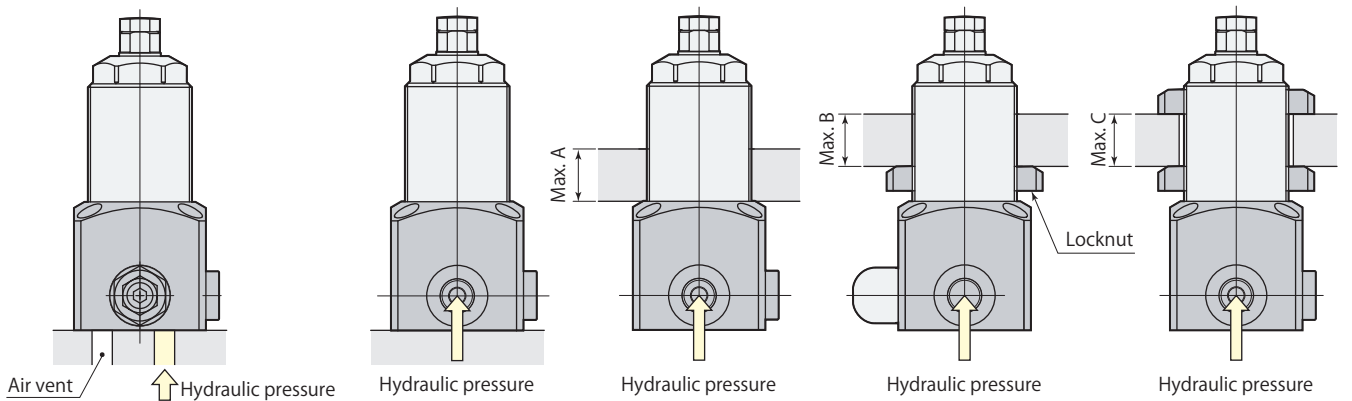
Flow control valve model VCF01S (with coolant cap)

Refer to **page →170** for details.

\* : For model CSK, stroke length shall be added on L.

Manifold piping example

G port piping mounting example

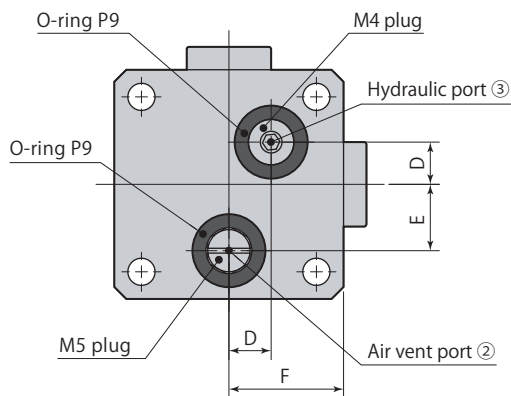
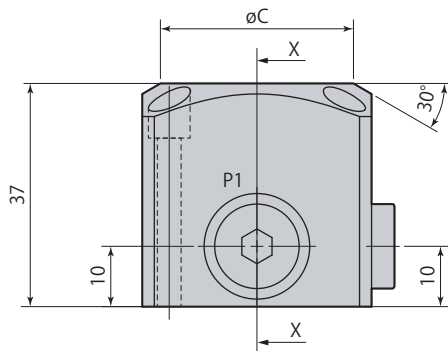
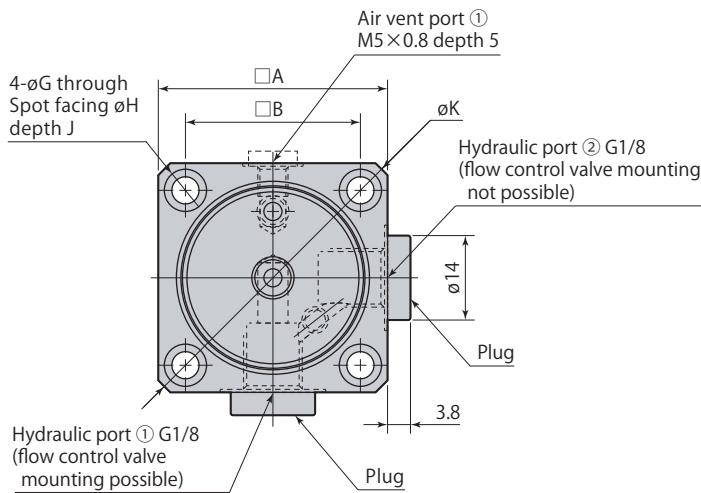


Model	CSP00-D	CSP-D	CSP04-D	CSP06-D
Max. A	27	12	32	37
Max. B	-	-	25	27
Max. C	-	-	18	17
Work support models	CSN00 CSY00 CSK00	CSN01 CSY01 CSK01	CSN03 CSY03 CSK03	CSN04 CSY04 CSK04

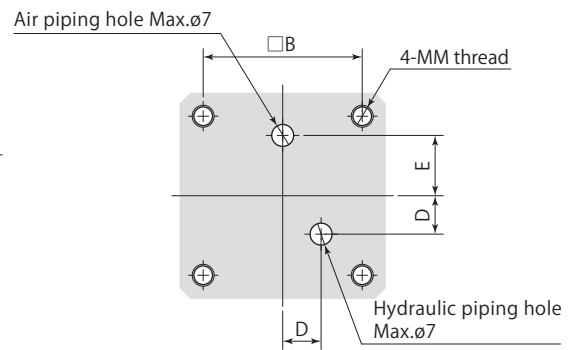
● Locknut is not included.

● Refer to **pages →152** for model CSN, **154** for model CSY, **160** for model CSK and **164, 167** for the dimensions of products that are not listed on this page.

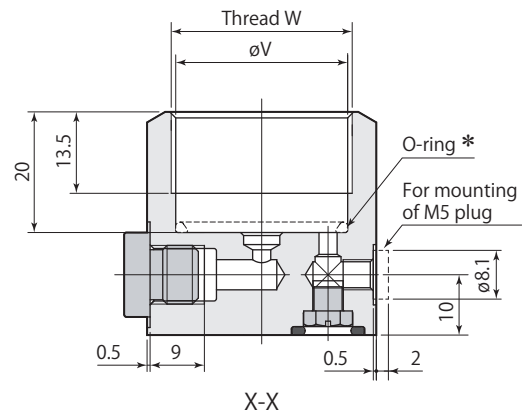
Dimensions



Mounting details



When using for manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

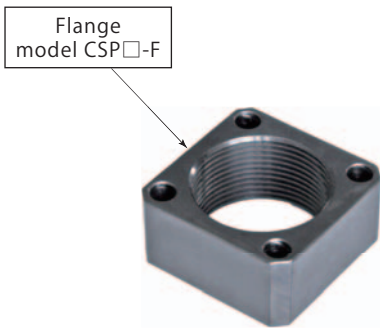


\*: Install O-ring in the same way even when a piping block is used for mounting. The O-ring is included in the package of the work support.

- Material of O-ring is fluorocarbon (with hardness Hs90).
- Mounting screws are not included.
- Provide the piping if there is a risk of coolant or metal chips intrusion from air vent.
- Remove the plug of fitting port to be used when mounting.
- In case of manifold piping, shift M5 plug from air vent port ② on the bottom face to the air vent port ① on side face.
- No flow control valve can be mounted to hydraulic port ②.

	mm			
Model	CSP00-D	CSP-D	CSP04-D	CSP06-D
A	36	38	45	55
B	27	29	34	44
øC	29	32	38	50
D	7	7	9	10
E	9	11	13	16
F	18	19	22.5	27.5
øG	4.5	4.5	5.5	5.5
øH	8	8	9	9
J	9	9	12	12
øK	48	50	60	75
MM	M4×0.7	M4×0.7	M5×0.8	M5×0.8
øV	24.5	28.5	34.5	43.5
W	M26×1.5	M30×1.5	M36×1.5	M45×1.5
Mass	0.26 kg	0.28 kg	0.38 kg	0.58 kg
Body tightening torque	35-45 N·m	40-50 N·m	45-55 N·m	55-65 N·m

Flange

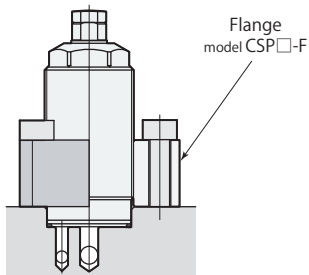


	Size	
<b>CSP</b>	<b>026</b>	: CS □ 00
	<b>030</b>	: CS □ 01, 03
	<b>036</b>	: CS □ 04
	<b>045</b>	: CS □ 06
		— <b>F</b> : Flange

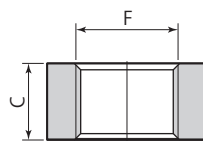
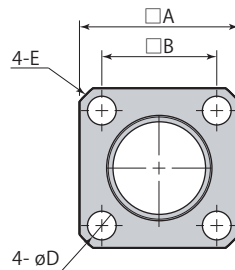
Use a mounting flange when installing with screws.



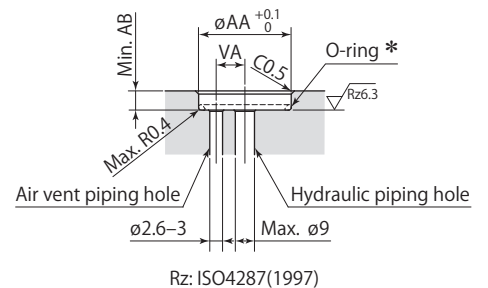
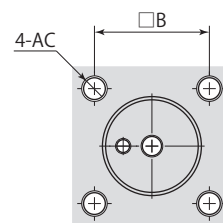
Work support model CSN, CSY, CSK mounting



Dimensions



Mounting details



- \* : Install O-ring in the same way even when a flange is used for mounting. The O-ring is included in the package of the work support.
- Mounting screws are not included.
- Refer to **pages →152** for model CSN, **154** for model CSY, **160** for model CSK for the dimensions of products that are not listed on this page.

- ① Mount a flange with screws.
- ② Screw the work support in the flange.

Model	CSP026-F	CSP030-F	CSP036-F	CSP045-F
A	35	40	50	55
B	26	31	40	42
C	17	16	16	18
∅D	5.5	5.5	6.8	9
E	C3	C3	C3	C4
F	M26×1.5	M30×1.5	M36×1.5	M45×1.5
∅AA	24.5	28.5	34.5	43.5
AB	3	3	3	3
AC	M5	M5	M6	M8
VA	9	11	13	16
Mass	0.09 kg	0.11 kg	0.18 kg	0.18 kg

mm



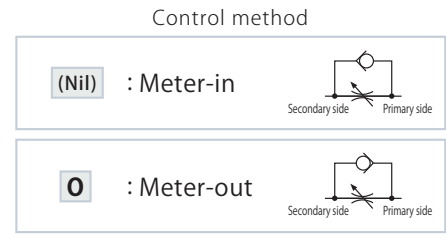
<b>VCF</b> □-□	<b>Flow control valve</b>	<b>Option</b>
----------------	---------------------------	---------------

### Specifications



G port size

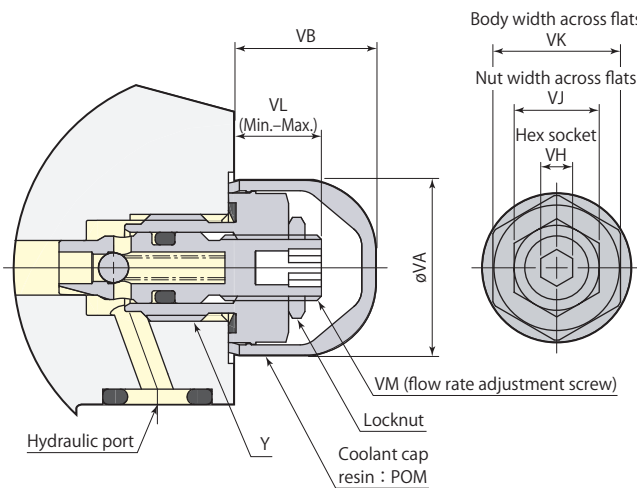
<b>01S</b>	: G1/8
<b>01</b>	: G1/8
<b>02</b>	: G1/4
<b>03</b>	: G3/8



Model	Meter-in				Meter-out				
	VCF01S	VCF01	VCF02	VCF03	VCF01S-O	VCF01-O	VCF02-O	VCF03-O	
G port size	G1/8	G1/8	G1/4	G3/8	G1/8	G1/8	G1/4	G3/8	
Cracking pressure	MPa	0.04	0.04	0.04	0.04	0.1	0.1	0.1	0.1
Orifice area	mm <sup>2</sup>	4.9	4.9	9.6	19.6	3.1	3.1	6.2	12.6
Recommended tightening torque	N·m	10	10	30	35	10	10	30	35
Mass	kg	0.011	0.013	0.024	0.038	0.011	0.013	0.024	0.038

- Pressure range : 0.5–7 MPa
- Proof pressure : 10.5 MPa
- Operating temperature : 0–70 °C
- Fluid used : General mineral based hydraulic oil (ISO-VG32 equivalent)

### Dimensions



Model	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
Y	G1/8	G1/8	G1/4	G3/8
øVA	16	16	21	24
VB	13	13	13	14
VH	3	3	5	6
VJ	8	8	10	14
VK	12	12	17	19
VL	8–11	7–11	7.5–11.5	8.5–12.5
Adjustment screw number of turns	4 rotations	5.3 rotations	5.3 rotations	5.3 rotations
VM	M6×0.75	M6×0.75	M8×0.75	M10×0.75

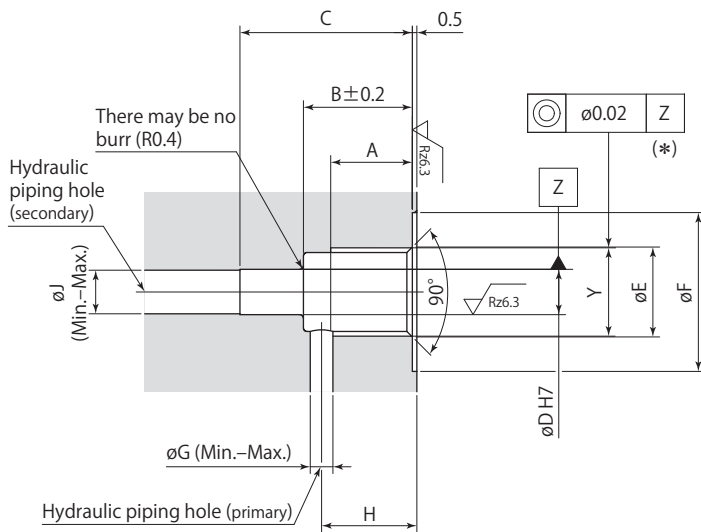
- Use a closed wrench or socket wrench for mounting and dismounting.
- Flow control valve can be mounted on hydraulic port (G port) when manifold piping.
- Adjust flow rate without hydraulic pressure. Conducting adjustments with hydraulic pressure may result in damaging seal.
- Diagram above indicates mounting for meter-in (VCF□).
- VCF is shipped with the valve fully open. Adjust the flow rate by loosening the screws after it is screwed in to close totally. Tighten the locknut after adjustment is completed.

### Applicable clamp and work support

Model	VCF01S	VCF01	VCF02	VCF03
Swing clamp (double acting)	CTM03, 04, 05, 06 CTP04, 05, 06	CTM10 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)*	CTN02, 04, 05, 06	CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)*	CTS04	CTS06	CTS10, 16	–
Link clamp (double acting)	CLM03, 04 CLP04, 05, 06	CLM05, 06, 10 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)*	CLN04	CLN05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01	CNB02, 04	–	–
Push, pull cylinder	–	CNA02, 04, 06	CNA10, 16	CNA25
Work support*	CSU CSP-D(CSN, CSY)	–	–	–

\* : Single acting swing clamp, swivel clamp, single acting link clamp and work support are meter-in only.

Mounting details



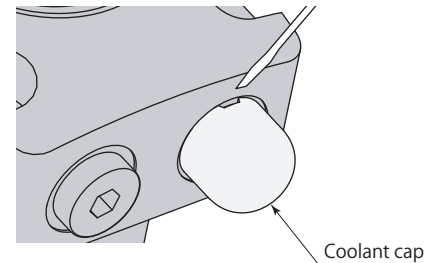
Rz: ISO4287(1997)

Model	mm			
	VCF01S VCF01S-O	VCF01 VCF01-O	VCF02 VCF02-O	VCF03 VCF03-O
A	9	9	13	13
B	11	13	18	19
C	15.5	17.5	22.5	23.5
øD	5 <sup>+0.012</sup> <sub>0</sub>	5 <sup>+0.012</sup> <sub>0</sub>	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>
øE	9.9	9.9	13.3	16.8
øF	17.5	17.5	21.5	24.5
øG	1.5-2	2.5-3	3.5-5	5-6
H	9-10	9.5-11.5	14.5-15.5	15-16
øJ	2.5-5	2.5-5	3.5-6	5-8
Y	G1/8	G1/8	G1/4	G3/8

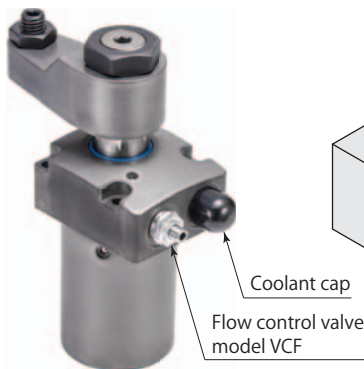
\*:Concentricity is required when machining øD and Y-portion thread. Misalignment or machining defect may cause the trouble of installation and adjusting flow rate.

Mounting & dismounting of flow control valve, air bleeding valve

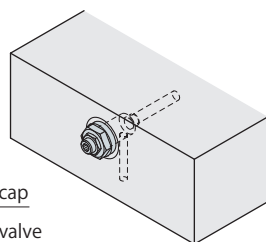
- When mounting or dismounting a flow control valve or air bleeding valve, be sure to set pressure within hydraulic circuit to 0 MPa before starting.
- When mounting a flow control valve or air bleeding valve, be sure to tighten it with the recommended tightening torque.
- When mounting a coolant cap (resin:POM), firmly press the body of cover. If it is not mounting properly, use a plastic mallet to tap it into place.
- When dismounting a coolant cap, use a sharp-pointed tool such as a precision screw driver by hooking the notched portion.



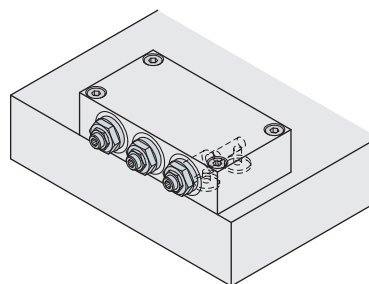
Mounting example



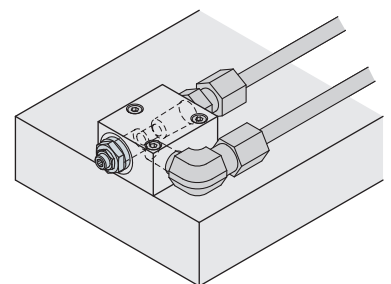
Cylinder mounting



Pallet mounting



Block mounting ①



Block mounting ②

### Specifications



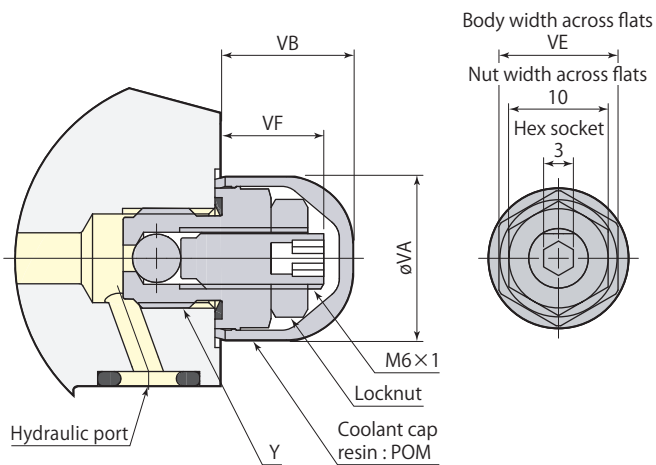
G port size

**01** : G1/8**VCE 02** : G1/4**03** : G3/8

Model	VCE01	VCE02	VCE03
G port size	G1/8	G1/4	G3/8
Recommended tightening torque N·m	10	30	35
Mass kg	0.017	0.029	0.044
Pressure range MPa	0–50		
Operating temperature °C	0–70		
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)		

### Dimensions

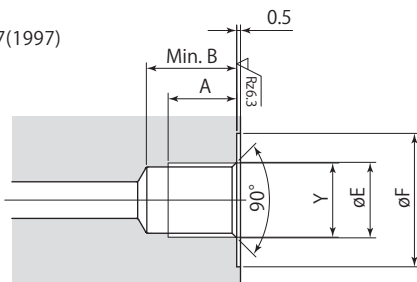
mm



Model	VCE01	VCE02	VCE03
A	9	13	13
B	10	14	14
øE	9.9	13.3	16.8
øF	17.5	21.5	24.5
Y	G1/8	G1/4	G3/8
øVA	16	21	24
VB	13	13	14
VE	12	17	19
VF	10.5	10.5	11.5

### Mounting details

Rz: ISO4287(1997)



- Use a closed wrench or socket wrench for mounting and dismounting.
- Air bleeding valve can be mounted on hydraulic port (G port) when manifold piping.

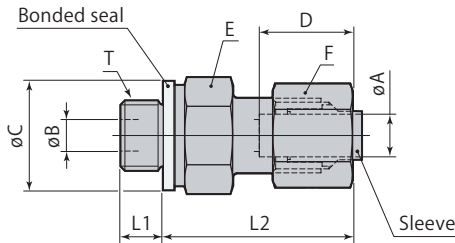
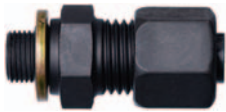
### Applicable clamp and work support

Model	VCE01	VCE02	VCE03
Swing clamp (double acting)	CTM03, 04, 05, 06, 10 CTP04, 05, 06 CTU01, 02, 04, 06	CTM16 CTU10, 16	CTU25
Swing clamp (single acting)	CTN02, 04, 05, 06 CTT01, 02, 04, 06	CTN10, 16 CTT10, 16	CTT25
Swivel clamp (double acting)	CTS04, 06	CTS10, 16	–
Link clamp (double acting)	CLM03, 04, 05, 06, 10 CLP04, 05, 06 CLU02, 04, 06	CLM16 CLU10, 16	CLU25
Link clamp (single acting)	CLN04, 05, 06 CLT02, 04, 06	CLN10, 16 CLT10, 16	CLT25
Work lift cylinder	CNB01, 02, 04	–	–
Push, pull cylinder	CNA02, 04, 06	CNA10, 16	CNA25
Work support	CSU CST CSP-D(CSN, CSY, CSK)	–	–





Parallel thread connector

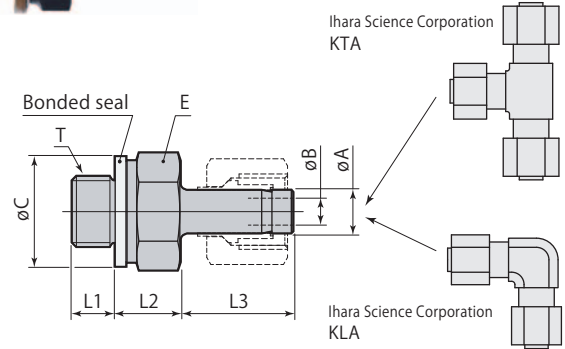


Model	Applicable pipe outer diameter $\phi A$	T	$\phi B$	$\phi C$	D	Width across flats		L1	L2
						E	F		
8FKCO06010	6	G1/8	4	17	17.5	14	14	6	32.5
8FKCO08010	8		4	17	17.5	17	17	6	32.5
8FKCO08020	8	G1/4	6	20.5	17.5	19	17	10	33.5
8FKCO10020	10		6	20.5	18.5	19	19	10	34.5
8FKCO10030	10	G3/8	8	24	18.5	22	19	10	35.5
8FKCO12030	12		8	24	18.5	22	22	10	35.5

Parallel thread adaptor

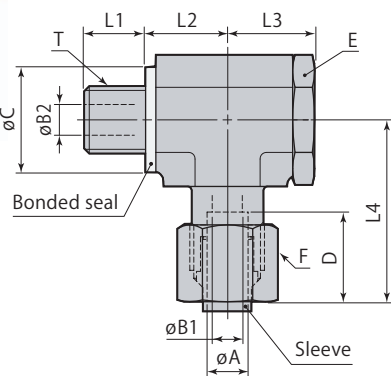


Use NE bite type tube fitting from Ihara Science Corporation on opposite side.



Model	Applicable pipe outer diameter $\phi A$	T	$\phi B$	$\phi C$	Width across flats E	L1	L2	L3
8FKHB08020	8	G1/4	5	20.5	19	10	10	21
8FKHB10020	10		6	20.5	19	10	10	22
8FKHB10030	10	G3/8	6	24	22	10	11	22
8FKHB12030	12		8	24	22	10	11.5	22.5

Stud elbow

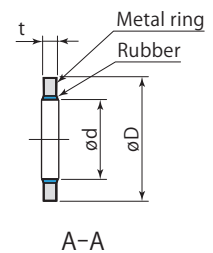
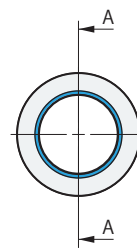


Model	Applicable pipe outer diameter $\phi A$	T	$\phi B1$	$\phi B2$	$\phi C$	D	Width across flats		L1	L2	L3	L4
							E	F				
8FKMB06010	6	G1/8	4	4	17	17.5	17	14	8	13	14	33.5
8FKMB08020	8	G1/4	6	7	20.5	17.5	22	17	12	16	17	35.5
8FKMB10020	10		8	7	20.5	18.5	22	19	12	16	17	36.5
8FKMB12030	12	G3/8	10	9	24	18.5	27	22	12	19	22	40.5

Bonded seal (spare parts)



Standard material is NBR for rubber and SPCC (cold roll steel) for metal ring. A bonded seal is usually supplied with a fitting however Pascal sells it alone as a service part.

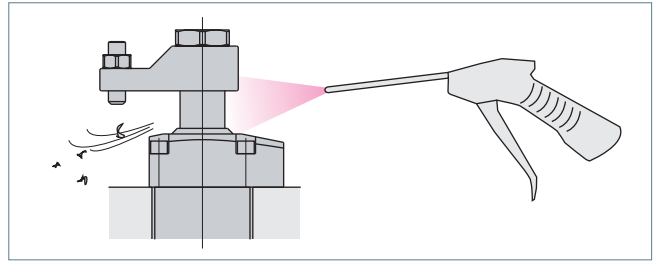


Model	Applicable thread	$\phi d$	$\phi D$	t
8FKP-C-010	G1/8	9.9	17	2
8FKP-C-020	G1/4	13.3	20.5	2
8FKP-C-030	G3/8	16.8	24	2

- Use a bonded seal to seal flange surface where a fitting will be fitted (do not use O-ring type G thread fitting).
- Use the sleeve KKO from Ihara Science Corporation for the sleeve of fitting.

## Caution in use of equipment

1. Clamp and work supports have been developed for the purpose of clamping workpiece for machine tools.  
Do not use them for other purposes.
2. Always protect them with a cover to ensure sliding surfaces are not exposed to weld slags when using them as jig for welding.
3. Clean sliding surfaces and top part of clamp body with air blowing periodically to ensure smooth operations.



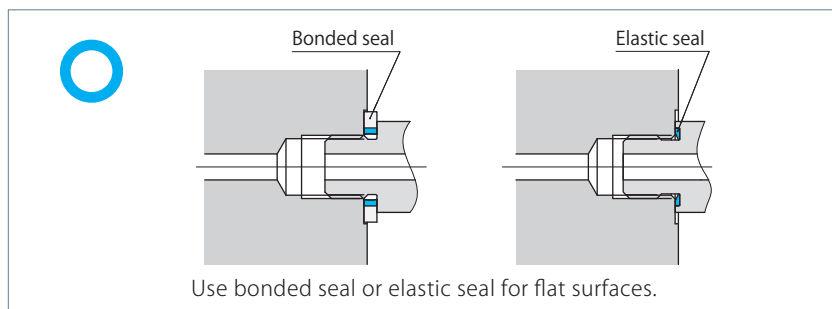
## Caution for hydraulic piping

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. After performing hydraulic piping, always be sure to bleed out air in the hydraulic circuit. Insufficient bleeding can lead to malfunction.
3. When using multiple clamps, operating speeds and timings vary due to variance in pipe resistance and internal resistance of clamps. Adjust operating speeds and timings using flow control valve.

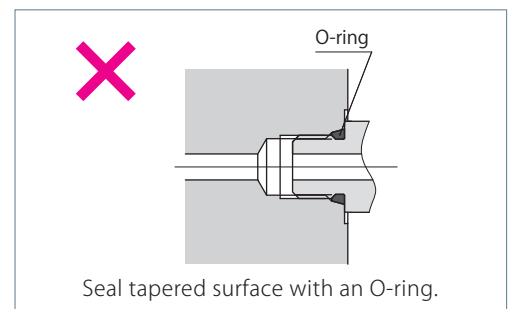
## G port sealing method

1. "Sealing method for flange surfaces" has been adopted as standard means for this product. Use fittings and connectors of bonded seal or elastic body seal. Do not use fittings of "Sealing method for tapered surfaces" (O-ring seal method).
2. Seal tapes and liquid packing are not necessary. Seal fittings are included with packing.
3. When mounting, clean metal chips and dust off surfaces that will come into contact with packing.

### Sealing method for flange surfaces



### Sealing method for tapered surfaces



### G port details

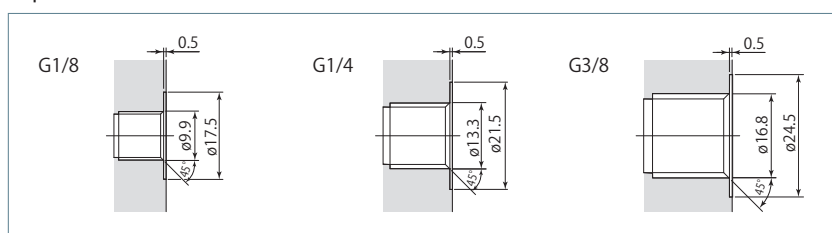


Table of contents

Structure, Explanation of operation .....	178
Features .....	180
Specifications .....	182
Hydraulic and pneumatic circuit diagram, Mounting example .....	183
CEK Dimensions .....	184
Mounting details .....	186

# Work positioning cylinder

Double acting 7 MPa

model **CEK**



X & Y axes positioning model CEK-A



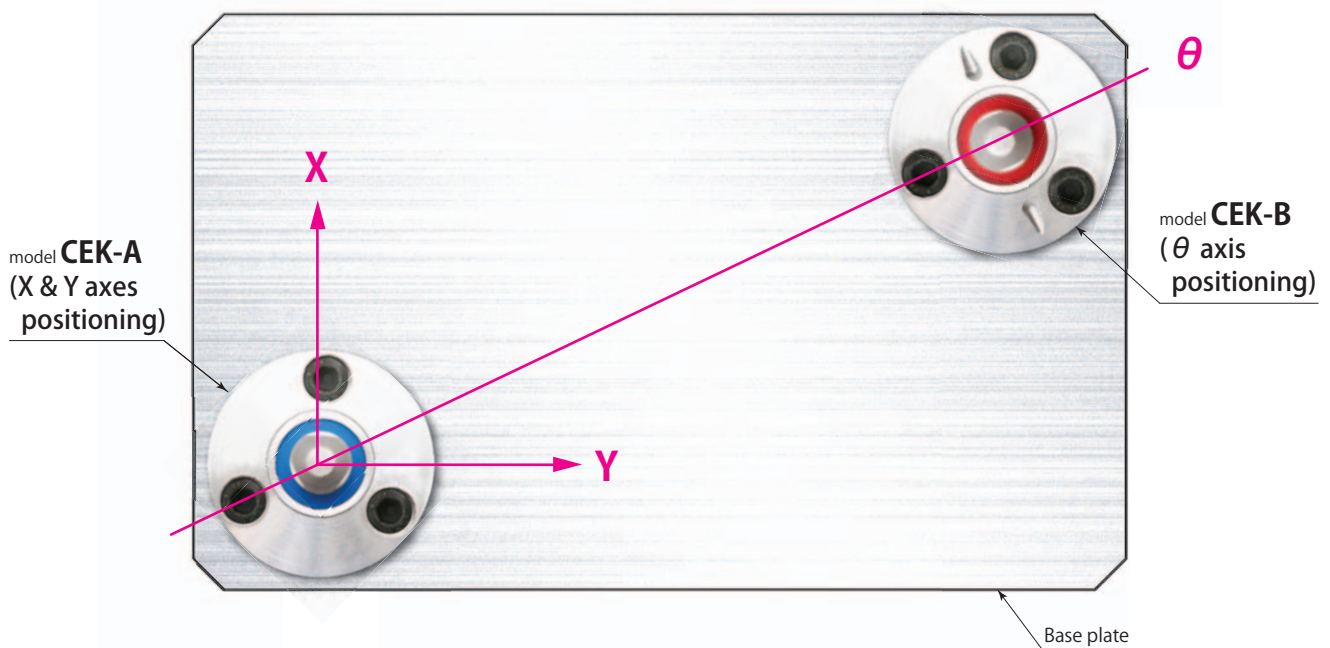
$\theta$  axis positioning model CEK-B

## X &amp; Y axes positioning

model **CEK-A** □ JP PAT. $\theta$  axis positioningmodel **CEK-B** □ JP PAT.

Enables high accuracy positioning of the workpiece  
and maintains machining accuracy under between operations.

Repeatability: within 5  $\mu$  m

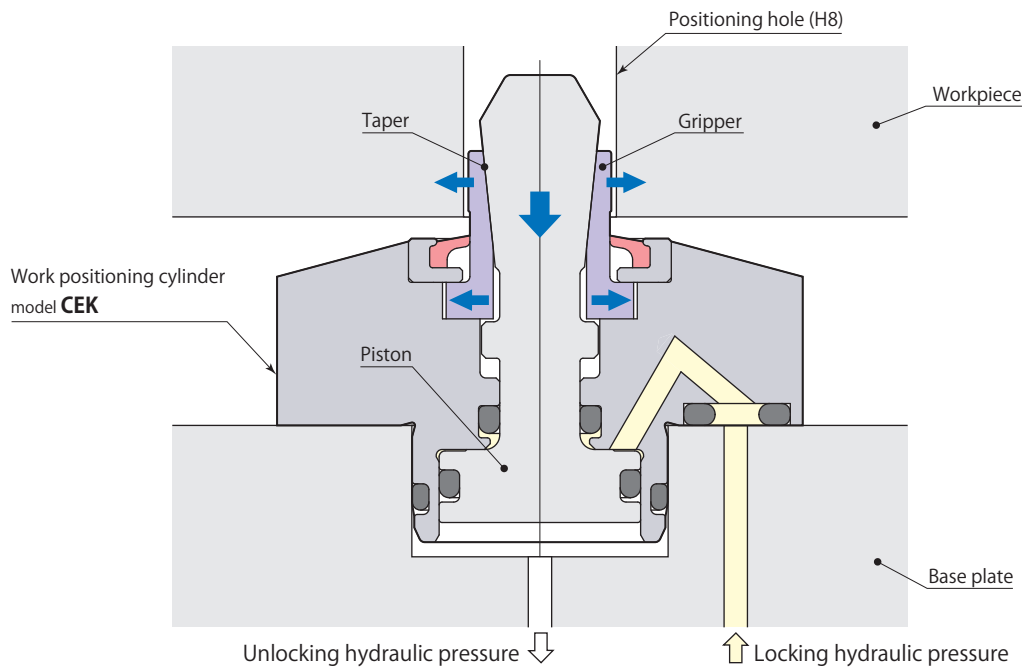


XY axes and  $\theta$  axis constraint allow high accuracy positioning.

