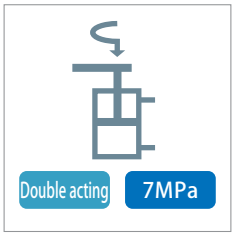
Swing clamp

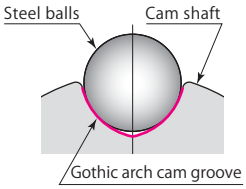
model
BTU



Block-type swing clamp that requires no spacer

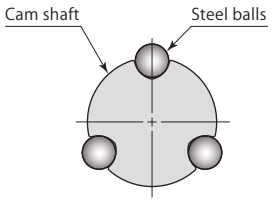
Gothic arch cam groove

Superior durability, high frequency, and high-speed swinging operation is achieved thanks to lowered and controlled seating surface pressure. This is made possible by adopting gothic arch cam grooves that use steel balls with larger surface area.



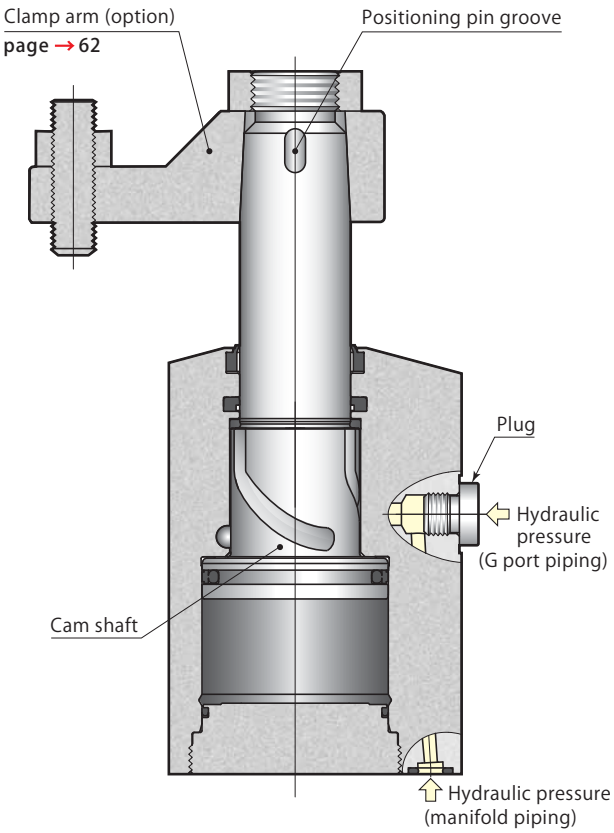
3-point ball support

Smooth, stable and high-speed swinging operation has been achieved by 3-point ball support mechanism.



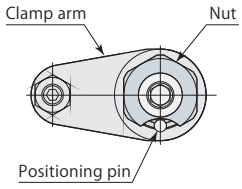
Large diameter cam shaft and wide distance between the cam grooves offers higher rigidity. A overload protection mechanism is not needed due to improvement of durability and impact resistance, providing stable and secure high-speed swing operation.

Cam groove view



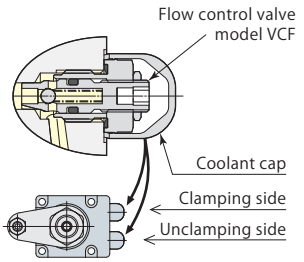
Clamp arm positioning & replacement

Positioning pin groove adopted with all models. Positioning (angle) of clamp arm can be performed easily.



Flow control valve

Operating speeds can be adjusted individually by mounting a flow control valve (option), making sequential operation on same circuit or control of synchronization operation easier. **page → 151**



2-way hydraulic piping

G thread piping connection port and manifold piping connection port are available.