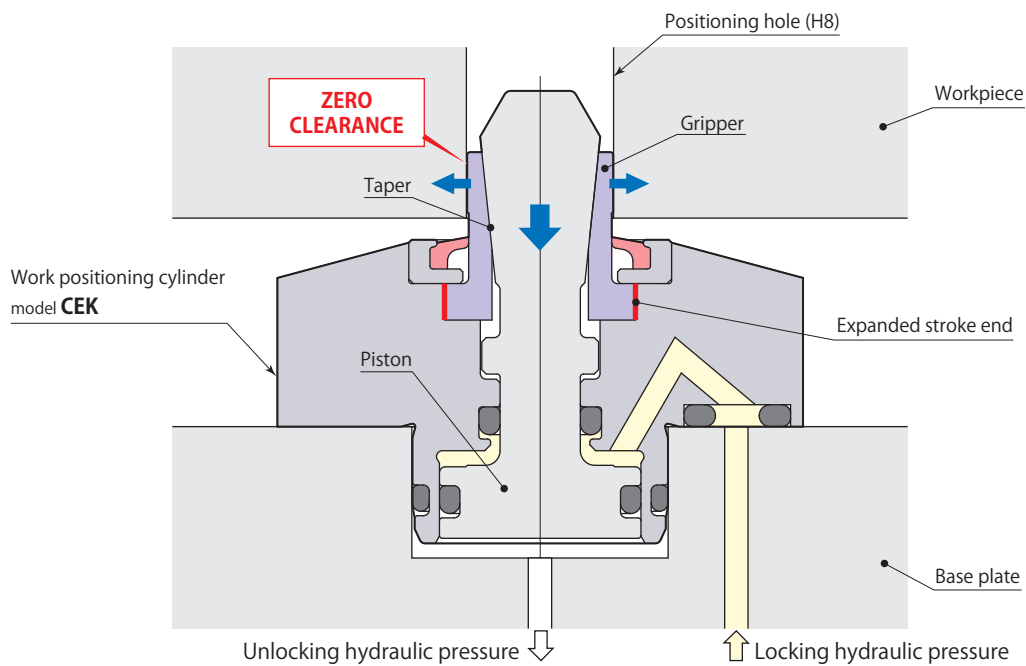
Specifications page → 182

Dimensions page → 184

Mounting details page → 186

Gripper expansion

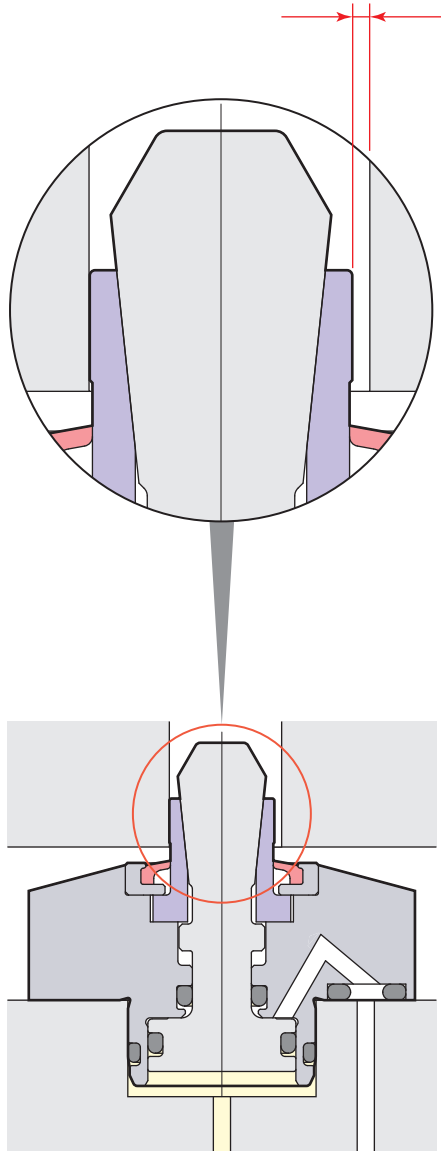
A piston lowers by locking hydraulic pressure then a gripper expands horizontally along the taper face of the piston.

Workpiece positioning

The gripper deforms elastically in radial direction when it comes to the stroke end and the clearance between hole and the gripper is infilled by the deformation, which ensures accurate positioning.

Enables workpiece change smooth**Clearance : 0.2mm**

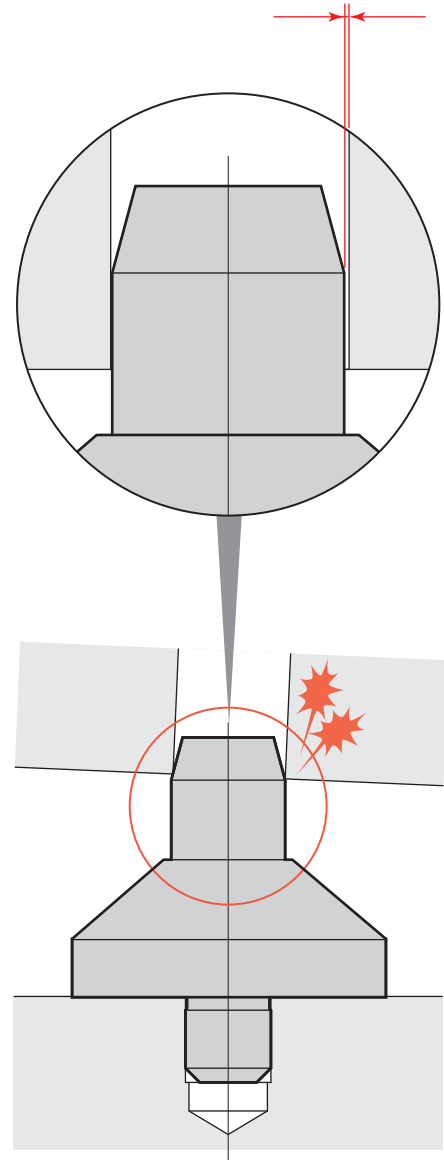
Enough clearance to make the change quick and easy

**Work positioning cylinder**

Model CEK has long expansion stroke to make an enough clearance (0.2mm) to change the workpiece easily and quickly.

**Clearance : 0.01–0.03mm**

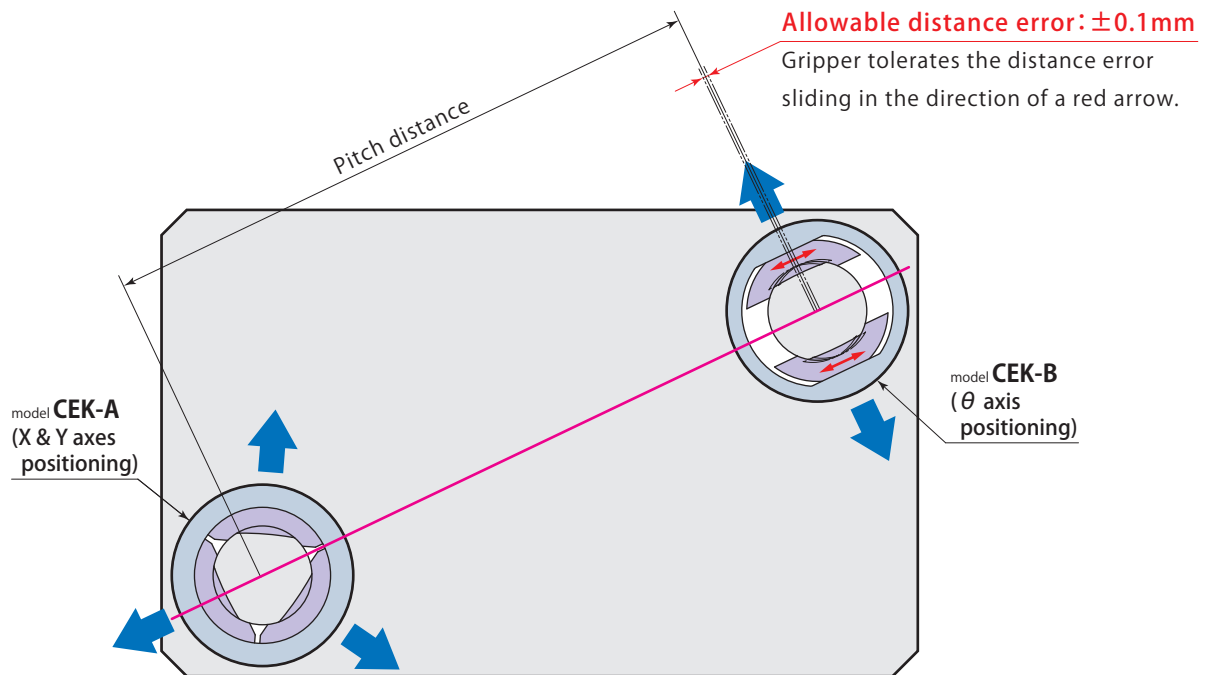
Difficult to change due to very small clearance

**Positioning pin**

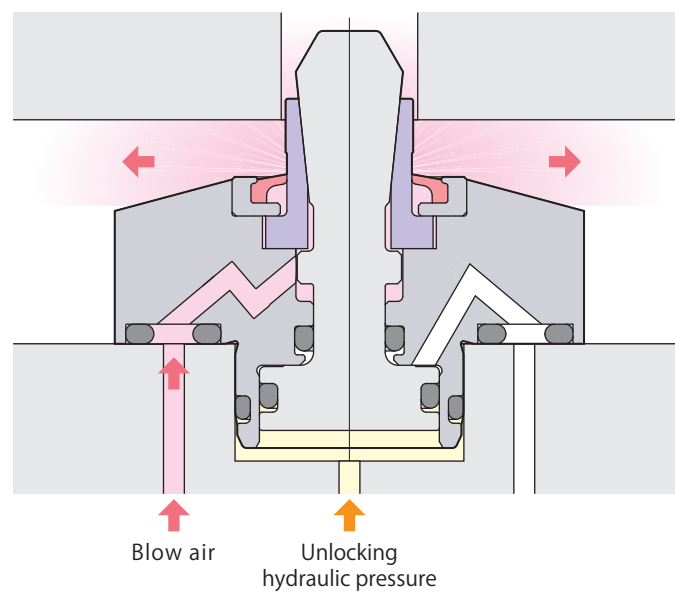
A positioning pin requires very small clearance to achieve accurate positioning, which makes it difficult to engage or disengage the pin.

Do not have an impact on gripper and piston since it employs many parts and has less strength than positioning pin.

### Positioning hole pitch error can be tolerated



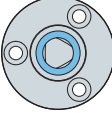
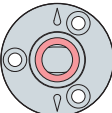
### Incorporating strong air blow circuit



Air blows out from the gap between rod, gripper and scraper to protect the positioning hole from the intrusion of chips and coolant.



## Specifications

Type	Size	Positioning hole diameter				
<b>A</b> : X & Y axes positioning 	01	08	09	10	11	12
	02	13	14	15	16	
<b>B</b> : $\theta$ axis positioning 	03	17	18	19	20	

Model		CEK-A01- <small>Positioning hole diameter</small>	CEK-A02- <small>Positioning hole diameter</small>	CEK-A03- <small>Positioning hole diameter</small>	
		CEK-B01- <small>Positioning hole diameter</small>	CEK-B02- <small>Positioning hole diameter</small>	CEK-B03- <small>Positioning hole diameter</small>	
Positioning hole diameter	mm	8-12	13-16	17-20	
Radial expansion force	Hydraulic pressure 2.5MPa	kN	1.21	1.78	2.52
	Hydraulic pressure 5MPa	kN	2.43	3.56	5.03
	Hydraulic pressure 7MPa	kN	3.40	4.99	7.05
Full stroke	mm	1.35	1.35	1.4	
Cylinder capacity	Lock	cm <sup>3</sup>	0.17	0.25	0.37
	Unlock	cm <sup>3</sup>	0.20	0.32	0.47
Allowable distance error*1	mm	±0.1			
Repeatability	μm	5			
Recommended air blow pressure	MPa	0.3-0.4			
Mass	kg	0.10	0.14	0.21	
Recommended tightening torque of mounting screws*2	N·m	3.6	3.6	7.2	

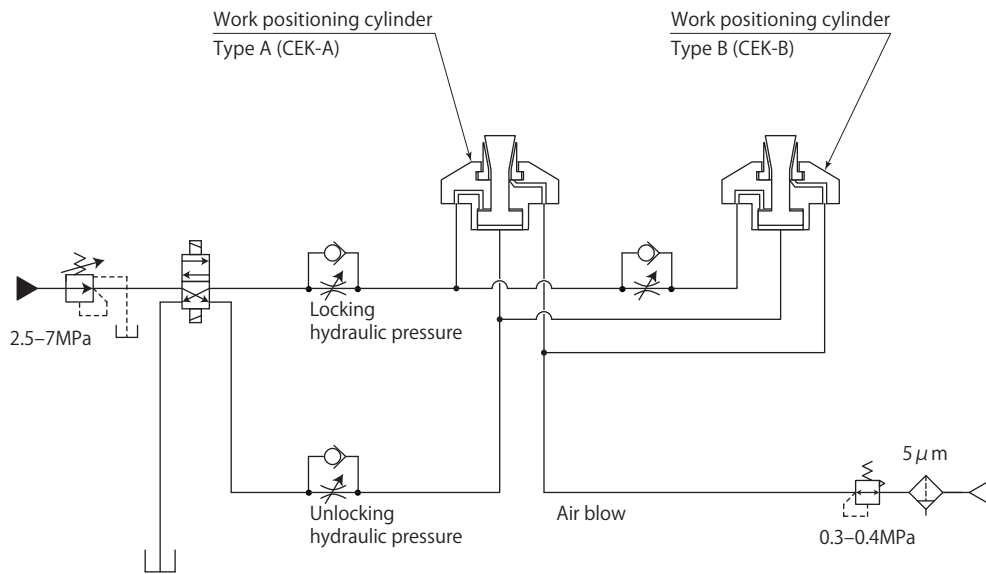
● Pressure range: 2.5-7 MPa    ● Proof pressure: 10.5 MPa    ● Operating temperature: 0-70 °C

● Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)

\*1: This is value when CEK-A and CEK-B are used in combination. The value is achievable only when CEK-A and CEK-B are used together.

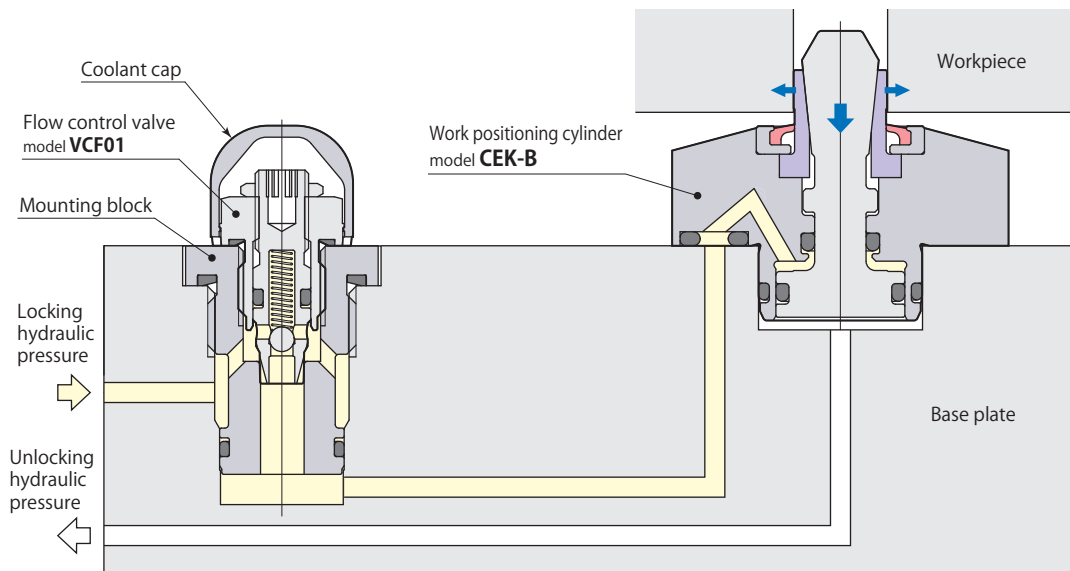
\*2: ISO R898 class 12.9

### Hydraulic and pneumatic circuit diagram



For stable positioning accuracy, the circuit should be built to have Type A actuate first.

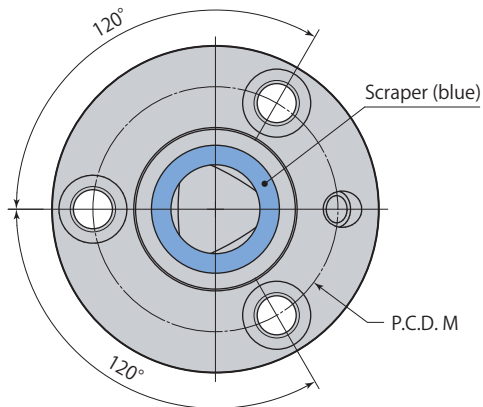
### Flow control valve mounting example



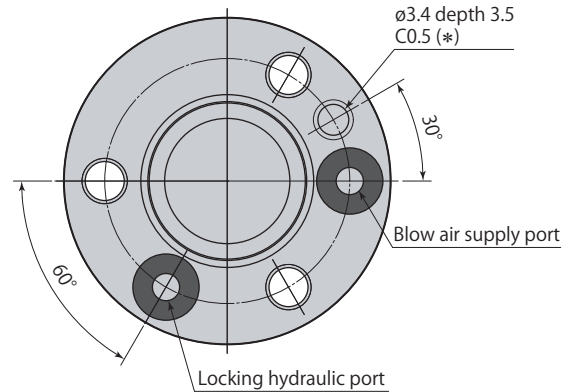
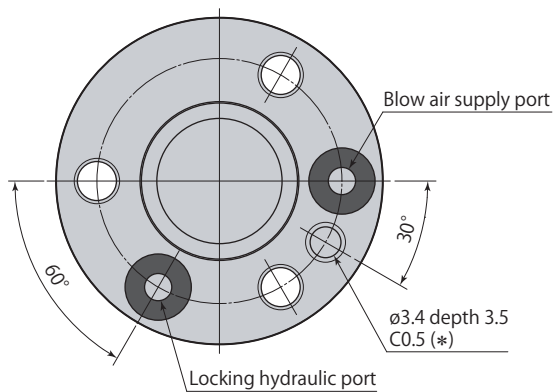
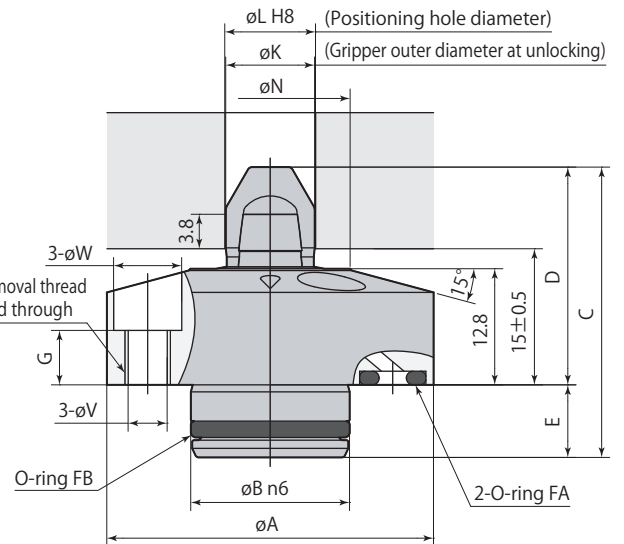
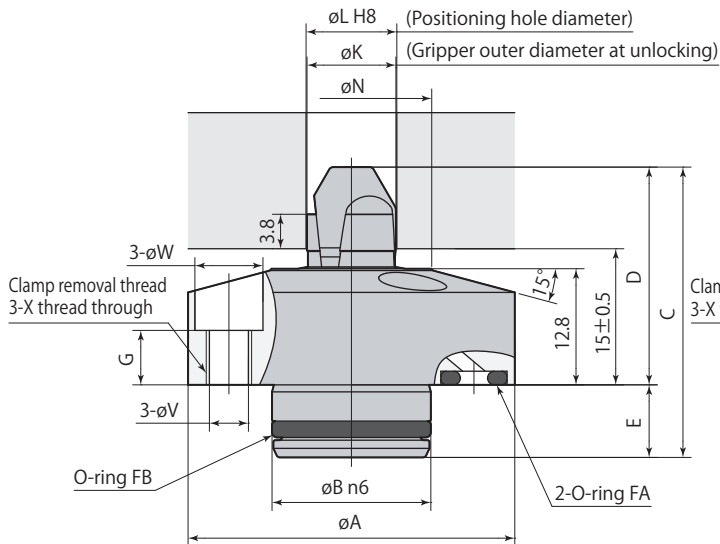
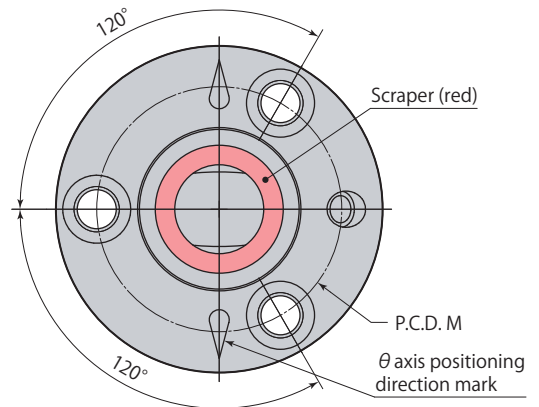
Refer to **page →170** for details on flow control valve model VCF.

Dimensions

CEK-A



CEK-B



\* : Positioning pin is used to prevent positioning mistake (recommended positioning pin : Spring pin ø3×8).

Work positioning cylinder

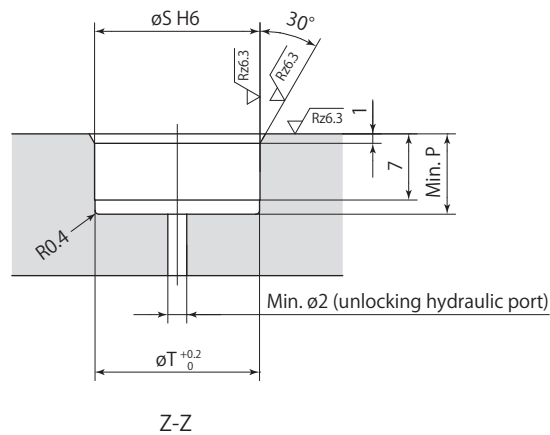
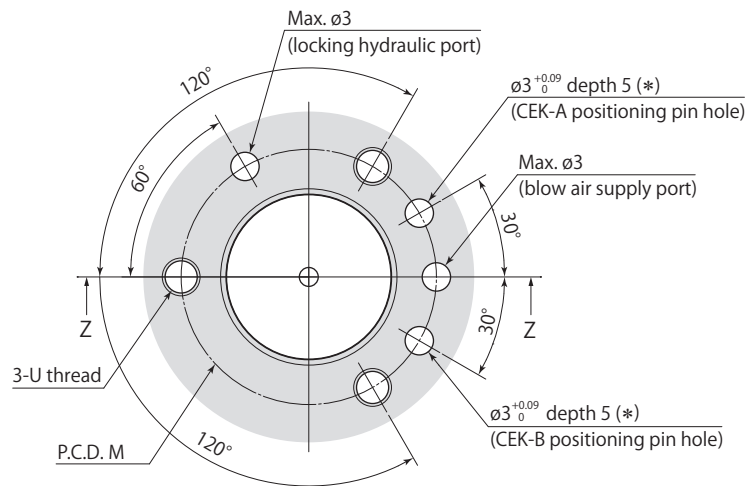
CEK

mm

Model	CEK-A01- <small>Positioning hole diameter</small>					CEK-A02- <small>Positioning hole diameter</small>				CEK-A03- <small>Positioning hole diameter</small>			
	CEK-B01- <small>Positioning hole diameter</small>					CEK-B02- <small>Positioning hole diameter</small>				CEK-B03- <small>Positioning hole diameter</small>			
Positioning hole diameter	8	9	10	11	12	13	14	15	16	17	18	19	20
øA	36					40				47			
øB	17.5 <sup>+0.023</sup> / <sub>+0.012</sub>					21 <sup>+0.028</sup> / <sub>+0.015</sub>				26 <sup>+0.028</sup> / <sub>+0.015</sub>			
C	32					35				38			
D	24					25				26			
E	8					10				12			
G	6					6				5			
øK	7.8	8.8	9.8	10.8	11.8	12.8	13.8	14.8	15.8	16.8	17.8	18.8	19.8
øL	8 <sup>+0.022</sup> / <sub>0</sub>	9 <sup>+0.022</sup> / <sub>0</sub>	10 <sup>+0.022</sup> / <sub>0</sub>	11 <sup>+0.027</sup> / <sub>0</sub>	12 <sup>+0.027</sup> / <sub>0</sub>	13 <sup>+0.027</sup> / <sub>0</sub>	14 <sup>+0.027</sup> / <sub>0</sub>	15 <sup>+0.027</sup> / <sub>0</sub>	16 <sup>+0.027</sup> / <sub>0</sub>	17 <sup>+0.027</sup> / <sub>0</sub>	18 <sup>+0.027</sup> / <sub>0</sub>	19 <sup>+0.033</sup> / <sub>0</sub>	20 <sup>+0.033</sup> / <sub>0</sub>
M	27					31				36			
øN	18					22				25.6			
øV	4.3					4.3				5.5			
øW	7.5					7.5				9			
X	M5×0.8					M5×0.8				M6×1			
O-ring FA (fluorocarbon hardness Hs90)	P4					P4				P4			
O-ring FB (fluorocarbon hardness Hs90)	S15					S18				AS568-020			

- The diagram indicates unlocked condition.
- Mounting screws, positioning pin are not included.
- Use øA for positioning measurement after mounting.

### Mounting details



Rz: ISO4287(1997)

\* : Positioning pin is used to prevent positioning mistake (recommended positioning pin : Spring pin  $\varnothing 3 \times 8$ ).

mm

Model	CEK-A01 - Positioning hole diameter	CEK-A02 - Positioning hole diameter	CEK-A03 - Positioning hole diameter
	CEK-B01 - Positioning hole diameter	CEK-B02 - Positioning hole diameter	CEK-B03 - Positioning hole diameter
M	27	31	36
P	8.5	10.5	12.5
$\varnothing S$	$17.5^{+0.011}_0$	$21^{+0.013}_0$	$26^{+0.013}_0$
$\varnothing T$	17.3	20.8	25.8
U	M4	M4	M5



Table of contents

Specifications .....	190
Structure, Explanation of operation .....	191
CEA Dimensions, Mounting details .....	192

# air Work sensor

model **CEA**



model CEA08-5

model CEA08-35



### Specifications

Size                      Stroke

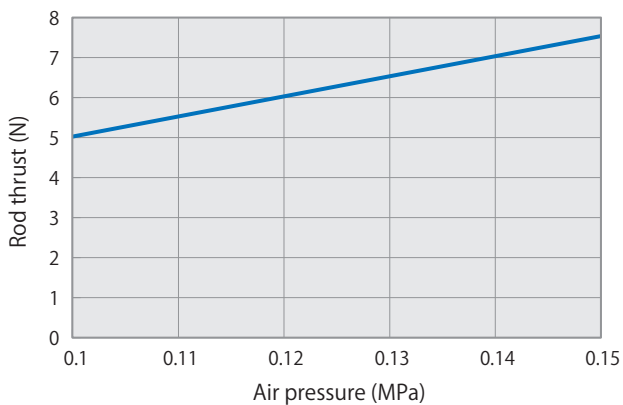
CEA **08** - **5**  
**35**

Model		CEA08-5	CEA08-35
Stroke	mm	5	35
Rod diameter	mm	8	
Air pressure range	MPa	0.10–0.15	
Recommended sensor model		ISA3-G series manufactured by SMC GPS2-05, GPS3-E series manufactured by CKD	
Operating temperature	°C	0–70	
Mass	g	45	65
Recommended tightening torque of mounting screws*1	N·m	3.6	

● Fluid used: Air\*2    ● Oil supply: Not required

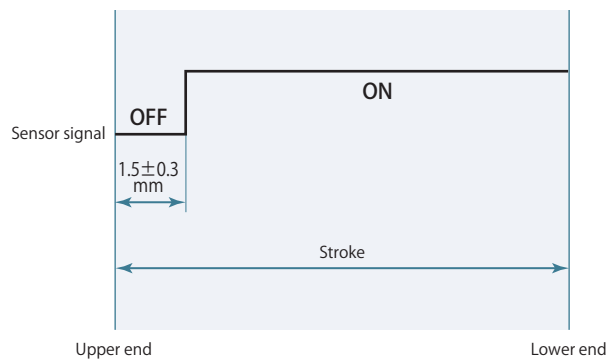
\*1: ISO R898 class 12.9    \*2: Supply the dry and filtered air. Particulate size 5 μm or less is recommended.

### Rod theory thrust



- The table indicates the theory thrust at air sensor ON.
- The force goes lower when air sensor OFF.
- Minimum 1.5 times of theory thrust force should be loaded to push the rod down.

### Air sensor triggering point



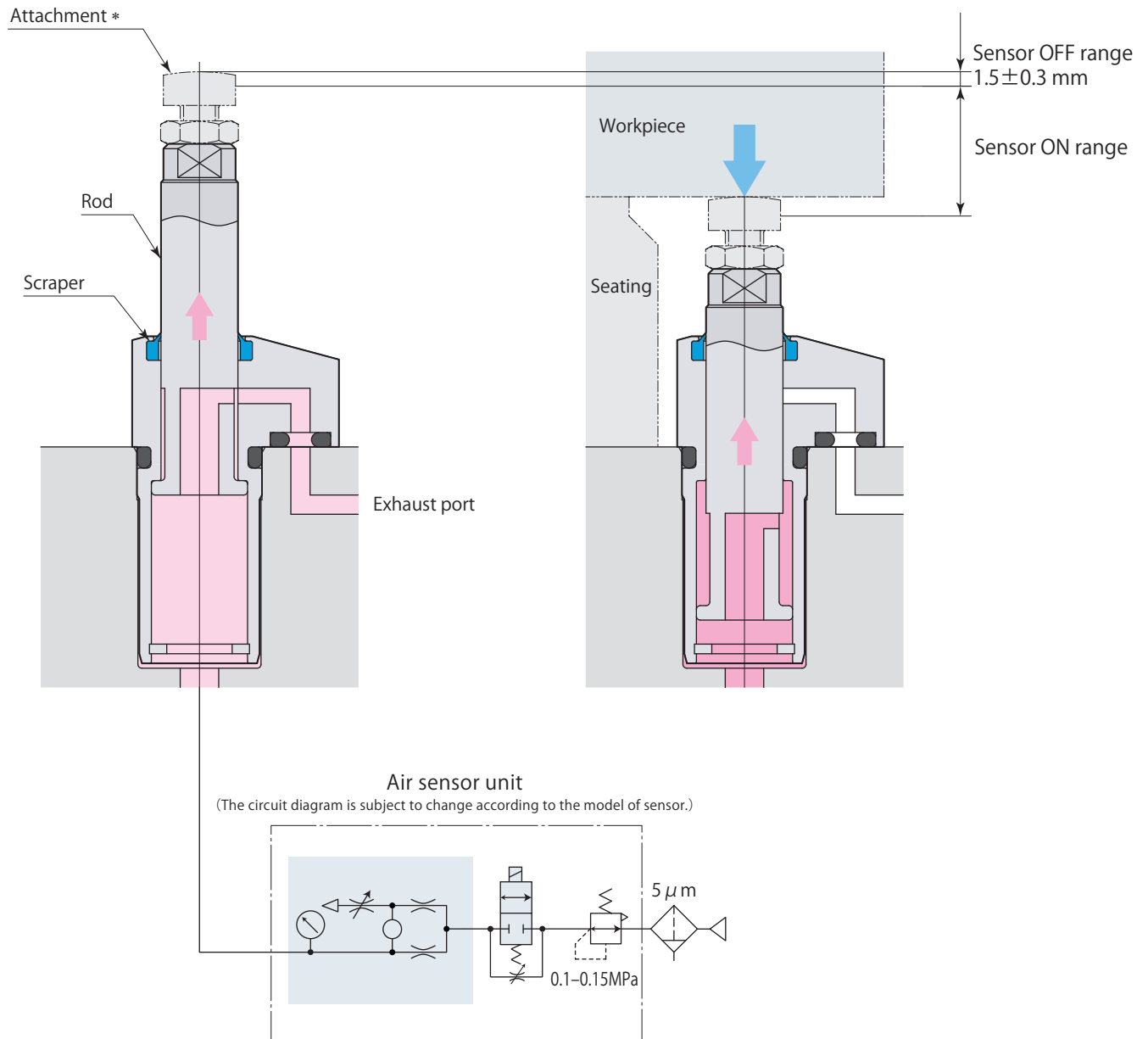
- Refer to the sensor supplier's instruction manual for the details of setting.
- Sensing performance such as detectable time and pressure differs depending on the supplier and model number of the sensor. Select the right model referring to sensor's application and characteristics.
- Use a solenoid valve with needle for air sensor unit and control it supplying air all the time in order to eliminate intrusion of chips or coolant.

Sensor OFF

The rod goes up by means of air from the sensor.  
Air sensor opens to exhaust air when the rod goes up to the air sensor OFF range.

Sensor ON

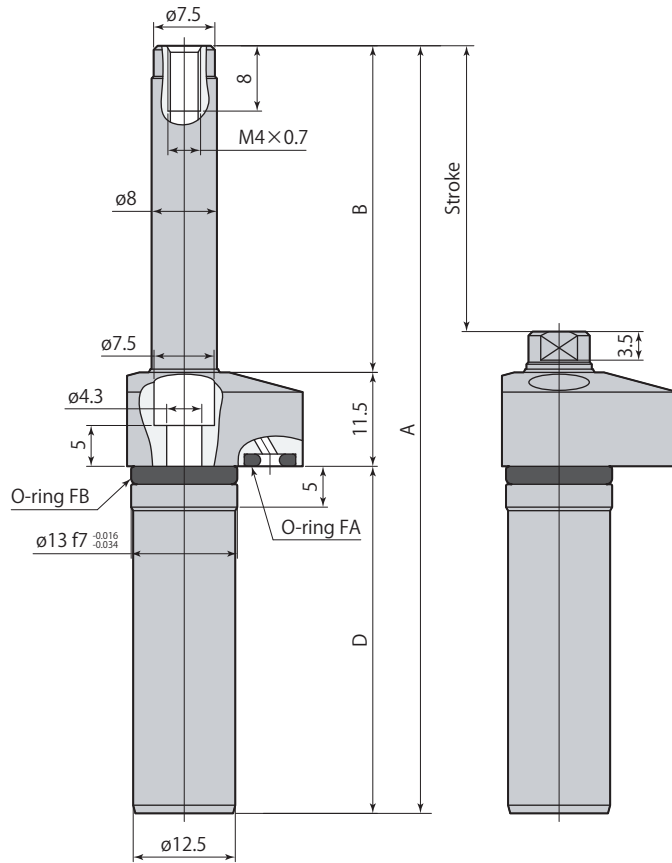
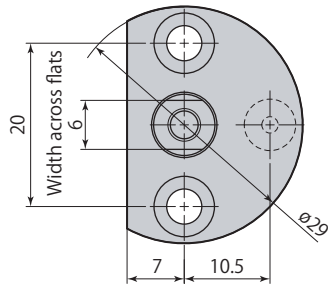
The rod goes down to sensor ON range by the top load like a workpiece and blocks the sensing air then air sensor can detect the load.



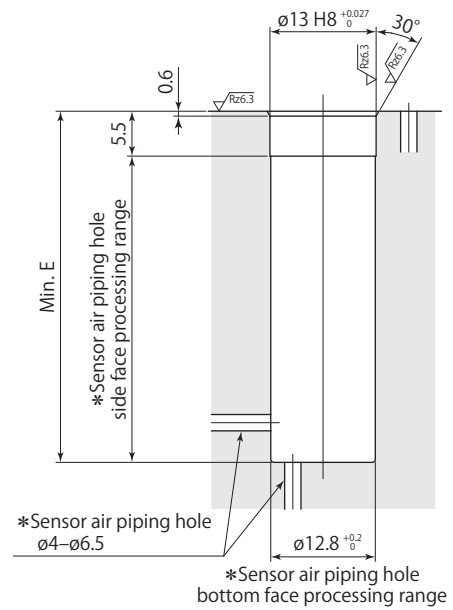
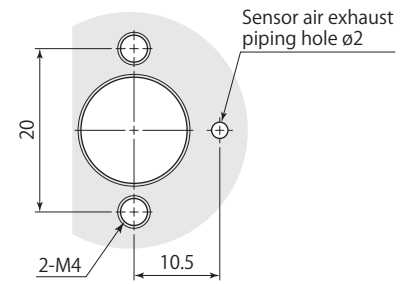
\*: Attachment is not included. The attachment should be less than 10g when manufacturing by the user.

- Do not apply side load (thrust force) to the rod.
- Exhaust port must be opened to atmosphere. Also the port should be protected from chips or coolant oil.
- The slight air leakage from scraper may be seen but it causes no problem on product performance.

## Dimensions



## Mounting details



\*: Sensor air piping hole must be made on either side or bottom face.

Model	CEA08-5	CEA08-35
Stroke	5	35
A	34	94
B	10	40
D	12.5	42.5
E	13	43
O-ring FA (fluorocarbon hardness Hs90)	P3	
O-ring FB (fluorocarbon hardness Hs90)	AS568-012	

● Mounting screws are not included

mm



Table of contents

Structure .....	196
Specifications, Usage example .....	197
Standard CVH Dimensions .....	198
Long stroke CVH-J Specifications, Dimensions .....	200
Option	
Jaw, Jaw nut CVJ .....	202

# Centering vise

model **CVH**

model CVH08

model CVH06

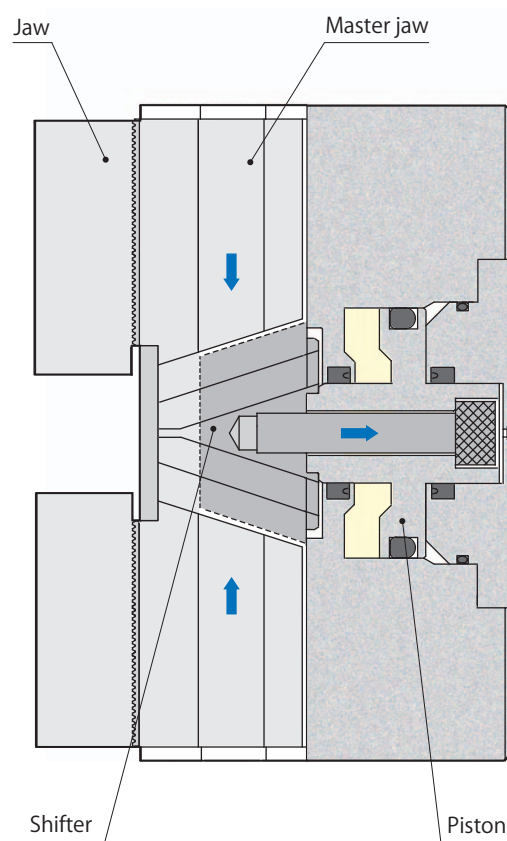


model CVH04

model CVH□□



Best suited for milling after lathe turning



Specifications page → 197  
Standard page → 198  
Long stroke page → 200  
Option page → 202

## Specifications

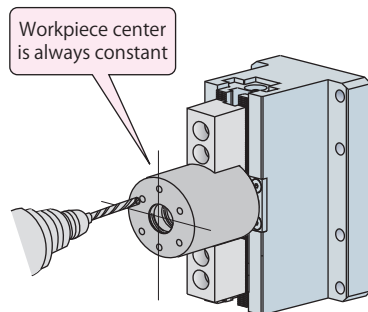
Size	Piping method	
CVH 04	G : Manifold piping	(Nil) : Standard
06	S : Rc thread piping	J : Long stroke
08		

Refer to **page →200** for long stroke.

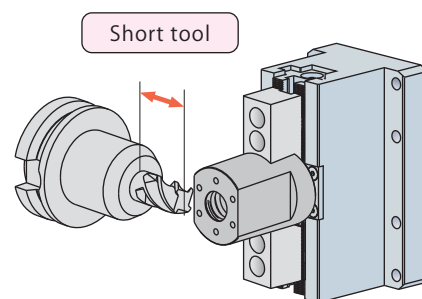
■ indicates made to order.

Model		CVH04 (4 inch)	CVH06 (6 inch)	CVH08 (8 inch)
Clamping force (hydraulic pressure 7MPa)	kN	10	20	30
Jaw stroke (diameter)	mm	5.6	5.8	6.0
Max. grip outer diameter	mm	100	145	190
Max. grip inner diameter	mm	125	170	220
Cylinder capacity	Grip outer diameter	cm <sup>3</sup>	23.7	34.6
	Grip inner diameter	cm <sup>3</sup>	11.6	23.7
Mass	kg	4.6	8.3	15.3
Recommended tightening torque of mounting screws*	N·m	12	29	57
Recommended tightening torque of jaw mounting screws*	N·m	29	57	77
Recommended positioning pin		ø6 (m6) × 18	ø8 (m6) × 24	ø10 (m6) × 30

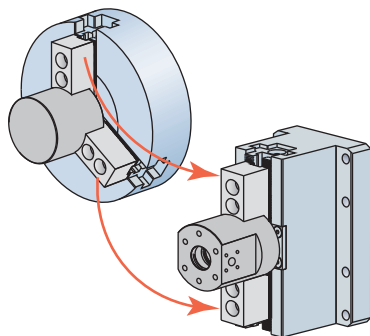
- Pressure range: 1–7 MPa
- Proof pressure: 10.5 MPa
- Operating temperature: 0–70 °C
- Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent) \* : ISO R898 class 12.9



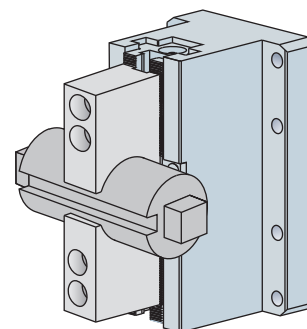
- Since both jaws stroke with centering vise, center datum processing is possible even when external shape of workpiece is variable.



- Centering vise minimizes tool interference and facilitates stable cutting process with comfortable tool length.



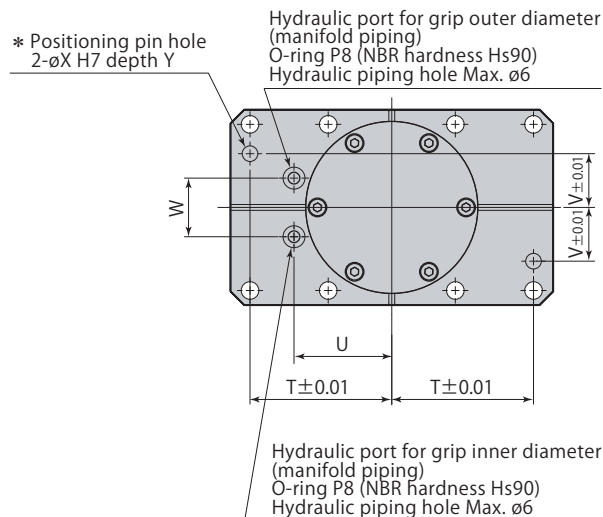
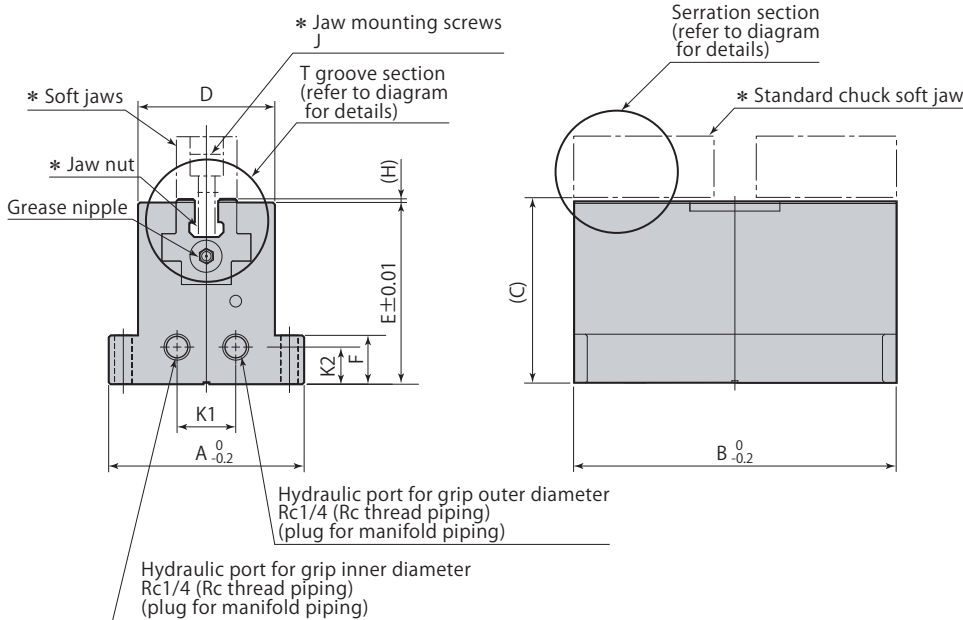
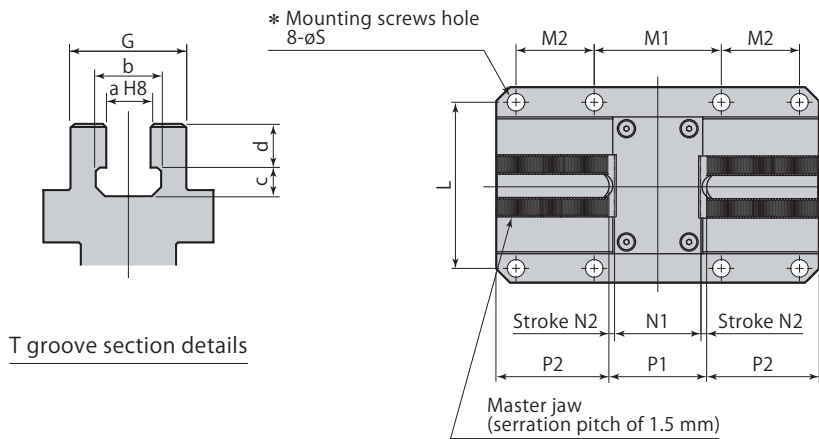
- Soft jaw used for lathe turning process can be mounted on centering vise, thereby eliminating fabrication of soft jaw at machining center.



- One chuck machining for diverse shapes of workpiece using self-cut soft jaw.



Dimensions



\* :Soft jaws, jaw nuts, mounting screws and positioning pins are not included.

Centering vise

CVH Standard

<b>CVH</b> □□	<b>Centering vise Standard</b>	<b>7MPa</b>	<b>Double acting</b>
---------------	--------------------------------	-------------	----------------------

Model	CVH04□	CVH06□	CVH08□
A	90	100	125
B	120	165	210
C	84.85	94.85	109.85
D	60	70	85
E	83	93	108
F	20	25	30
G	27	31	35
H	1.85	1.85	1.85
J	M8	M10	M12
K1	30	30	35
K2	17	19	19
L	75	85	105
M1	45	65	60
M2	30	40	60
N1	38.6	44.2	64.9
N2	2.8	2.9	3
P1	44.2	50	70.9
P2	37.5	57	69
R	0.4	0.5	0.55
øS	6.8	9	11
T	52.5	72.5	90
U	42.5	50	75
V	27.5	27.5	35
W	30	30	35
øX	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>	10 <sup>+0.015</sup> <sub>0</sub>
Y	9	12	15
a	10 <sup>+0.022</sup> <sub>0</sub>	12 <sup>+0.027</sup> <sub>0</sub>	14 <sup>+0.027</sup> <sub>0</sub>
b	15.5	18.5	21.5
c	6	8	10
d	10	12	13

- The diagram shown on the left indicates the jaw strokes out when gripping inner diameter.
- The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

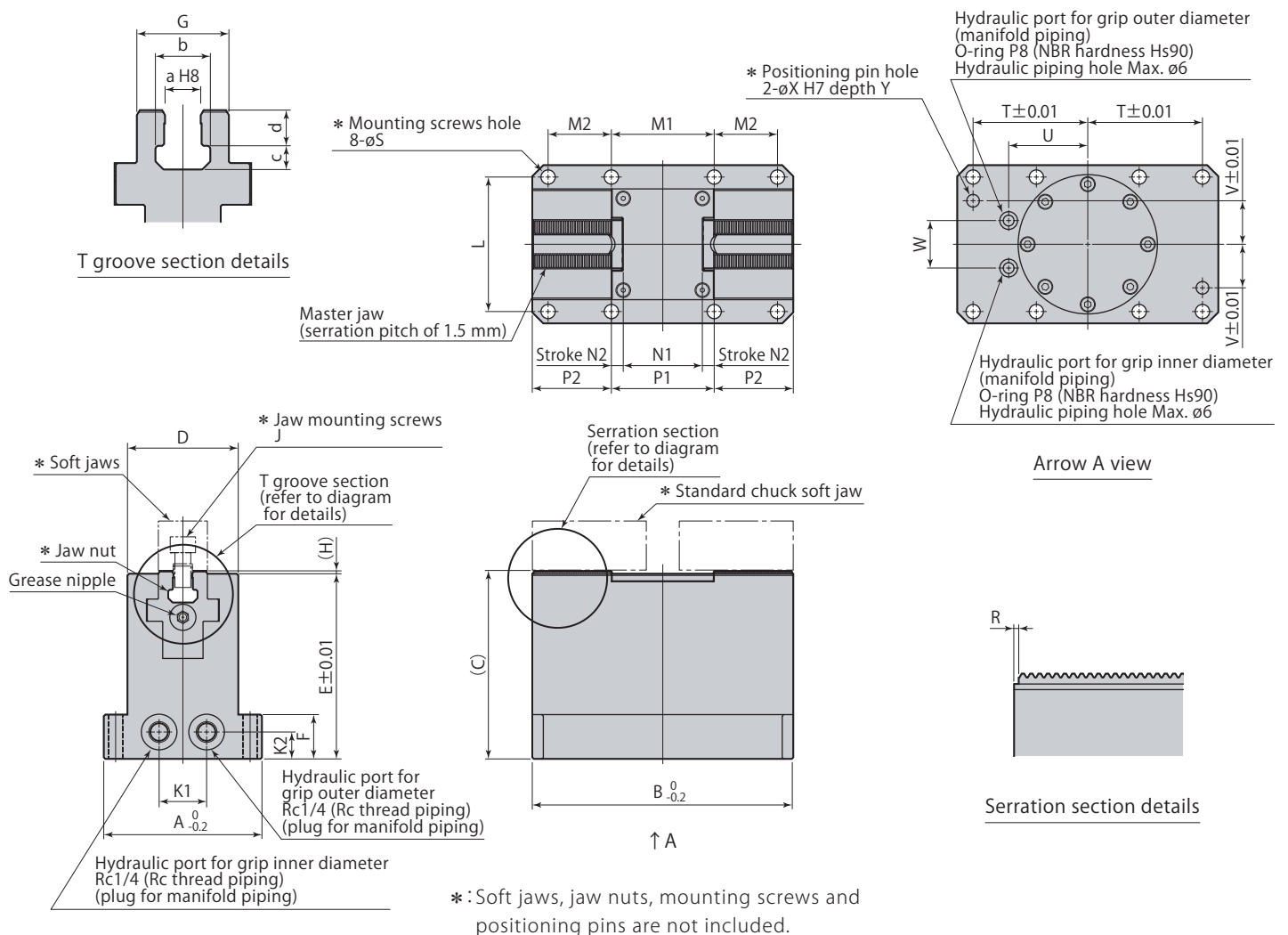
Centering vise  
CVH Standard

## Specifications

Model		CVH04□-J (4 inch)	CVH06□-J (6 inch)	CVH08□-J (8 inch)
Clamping force	Outer diameter (hydraulic pressure 7MPa)	kN 10	20	30
	Inner diameter (hydraulic pressure 5MPa)	kN 9	17	25
Jaw stroke (diameter)	mm	12.1	13	13
Max. grip outer diameter	mm	100	145	190
Max. grip inner diameter	mm	125	170	220
Cylinder capacity	Grip outer diameter	cm <sup>3</sup> 24.7	52.5	74.2
	Grip inner diameter	cm <sup>3</sup> 29.5	62.3	88.4
Mass	kg	5.8	10	17.9
Recommended tightening torque of mounting screws*	N·m	12	29	57
Recommended tightening torque of jaw mounting screws*	N·m	29	57	77
Recommended positioning pin		ø6 (m6) × 18	ø8 (m6) × 24	ø10 (m6) × 30

- Pressure range: 1–7 MPa (grip outer diameter), 1–5 MPa (grip inner diameter)
- Proof pressure: 10.5 MPa (grip outer diameter), 7.5 MPa (grip inner diameter)
- Operating temperature: 0–70 °C
- Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent) \* : ISO R898 class 12.9

## Dimensions

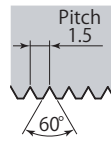
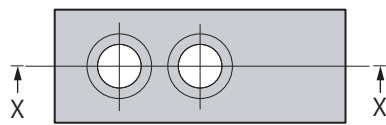


<b>CVH□□-J</b>	<b>Centering vise Long stroke</b>	<b>7MPa</b>	<b>Double acting</b>
----------------	-----------------------------------	-------------	----------------------

Model	CVH04□-J	CVH06□-J	CVH08□-J
A	90	100	125
B	130	165	210
C	100.85	118.85	133.85
D	60	70	85
E	99	117	132
F	20	28	30
G	27	31	35
H	1.85	1.85	1.85
J	M8	M10	M12
K1	30	30	35
K2	17	17	19
L	75	85	105
M1	45	65	60
M2	30	40	60
N1	41.9	51.4	63.7
N2	6.05	6.5	6.5
P1	54	64.4	76.7
P2	37.5	49.5	66
R	0.5	0.8	0.6
øS	6.8	9	11
T	52.5	72.5	90
U	42.5	50	75
V	27.5	27.5	35
W	30	30	35
øX	6 <sup>+0.012</sup> <sub>0</sub>	8 <sup>+0.015</sup> <sub>0</sub>	10 <sup>+0.015</sup> <sub>0</sub>
Y	9	12	15
a	10 <sup>+0.022</sup> <sub>0</sub>	12 <sup>+0.027</sup> <sub>0</sub>	14 <sup>+0.027</sup> <sub>0</sub>
b	15.5	18.5	21.5
c	6	8	10
d	10	12	13

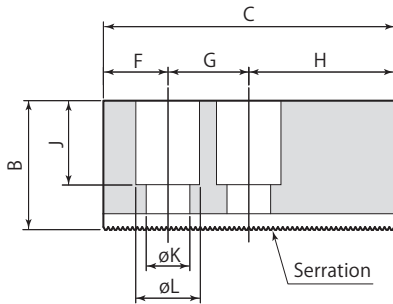
- The diagram shown on the left indicates the jaw strokes out when gripping inner diameter.
- The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

Centering vise  
CVH  
Long stroke

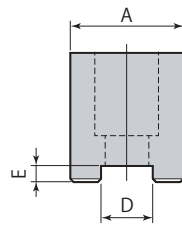
Jaw (option)

Material : S50C

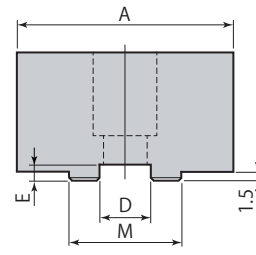
Serration section details



X-X



Standard jaw &amp; tall jaw



Wide jaw

- Jaw (soft jaw) is supplied in sets of two. Specify number of sets when ordering. (Example : CVJ06-N×1 set)

Model	Soft jaw shape	A	B	C	D	E	F	G	H	J	øK	øL	M
CVJ04-N	Standard jaw	23	25	55	10	4	13	14	28	16	8.5	13.5	-
CVJ04-H	Tall jaw	23	48							39			-
CVJ04-W	Wide jaw	60	25							16			23

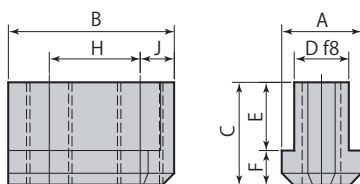
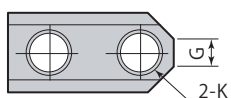
- CVJ04 mounting screw size : M8×22L (not included)

Model	Soft jaw shape	A	B	C	D	E	F	G	H	J	øK	øL	M
CVJ06-N	Standard jaw	31	32	72	12	5	15	20	37	20	11	17	-
CVJ06-H	Tall jaw	31	66							54			-
CVJ06-W	Wide jaw	70	32							20			31

- CVJ06 mounting screw size : M10×30L (not included)

Model	Soft jaw shape	A	B	C	D	E	F	G	H	J	øK	øL	M
CVJ08-N	Standard jaw	35	38	95	14	5	24	25	46	23	13	19	-
CVJ08-H	Tall jaw	35	76							61			-
CVJ08-W	Wide jaw	85	38							23			35

- CVJ08 mounting screw size : M12×35L (not included)

Jaw nut (option)

- Jaw nut is supplied in sets of two. Specify number of sets when ordering. (Example : CVJ06-T×1 set)

Model	A	B	C	D	E	F	G	H	J	K
CVJ04-T	14.5	26	18	10	12.5	5.5	5	14	6	M8×1.25
CVJ06-T	17	36.5	22.5	12	15	7.5	8	20	7.5	M10×1.5
CVJ08-T	20	48	25.5	14	16	9.5	8	25	11	M12×1.75

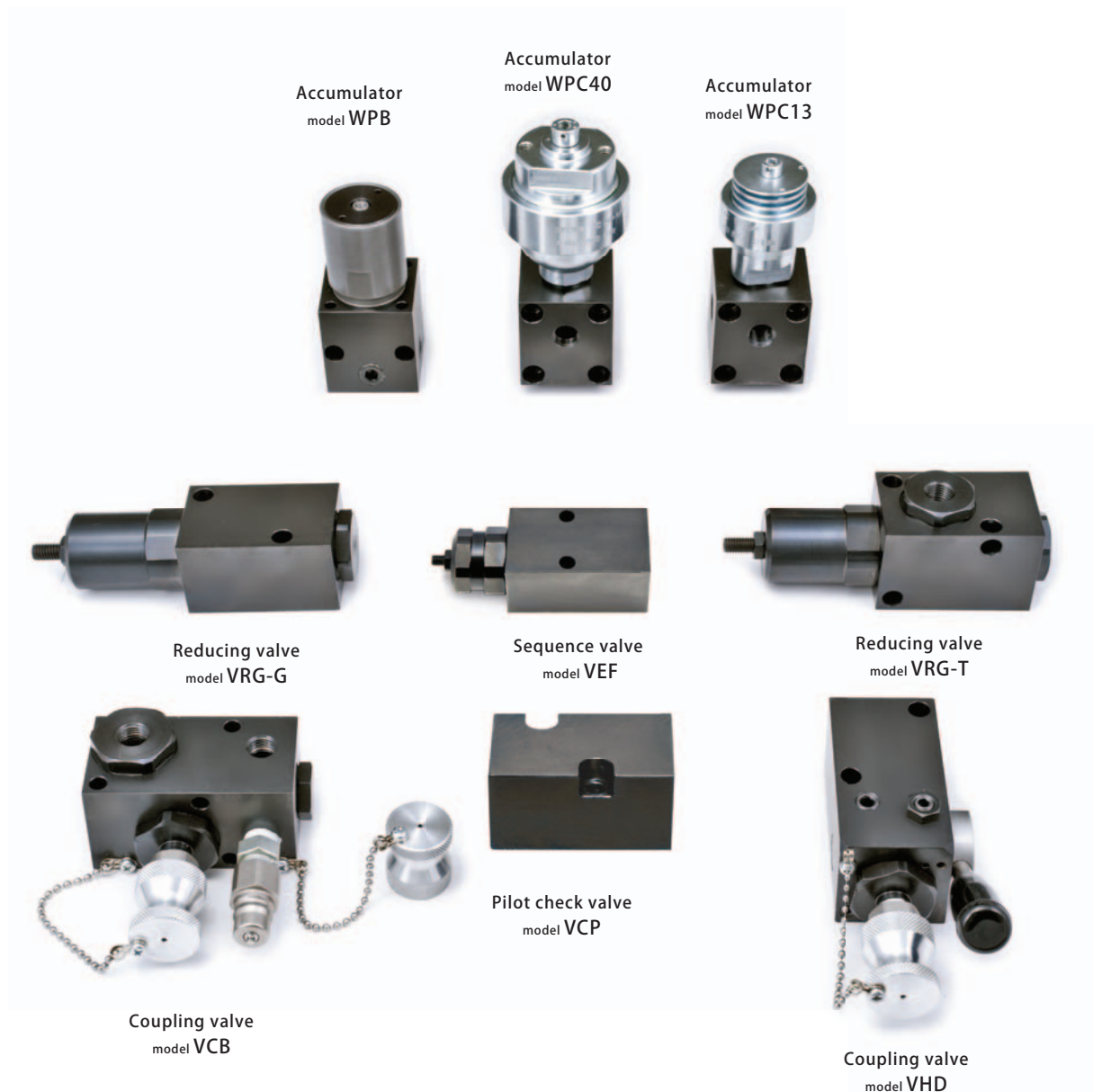


### Table of contents

Usage example of double acting control system .....	<b>206</b>
Usage example of single acting control system .....	<b>210</b>
Valve, Accumulator Structure, Specifications, Dimensions	
Coupling valve Double acting <b>VCB-L</b> .....	<b>214</b>
Pilot check valve <b>VCP-LG</b> .....	<b>216</b>
Coupling valve Single acting <b>VHD-L</b> .....	<b>218</b>
Reducing valve <b>VRG-L</b> .....	<b>220</b>
Sequence valve <b>VEF-L</b> .....	<b>222</b>
Accumulator Spring <b>WPB</b> .....	<b>224</b>
Accumulator N <sub>2</sub> gas <b>WPC</b> .....	<b>228</b>
Control unit Hydraulic and pneumatic circuit diagram, Specifications, Dimensions	
Double acting, Manual operated <b>HCD-W</b> .....	<b>230</b>
Single acting, Manual operated <b>HCD-S</b> .....	<b>231</b>
Double acting, Solenoid operated <b>HCSD-U</b> .....	<b>232</b>
Single acting, Solenoid operated <b>HCSD-A</b> .....	<b>233</b>
Single acting, Manual operated <b>HCT</b> .....	<b>234</b>
Pascal pump <b>X63</b> Specifications, Performance diagram .....	<b>235</b>

# Control system

7 MPa





Double acting clamp is controlled and operated with control unit model HCD□H-W and coupling valve model VCB.



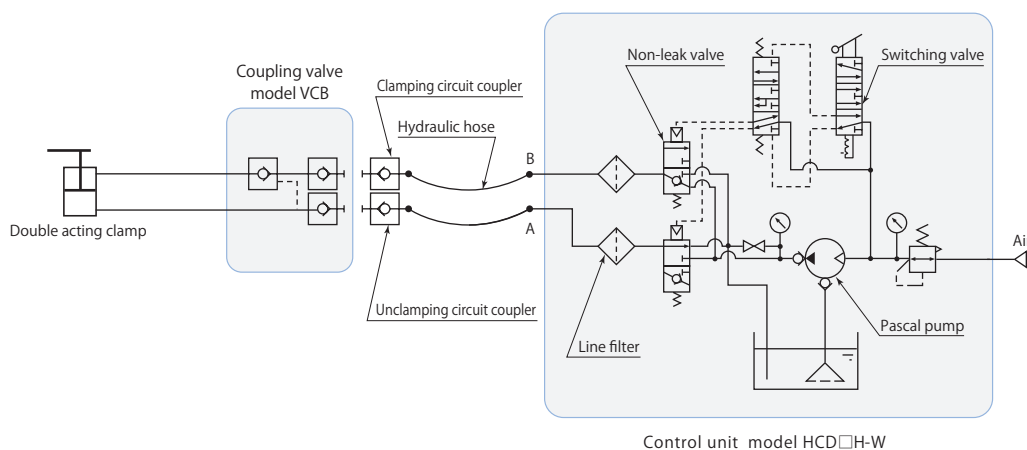
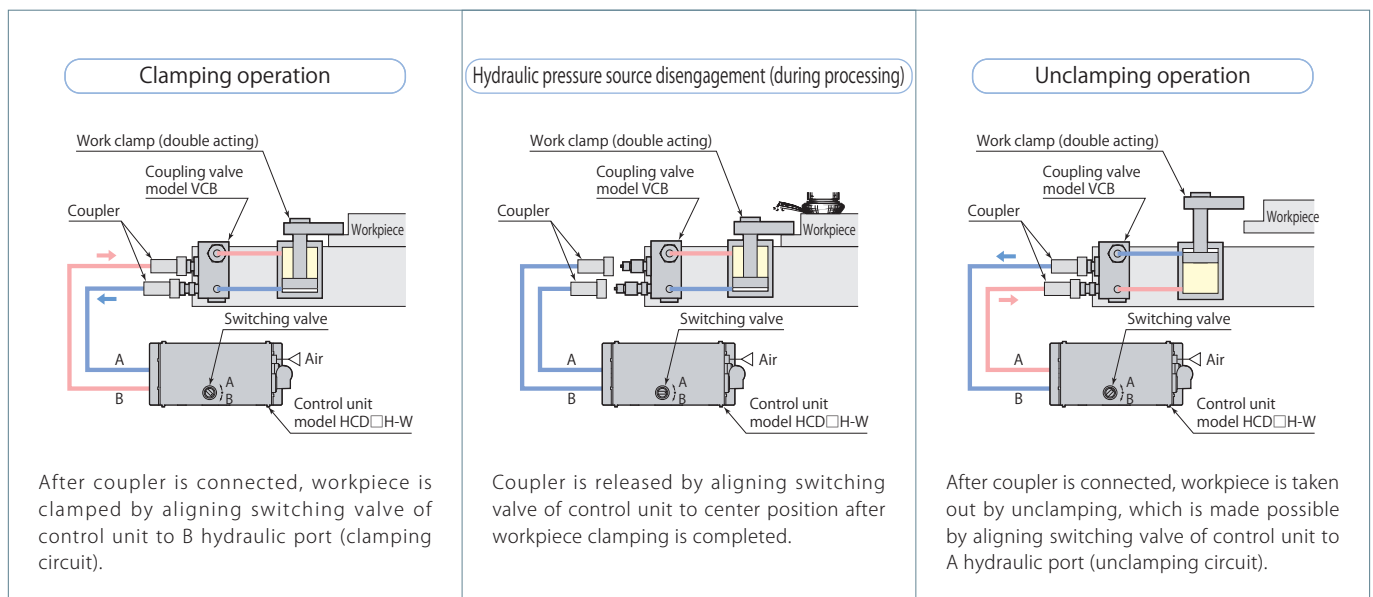
Control unit model **HCD□H-W**  
Page →230



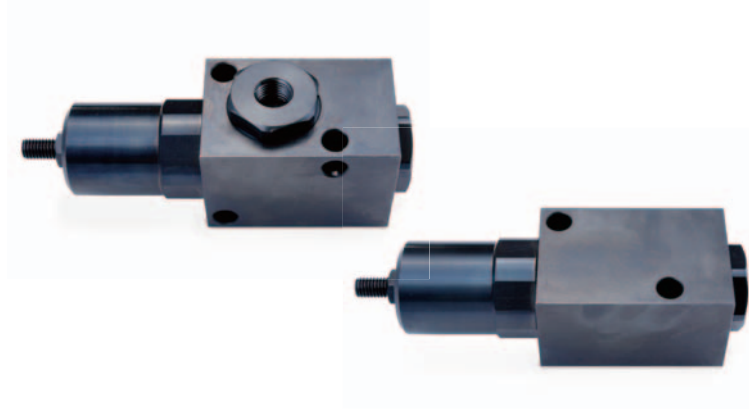
Coupling valve model **VCB**  
Pages →214, 215

Control unit (HCD□H-W) converts air pressure to hydraulic pressure by actuation of air driven Pascal pump. Once circuit pressure is attained to the set pressure, it stops pumping then keeps the hydraulic pressure.

Coupling valve (VCB) is placed between a control unit and double acting clamps, and it allows to disconnect the control unit from the valve by means of hydraulic coupler. Built-in check valve in coupling valve can positively seal the pressure.