Specifications

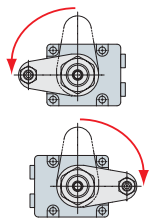
Model			BTU02	BTU04	BTU06	BTU10	BTU16	BTU25
Cylinder force (hydraulic pressure 7 MPa)		(kN)	2.8	4.4	6.3	9.9	16.3	25.8
Clamping force *1	Hydraulic pressure 7 MPa	(kN)	2.4	3.8	5.3	8.3	13.5	21.2
	Clamp arm length (LH)	(mm)	35	40	50	60	70	90
Cylinder inner diameter		(mm)	29	36	42	52	65	82
Rod diameter		(mm)	18	22.4	25	30	35.5	45
Effective area (clamp)		(cm^2)	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)	18	20.5	23.5	26.5	28.5	36
Swing stroke		(mm)	10	12.5	13.5	16.5	18.5	23
Clamp stroke		(mm)	8	8	10	10	10	13
Max. swing torque *2		(N·m)	0.7	1.6	1.8	3.4	5.6	9.3
Cylinder capacity	Clamp	(cm^3)	7.3	12.8	21.0	37.5	66.4	132.9
	Unclamp	(cm^3)	11.9	20.9	32.6	56.3	94.6	190.1
Mass		(kg)	1.4	1.9	2.6	4.4	6.9	12.9

Working 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)
*1 : Clamping force varies depending on clamp arm length. Refer to section on 7 MPa swing clamp model CTU (**page →37**) for details.
*2 : This is the limit value for lifting arm at 1 MPa when mounted vertically.
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 designation

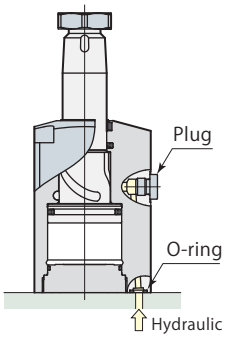
BTU ①-② (Example : BTU06-R)

	① Size (refer to specification table)		② Swing direction (when clamping)
BTU	**02** **04** **06** **10** **16** **25**	–	**L** : Counter-clockwise **R** : Clockwise

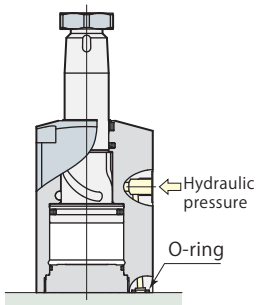


Piping method

Manifold piping

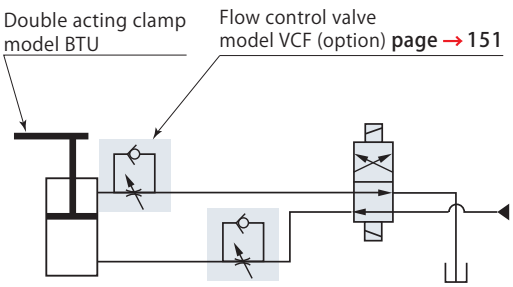


G port piping



Two piping methods are available for model BTU, manifold piping and G port piping.
Dismount plug when using G port piping. Whichever method is chosen for piping, O-ring must be used.
Refer to **page →155** for details on G port piping flareless fitting.

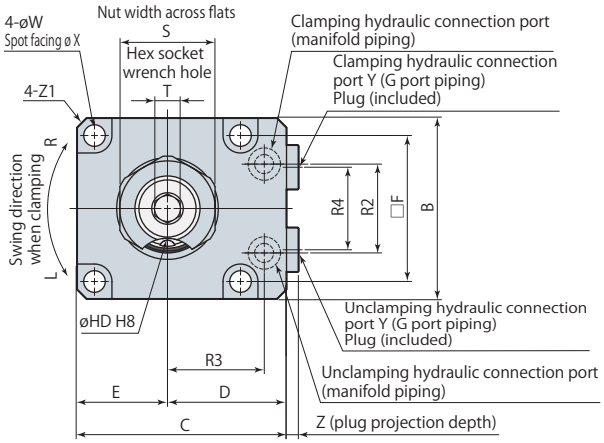
Hydraulic circuit diagram (reference)

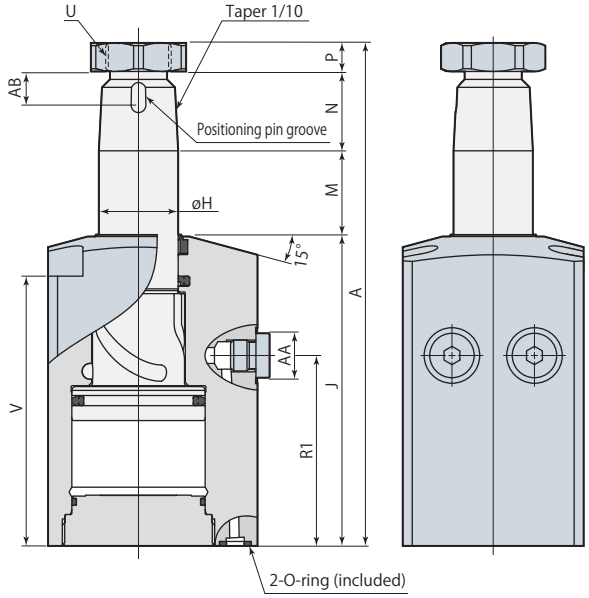


For flow control valve, we recommend the meter-in control. If meter-out control is used, due to the area difference, it will cause back pressure and become high pressure. This can lead to malfunction of the system. Please be aware when designing the circuit.

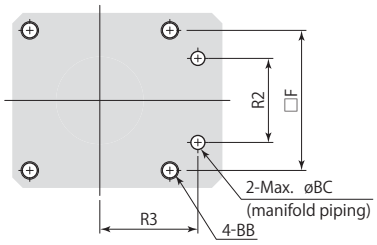
Dimensions

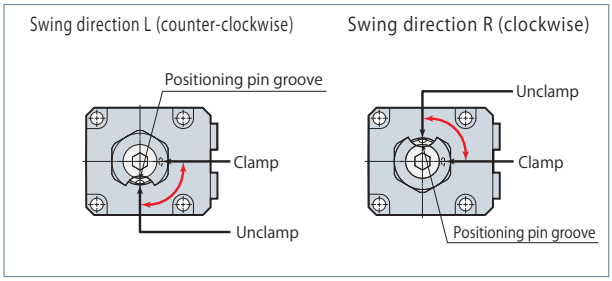
BTU 02 04 06 10 16 25 – L R





Mounting details

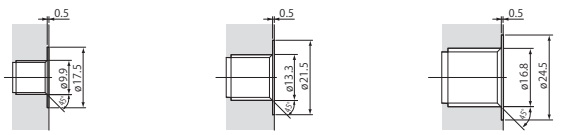




(mm)

Model	BTU02-L/R	BTU04-L/R	BTU06-L/R	BTU10-L/R	BTU16-L/R	BTU25-L/R
A	131	148.5	158.5	178.5	201.5	244
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
H	18	22.4	25	30	35.5	45
J	81.5	90.5	97.5	111.5	123	147
M	21.5	24	27	30	31.5	39
N (arm thickness)	20	25	25	27	35	45
P (nut thickness)	8	9	9	10	12	13
R1	52.5	57	60	70	76	92
R2	22	24	28	36	45	50
R3	25	28	30.5	36	42	57
R4	20	22	26	30	38	50
S (nut width across flats)	22	27	30	36	46	55
T (hex socket wrench hole)	6	6	8	8	10	14
U (recommended tightening torque)	M14×1.5 (26 N·m)	M18×1.5 (51 N·m)	M20×1.5 (60 N·m)	M24×1.5 (86 N·m)	M30×1.5 (120 N·m)	M39×1.5 (180 N·m)
V	71	80	85	95	102.5	121.5
W	5.5	5.5	6.8	9	11	14
X	9.5	9.5	11	14	17.5	20
Y *1	G1/8	G1/8	G1/8	G1/4	G1/4	G3/8
Z	3.8	3.8	3.8	4.8	4.8	4.8
Z1	C3	C3	C3	C4	C6	C6.5
O-ring *2	P7	P7	P7	P8	P8	P10
AA	14	14	14	19	19	22
AB	10.5	10.5	10.5	12.5	12.5	14.5
BB	M5	M5	M6	M8	M10	M12
BC	4	4	4	6	6	8
HD	4 $^{+0.018}_{0}$	4 $^{+0.018}_{0}$	5 $^{+0.018}_{0}$	6 $^{+0.018}_{0}$	6 $^{+0.018}_{0}$	6 $^{+0.018}_{0}$
Positioning pin	ø4(h8)×10	ø4(h8)×10	ø5(h8)×10	ø6(h8)×12	ø6(h8)×12	ø6(h8)×14