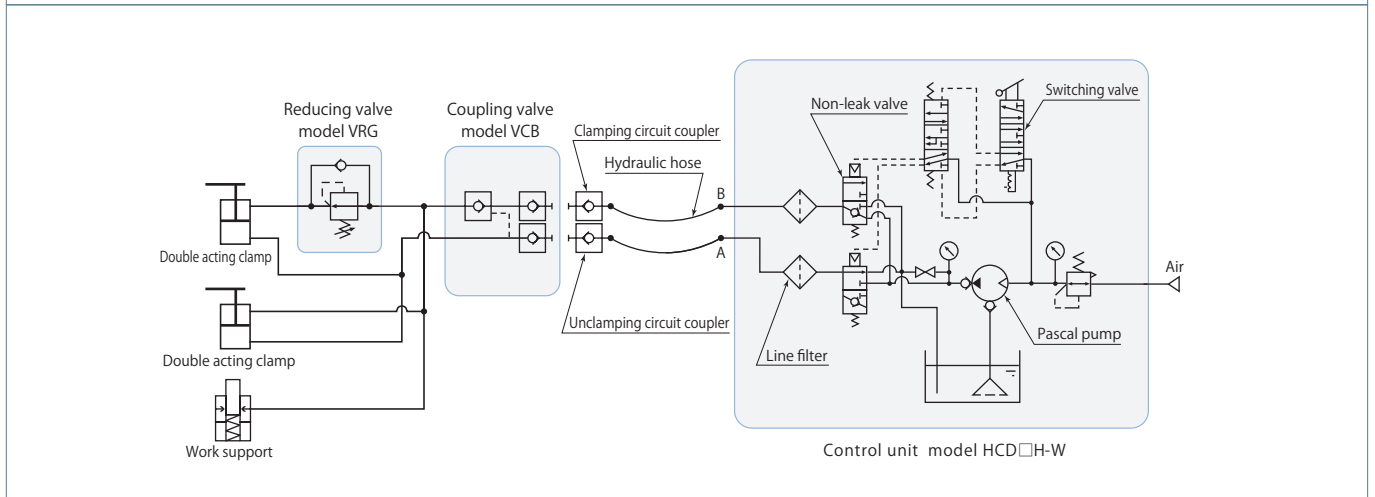
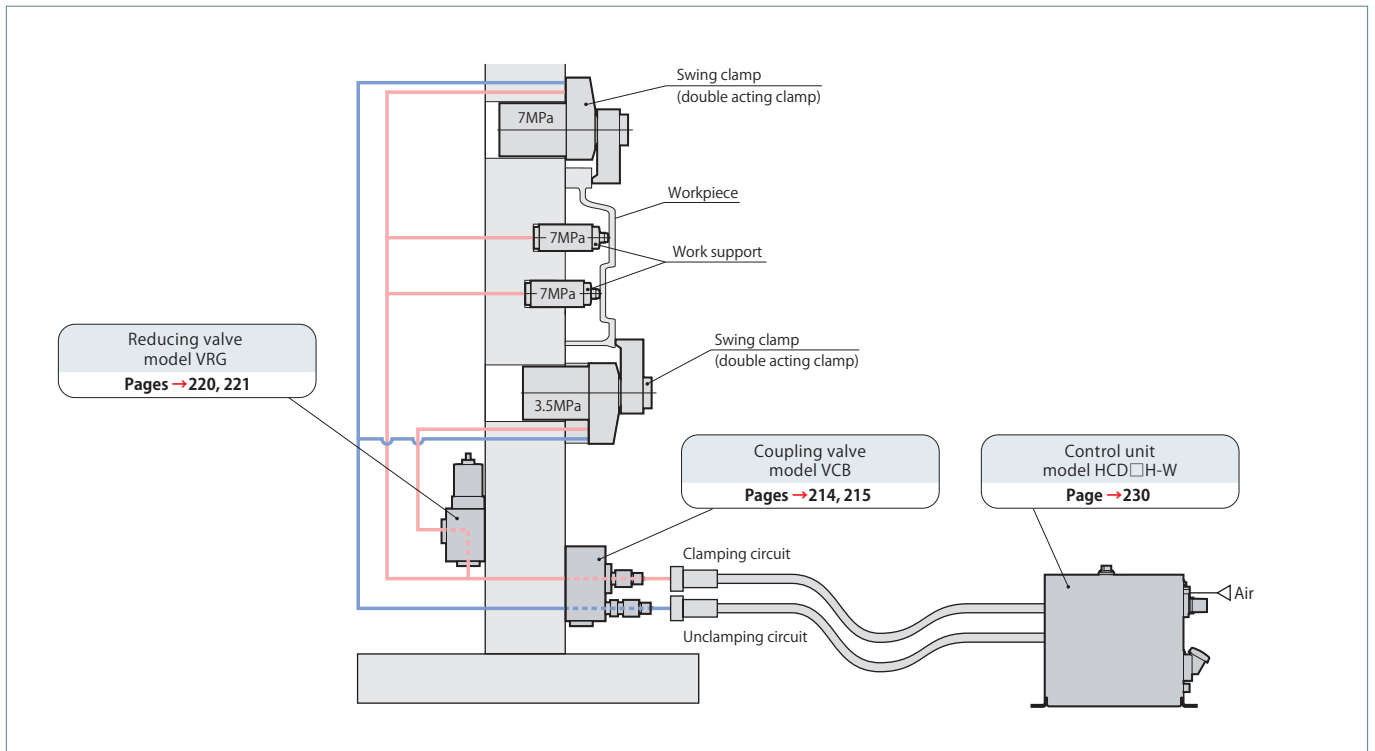


Since Pascal pump does not raise oil temperature like electrical pumps, it does not trigger pressure drop (reduction in clamping force) after clamping due to difference between ambient temperature and oil temperature. Fluctuation of pressure due to changes in ambient temperature, however, does occur. (This fluctuation presents minimal problems with ordinary cutting processes. Inquire for details.)

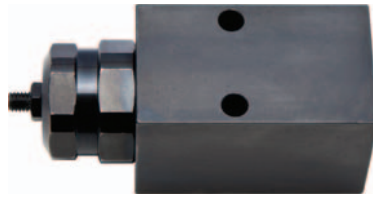


Reducing valve model **VRG**  
Pages → 220, 221

Internal hydraulic pressure of circuit can be partially reduced.  
(Example) For work support 7 MPa (primary pressure)  
pressure of work clamp is reduced to 3.5 MPa.

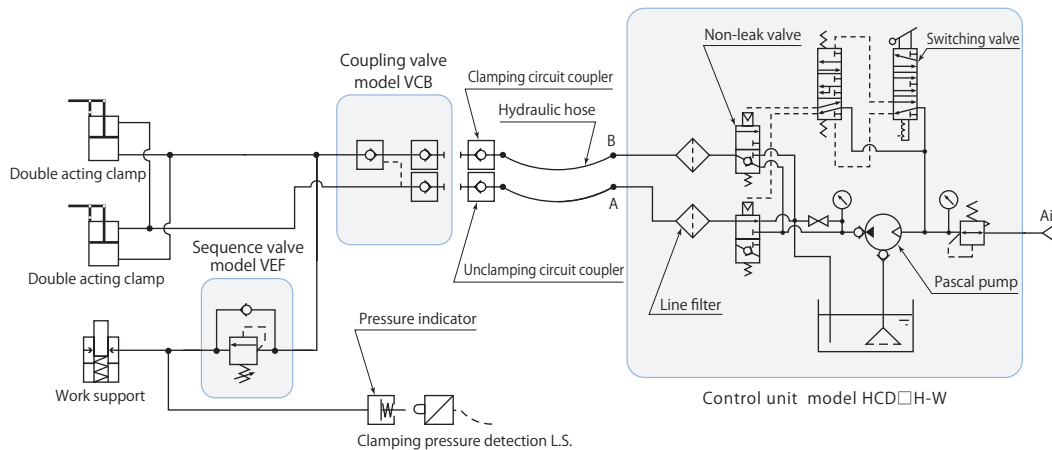
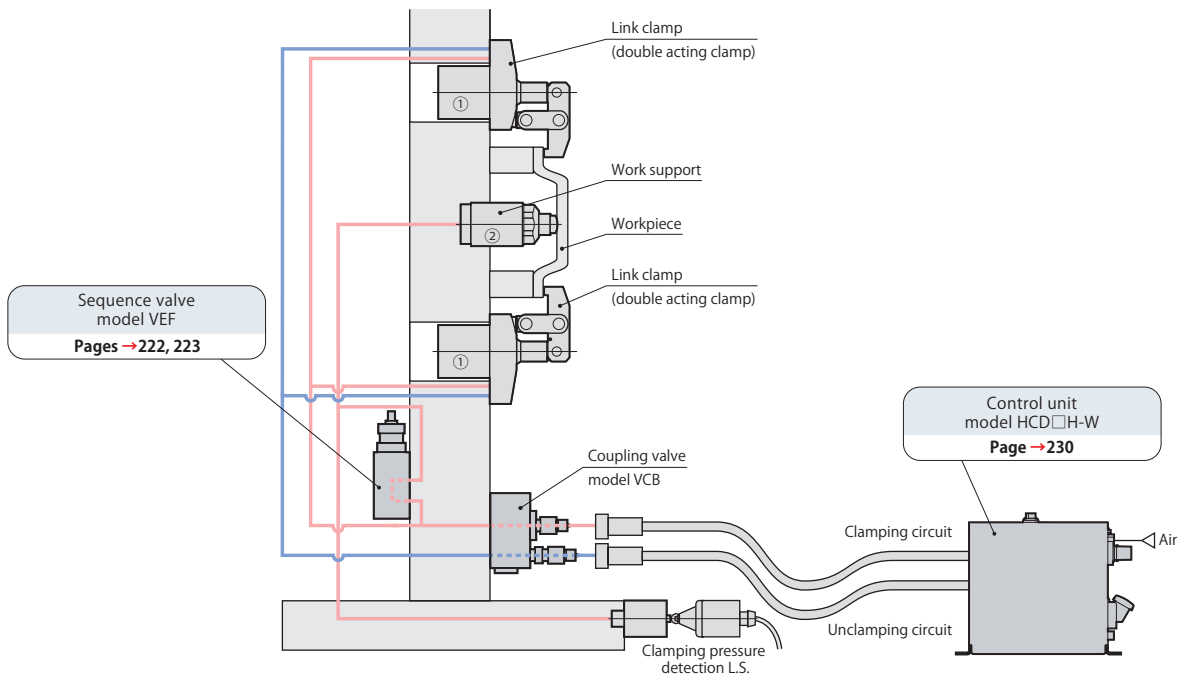


Control system



Sequence valve model **VEF**  
Pages →222, 223

Clamps are sequentially operated through same circuit.  
(Example) ① After clamping operation of work clamp  
② Work support operation locked.





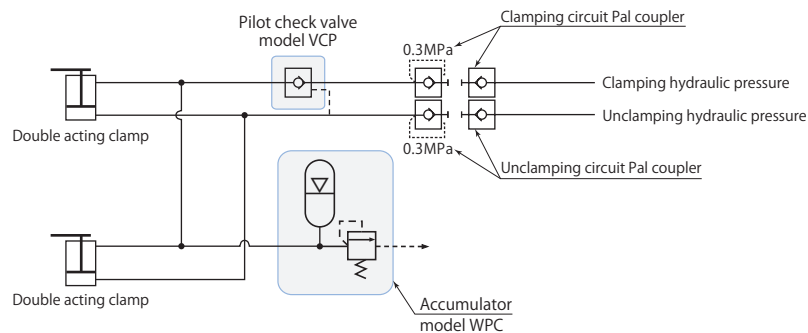
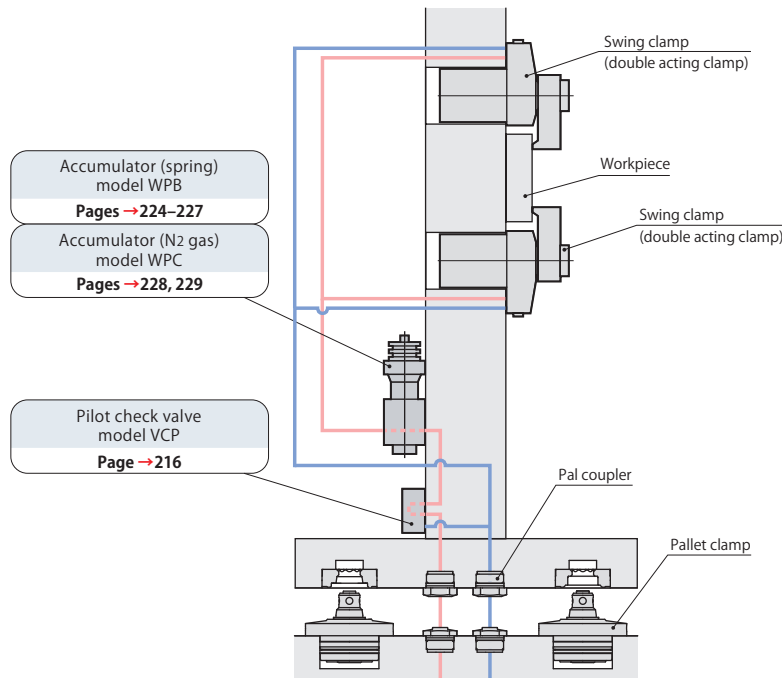
Pilot check valve model **VCP**  
Page →216



Accumulator model **WPB, WPC**  
Pages →224-229

It ensures the clamp circuit pressure positively retained even when hydraulic unit provides zero pressure or pressure line is cut off, which can prevent the workpiece fall or accident due to the clamp loose.

After hydraulic pressure source has been disengaged, circuit pressure fluctuation due to temperature changes is suppressed.



Single acting clamp is controlled and operated with control unit model HCD□H-S and coupling valve model VHD.



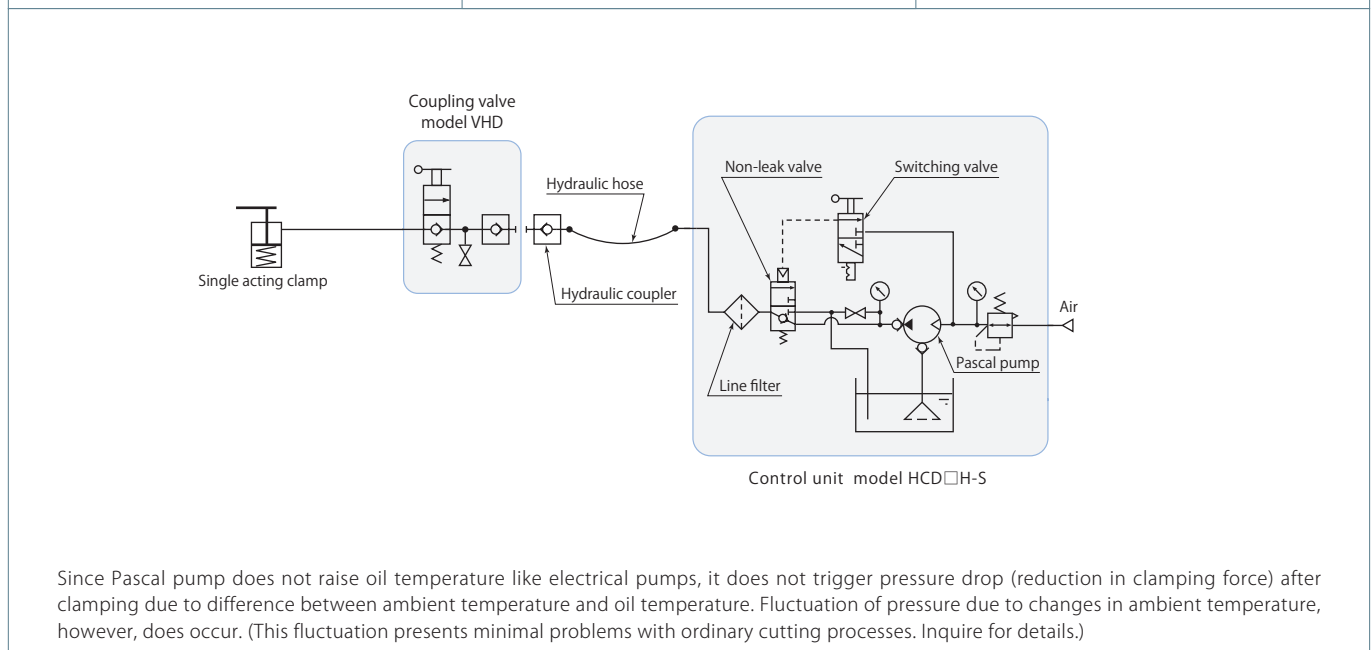
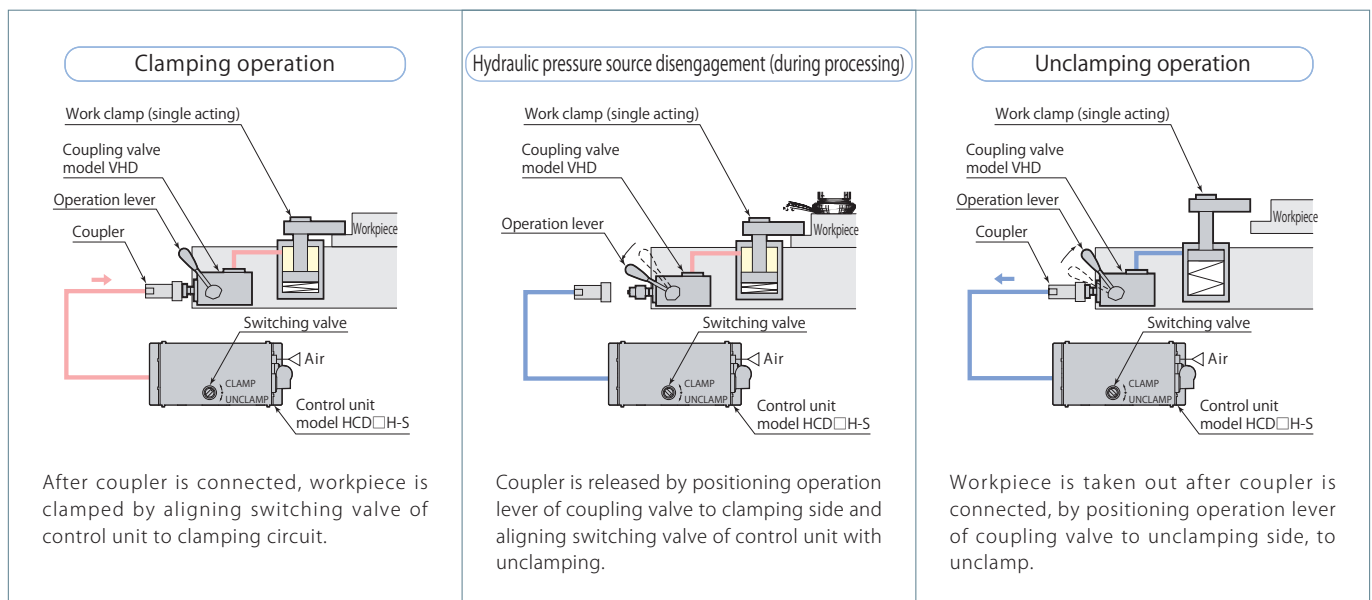
Control unit model **HCD□H-S**  
Page →231



Coupling valve model **VHD**  
Pages →218, 219

Control unit (HCD□H-S) converts air pressure to hydraulic pressure by actuation of air driven Pascal pump. Once circuit pressure is attained to the set pressure, it stops pumping then keeps the hydraulic pressure.

Coupling valve (VHD) is placed between a control unit and single acting clamps, and it allows to disconnect the control unit from the valve by means of hydraulic coupler. Built-in check valve in coupling valve can positively seal the pressure.



Since Pascal pump does not raise oil temperature like electrical pumps, it does not trigger pressure drop (reduction in clamping force) after clamping due to difference between ambient temperature and oil temperature. Fluctuation of pressure due to changes in ambient temperature, however, does occur. (This fluctuation presents minimal problems with ordinary cutting processes. Inquire for details.)



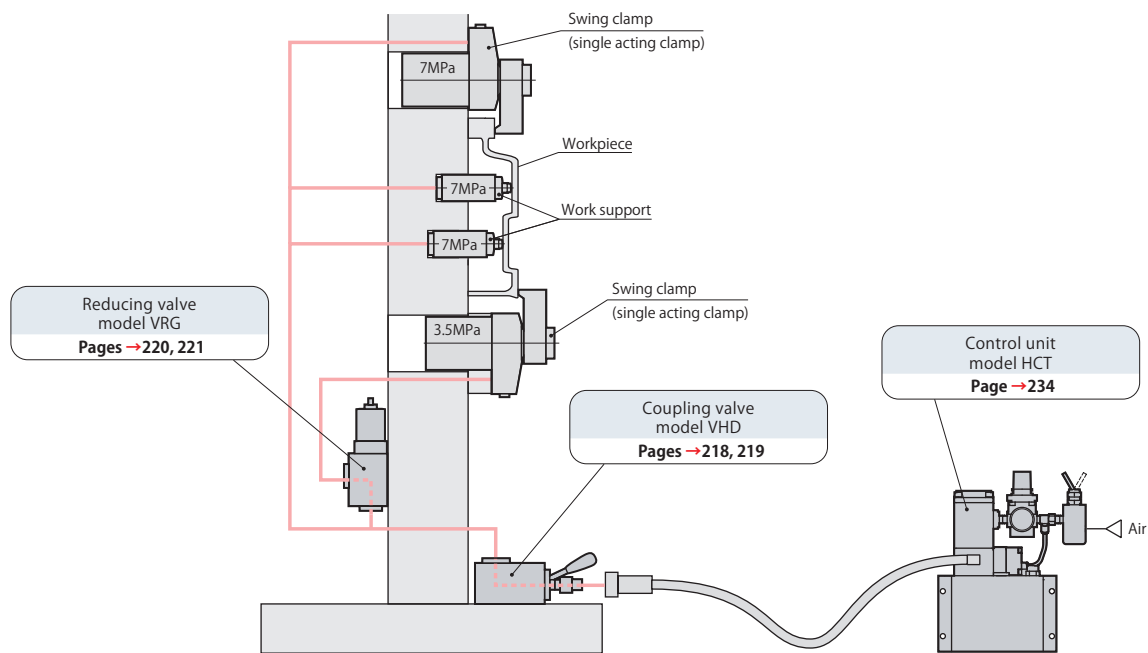
Control unit model **HCT-□**  
Page →234



Reducing valve model **VRG**  
Pages →220, 221

Compact hydraulic control unit for air drive and manual operations. Control unit (HCT-□) converts air pressure to hydraulic pressure by actuation of air driven Pascal pump. Once circuit pressure is attained to the set pressure, it stops pumping then keeps the hydraulic pressure.

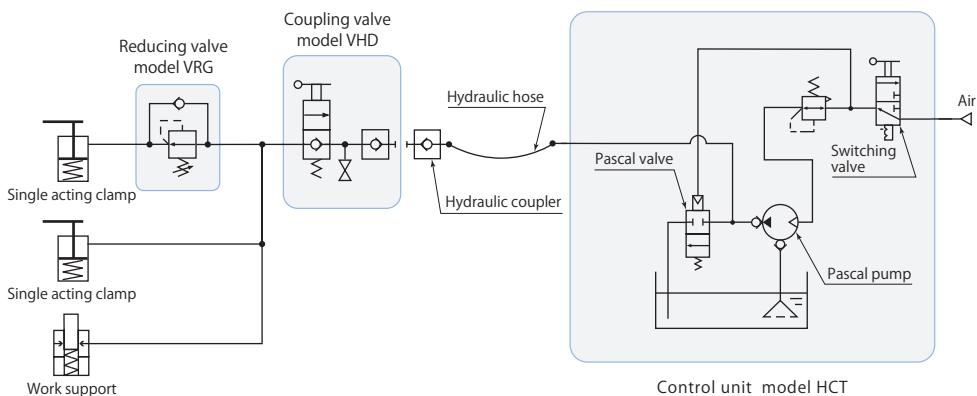
Internal hydraulic pressure of circuit can be partially reduced. (Example) For work support 7 MPa (primary pressure) pressure of work clamp is reduced to 3.5 MPa.



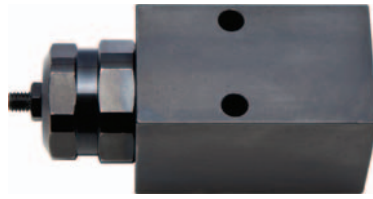
Reducing valve model **VRG**  
Pages →220, 221

Coupling valve model **VHD**  
Pages →218, 219

Control unit model **HCT**  
Page →234

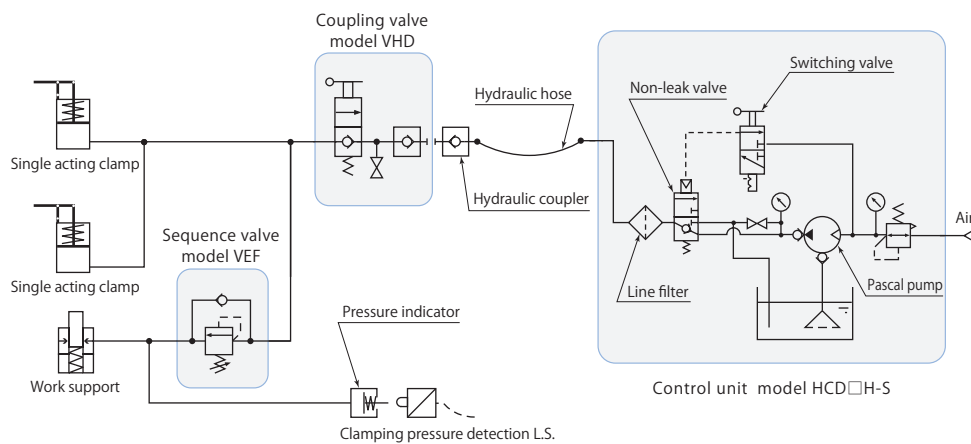
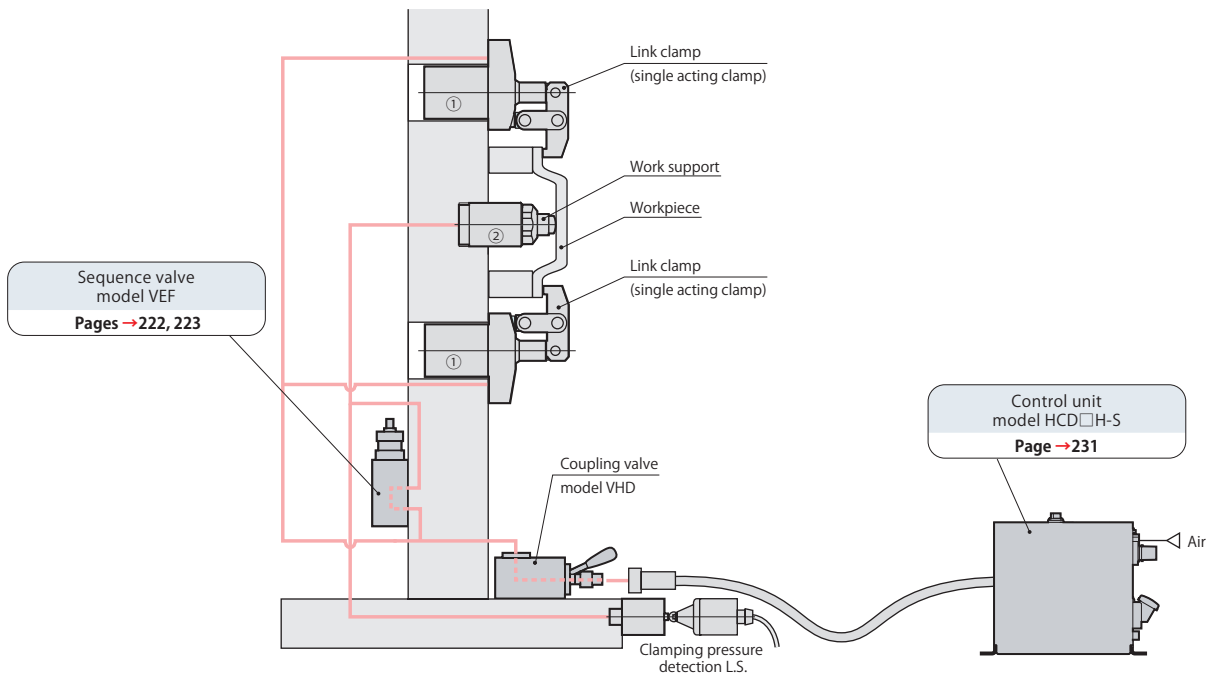


Control system



Sequence valve model **VEF**  
Pages →222, 223

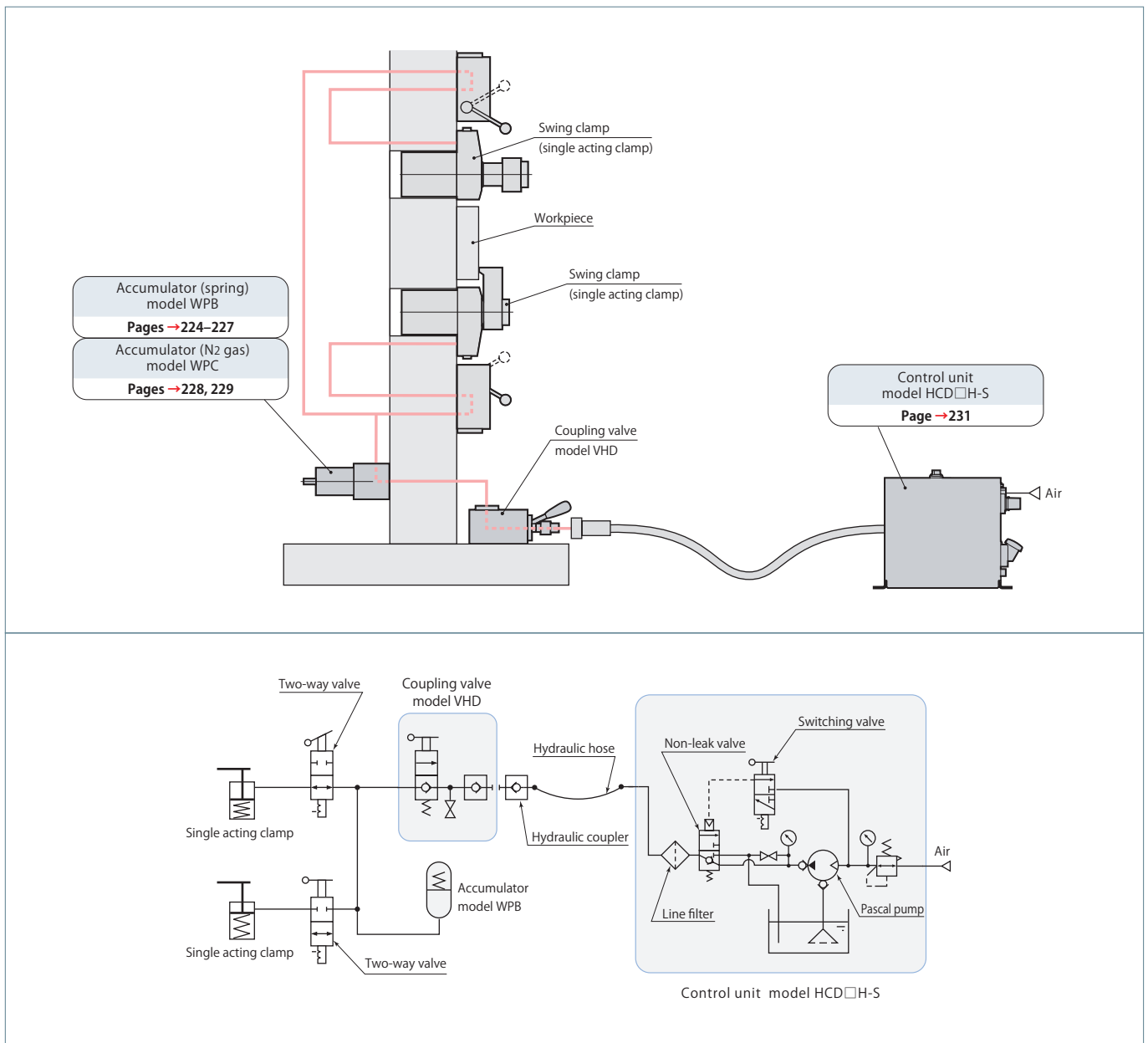
Clamps are sequentially operated through same circuit.  
(Example) ① After clamping operation of work clamp  
② Work support operation locked.





Accumulator model **WPB, WPC**  
Pages →224–229

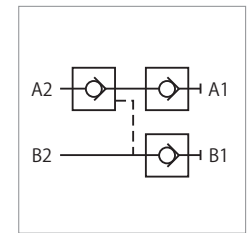
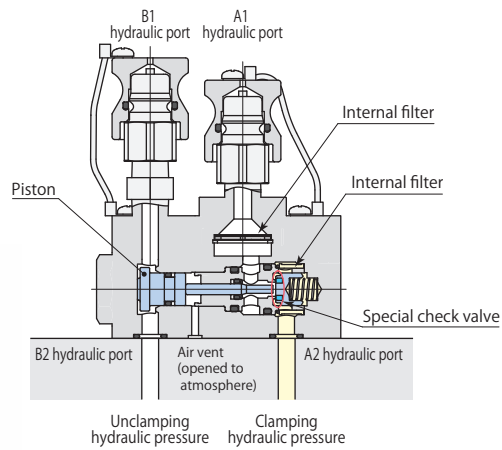
After hydraulic pressure source has been disengaged, circuit pressure fluctuation due to temperature changes is suppressed.







Coupling valve model VCB



This is a non-leak valve, with which coupling of double acting clamp can be performed easily and clamping circuit pressure can be retained over a long period of time after disengagement of hydraulic pressure source.

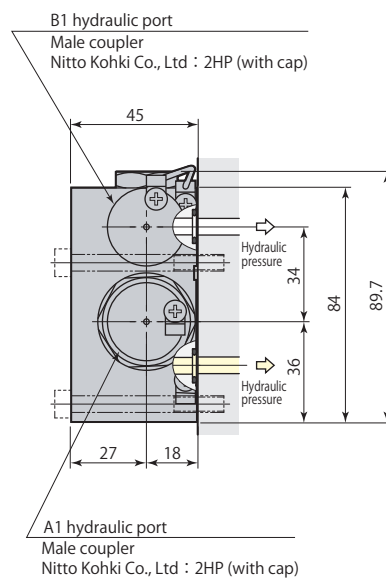
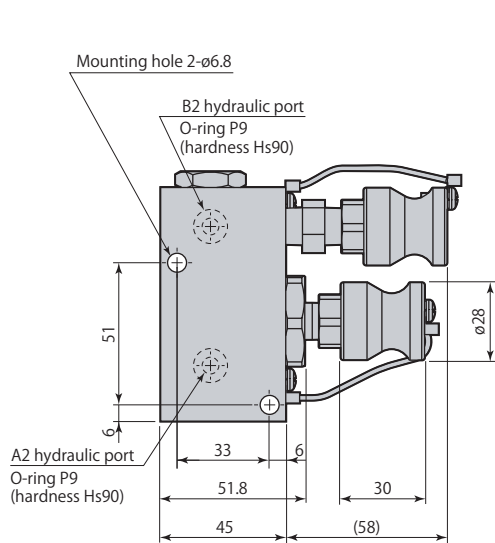
Specifications

Model		VCB-LGB	VCB-LGS	VCB-LT
Mounting, piping methods		Manifold, GB mounting	Manifold, GS mounting	Piping mounting
Pressure range	MPa	2-7		
Proof pressure	MPa	10.5		
Min. pilot pressure (open valve)	MPa	0.3 + 0.23 × secondary side pressure		
Orifice area	mm <sup>2</sup>	14.2		
Operating temperature	°C	0-70		
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent)		
Mass	kg	1.4		

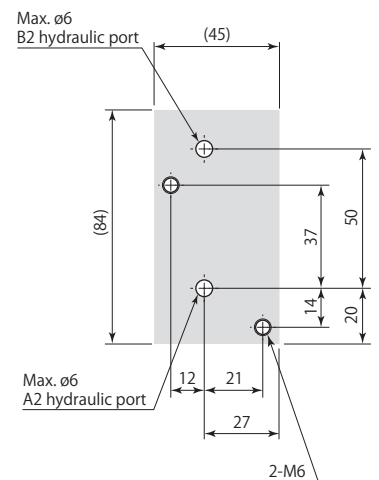
● There is also a type that adopts fluorocarbon for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification. Model designation VCB-□□-V).

Dimensions

VCB-LGB Manifold, GB mounting \*With internal filter (A1 & A2 hydraulic ports)



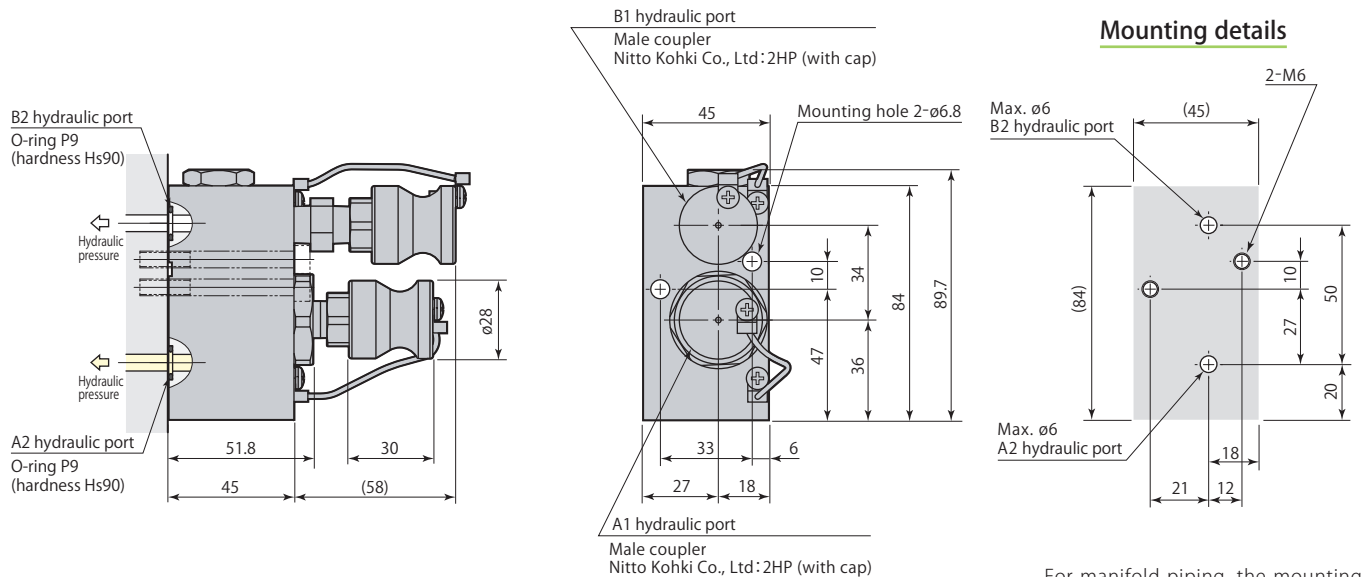
Mounting details



For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

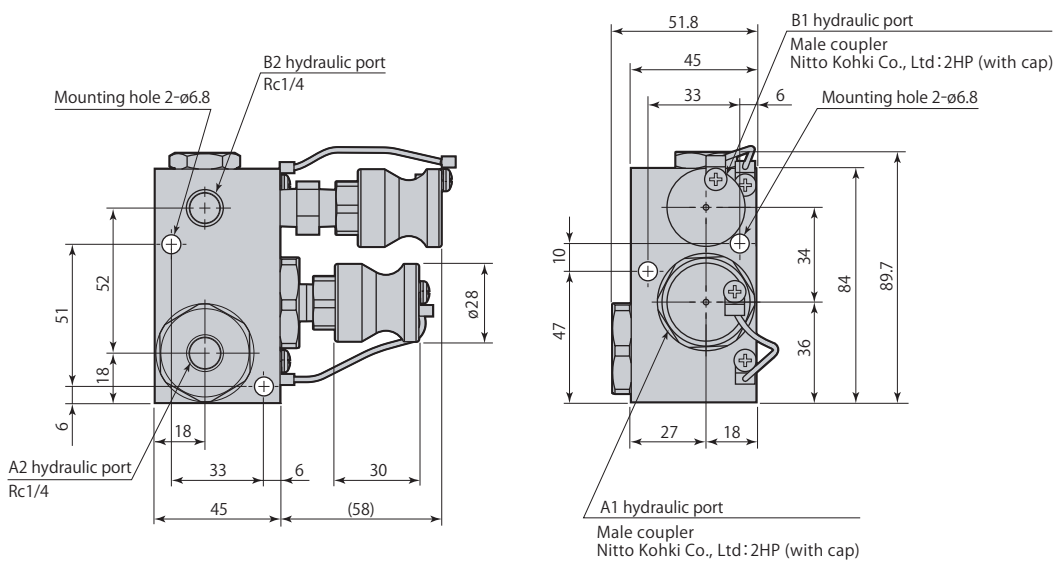
### Dimensions

#### VCB-LGS Manifold, GS mounting \*With internal filter (A1 & A2 hydraulic ports)



For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

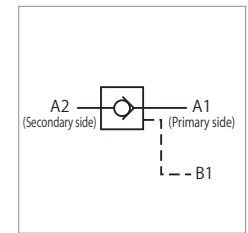
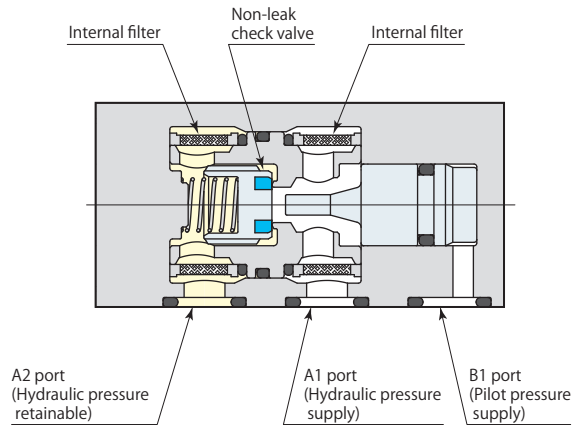
#### VCB-LT Piping mounting \*With internal filter (A1 & A2 hydraulic ports)



● Female coupler (Nitto Kohki Co., Ltd:2HS) and mounting screws are not included.



Pilot check valve model VCP



This is a non-leak pilot check valve, with which clamping circuit pressure can be retained over a long period of time after disengagement of hydraulic pressure source.

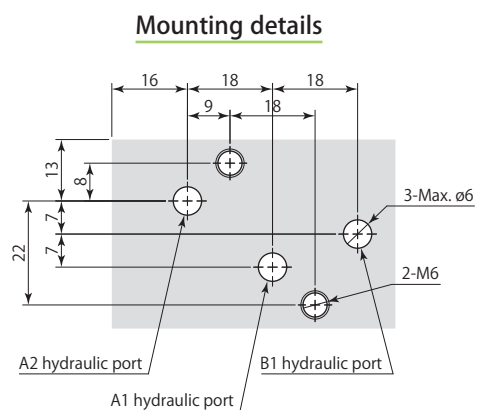
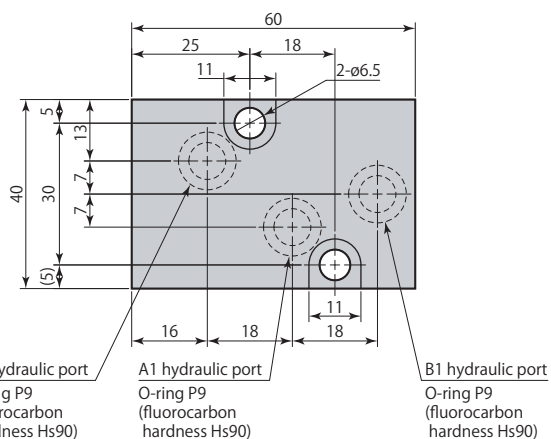
### Specifications

Model		VCP-LG
Mounting, piping methods		Manifold mounting
Pressure range	MPa	1-7
Proof pressure	MPa	10.5
Cracking pressure	MPa	0.019
Min. pilot pressure (open valve)	MPa	$0.01 + 0.24 \times A2$ hydraulic port (secondary side) pressure
Orifice area	mm <sup>2</sup>	14.2
Operating temperature	°C	0-70
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent)
Mass	kg	0.5

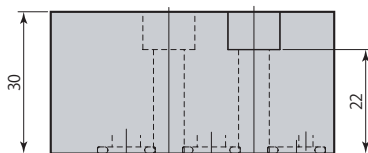
● Fluorocarbon has been adopted for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification).

### Dimensions

VCP-LG Manifold mounting \*With internal filter (A1 & A2 hydraulic ports)



For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

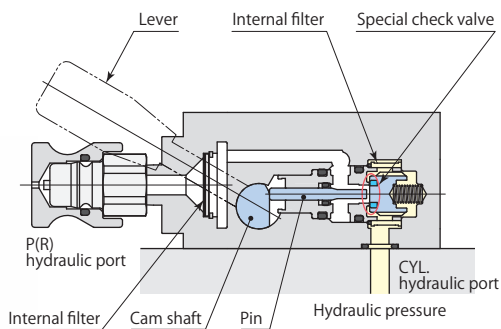


- Mounting screws are not included.
- This valve cannot be used in the circuit which pressure is applied to both of A1 and B1 port.





Coupling valve model VHD



This is a non-leak valve, with which coupling of single acting clamp can be performed easily and clamping circuit pressure can be retained over a long period of time after disengagement of hydraulic pressure source.

Specifications

Mounting, piping methods

**GB** : Manifold, GB mounting

**VHD-L GS** : Manifold, GS mounting

**T** : Piping

Lever action

**(Nil)** : Clamping position keeping type

**D** : Detent type

**D** indicates made to order.

Lever mounting

**(Nil)** : Standard

**K** : Opposite side

Option

**(Nil)** : NBR

**V\*** : Fluorocarbon

\*: Fluorocarbon has been adopted for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification).

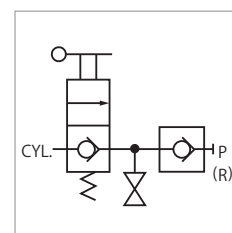
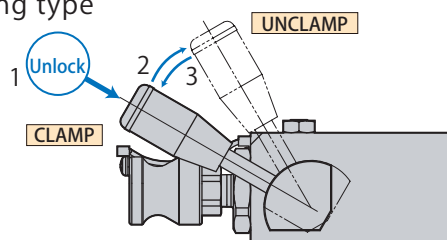
Model	VHD-LGB	VHD-LGS	VHD-LT
Pressure range	MPa	2-7	
Proof pressure	MPa	10.5	
Cracking pressure	MPa	0.017	
Orifice area	mm <sup>2</sup>	21.0	
Operating temperature	°C	0-70	
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)		
Mass	kg	1.4	

Lever operation

**VHD-L□-□□** Clamping position keeping type

From the clamping position

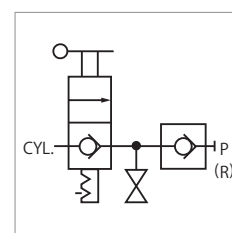
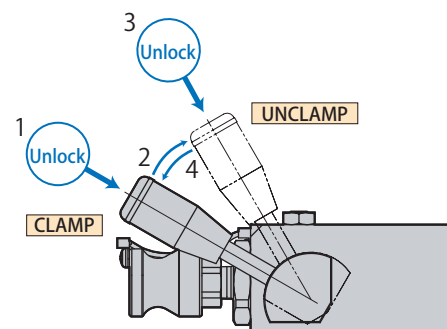
1. Push the lever lock is released.
2. Unclamp causing the lever.
3. Return to the clamping position when you take your hand off the lever.



**VHD-L□-D□□** Detent type

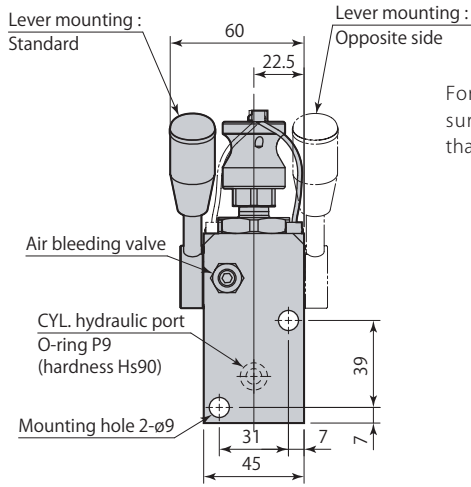
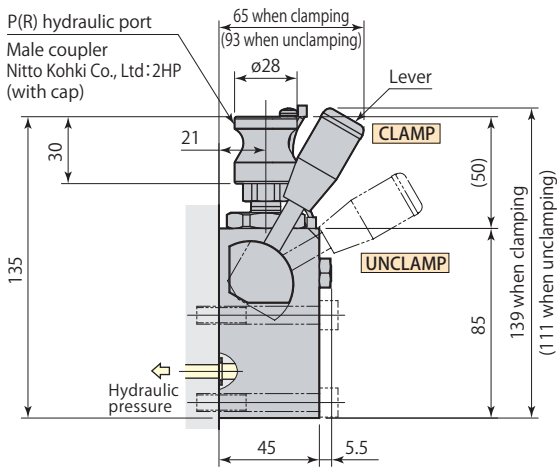
From the clamping position

1. Push the lever lock is released.
2. Unclamp and lock causing the lever.
3. When the clamp, push the lever to unlock.
4. Clamp and lock the lever back.



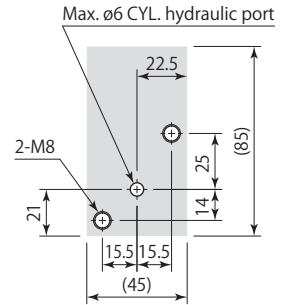
Dimensions

**VHD-LGB-□□□□** Manifold, GB mounting \*With internal filter (P & CYL. hydraulic ports)

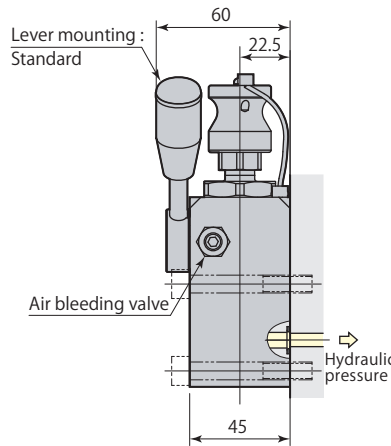
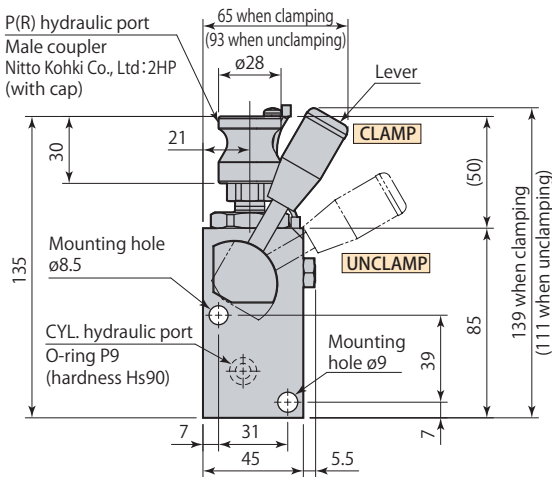


Mounting details

For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

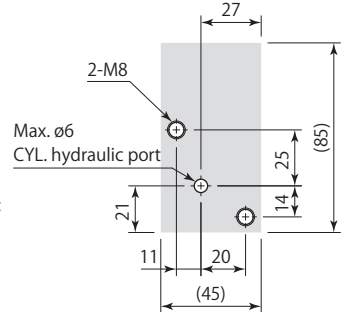


**VHD-LGS-□□□□** Manifold, GS mounting \*With internal filter (P & CYL. hydraulic ports)  
Opposite side lever not available

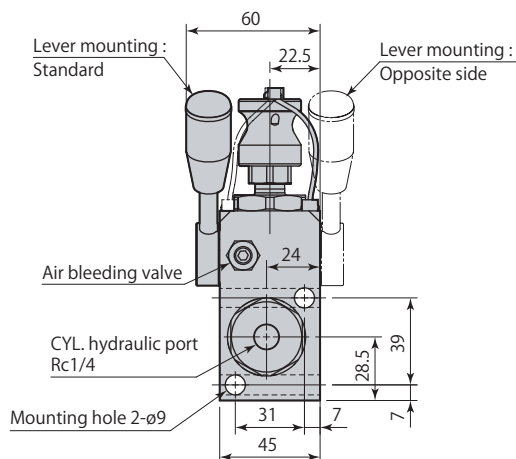
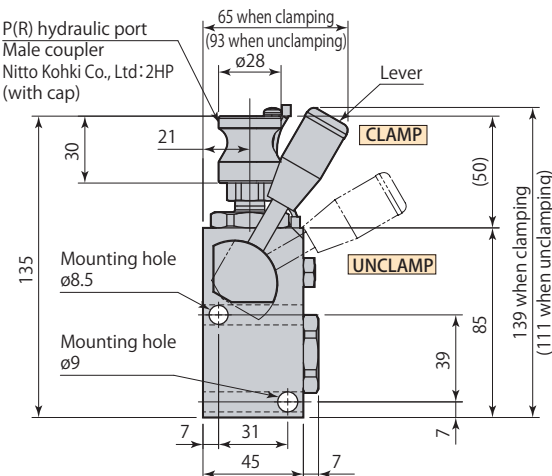


Mounting details

For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).



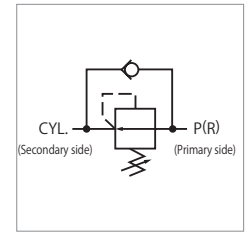
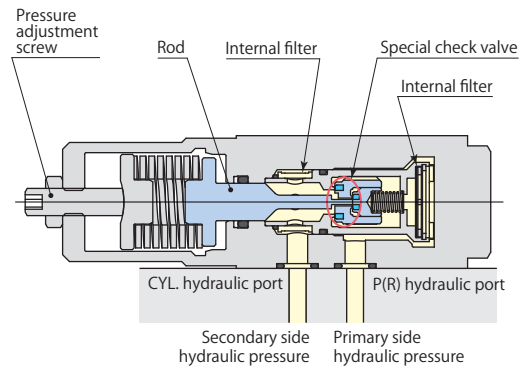
**VHD-LT-□□□□** Piping mounting \*With internal filter (P & CYL. hydraulic ports)



● Female coupler (Nitto Kohki Co., Ltd.:2HS) and mounting screws are not included.



Reducing valve model VRG



Internal hydraulic pressure of circuit can be partially reduced. This is a non-leak type that requires no drain.

Specifications

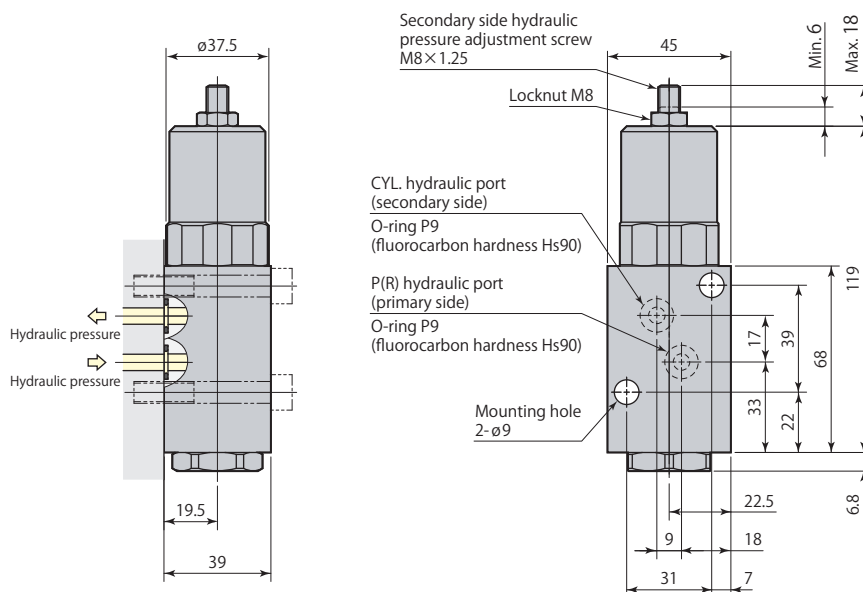
Model		VRG-LG	VRG-LT	VRG-LS
Mounting, piping methods		Manifold mounting	Piping mounting	VHD linking
Primary side hydraulic pressure range	MPa		2-7	
Secondary side hydraulic pressure range	MPa		1-6	
Allowable min. differential pressure*	MPa		1	
Proof pressure	MPa		10.5	
Pressure change per revolution	MPa/rev		0.5	
Orifice area	mm <sup>2</sup>		28.1	
Operating temperature	°C		0-70	
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent)		
Mass	kg	0.9	1.0	1.0

- Fluorocarbon has been adopted for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification).
  - Avoid overpressure to CYL. hydraulic port of the valve if there is a risk of back pressure in secondary circuit.
- \*: The setting should be performed so that the differential pressure between primary side hydraulic pressure and secondary side hydraulic pressure may exceed 1 MPa. (Example: If primary side hydraulic pressure is 5 MPa, secondary side hydraulic pressure should be from 1 to 4 MPa.)

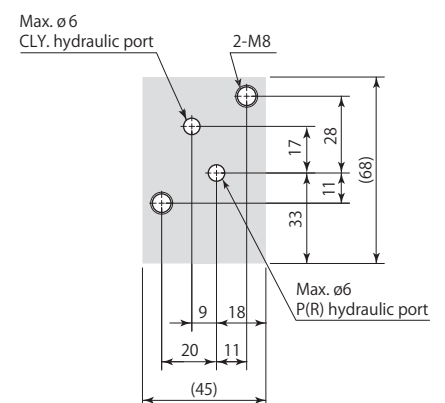
■ indicates made to order.

Dimensions

**VRG-LG** Manifold mounting \*With internal filter (P & CYL. hydraulic ports)



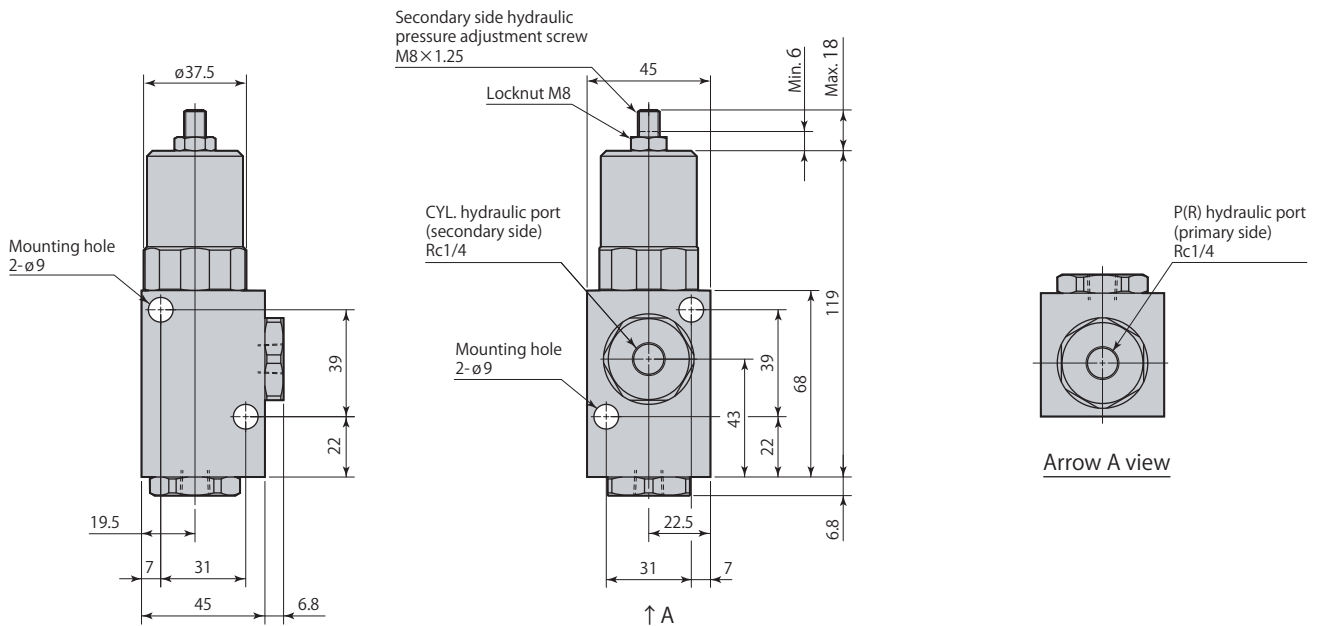
Mounting details



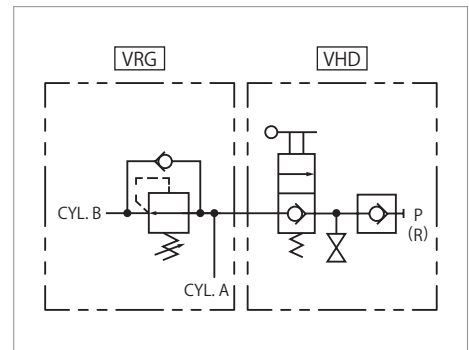
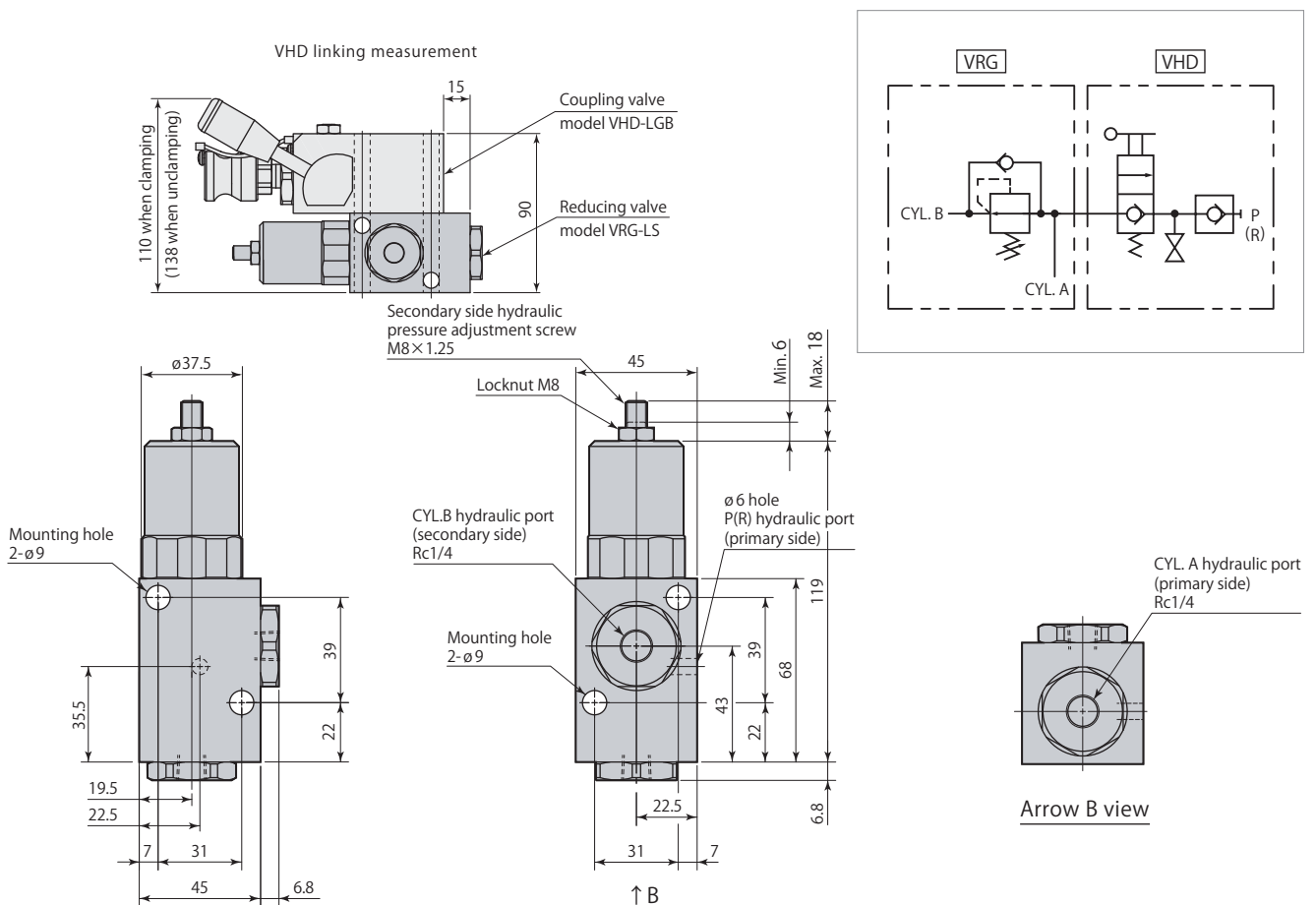
For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

Dimensions

**VRG-LT** Piping mounting \*With internal filter (P & CYL. hydraulic ports)

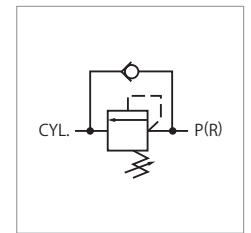
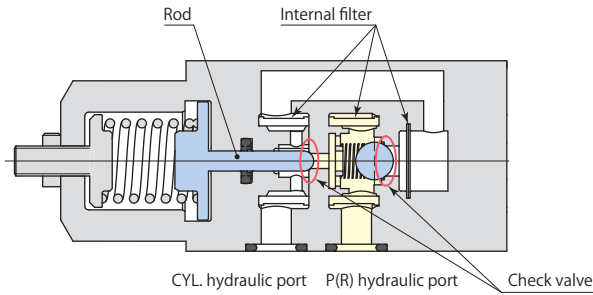
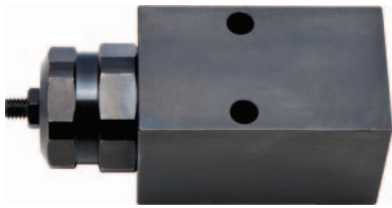


**VRG-LS** VHD linking \*With internal filter (P & CYL. hydraulic ports)



- Structure is such that when pressure on secondary side (low pressure side) drops due to temperature change or oil leak, flow channel to primary side (high pressure side) is opened to replenish oil until pressure reaches set pressure.
- Pressure is not supplemented when primary side is separated from hydraulic pressure source.
- Mounting screws are not included.





Clamps are sequentially operated through same circuit.

Sequence valve model **VEF**

Specifications

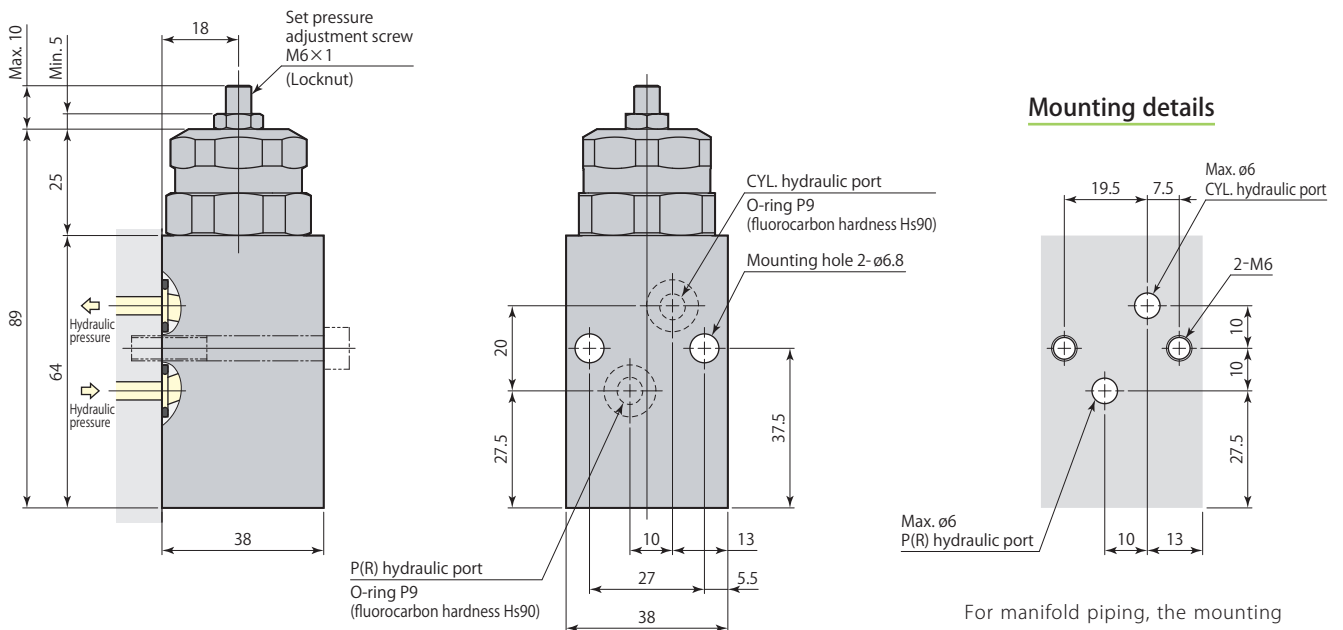
Model		VEF-LG	VEF-LT
Mounting, piping methods		Manifold mounting	Piping mounting
Pressure range	MPa	2-30	
Allowable min. differential pressure*	MPa	1	
Set hydraulic pressure range	MPa	1-6	
Proof pressure	MPa	37.5	
Cracking pressure	MPa	0.01	
Pressure change per revolution	MPa/rev	1	
Orifice area	mm <sup>2</sup>	P → CYL. 7.1	CYL. → R 28.3
Operating temperature	°C	0-70	
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent)	
Mass	kg	0.8	1.0

● Fluorocarbon has been adopted for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification).

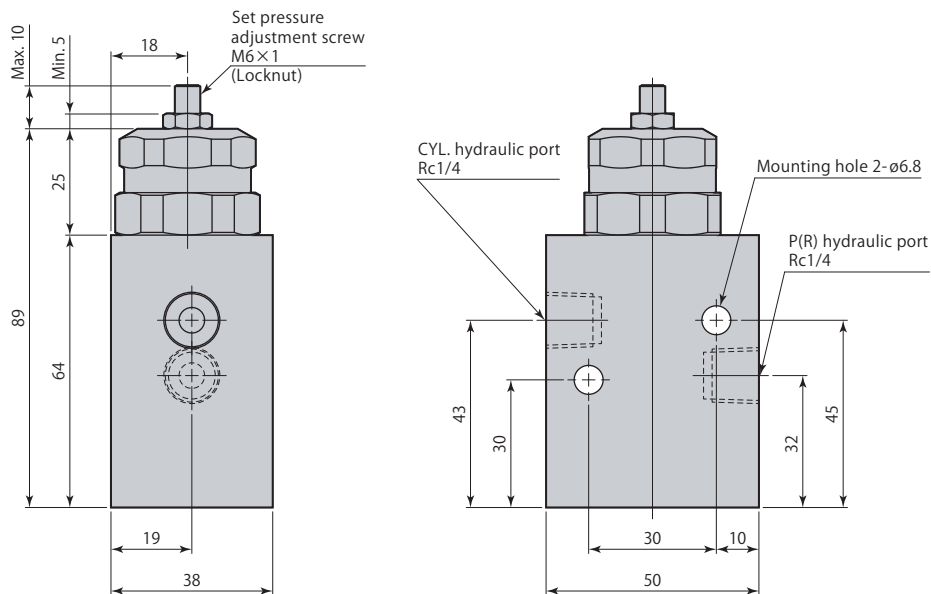
\*: The setting should be performed so that the differential pressure between working pressure and set hydraulic pressure may exceed 1 MPa. (Example: If working pressure is 5 MPa, set hydraulic pressure should be from 1 to 4 MPa.)