*1



*2 : Material used for O-ring is fluorocarbon (with hardness Hs90).

Note 1. This diagram indicates unclamped condition of swing direction L (counter-clockwise).
Direction of positioning pin groove will be hydraulic connection port side at the time of clamping.
Refer to diagram on left for relationship between swing direction and positioning pin groove.

2. The mounting surface finish must be no rougher than Rz6.3 (ISO4287:1997).

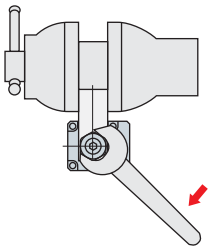
3. Positioning pins and mounting screws are not included.

4. Refer to **pages →61 and 62** for details on taper sleeve and clamp arm.

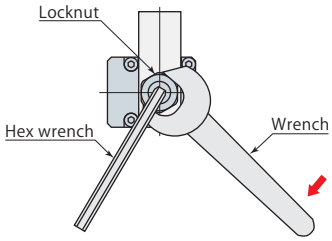
Mounting & dismounting of clamp arm

1. 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.
2. Be sure to tighten locknut with recommended tightening torque (refer to **pages →39, 53 and 59** for recommended tightening torque). If the tightening torque is insufficient, clamp arm may slip during operation.

Mounting of clamp arm

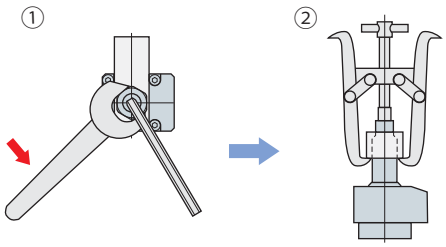


Fix the clamp arm in a vise, then set the clamp body and clamp arm at the desired orientation, and tighten locknut with a wrench.



For clamps that are mounted on jig, set clamp arm at desired orientation as shown in diagram above. 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



① Insert hex wrench to hex socket at tip section of piston rod to ensure that piston rod is held in place, then loosen locknut with wrench.

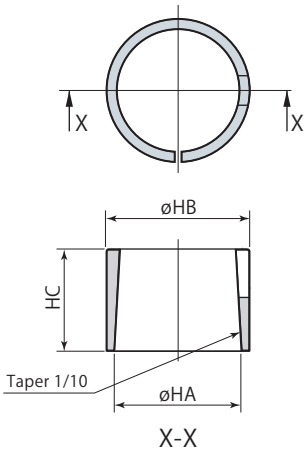
② After dismounting the locknut, pull out clamp arm using gear puller.