Dimensions

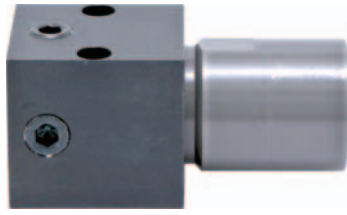
**VEF-LG** Manifold mounting \*With internal filter (P & CYL. hydraulic ports)



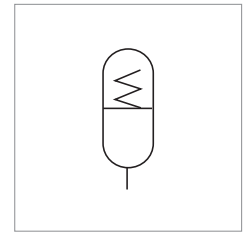
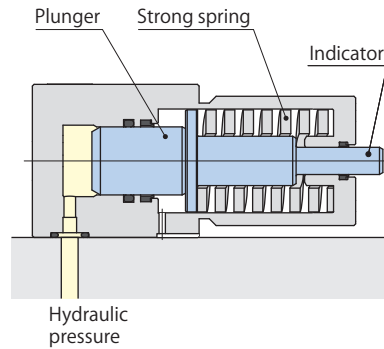
For manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

Dimensions**VEF-LT** Piping mounting \*With internal filter (P & CYL. hydraulic ports)

- The sequence valve may open by lower pressure than the set value when a large volume of oil flow is applied. It is due to the surge pressure caused by an oil hammer phenomenon. Use VEF with a flow control valve installing at primary side to adjust the flow rate.
- The sequence effect may not be achievable due to a back pressure in case the hydraulic circuit would be built by meter-out control or would generate pipe resistance.
- Mounting screws are not included.



Accumulator model **WPB**



Spring pressure type accumulator. Pressure fluctuation that occurs due to temperature change after disengaging hydraulic pressure source is suppressed.

Specifications

		Oil discharge, absorption amount	Mounting method	Scraper, seal material
<b>WPB</b>	2			
	3	1 : 3.3 cm <sup>3</sup>	<b>GB</b> : Manifold, GB mounting	(Nil) : NBR (standard)
	4			
	5	2 : 6.6 cm <sup>3</sup>	<b>GS</b> : Manifold, GS mounting	<b>V*</b> : Fluorocarbon
	6			
	7	3 : 13 cm <sup>3</sup>	<b>T</b> : Piping	

\*:Fluorocarbon has been adopted for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification).

Model	WPB2-1	WPB2-2	WPB2-3	WPB3-1	WPB3-2	WPB3-3	WPB4-1	WPB4-2	WPB4-3	
Hydraulic pressure MPa	Refer to page →227 for characteristic line diagram.									
Oil capacity cm <sup>3</sup>	3.3	6.6	13.0	3.3	6.6	13.0	3.3	6.6	13.0	
Pressure fluctuation per 1cm <sup>3</sup> MPa	0.55	0.38	0.19	0.50	0.33	0.17	0.43	0.29	0.14	
Mass kg	0.9	1.2	1.8	0.9	1.2	1.8	0.9	1.2	1.8	

Model	WPB5-1	WPB5-2	WPB5-3	WPB6-1	WPB6-2	WPB6-3	WPB7-1	WPB7-2	WPB7-3	
Hydraulic pressure MPa	Refer to page →227 for characteristic line diagram.									
Oil capacity cm <sup>3</sup>	3.3	6.6	13.0	3.3	6.6	13.0	3.3	6.6	13.0	
Pressure fluctuation per 1cm <sup>3</sup> MPa	0.41	0.27	0.16	0.90	0.61	0.36	0.84	0.59	0.34	
Mass kg	1.3	1.7	2.4	1.3	1.7	2.4	1.3	1.7	2.4	

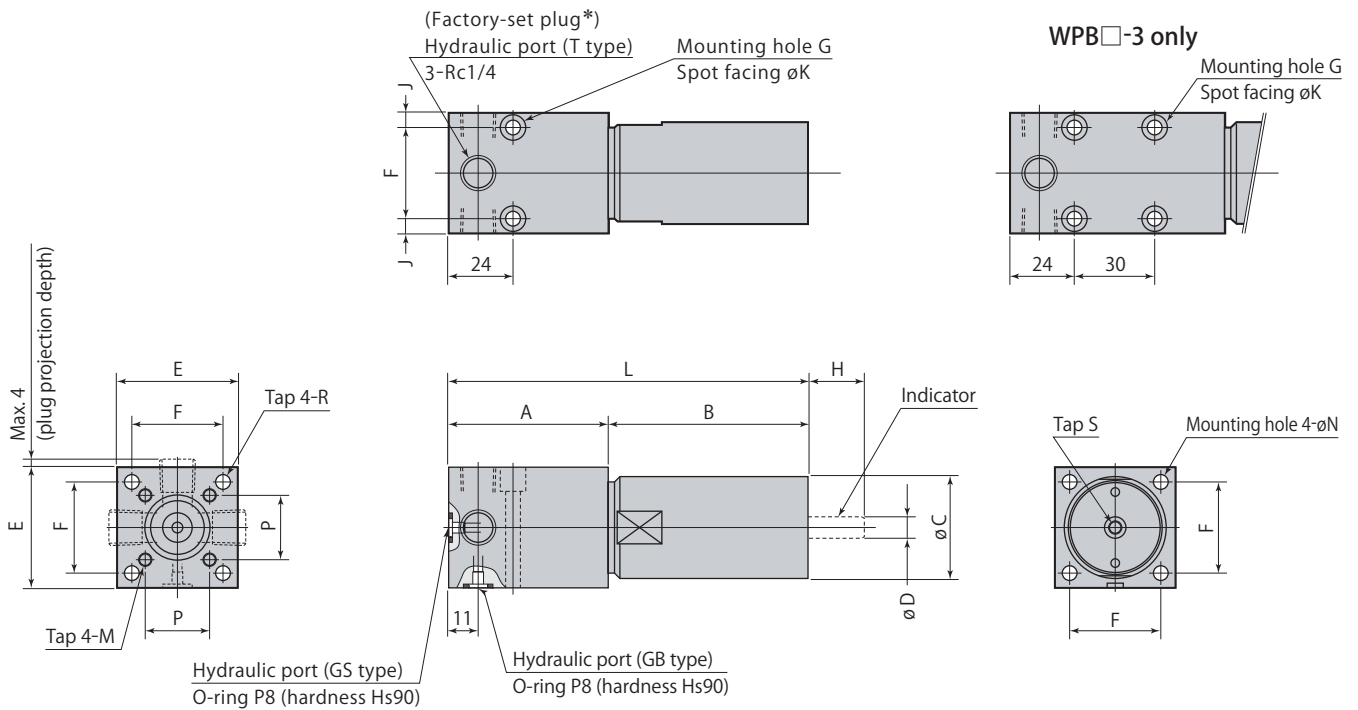
- Proof pressure: 7 MPa (WPB2, 3, 4) , 15 MPa (WPB5, 6, 7) ● Operating temperature: 0–70°C
- Fluid used: General mineral based hydraulic oil (ISO-VG32 or equivalent)

Accumulator

WPB Spring

Dimensions

WPB□-□□□-□ \*No internal filter



mm																	
Model		A	B	øC	øD	E	F	G	Max. H	J	øK	L	M	øN	P	R	S
WPB <sup>2</sup> <sub>3</sub> <sup>4</sup>	-1	49	46	38	8	45	34	2-ø5.5	10.5	5.5	9.5 depth 9	95	M5×0.8 depth 10	5.5	24	-	M5×0.8 depth 9
	-2	59.5	74.5					2-ø5.5	21			134					
	-3	80	151					4-ø5.5	41.5			231					
WPB <sup>5</sup> <sub>6</sub> <sup>7</sup>	-1	49	70	42.7	10	50	38	2-ø6.8	10.5	6	11 depth 11	119	-	6.8	-	M8×1.25 depth 16	M6×1 depth 11
	-2	59.5	105					2-ø6.8	21			164.5					
	-3	80	186					4-ø6.8	41.5			266					

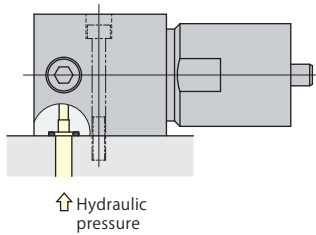
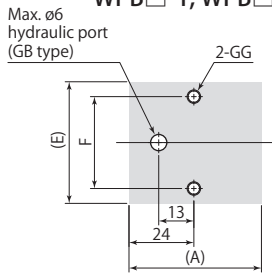
\* : Included plug T type: 2 pieces, GB & GS type: 3 pieces.

● Mounting screws are not included.

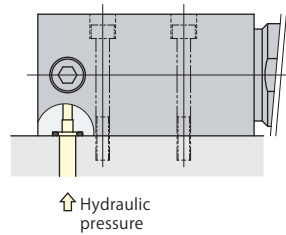
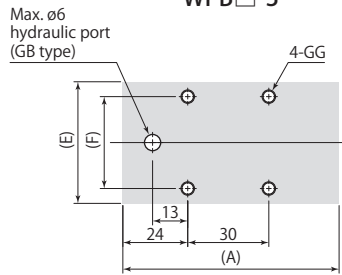
Mounting details

Manifold, GB mounting / Piping mounting

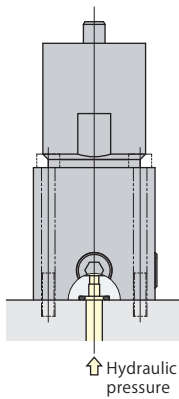
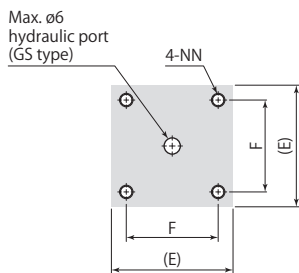
WPB□-1, WPB□-2



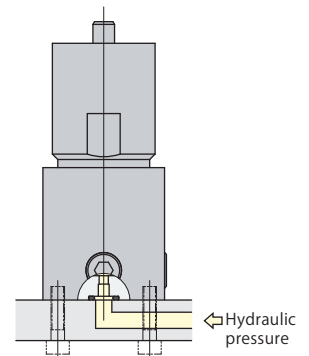
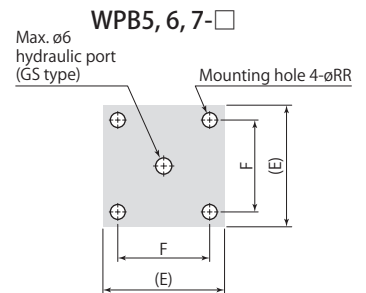
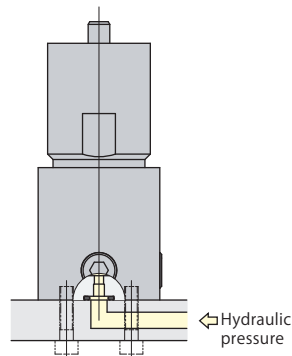
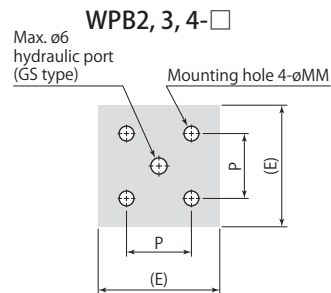
WPB□-3



Manifold, GS mounting ① / Piping mounting ①



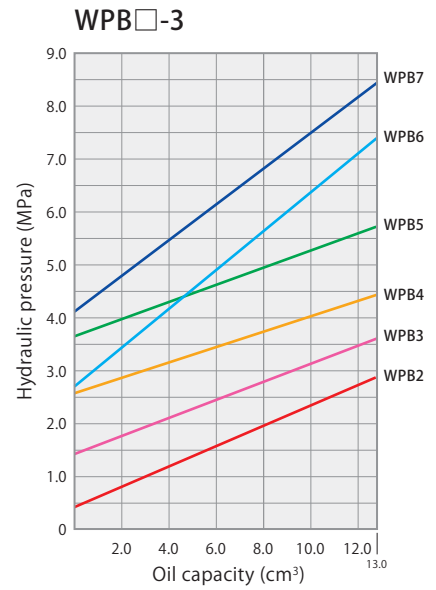
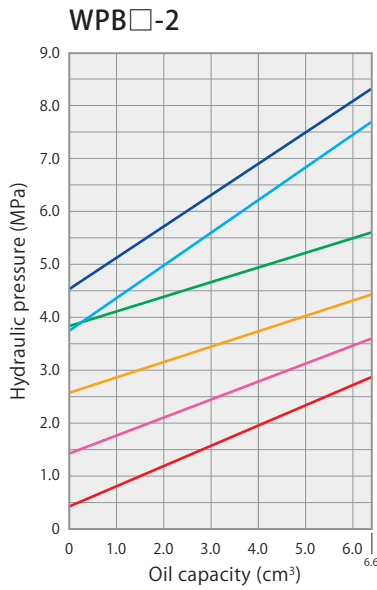
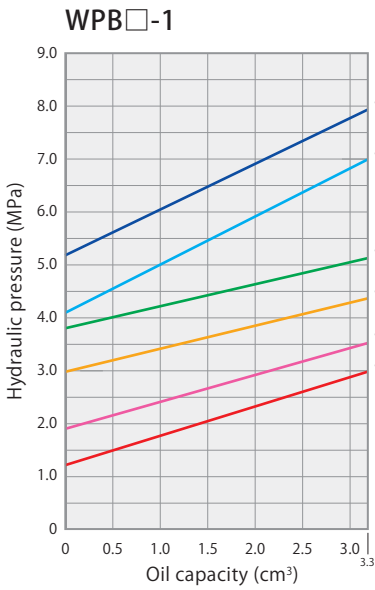
Manifold, GS mounting ② / Piping mounting ②



When manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

Model		A	E	F	GG	øMM	NN	P	øRR
WPB 2 3 4	-1	49	45	34	M5	5.5	M5	24	-
	-2	59.5							
	-3	80							
WPB 5 6 7	-1	49	50	38	M6	-	M6	-	9
	-2	59.5							
	-3	80							

Characteristic line diagram



This characteristic line diagram represents theoretical values.

Model selection example

Condition (estimated temperature drop : 20°C )

Working clamp	CLU06×4 pieces	Piping	Inner diameter ø6×0.6m×4 pieces
Hydraulic pressure:P	3.5 MPa	Valve & hydraulic pressure equipment	VCB : 1 piece, VRG : 2 pieces

Selection procedure

1. Calculation of circuit capacity

$$\text{Clamping capacity} : \frac{9.6 \times 2.6 \times 4}{\text{Pressure bearing area} \quad \text{Stroke} \quad \text{Qty}} = 100 \text{ cm}^3$$

$$\text{Piping capacity} : 0.283 \times 60 \times 4 = 68 \text{ cm}^3$$

$$\text{Valve \& hydraulic equipment capacity} : 8 \times 3 = 24 \text{ cm}^3$$

(Perform calculation with capacity of 8 cm<sup>3</sup> for each of valves and hydraulic equipment in hydraulic circuit, when using Pascal product.)

$$\text{Circuit capacity} : 100 + 68 + 24 = 192 \text{ cm}^3$$

2. Selection of oil capacity

Select the equipment having oil capacity capable of keeping volumetric change.

Volumetric change is obtained by using formula shown below.

$$\Delta V = V \times \Delta T \times \alpha \quad \Delta V: \text{Volumetric change (cm}^3\text{)} \quad V: \text{Circuit capacity (cm}^3\text{)}$$

$$\Delta T: \text{Temperature change (}^\circ\text{C)} \quad \alpha: \text{Thermal expansion coefficient (7.8} \times 10^{-4}\text{)}$$

$$\Delta V = 192 \times 20 \times 7.8 \times 10^{-4} = 3.0 \text{ cm}^3$$

Here, WPB□-2 is selected as an example (\*1).

3. Selection of WPB hydraulic pressure

Select the pressure whose oil discharge amount (\*2) under hydraulic pressure satisfies  $\Delta V$  calculated in step 2. Read off characteristic line diagram.

If the hydraulic pressure is 3.5 MPa, select WPB3-2 or WPB4-2.

4. Verification of hydraulic pressure and residual discharge amount (\*2) after temperature change

Select the one whose hydraulic pressure drop after temperature change is low and residual discharge amount (\*2) satisfies the marginal oil amount (\*3). Read off characteristic line diagram.

The hydraulic pressure after temperature change drops to 2.5 MPa with WPB3-2 (P3) and to 2.6 MPa with WPB4-2 (P4).

The residual discharge amount (\*2) becomes 3.3 cm<sup>3</sup> with WPB3-2 (V3) and 0.3 cm<sup>3</sup> with WPB4-2 (V4).

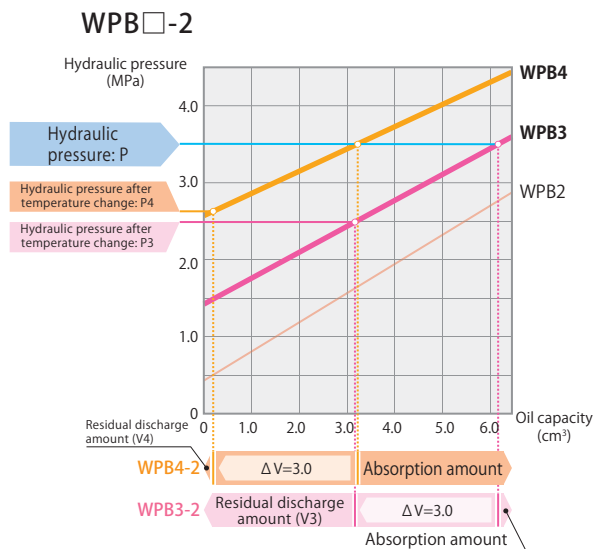
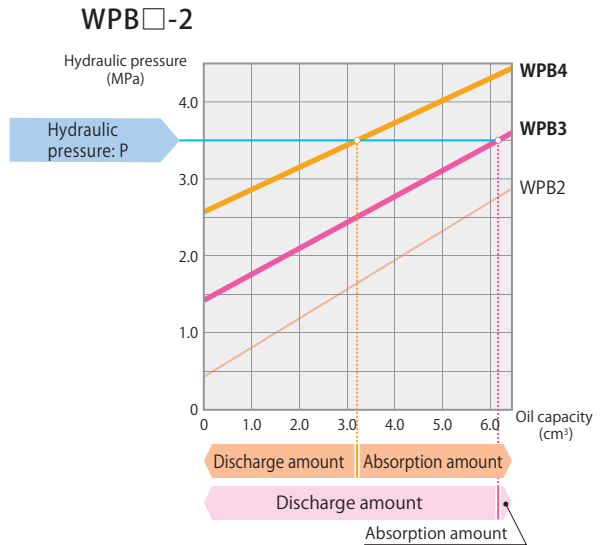
In this case, select WPB3-2□ with the marginal amount retained.

5. Select piping method.

\*1 : WPB□-1 and WPB□-3 are also selectable. Likewise, select appropriate one in consideration of steps 3 and 4.

\*2 : For when the temperature decreases. If the temperature increases, check the absorption amount.

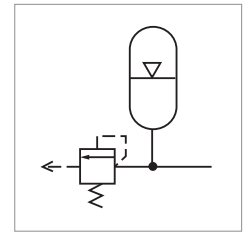
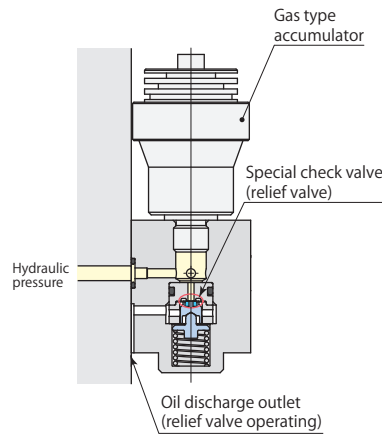
\*3 : Allow adequate margin for residual discharge amount after temperature change, as there may be margin of error with spring force of internal spring.  
 Marginal oil amount : WPB□-1 : About 0.5 cm<sup>3</sup>, WPB□-2 : About 1.0 cm<sup>3</sup>, WPB□-3 : About 1.5 cm<sup>3</sup>



Accumulator  
WPB Spring



Accumulator model WPC



N2 pressure type accumulator. Equipped with a relief valve for preventing breakdown of device in case of problems with circuit pressure (high pressure).

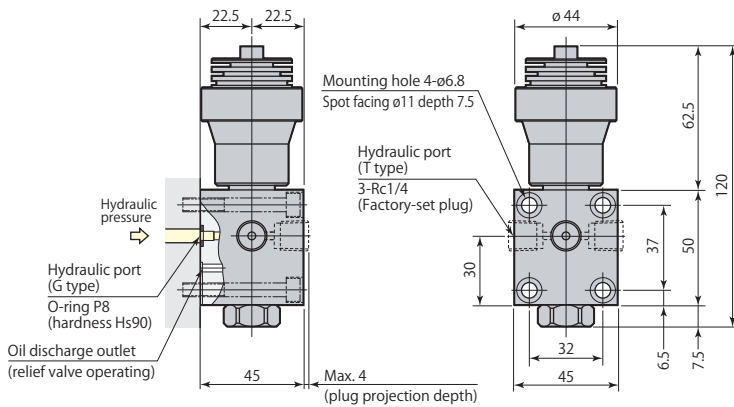
**Specifications**

Model	WPC13L-G	Gas pressure*	WPC13L-T	Gas pressure*	WPC40L-G	Gas pressure*	WPC40L-T	Gas pressure*
Mounting, piping methods	Manifold mounting		Piping mounting		Manifold mounting		Piping mounting	
Pressure range	MPa Refer to page →229 for characteristic line diagram.							
Gas capacity	cm <sup>3</sup>		13		cm <sup>3</sup>		40	
Oil capacity	cm <sup>3</sup>		10		cm <sup>3</sup>		30	
Mass	kg		1.1		kg		1.6	

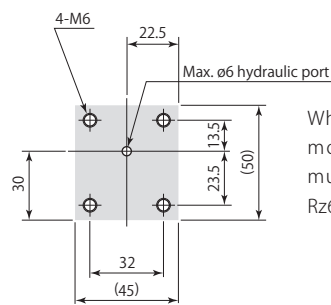
- Proof pressure: 10.5 MPa ● Operating temperature: 0-60°C ● Fluid used: General mineral based hydraulic oil (ISO-VG32 equivalent)
- There is also a type that adopts fluorocarbon for seal sections where cutting fluid is applied, as a measure for the use of chlorine-based cutting fluid (this is not thermal resistant specification. Model designation WPC□L-□□-V).
- \*: Initially filled gas pressure can be set in range of 1 MPa to 6 MPa with 0.5 MPa increment. Specify gas pressure when ordering. Example: WPC13L-T3.0 (gas pressure 3 MPa)

**Dimensions**

**WPC13L-□□ \*No internal filter**

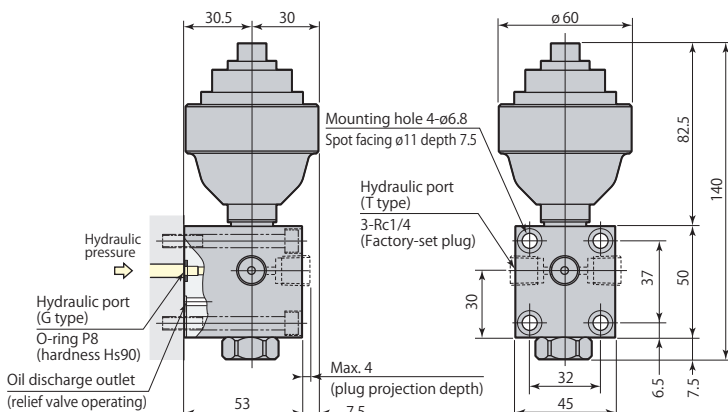


**Mounting details**

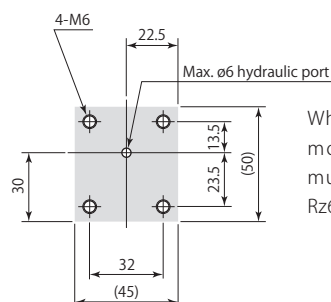


When manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

**WPC40L-□□ \*No internal filter**



**Mounting details**



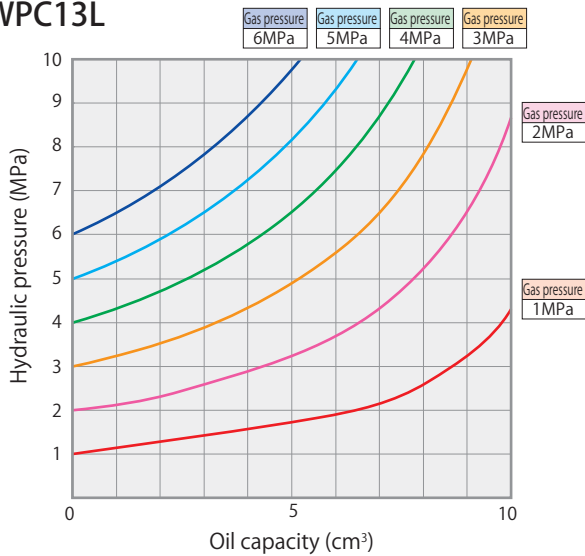
When manifold piping, the mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

● Mounting screws are not included.

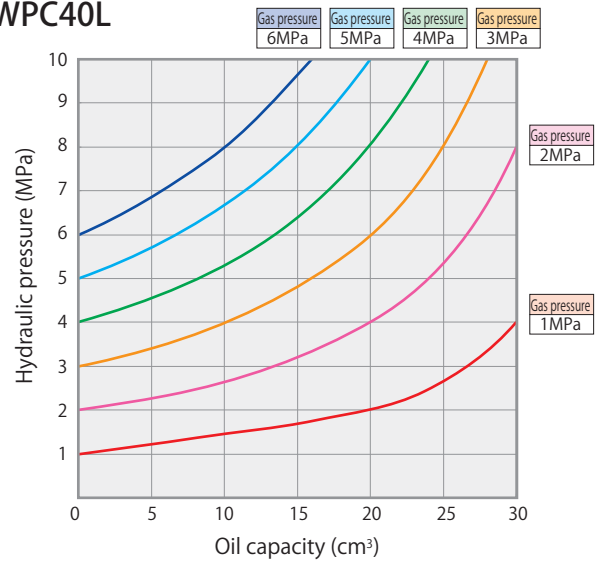
Accumulator  
WPC  
N2 gas

Characteristic line diagram

WPC13L



WPC40L



This characteristic line diagram represents theoretical values.

Model selection example

Condition (estimated temperature drop : 20°C )

Working clamp	CTU06×8 pieces	Piping	Inner diameter ø6×0.8 m×8 pieces
Hydraulic pressure:P	6 MPa	Valve & hydraulic pressure equipment	VCB : 1 piece, VRG : 2 pieces

Selection procedure

1. Calculation of circuit capacity

$$\text{Clamping capacity} : 8.9 \times 2.35 \times 8 = 167 \text{ cm}^3$$

Pressure bearing area    Stroke    Qty

$$\text{Piping capacity} : 0.283 \times 80 \times 8 = 181 \text{ cm}^3$$

$$\text{Valve \& hydraulic equipment capacity} : 8 \times 3 = 24 \text{ cm}^3$$

(Perform calculation with capacity of 8 cm<sup>3</sup> for each of valves and hydraulic equipment in hydraulic circuit, when using Pascal product.)

$$\text{Circuit capacity} : 167 + 181 + 24 = 372 \text{ cm}^3$$

2. Selection of oil capacity

Select the equipment having oil capacity capable of keeping volumetric change.

Volumetric change is obtained by using formula shown below.

$$\Delta V = V \times \Delta T \times \alpha \quad \Delta V: \text{Volumetric change (cm}^3\text{)} \quad V: \text{Circuit capacity (cm}^3\text{)}$$

$$\Delta T: \text{Temperature change (}^\circ\text{C)} \quad \alpha: \text{Thermal expansion coefficient (7.8} \times 10^{-4}\text{)}$$

$$\Delta V = 372 \times 20 \times 7.8 \times 10^{-4} = 5.8 \text{ cm}^3$$

Here, WPC40L is selected as an example (\*1).

3. Selection of gas pressure

Select the pressure whose oil discharge amount (\*2) under hydraulic pressure satisfies  $\Delta V$  calculated in step 2. Read off characteristic line diagram.

If the hydraulic pressure of the clamping circuit is 6 MPa, select gas pressure 2 MPa, 3 MPa, or 4 MPa.

4. Verification of hydraulic pressure and residual discharge amount (\*2) after temperature change

Select the one whose hydraulic pressure drop after temperature change is low and residual discharge amount (\*2) satisfies the marginal oil amount (\*3). Read off characteristic line diagram.

The hydraulic pressure after temperature change drops to 4.2 MPa with 2 MPa gas pressure (P2), to 4.7 MPa with 3 MPa gas pressure (P3), and to 4.9 MPa with 4 MPa gas pressure (P4), respectively.

The residual discharge amount (\*2) is 20.9 cm<sup>3</sup> for 2 MPa gas pressure (V2), 14.2 cm<sup>3</sup> for 3 MPa (V3), and 7.5 cm<sup>3</sup> for 4 MPa (V4), respectively.

Here, select WPC40L-□4 whose pressure drop is low.

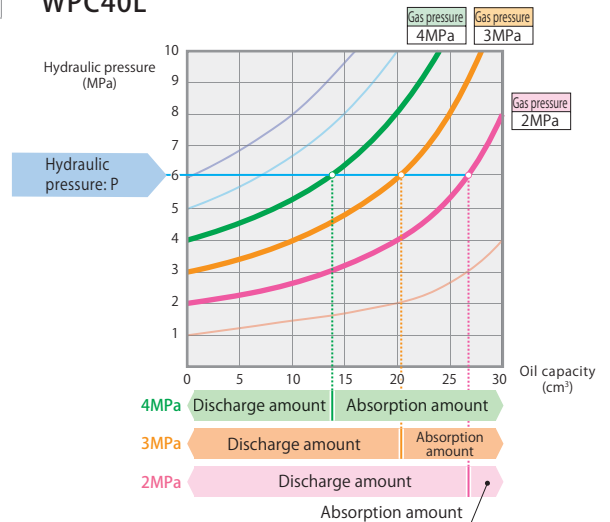
5. Select piping method.

\*1 : WPC13L is also available. Likewise, select appropriate one in consideration of steps 3 and 4.

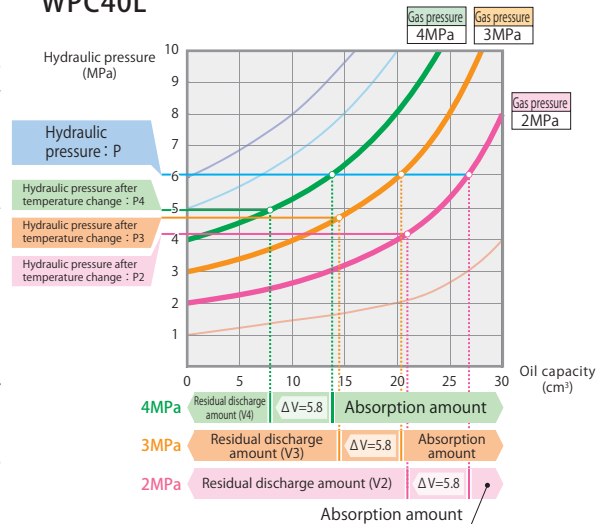
\*2 : For when the temperature decreases. If the temperature increases, check the absorption amount.

\*3 : Allow adequate margin for residual discharge amount after temperature change, as there may be margin of error with gas filling pressure. Marginal oil amount : About 2.0 cm<sup>3</sup>

WPC40L



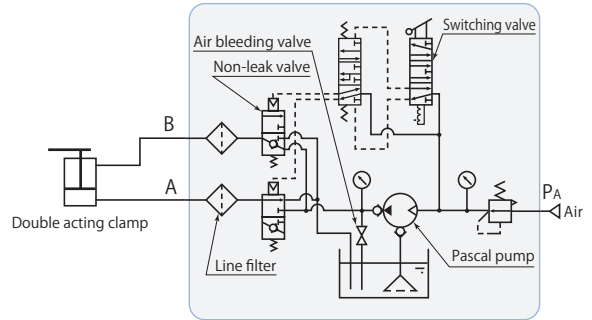
WPC40L



Accumulator

WPC N<sub>2</sub> gas





Control unit model **HCD□H-W**

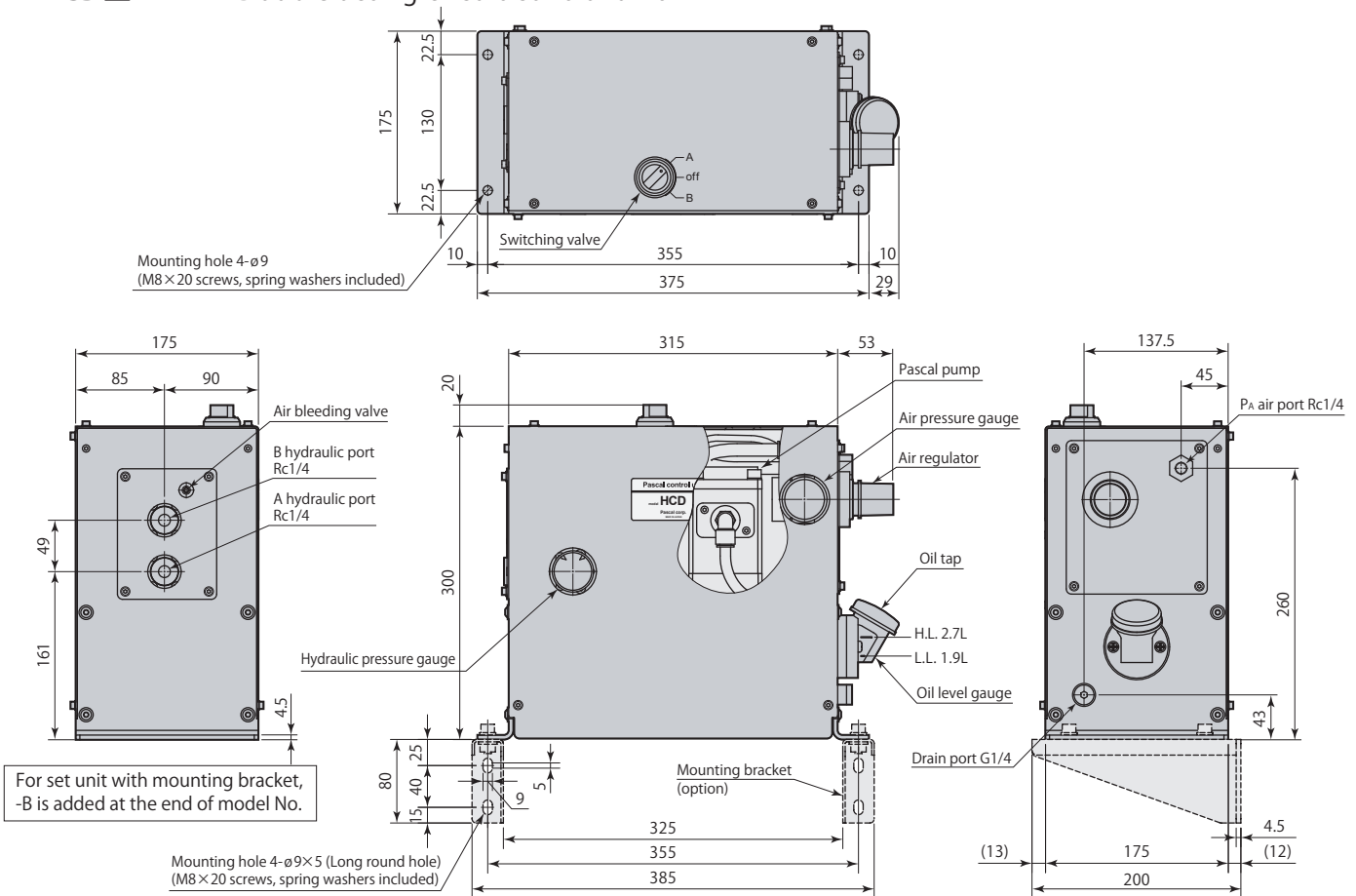
This is a hydraulic control unit that is air driven and manually operated, combining non-leak valve with non-leak feature (zero oil leaks), which is essential for hydraulic clamps, and Pascal pump. Since two hydraulic circuits can be operated and controlled alternately, it is best suited hydraulic pressure source for double acting clamps. Pascal pump stops pumping once circuit pressure has been attained and retains the pressure. Furthermore, since there is hardly any temperature fluctuation of working fluid, there is no need for any auxiliary pressure equipment.

Model	HCD4H-W	HCD5H-W
Pascal pump	X6312U-C	X6316S-C
Discharge oil pressure*1	MPa 3.6-10.8	2.25-6.75
Set air pressure	MPa 0.2-0.5	
Unloaded oil discharge amount	L/min	Refer to <b>page →235</b> for performance diagram.
Tank capacity*2	L	H.L. 2.7 L.L. 1.9
Operating temperature °C		5-60
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)	
Mass	kg	23

\*1: Ask for consultation on specifications that exceed discharge oil pressure range.  
 \*2: Oil level in the tank should be always between H.L. and L.L. of the gauge.

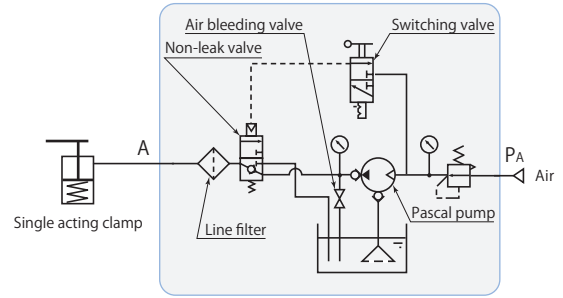
Dimensions

**HCD□H-W** Double acting circuit control unit



Control unit

HCD Manual operated



Control unit model HCD□H-S

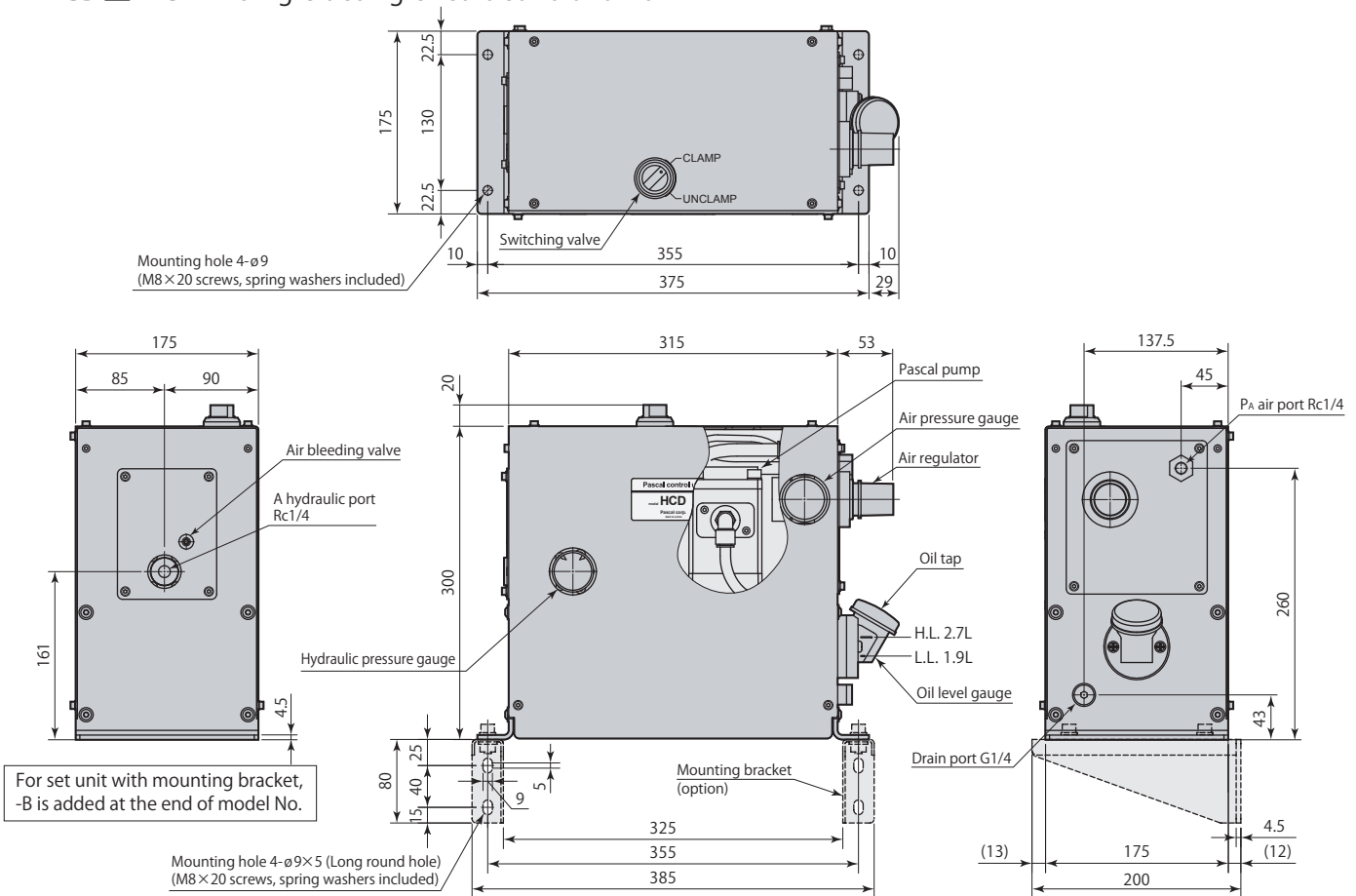
This is a hydraulic control unit that is air driven and manually operated, combining non-leak valve with non-leak feature (zero oil leaks), which is essential for hydraulic clamps, and Pascal pump. Pascal pump stops pumping once circuit pressure has been attained and retains the pressure. Furthermore, since there is hardly any temperature fluctuation of working fluid, there is no need for any auxiliary pressure equipment.

Model	HCD4H-S	HCD5H-S
Pascal pump	X6312U-C	X6316S-C
Discharge oil pressure*1	MPa 3.6-10.8	2.25-6.75
Set air pressure	MPa 0.2-0.5	
Unloaded oil discharge amount	L/min	Refer to page →235 for performance diagram.
Tank capacity*2	L	H.L. 2.7 L.L. 1.9
Operating temperature °C	5-60	
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)	
Mass	kg	21

\*1: Ask for consultation on specifications that exceed discharge oil pressure range.  
 \*2: Oil level in the tank should be always between H.L. and L.L. of the gauge.

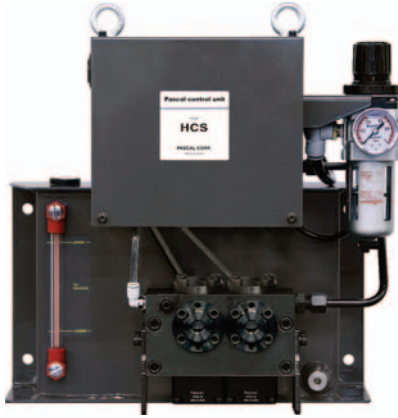
Dimensions

HCD□H-S Single acting circuit control unit



Control unit

HCD Manual operated

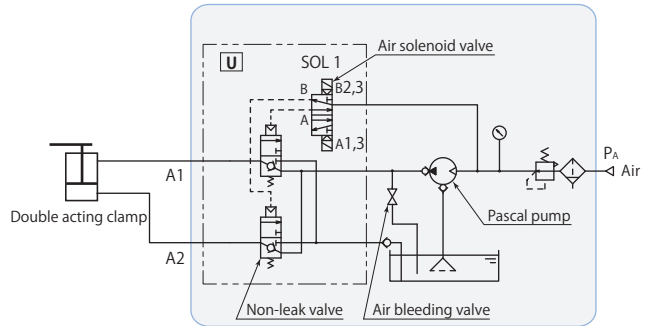


Control unit model **HCS-D-H□U**

This is a hydraulic control unit that is air driven and solenoidal operated, combining non-leak valve with non-leak feature (zero oil leaks), which is essential for hydraulic clamps, and Pascal pump. Since two hydraulic circuits can be operated and controlled alternately, it is best suited hydraulic pressure source for double acting clamps.

Pascal pump stops pumping once circuit pressure has been attained and retains the pressure. Furthermore, since there is hardly any temperature fluctuation of working fluid, there is no need for any auxiliary pressure equipment.

HCS-D-H□U is made to order.

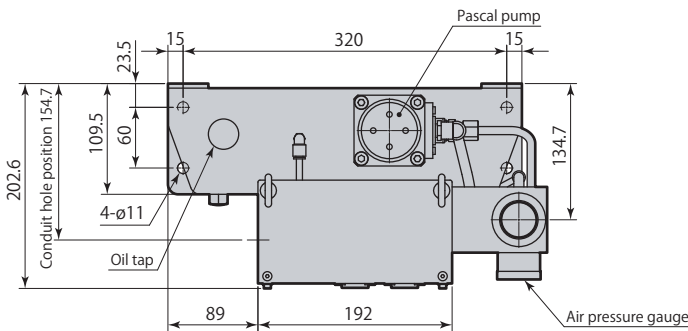


Model	HCS-D-H4U	HCS-D-H5U
Pascal pump	X6312U-D	X6316U-D
Control voltage*1	DC24V	
Discharge oil pressure*2	MPa 3.6–10.8	2.25–6.75
Set air pressure	MPa 0.2–0.5	
Unloaded oil discharge amount	L/min Refer to page →235 for performance diagram.	
Tank capacity*3	L H.L. 3.5	L.L. 1.5
Operating temperature °C	0–50	
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)	
Mass	kg 20	

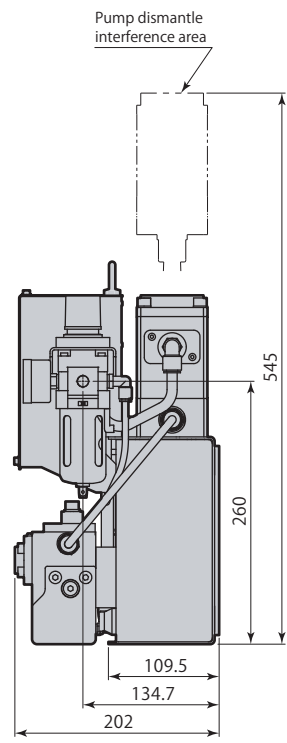
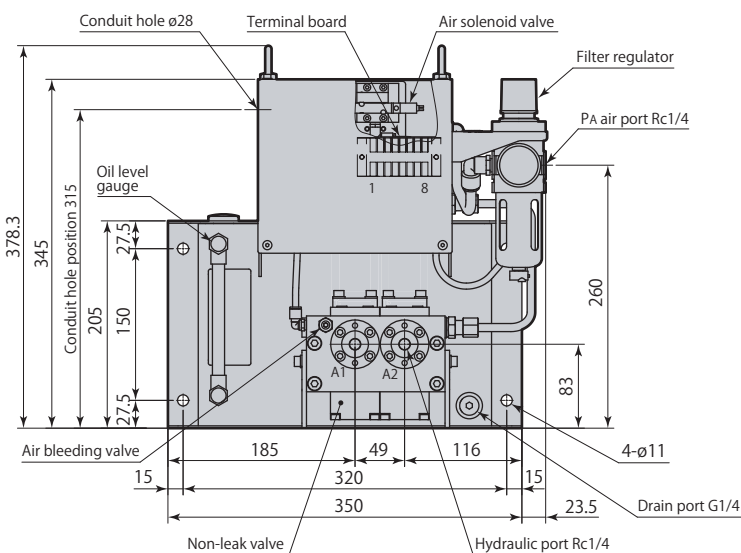
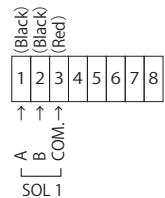
- \*1: Ask us if the control voltage is different.
- \*2: Ask for consultation on specifications that exceed discharge oil pressure range.
- \*3: Oil level in the tank should be always between H.L. and L.L. of the gauge.

**Dimensions**

**HCS-D-H□U Double acting circuit control unit**



**Wiring Diagram**



Control unit

HCS Solenoid operated

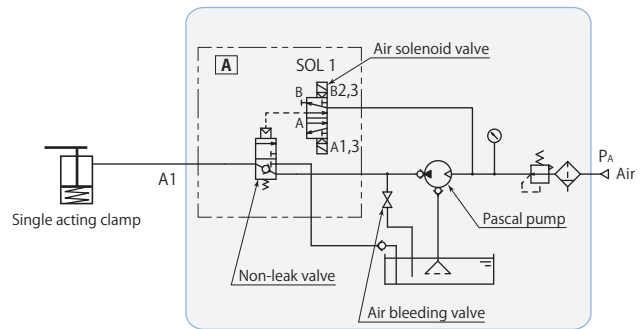


Control unit model **HCS-D-H□A**

This is a hydraulic control unit that is air driven and solenoidal operated, combining non-leak valve with non-leak feature (zero oil leaks), which is essential for hydraulic clamps, and Pascal pump.

Pascal pump stops pumping once circuit pressure has been attained and retains the pressure. Furthermore, since there is hardly any temperature fluctuation of working fluid, there is no need for any auxiliary pressure equipment.

HCS-D-H□A is made to order.

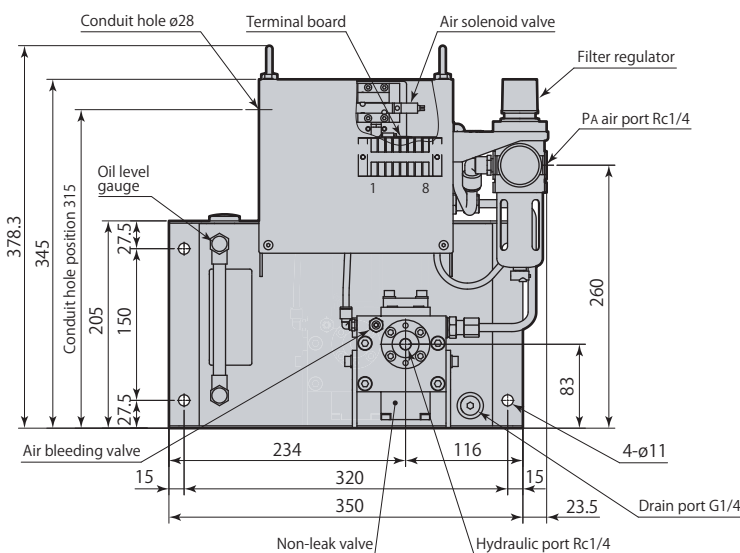
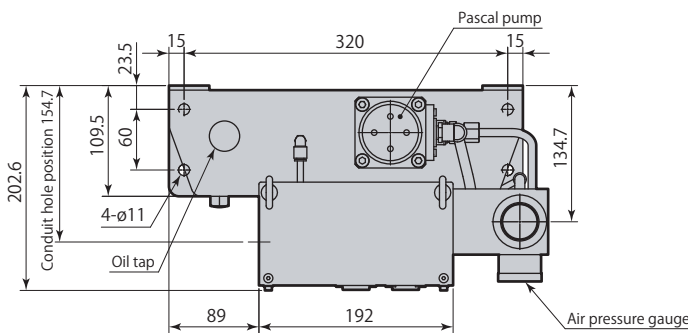


Model	HCS-D-H4A	HCS-D-H5A
Pascal pump	X6312U-D	X6316U-D
Control voltage*1	DC24V	
Discharge oil pressure*2	MPa 3.6–10.8	2.25–6.75
Set air pressure	MPa 0.2–0.5	
Unloaded oil discharge amount	L/min Refer to <b>page →235</b> for performance diagram.	
Tank capacity*3	L H.L. 3.5	L.L. 1.5
Operating temperature °C	0–50	
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)	
Mass	kg 17	

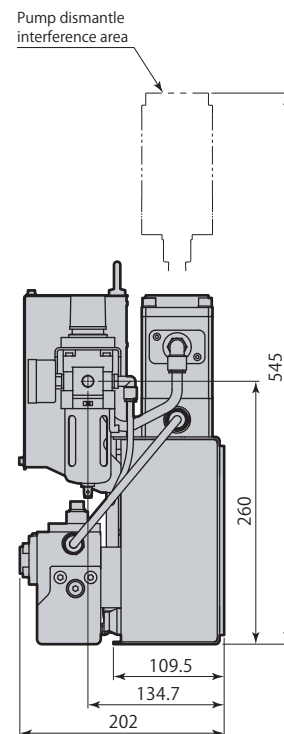
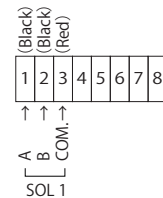
- \*1: Ask us if the control voltage is different.
- \*2: Ask for consultation on specifications that exceed discharge oil pressure range.
- \*3: Oil level in the tank should be always between H.L. and L.L. of the gauge.

**Dimensions**

**HCS-D-H□A Single acting circuit control unit**



**Wiring Diagram**

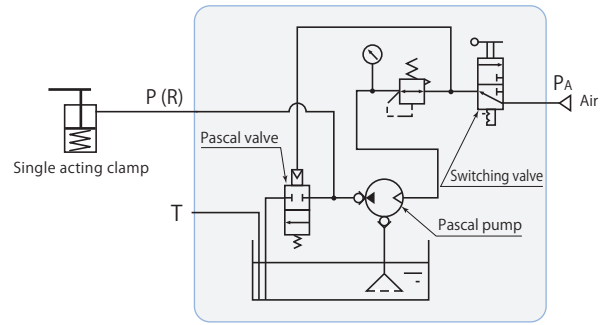


Control unit  
HCS  
Solenoid operated



Control unit model HCT-□

Compact hydraulic control unit for air drive and manual operations. Pascal pump stops pumping once circuit pressure has been attained and retains the pressure. Furthermore, since there is hardly any temperature fluctuation of working fluid, there is no need for any auxiliary pressure equipment.

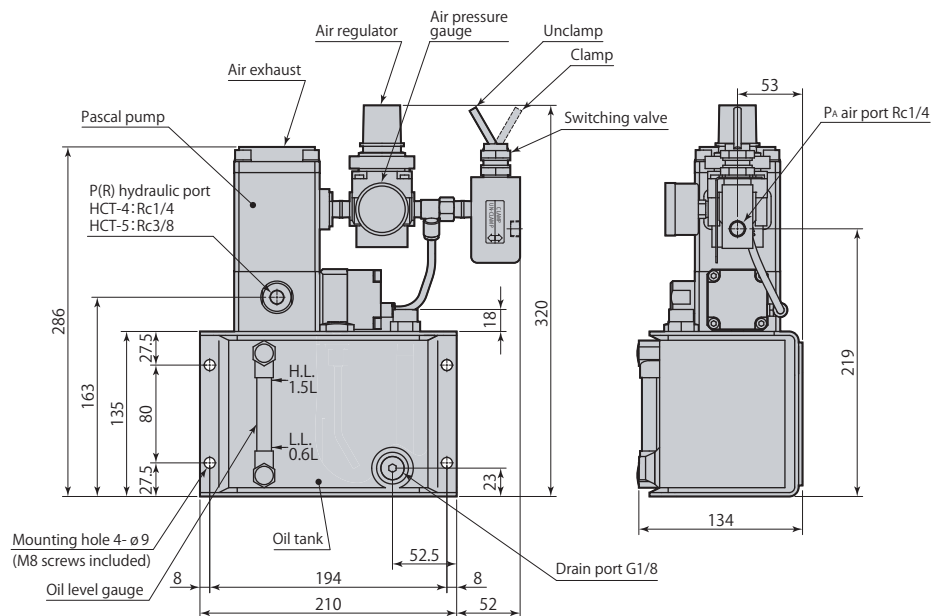
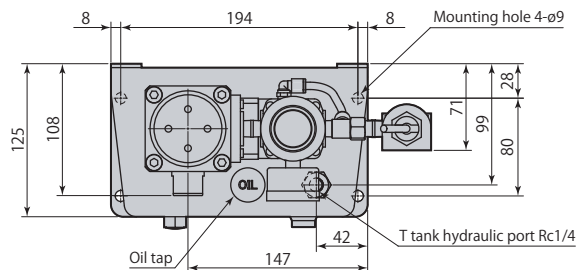


Model	HCT-4	HCT-5
Pascal pump	X6312-HCK-C	X6316-HCK-C
Discharge oil pressure*1	MPa 3.6-10.8	2.25-6.75
Set air pressure	MPa 0.2-0.5	
Unloaded oil discharge amount	L/min Refer to <b>page →235</b> for performance diagram.	
Tank capacity*2	L H.L. 1.5	L.L. 0.6
Operating temperature °C	5-60	
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent)	
Mass	kg 8.3	

\*1: Ask for consultation on specifications that exceed discharge oil pressure range.  
 \*2: Oil level in the tank should be always between H.L. and L.L. of the gauge.

### Dimensions

#### HCT-□ Single acting circuit control unit



Control unit

HCT Manual operated



Pascal pump model X63

- Air-driven, compact, high performance hydraulic pump.
- Pascal pump is a compact but reliable hydraulic pump, which converts a compressed air force into high-pressure hydraulic power.
- Secure and high speed reciprocation of air and hydraulic piston generates a repetitive suction and discharge of air and oil. As the hydraulic pressure becomes close to the designated level, the reciprocation becomes slower. At the designated hydraulic pressure, the driving air force and hydraulic force become balanced to maintain the pressure.
- At the balanced condition, there is no air consumption so that there is no power loss or temperature rise compared to an electric pump. In the event of an air supply failure, the hydraulic pressure can be kept by the built-in check valve on the discharge side.
- If there is a decrease in the downstream holding pressure, the pump immediately reacts to start reciprocating to recover the pressure loss.

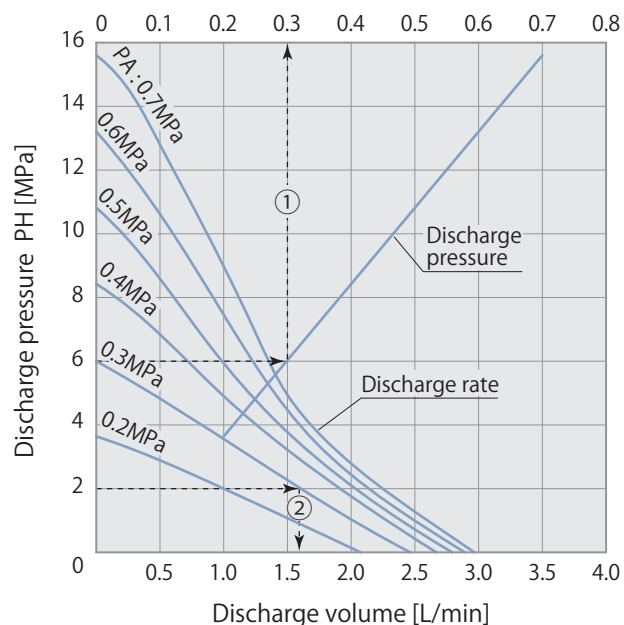
Model	X6312	X6316	
Control unit models	HCD4H-W HCD4H-S HCSD-H4U HCSD-H4A HCT-4	HCD5H-W HCD5H-S HCSD-H5U HCSD-H5A HCT-5	Air pressure range :0.2–0.7 MPa Air consumption :0.4 Nm <sup>3</sup> /min Operating noise :78±1 db (A) Operating temperature :0–70 °C (No frozen)
Boosting ratio	24	15	
Mass	2.6 kg		

**Performance diagram [Measured with operating oil ISO-VG32 at 20°C]**

**X6312**

PH = 24 (PA-0.05)

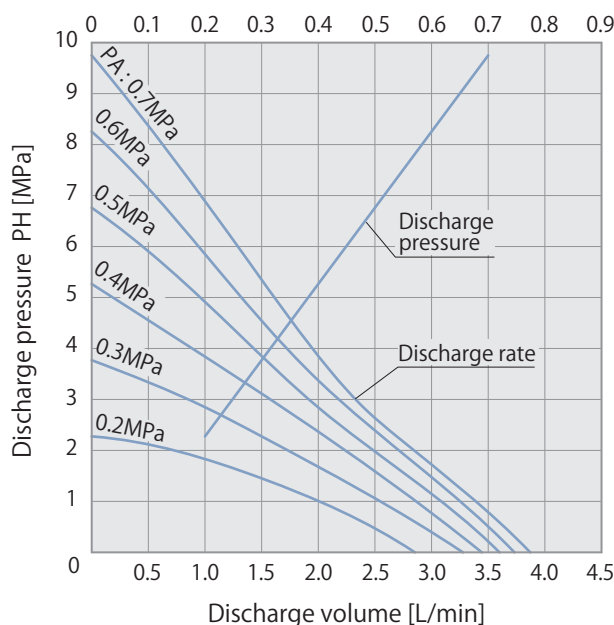
Air pressure PA [MPa]



**X6316**

PH = 15 (PA-0.05)

Air pressure PA [MPa]



**1. How to read the discharge pressure (PH)\* [ex:X6312]**

\*:PH is the pump discharge pressure when cylinders are clamped and the circuit pressure is built up.

When 6 MPa is required for PH, the desired air pressure (PA) should be 0.3 MPa by following the chain line ①.

**2. How to read the discharge volume [ex:X6312]**

When 0.3 MPa air pressure (PA) is supplied, with discharge pressure at 2 MPa, the discharge volume should be 1.6 L/min by following the chain line ②. (Pump discharge pressure while cylinders are in action may vary according to the circuit structure.)

Table of contents

Rotary joint Structure, Specifications, Dimensions	
25MPa Single rotary standard WRA□	238
25MPa Single rotary with flange WRA□F	240
25MPa Double rotary with flange WRA□□	242
7MPa Single rotary with flange WRB□	244
Rotating torque, Allowable rotations	246
Caution in use	247



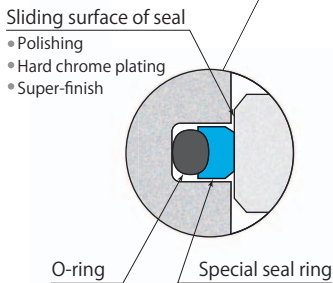
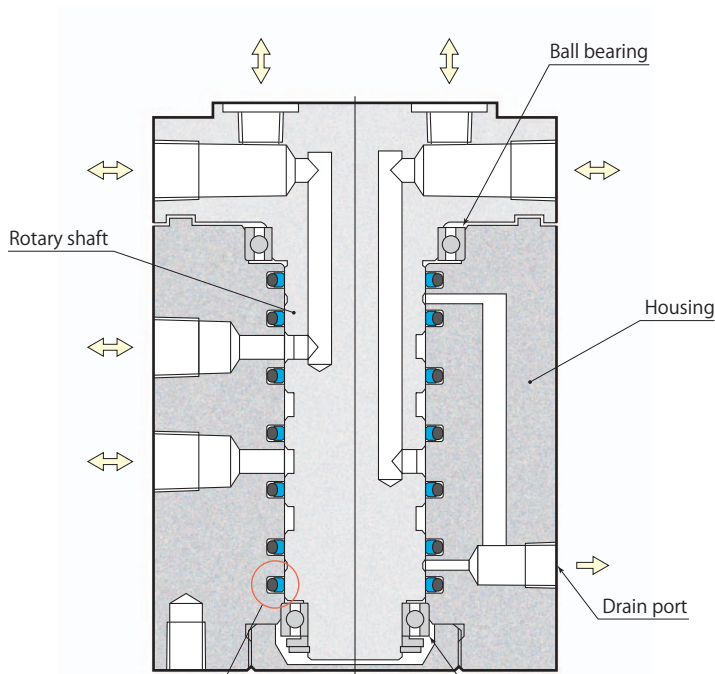
# Rotary joint





Single rotary standard 25MPa

model WRA □



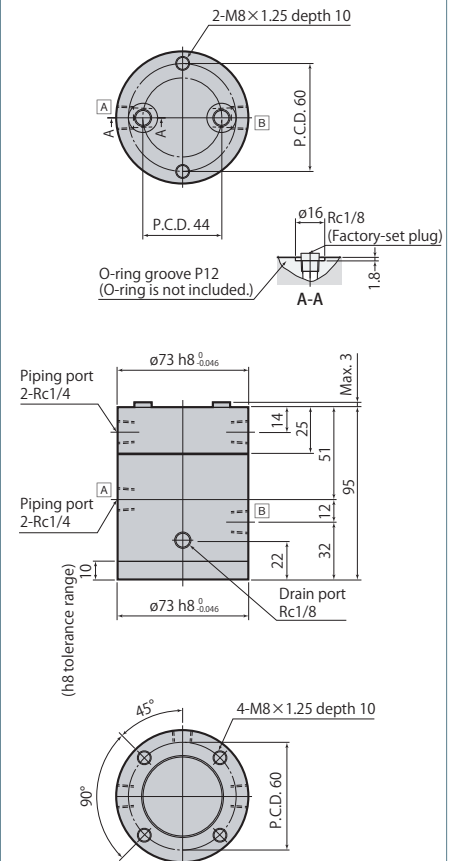
Sliding surface is polished, hard chrome plated and then super-finished to offer superior seal performance and durability.

Rotary joints are best suited for supplying hydraulic pressure and air to rotary table of machining center on which use of secured hydraulic hoses or fixed piping is difficult.

Four types are available with 2 to 8 circuits, and each circuit can be used independently.

2 circuits

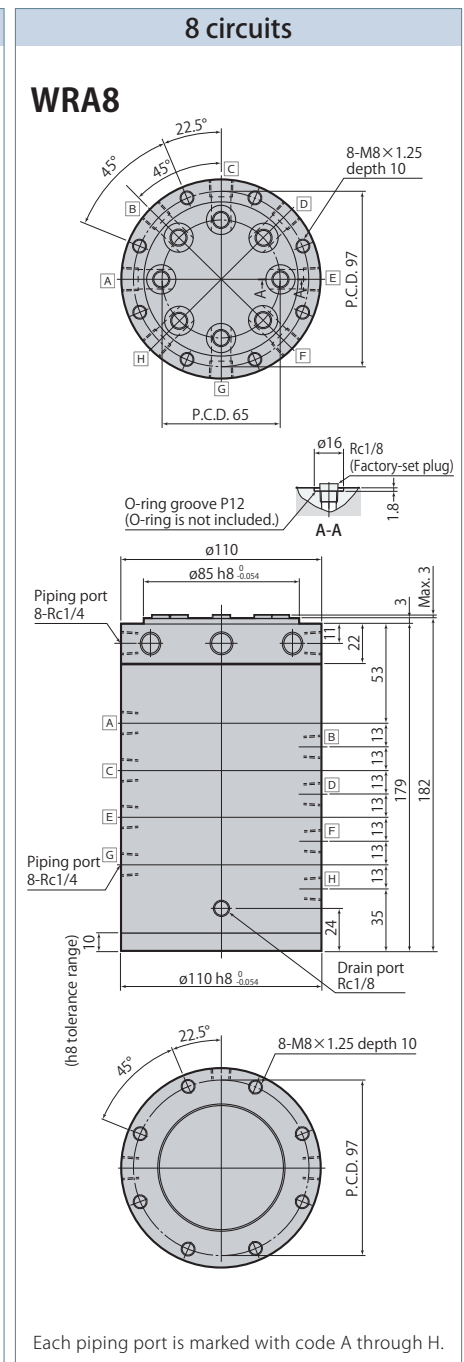
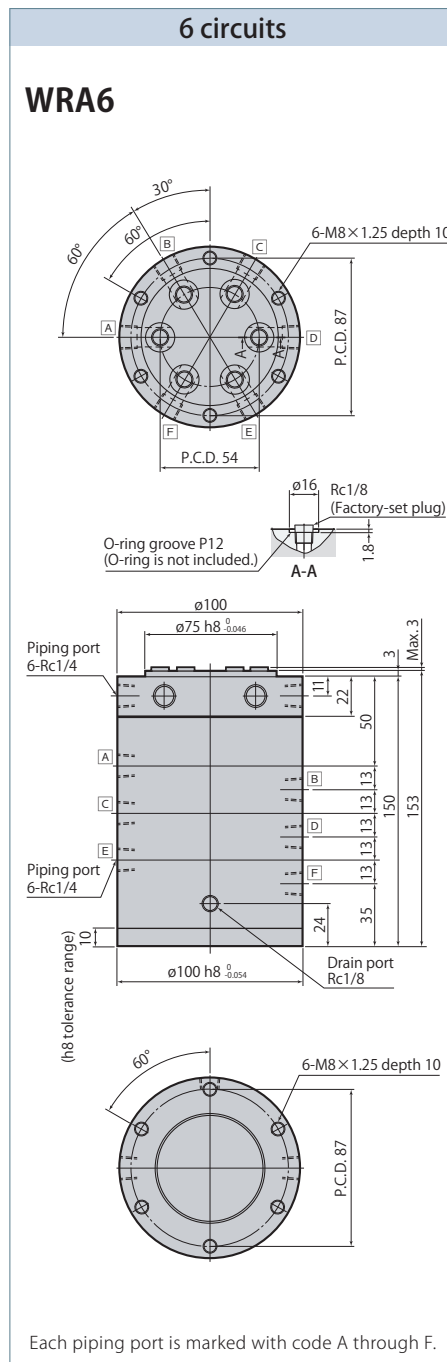
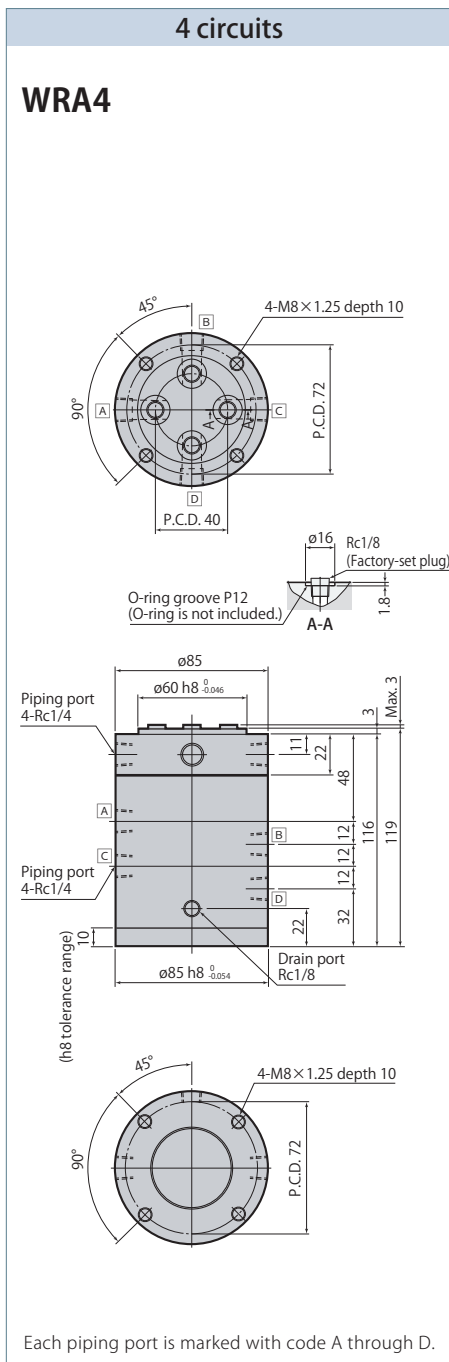
WRA2



Each piping port is marked with code A or B.

Specifications

Model	WRA2	WRA4	WRA6	WRA8
Number of circuits	2 circuits	4 circuits	6 circuits	8 circuits
Orifice area mm <sup>2</sup>	20.4			
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent) or air			
Max. pressure MPa	25			
Allowable rotations	Varies depending on fluid pressure (refer to <b>page →246</b> for details on allowable rotations.)			
Operating temperature °C	0–70			
Piping port size	Rc1/4 (body upper surface is Rc1/8)			
Mass kg	3.0	5.0	8.9	12.9



● Mounting screws are not included.