Model designation

CTH ①-TS (Example : CTH06-TS)

	① Size (refer to specification table)		
CTH	**01** **02** **04** **06** **10** **16** **25**	–	**TS** : Taper sleeve

Taper sleeve

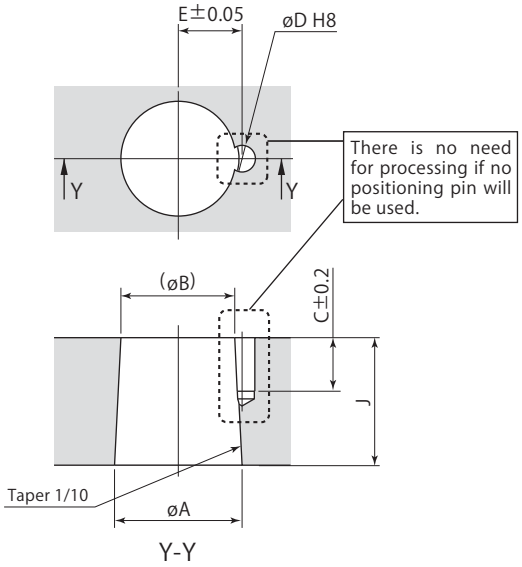


(mm)

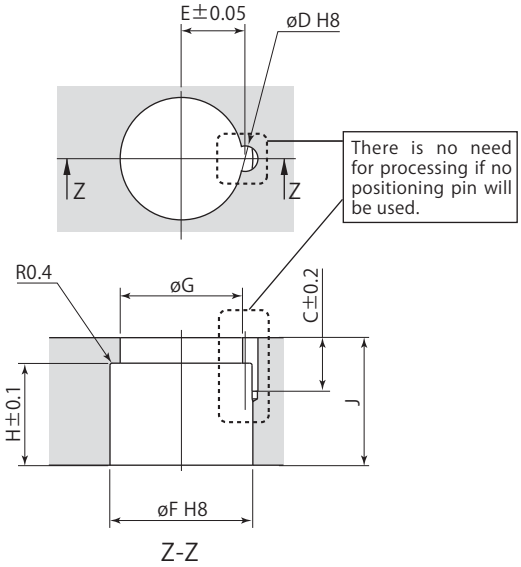
Model	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS
HA	14	18	22.4	25	30	35.5	45
HB	16	20	25	28	34	40	49
HC	13	16	21	20	22	29	38

Clamp arm details

Not using taper sleeve



Using taper sleeve



(mm)

Clamp models	CTU01 CTT01	CTU02 CTT02 BTU02	CTU04 CTT04 BTU04	CTU06 CTT06 BTU06	CTU10 CTT10 BTU10	CTU16 CTT16 BTU16	CTU25 CTT25 BTU25
A	14 $^{-0.016}_{-0.034}$	18 $^{-0.016}_{-0.034}$	22.4 $^{-0.020}_{-0.041}$	25 $^{-0.020}_{-0.041}$	30 $^{-0.020}_{-0.041}$	35.5 $^{-0.025}_{-0.050}$	45 $^{-0.025}_{-0.050}$
B	12.4	16	19.9	22.5	27.3	32	40.5
C	9	10.5	10.5	10.5	12.5	12.5	14.5
D	3 $^{+0.014}_{0}$	4 $^{+0.018}_{0}$	4 $^{+0.018}_{0}$	5 $^{+0.018}_{0}$	6 $^{+0.018}_{0}$	6 $^{+0.018}_{0}$	6 $^{+0.018}_{0}$
E	7.55	9.1	11.1	12.6	15.1	18.1	22.6
F	16 $^{+0.027}_{0}$	20 $^{+0.033}_{0}$	25 $^{+0.033}_{0}$	28 $^{+0.033}_{0}$	34 $^{+0.039}_{0}$	40 $^{+0.039}_{0}$	49 $^{+0.039}_{0}$
G	13	17	21	24	28.5	34	42
H	13	16	21	20	22	29	38
J	16	20	25	25	27	35	45
Positioning pin	ø3(h8)×8	ø4(h8)×10	ø4(h8)×10	ø5(h8)×10	ø6(h8)×12	ø6(h8)×12	ø6(h8)×14
Taper sleeve models	CTH01-TS	CTH02-TS	CTH04-TS	CTH06-TS	CTH10-TS	CTH16-TS	CTH25-TS

Mounting of clamp and work support

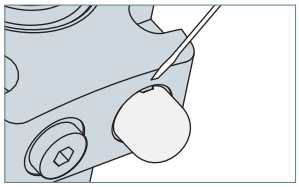
Use screws with ISO R898 class 12.9 for mounting clamp and work support and be sure to apply recommended torque for tightening, by referring to recommended tightening torque of mounting screws indicated below.

Recommended tightening torque of mounting screws (ISO R898 class 12.9)

Mounting screws size	Tightening torque
M4 ×0.7	2.8 N·m
M5 ×0.8	7 N·m
M6 ×1	11 N·m
M8 ×1.25	25 N·m
M10×1.5	49 N·m
M12×1.75	60 N·m

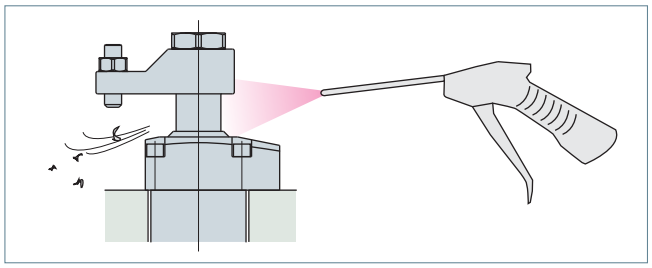
Mounting & dismounting of optional parts

1. 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.
2. When mounting a flow control valve or air bleeding valve, be sure to tighten it with the recommended tightening torque (refer to **pages →151 and 152** for recommended tightening torque).
3. 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.
4. When dismounting a coolant cap, use a sharp-pointed tool such as a precision screw driver by hooking the notched portion.



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.
4. The special scraper has superior scraping capability to remove oil film on the surface of the rod, there are cases where grease and working fluid (oil films) inside the clamp are scraped and expelled to the outside. This may result in accumulation of oil in the external perimeters of piston rod on the upper part of the scraper, but this does not indicate an oil leak.

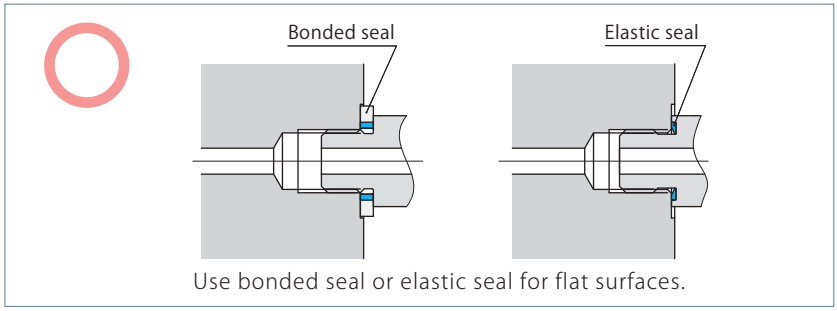
G port sealing method

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 with included with packing.

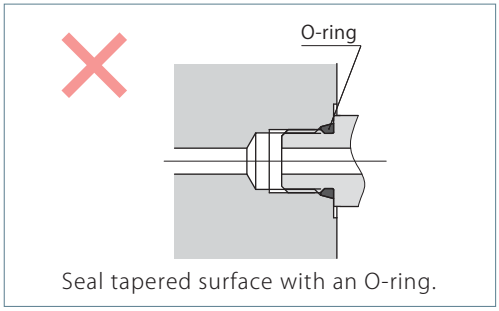
3. When mounting, clean metal chips and dust off surfaces that will come into contact with packing.

Sealing method for flange surfaces



Use bonded seal or elastic seal for flat surfaces.

Sealing method for tapered surfaces



Seal tapered surface with an O-ring.