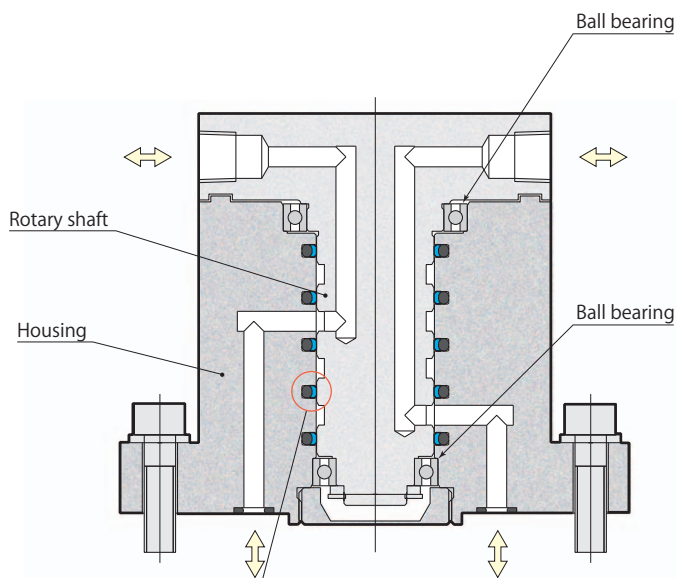
## Single rotary with flange 25MPa

model WRA□F



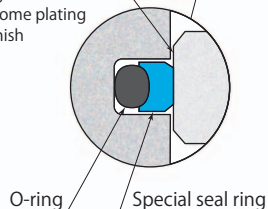
Single rotary with flange is a compact type rotary joint with mounting section of the body shaped in the form of flange to keep the overall height low. Four types are available with 2 to 8 circuits, and each circuit can be used independently.

Fluid should be supplied from flange side of the body with manifold piping.



## Sliding surface of seal

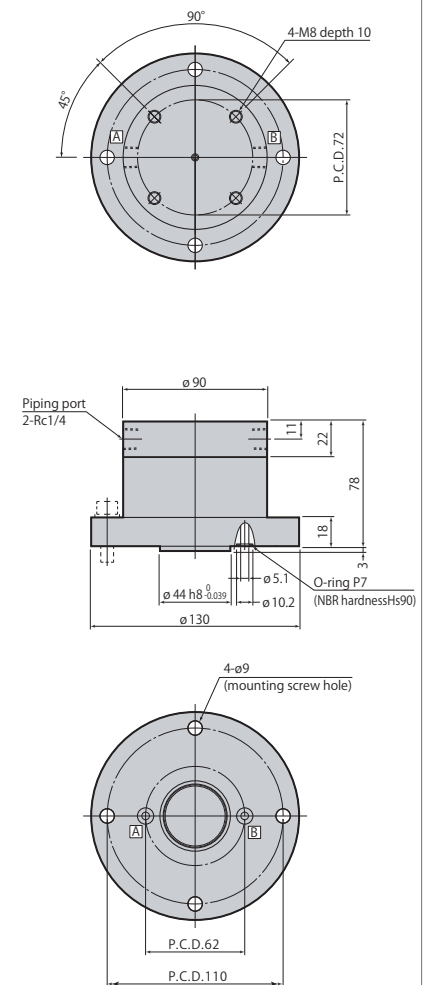
- Polishing
- Hard chrome plating
- Super-finish



Sliding surface is polished, hard chrome plated and then super-finished to offer superior seal performance and durability.

## 2 circuits

## WRA2F



Each piping port is marked with code A or B. The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

Specifications

Model	WRA2F	WRA4F	WRA6F	WRA8F
Number of circuits	2 circuits	4 circuits	6 circuits	8 circuits
Orifice area mm <sup>2</sup>	20.4			
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent) or air			
Max. pressure MPa	25			
Allowable rotations	Varies depending on fluid pressure (refer to <b>page →246</b> for details on allowable rotations.)			
Operating temperature °C	0-70			
Piping port size	Rc1/4 (body lower surface is manifold piping)			
Mass kg	4.9	6.1	10.9	14.9

### 4 circuits

## WRA4F

Each piping port is marked with code A through D. The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

### 6 circuits

## WRA6F

Each piping port is marked with code A through F. The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

### 8 circuits

## WRA8F

Each piping port is marked with code A through H. The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

● Mounting screws are not included.

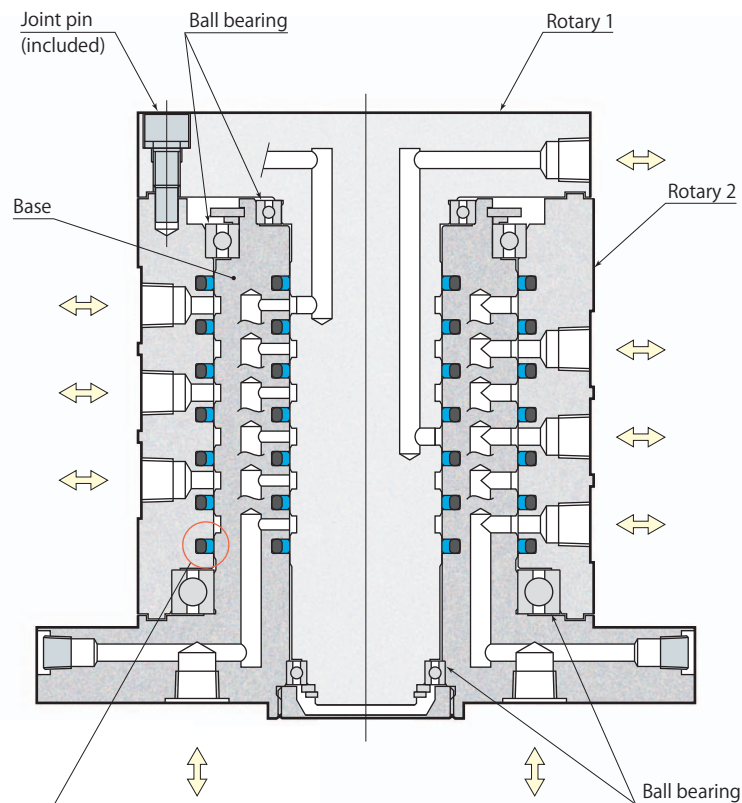
## Double rotary with flange 25MPa

model WRA□□



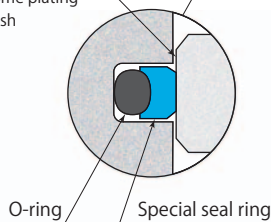
Double rotary type combines two rotaries on same axis to keep the overall height lower still. Two types are available with 12 or 16 circuits, and each circuit can be used independently.

Rotary 1 and Rotary 2 rotate independently but they can be synchronized by using a joint pin (included).



Sliding surface of seal

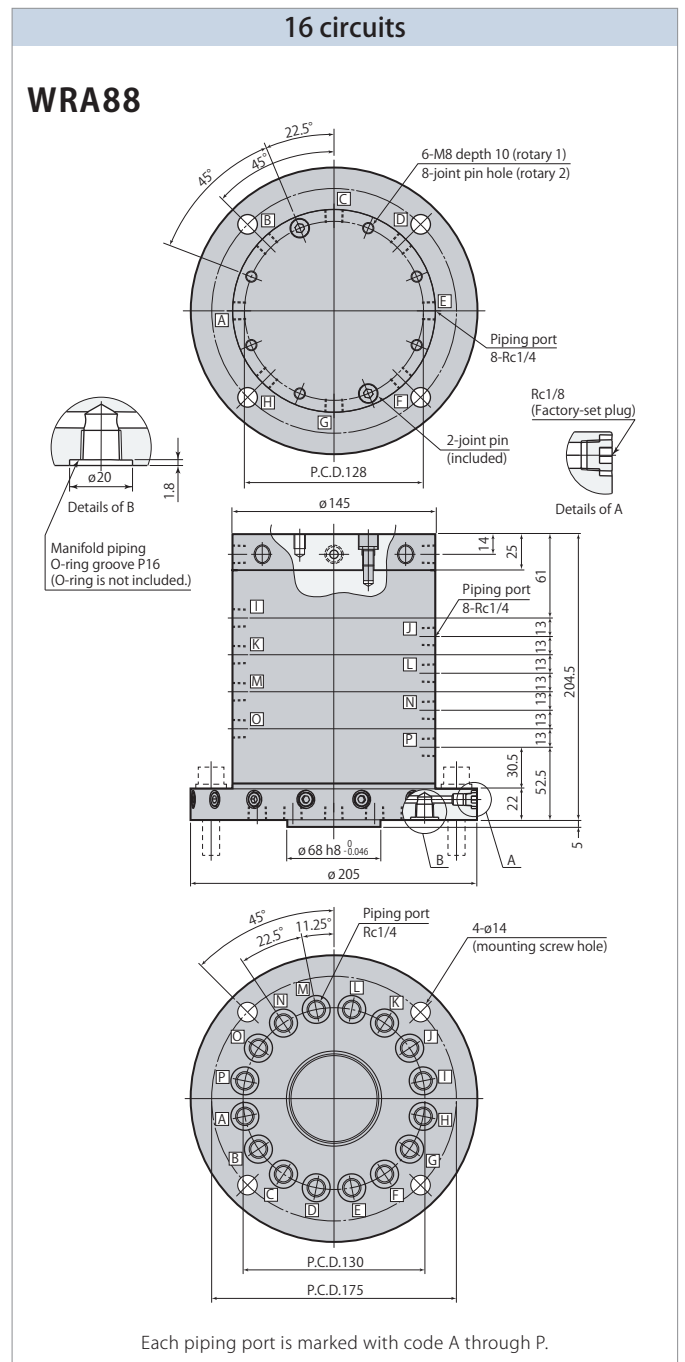
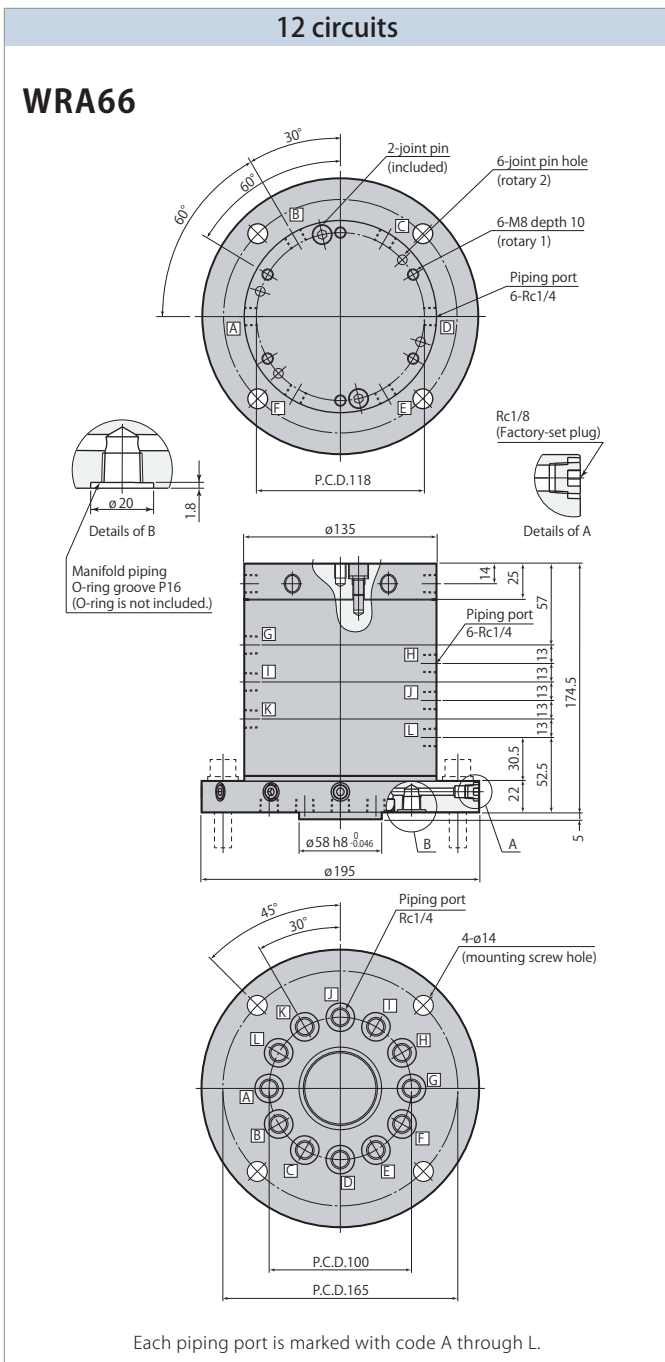
- Polishing
- Hard chrome plating
- Super-finish



Sliding surface is polished, hard chrome plated and then super-finished to offer superior seal performance and durability.

Specifications

Model		WRA66	WRA88
Number of circuits		12 circuits	16 circuits
Orifice area	mm <sup>2</sup>	A-F port : 8.6    G-L port : 20.4	A-H port : 8.6    I-P port : 20.4
Fluid used		General mineral based hydraulic oil (ISO-VG32 equivalent) or air	
Max. pressure	MPa	25	
Allowable rotations		Varies depending on fluid pressure (refer to <b>page →246</b> for details on allowable rotations.)	
Operating temperature	°C	0-70	
Piping port size		Rc1/4	
Mass	kg	22	30



● Mounting screws are not included.



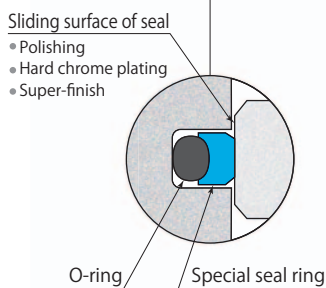
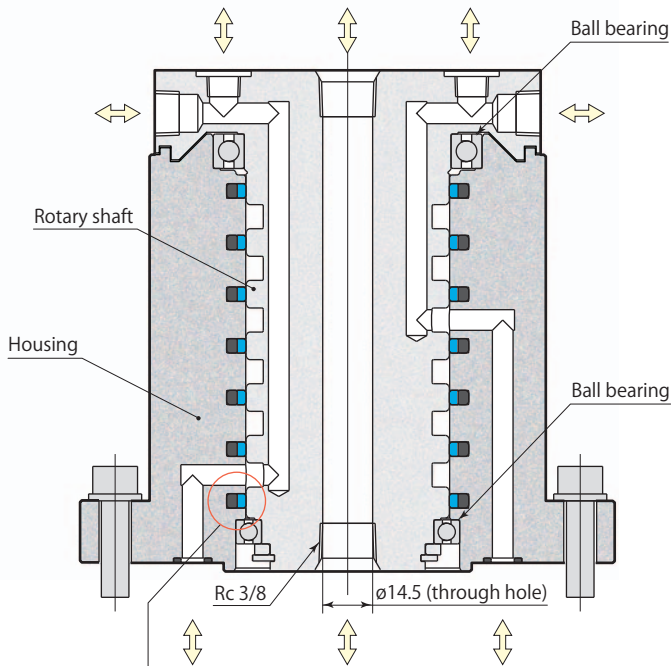
## Single rotary with flange 7MPa

model WRB □



Rotary joint model WRB was developed for low pressure applications. Aluminum is adopted as body material to reduce the weight. This is a center through type, which the through bore of rotary shaft can be used for coolant piping.

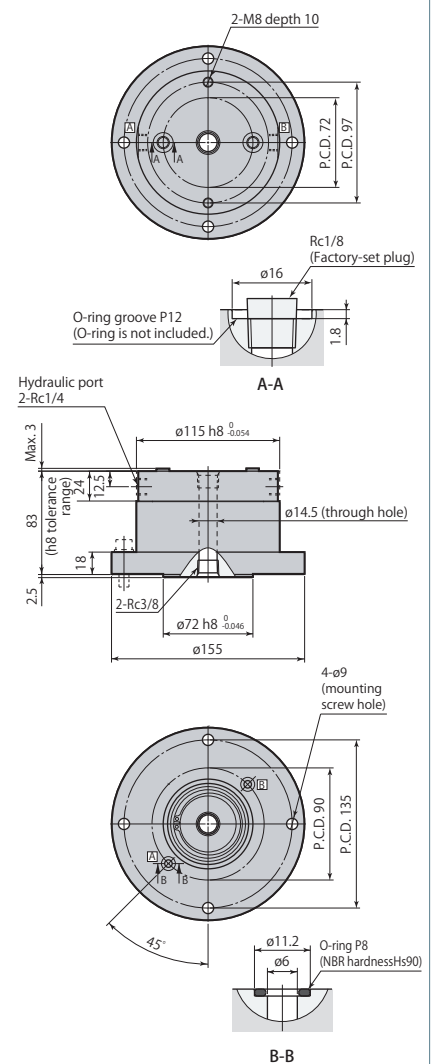
Single rotary with flange is a compact type rotary joint with mounting section of the body shaped in the form of flange to keep the overall height low. Four types are available with 2 to 8 circuits, and each circuit can be used independently. Fluid should be supplied from flange side of the body with manifold piping.



Sliding surface is polished, hard chrome plated and then super-finished to offer superior seal performance and durability.

## 2 circuits

## WRB2

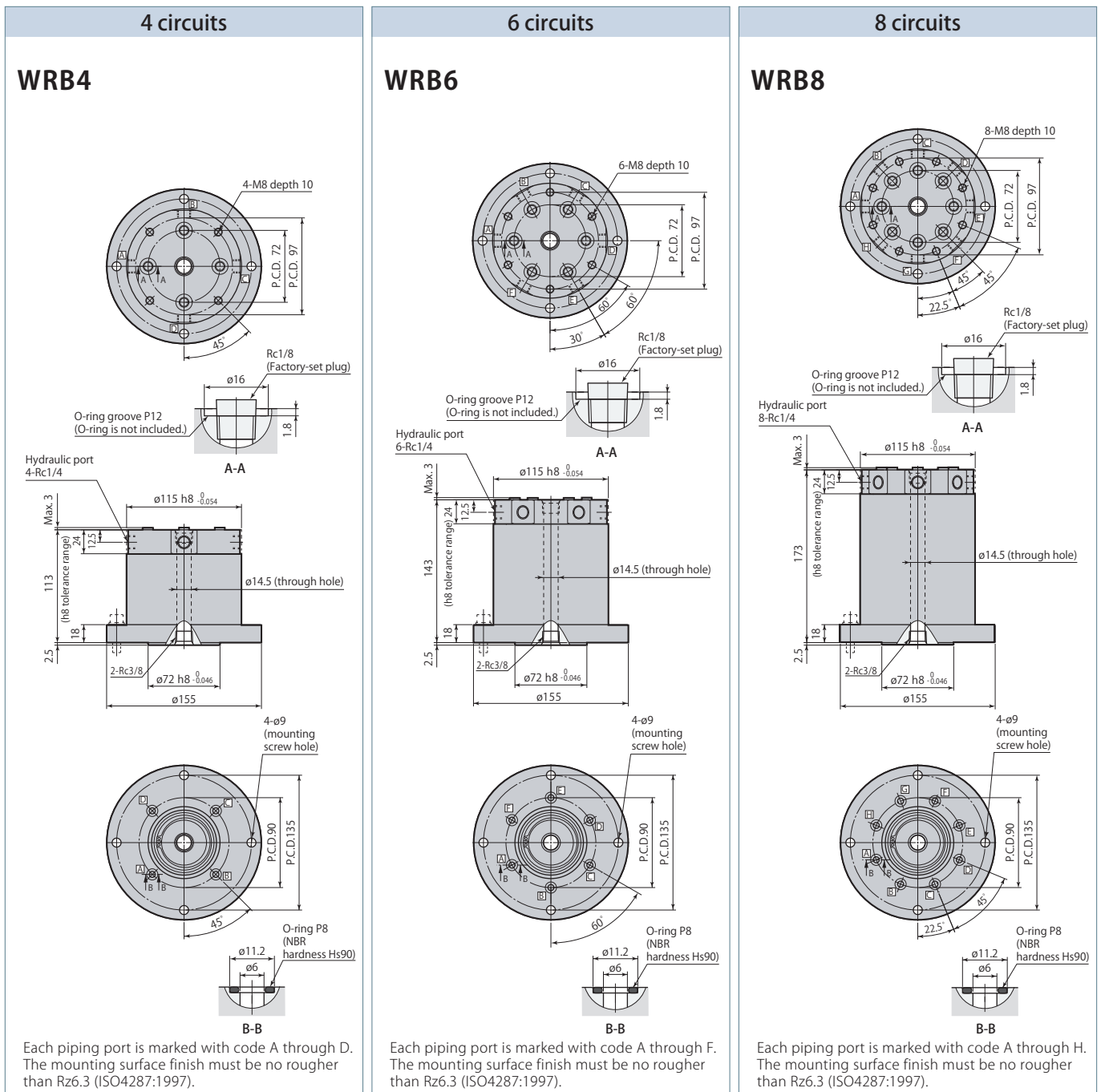


Each piping port is marked with code A or B. The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

### Specifications

Model	WRB2	WRB4	WRB6	WRB8
Number of circuits	2 circuits+1 circuit*	4 circuits+1 circuit*	6 circuits+1 circuit*	8 circuits+1 circuit*
Orifice area mm <sup>2</sup>	28.3			
Fluid used	General mineral based hydraulic oil (ISO-VG32 equivalent) or air (center through circuit: coolant)			
Max. pressure MPa	7			
Allowable rotations	Varies depending on fluid pressure (refer to <b>page →246</b> for details on allowable rotations.)			
Operating temperature °C	0–70			
Piping port size	Body lower surface is manifold piping, upper surface is Rc1/8, side surface is Rc1/4, center through is Rc3/8			
Mass kg	4.5	5.5	6.5	7.5

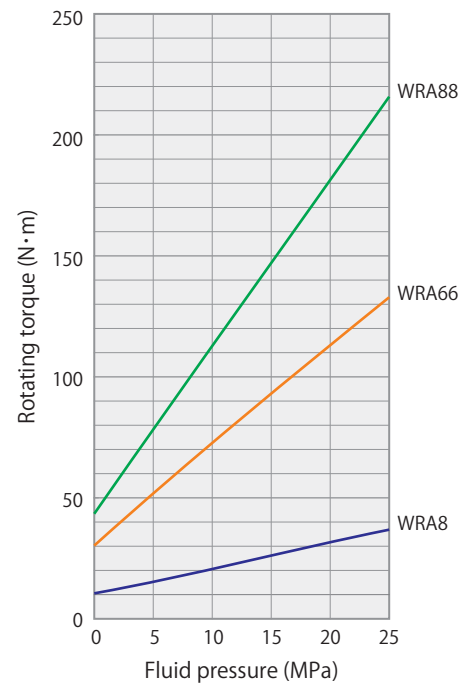
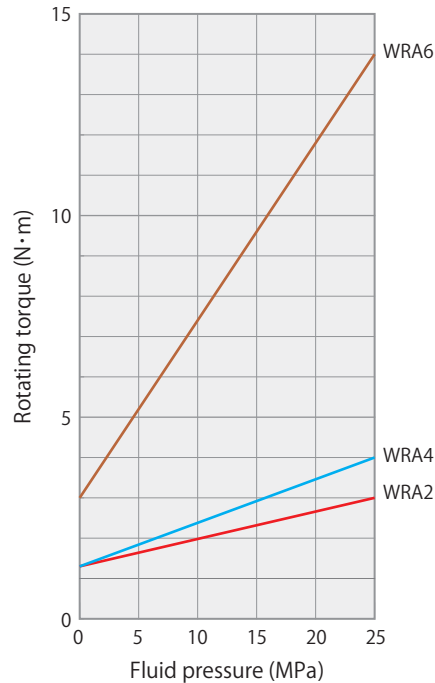
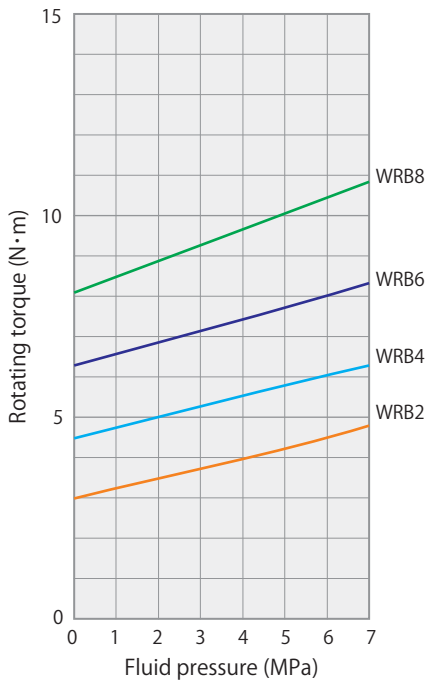
\*: +1 circuit indicates a center through circuit (coolant).



● Mounting screws are not included.

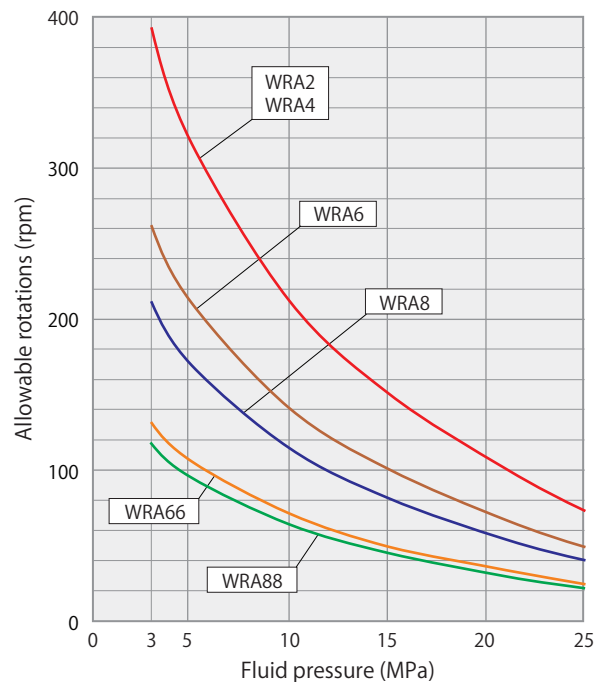
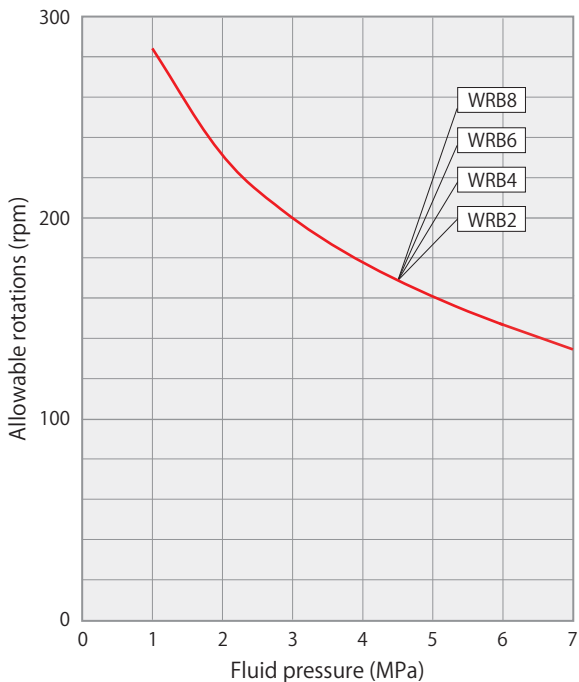


### Rotating torque (reference)



1. Diagram above depicts torque (sliding resistance of packing) for stable rotation.
2. Starting torque may become twice as much as torque during stable rotation.
3. There is variance of torque with each product.
4. Rotating torque values indicated above are reference values.

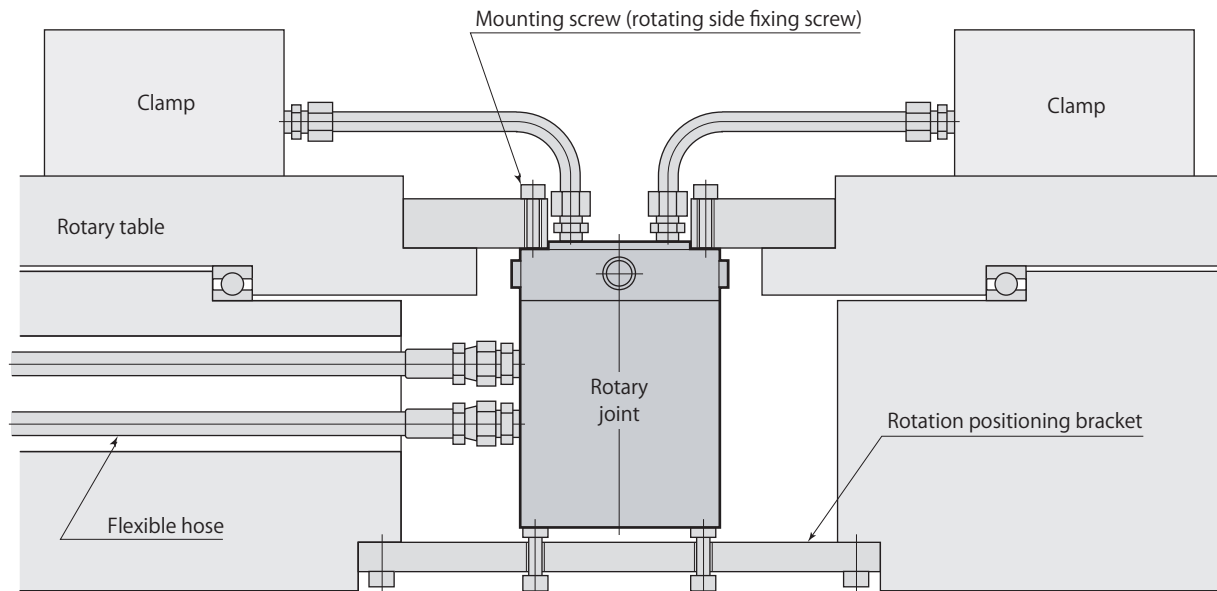
### Allowable rotations



1. Diagram above depicts allowable rotation when proper lubrication oil film has been formed.
2. Simultaneous use of maximum values is not possible, since used fluid pressure, rotating speed and operating temperature mutually affect each other.

### Caution in use

1. Fluid applied is limited to general mineral based hydraulic oil or air. Contact us concerning other fluid.
2. When applying hydraulic oil to rotary joint, oil film leakage to adjacent circuits is inevitable. When the oil and air circuits are being allocated in one rotary joint, be sure to allocate a circuit between them as a drain circuit. (If the air circuit can tolerate the oil leakage, drain circuit is not mandatory.)
3. Non-stop operation should be avoided, as heat from packing's sliding resistance is generated.
4. At installation, fixate the rotating side. For the stationary side, only the rotational restraint should be provided to avoid an eccentric overload. (Refer to diagram below.)
5. Flexible hose must be used for piping when installation. Do not use the steel tube.
6. When using mineral hydraulic oil, drain port should have an independent piping to return the oil directly to tank.







	Model	Page		Model	Page
<b>8FK</b>	8FK□	174	<b>CVJ</b>	CVJ□-□	202
<b>CEA</b>	CEA□-□	192	<b>HCD</b>	HCD□H-S	231
<b>CEK</b>	CEK-□□-□	184		HCD□H-W	230
<b>CLT</b>	CLT□-□	80	<b>HCS</b>	HCS□H□A	233
<b>CLU</b>	CLU□-□	64		HCS□H□U	232
<b>CLU-A</b>	CLU□-□A	68	<b>HCT</b>	HCT-□	234
<b>CLU-E</b>	CLU□-□E	67	<b>VCB</b>	VCB-L□	214
<b>CMC</b>	CMC□-□□□	116	<b>VCE</b>	VCE□	54, 88, 124, 172
<b>CMD</b>	CMD□-□	119	<b>VCF</b>	VCF□-□	52, 86, 122, 170
<b>CMH</b>	CMH□-□	121	<b>VCP</b>	VCP-LG	216
<b>CNA-A</b>	CNA□-□□A□	106	<b>VEF</b>	VEF-L□	222
<b>CNA-E</b>	CNA□-□□E	104	<b>VHD</b>	VHD-L□-□□□	218
<b>CNA-M</b>	CNA□-□M□	102	<b>VRG</b>	VRG-L□	220
<b>CNA-P</b>	CNA□-□P□	100	<b>WPB</b>	WPB□-□□-□	225
<b>CNA-T</b>	CNA□-□T□	96	<b>WPC</b>	WPC□L-□□	228
<b>CSK</b>	CSK□-□	160	<b>WRA</b>	WRA□	238
<b>CSN</b>	CSN□-□□	152		WRA□□	242
<b>CSN-B</b>	CSN□-□B	156		WRA□F	240
<b>CSP</b>	CSP□-A	164	<b>WRB</b>	WRB□	244
	CSP□-C	164	<b>X63</b>	X63□	235
	CSP□-D	167			
	CSP□-F	120, 168			
<b>CST</b>	CST□-□	142			
<b>CSU</b>	CSU□□-□□	136			
<b>CSU-B</b>	CSU□-□B	138			
<b>CSY</b>	CSY□-□□	154			
<b>CSY-B</b>	CSY□-□B	156			
<b>CTH</b>	CTH□-CQ	48			
	CTH□-TN	41			
	CTH□-TNR	43			
	CTH□-TS	25, 39			
<b>CTT</b>	CTT□-□	32			
<b>CTT-N</b>	CTT□-□N30, 45, 60	37			
<b>CTT-P</b>	CTT□-□P	35			
<b>CTU</b>	CTU□-□	10			
<b>CTU-A</b>	CTU□-□A	16			
<b>CTU-E</b>	CTU□-□E	14			
<b>CTU-N</b>	CTU□-□N30, 45, 60	21			
<b>CTU-P</b>	CTU□-□P	15			
<b>CTU-S</b>	CTU□-□S□	22			
<b>CVH</b>	CVH□□	198			
<b>CVH-J</b>	CVH□□-J	200			

Work clamp & work support 7 MPa

● Swing clamp

Old model	New model	End date
<b>CTE</b>	<b>CTT</b>	September 2003
<b>CTG</b>	<b>CTU</b>	September 2003
<b>CTF</b>	<b>CTU</b>	April 2000

● Link clamp

Old model	New model	End date
<b>CLR</b>	<b>CLT</b>	April 2004
<b>CLG</b>	<b>CLU</b>	February 2004
<b>CLC</b>	<b>CLT</b>	January 2001
<b>CLD</b>	<b>CLU</b>	February 2000

● Work support

Old model	New model	End date
<b>CSH</b>	<b>CSU</b>	June 2009
<b>CSG</b>	<b>CST</b>	June 2009

Work positioning cylinder

● Work positioning cylinder

Old model	New model	End date
<b>CGK</b>	<b>CEK</b>	November 2013

Hydraulic control system 7 MPa

● Coupling valve

Old model	New model	End date
<b>VHC</b>	<b>VHD</b>	December 2010

● Reducing valve

Old model	New model	End date
<b>VRD</b>	<b>VRG</b>	October 2008

● Sequence valve

Old model	New model	End date
<b>VED</b>	<b>VEF</b>	January 2014

● Control unit

Old model	New model	End date
<b>HCD□</b>	<b>HCD□H</b>	November 2015

● Control unit

Old model	New model	End date
<b>HCK</b>	<b>HCT</b>	November 2011

● Pascal pump

Old model	New model	End date
<b>HPX</b>	<b>X63</b>	July 2013

